ANNEX I : FIGURES

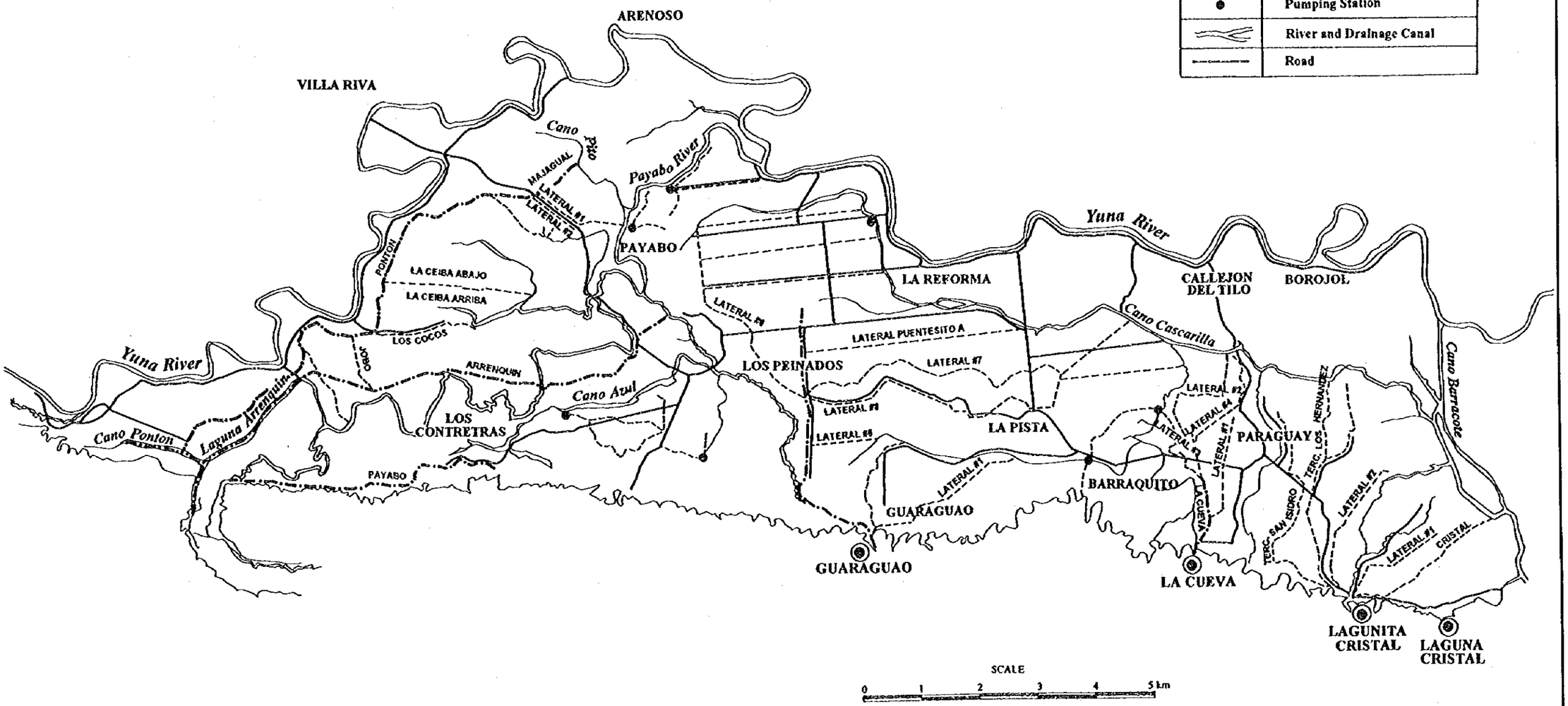


Fig I.2.1 Existing Irrigation Network

LEGEND			
	District	Irrigation Area (ha)	Pumping Irrigation Area (ha)
	Ponton	1,910	980
	Payabo	630	240
	Guaraguao	2,280	460
	La Cueva	330	30
	Lagunita	770	0
	Borojol	760	760
	Total	6,680	2,470

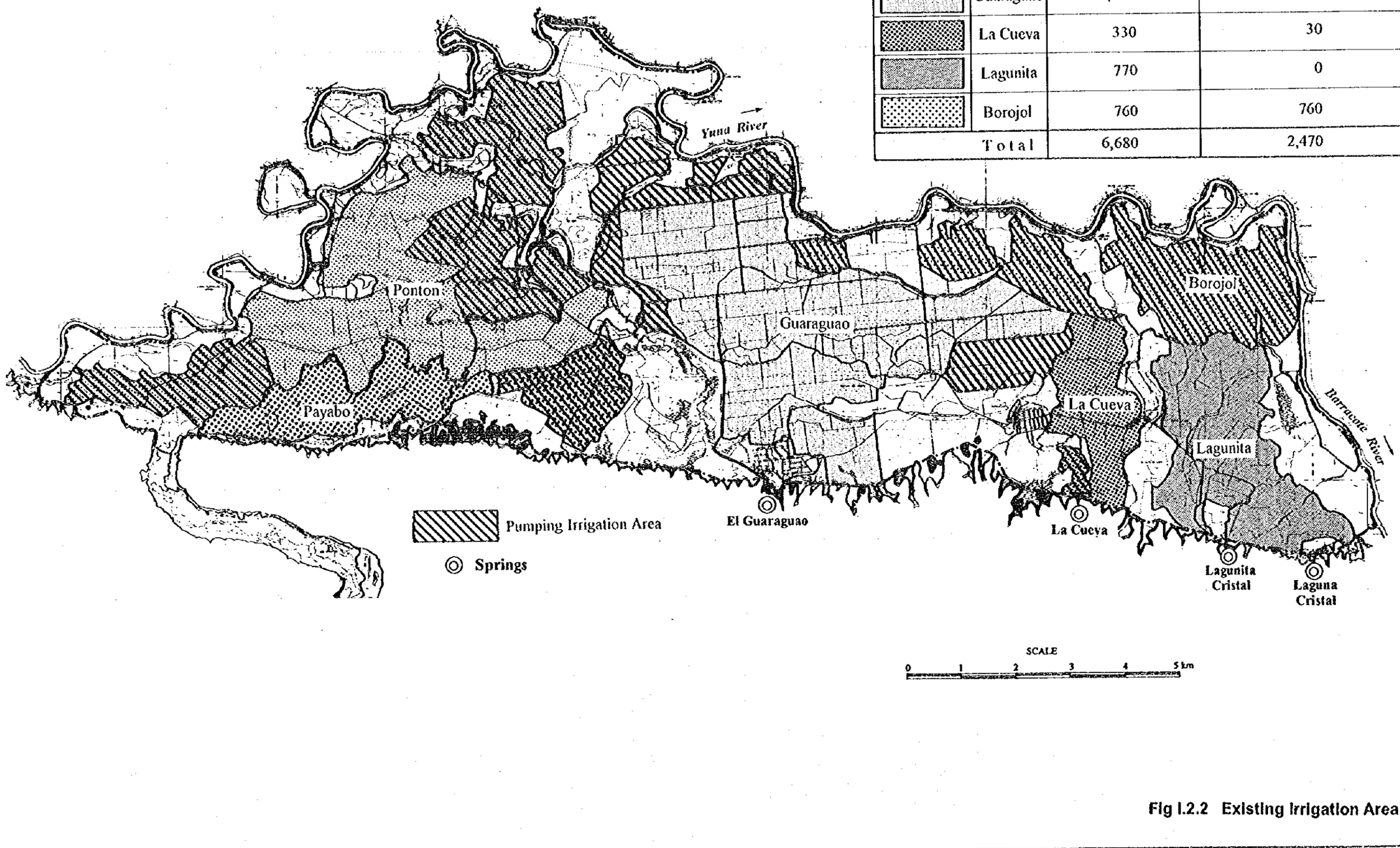


Fig I.2.2 Existing Irrigation Area

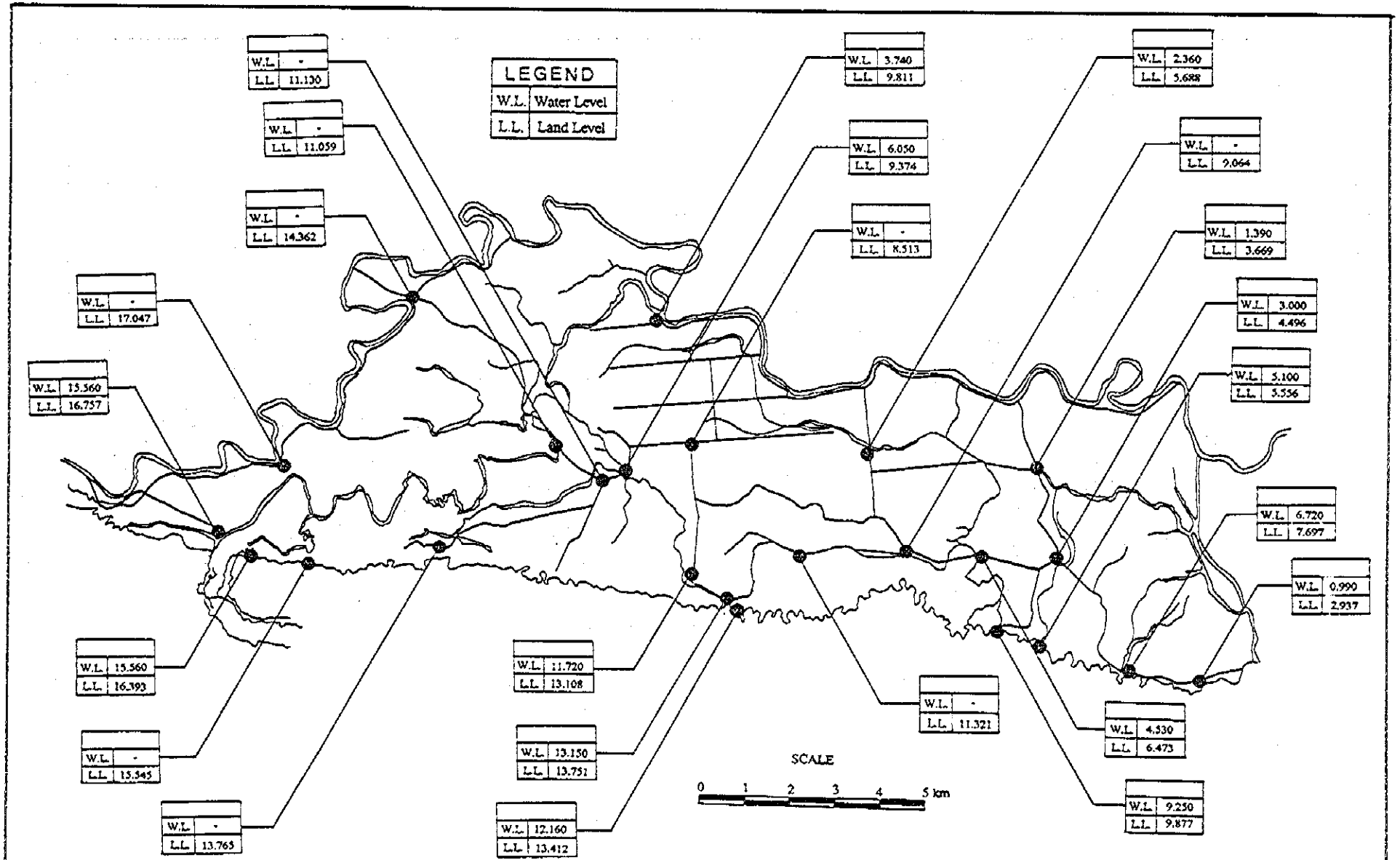


Fig I.2.3 Elevation of Water Sources Farmland Area

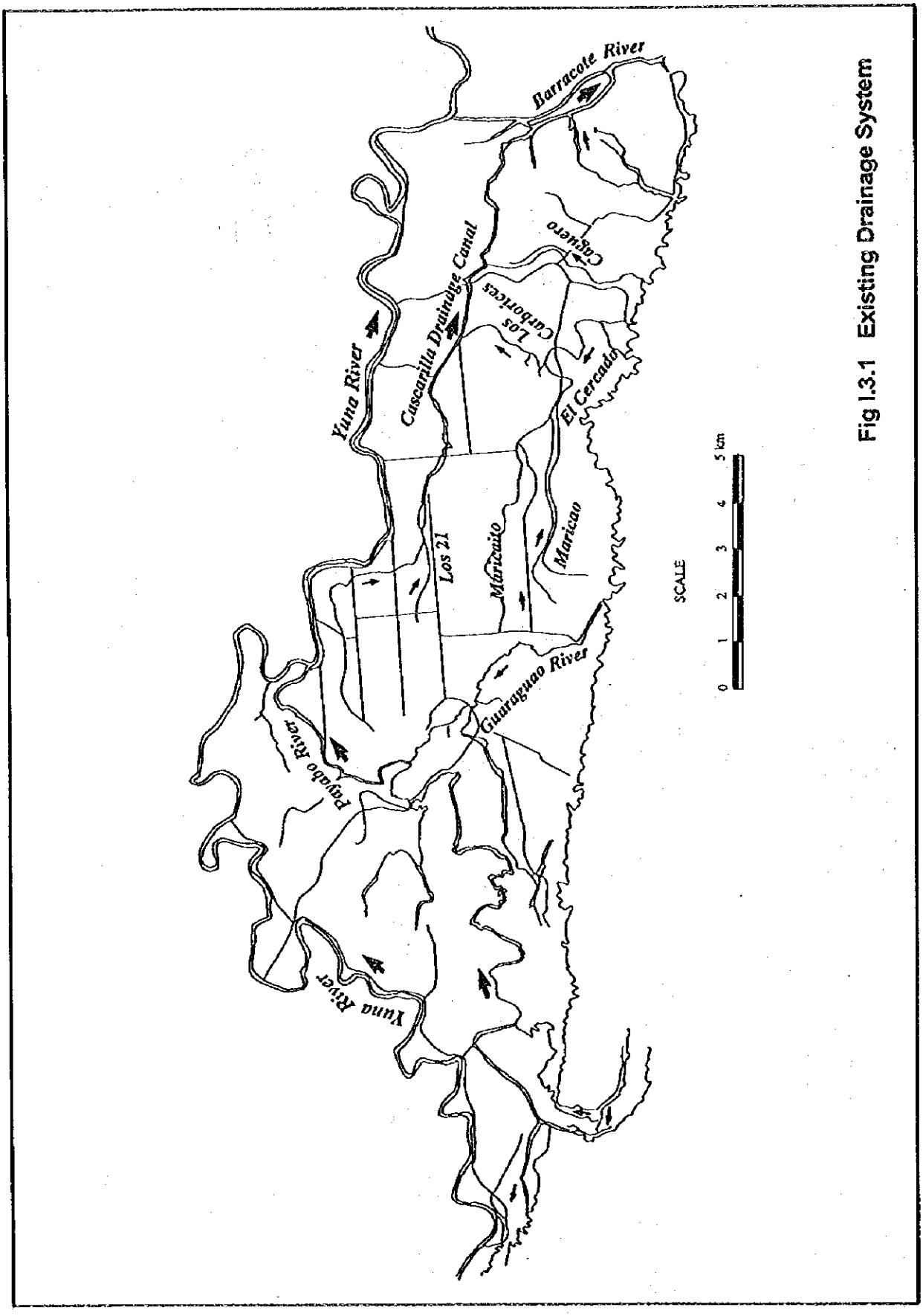


Fig I.3.1 Existing Drainage System

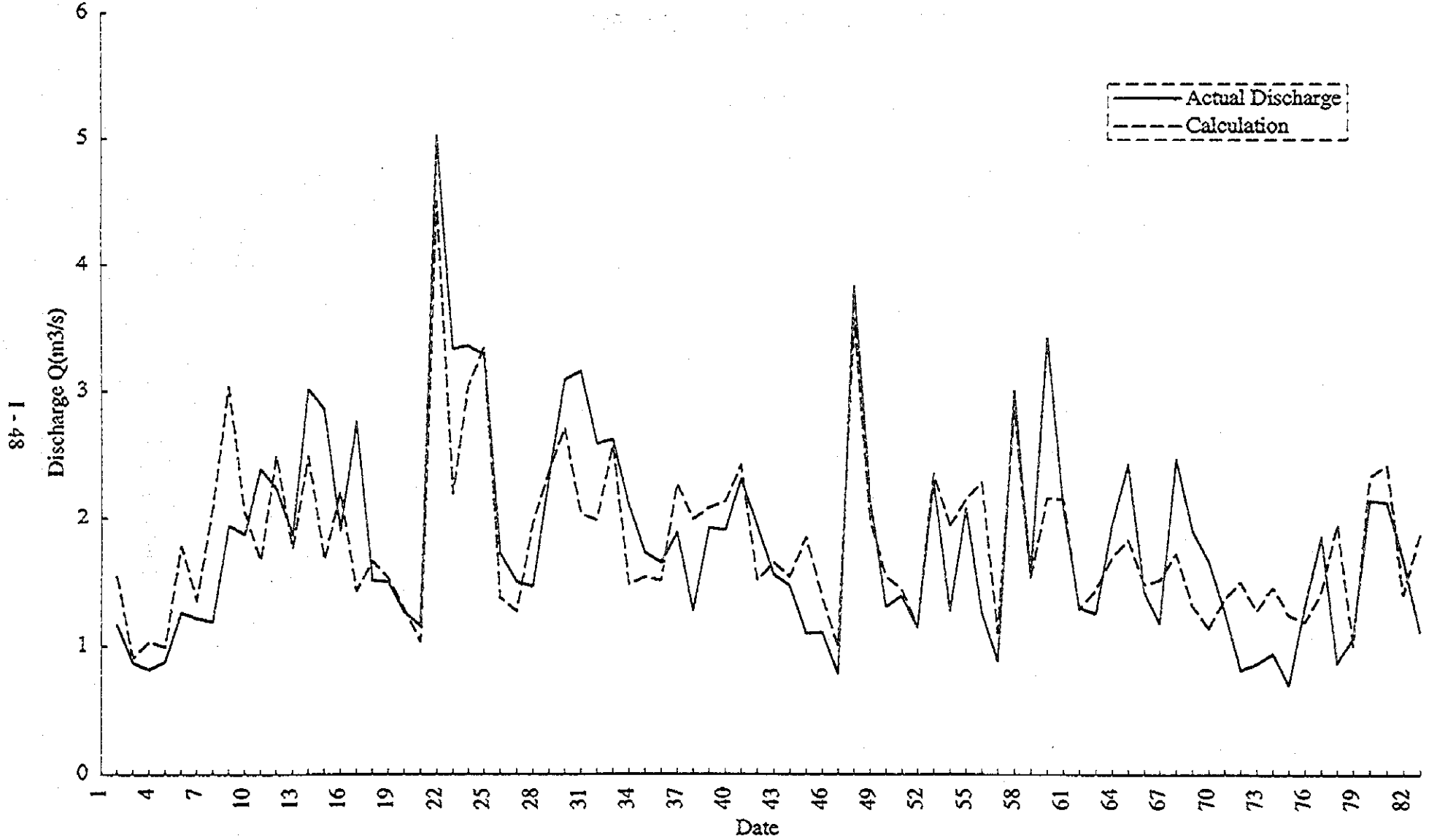


Fig I.4.1 Discharge of Guaraguao Spring by Simulation

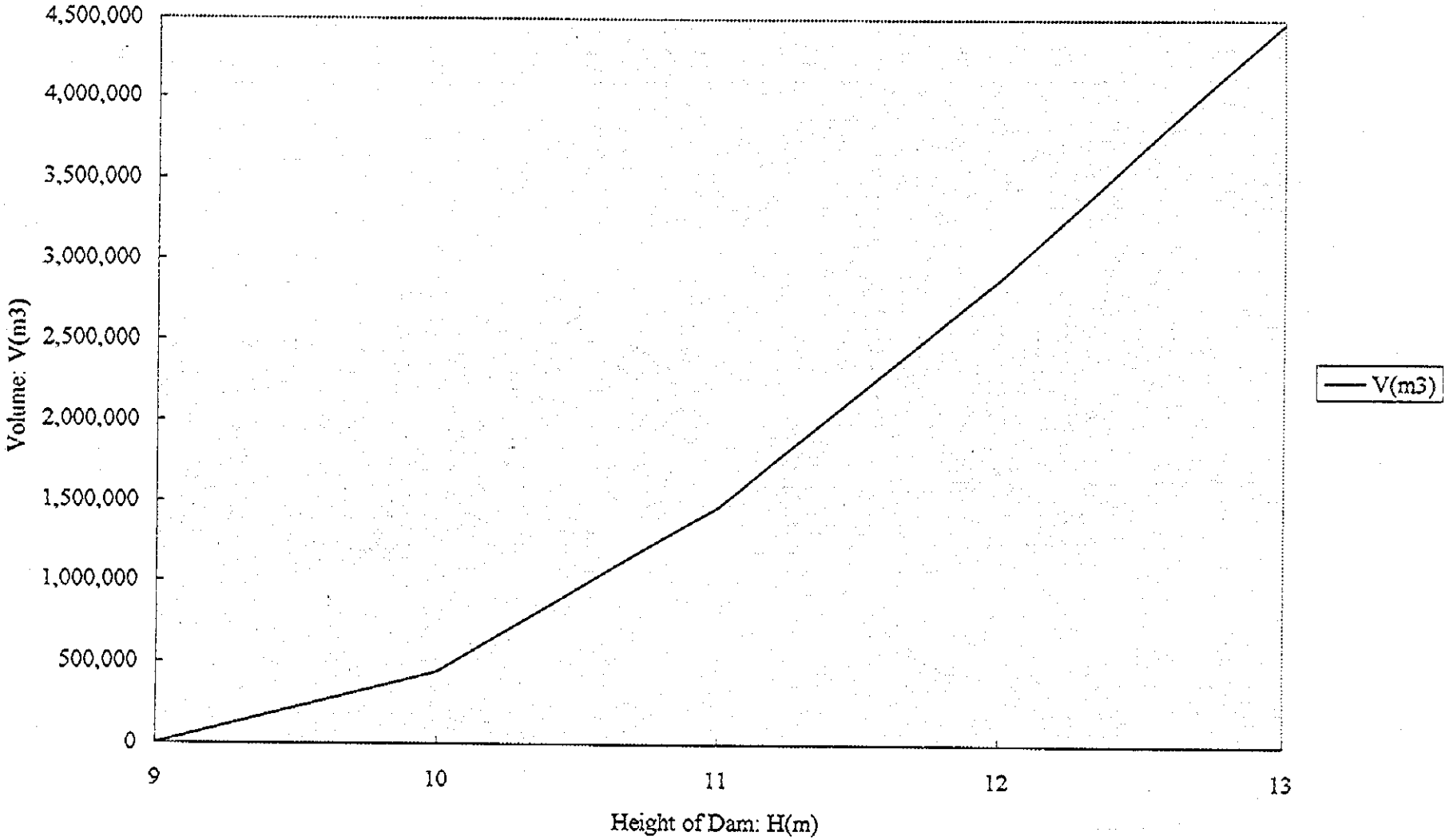


Fig I.4.2 H-V Curve at Reservoir

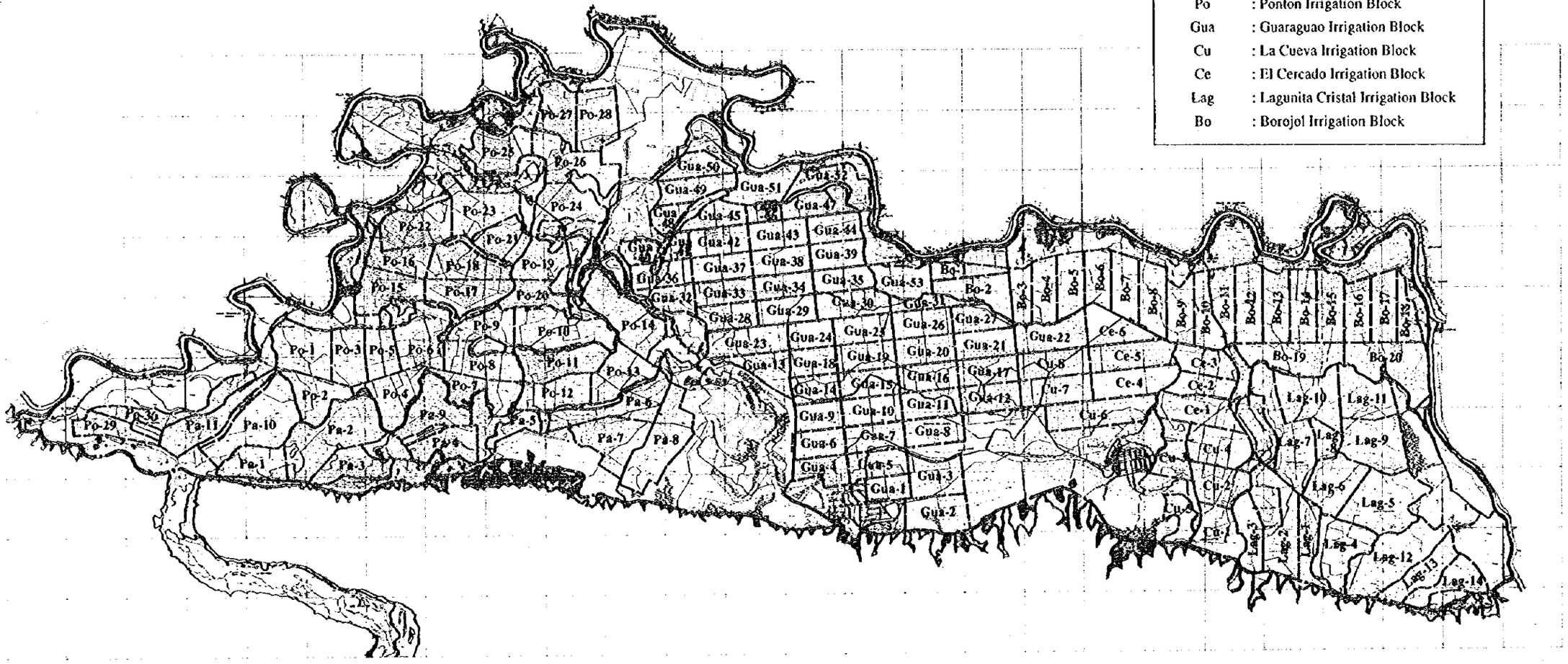


Fig I.6.1-1 Irrigation Block (Alternative A)

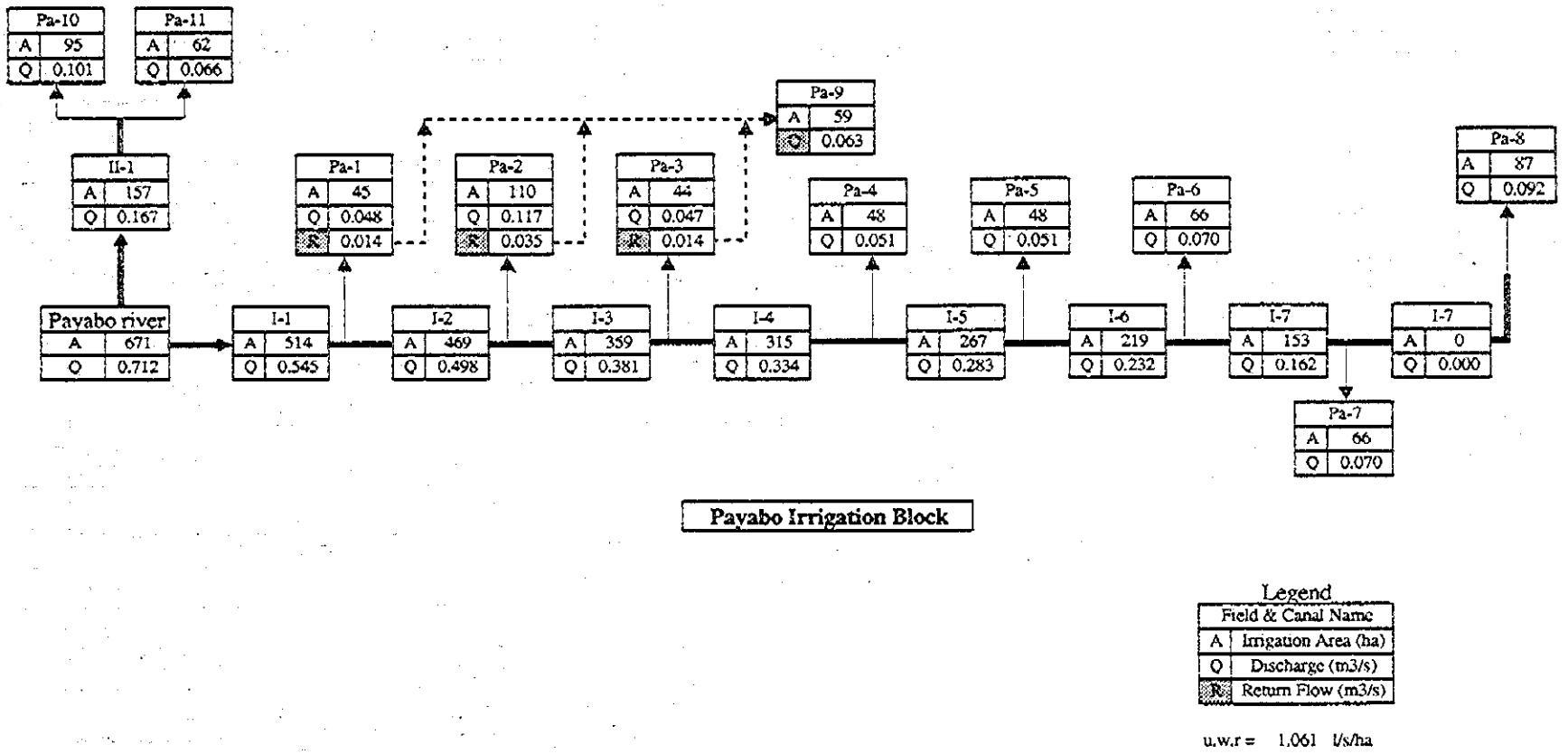


Fig I.6.1-2 Irrigation Network In Case of Considering Effective Rainfall (Alternative A) : 1/6

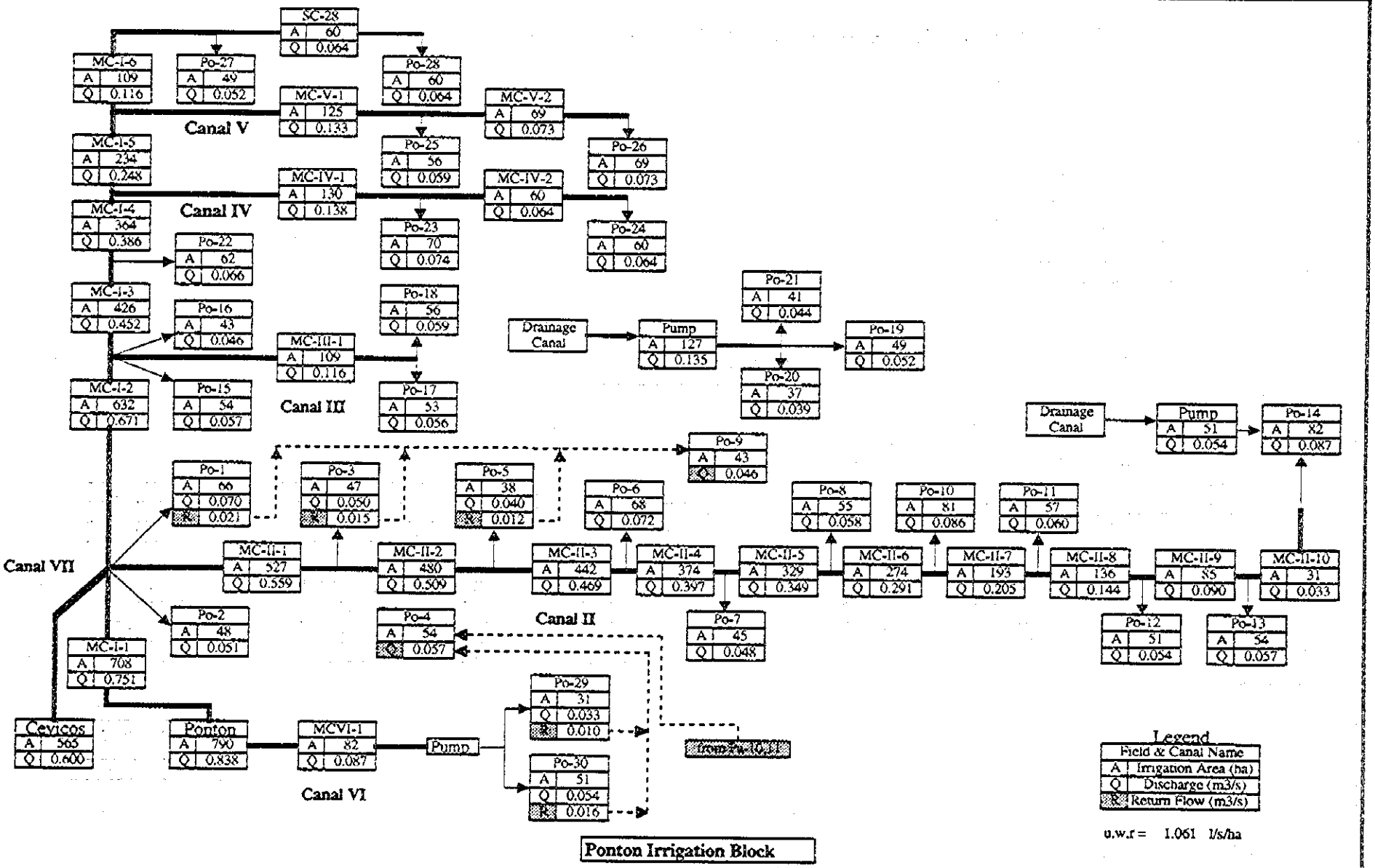


Fig I.6.1-2 Irrigation Network in Case of Considering Effective Rainfall (Alternative A) : 2/6

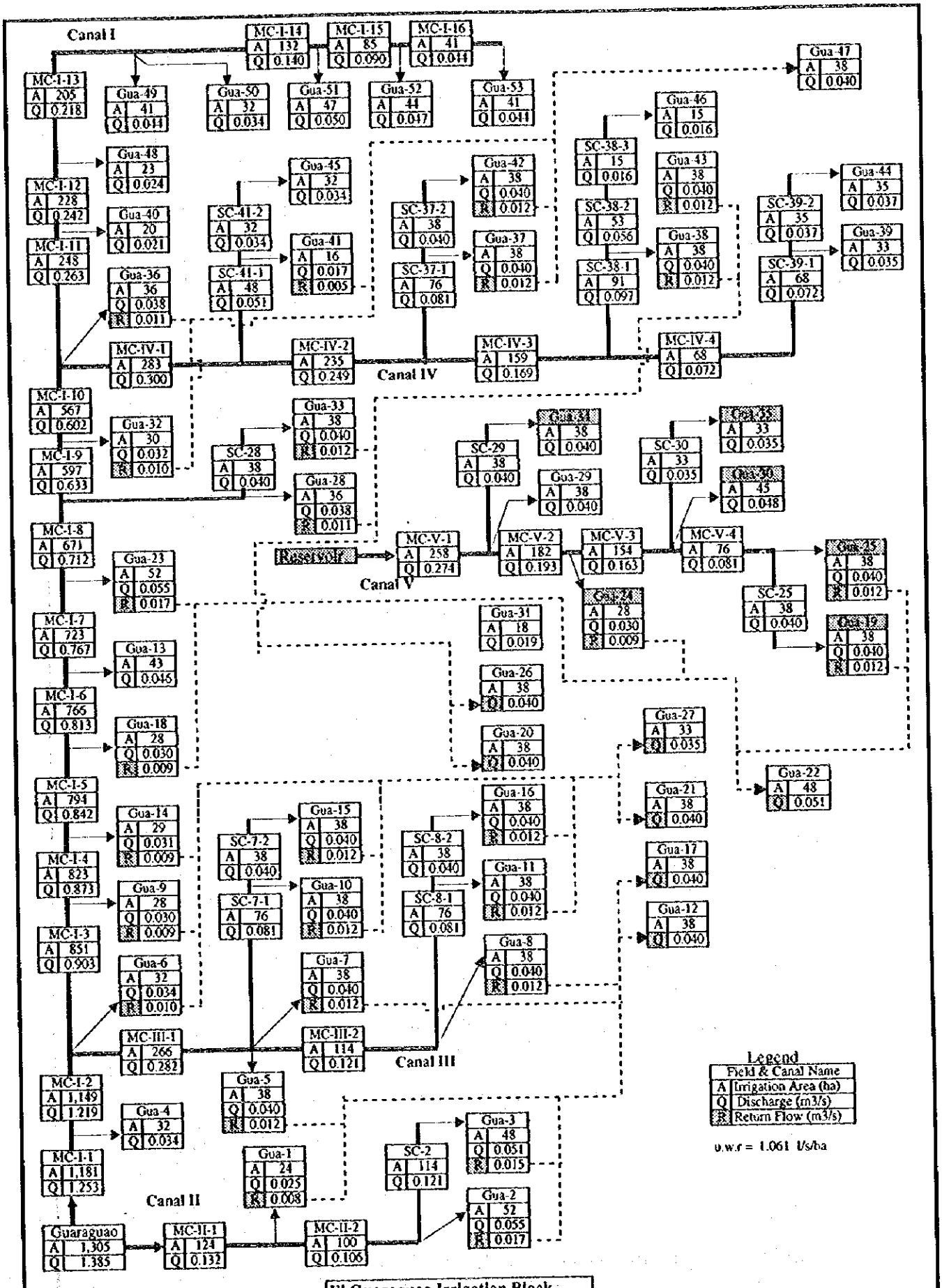


Fig I.6.1-2 Irrigation Network In Case of Considering Effective Rainfall (Alternative A) : 3/6

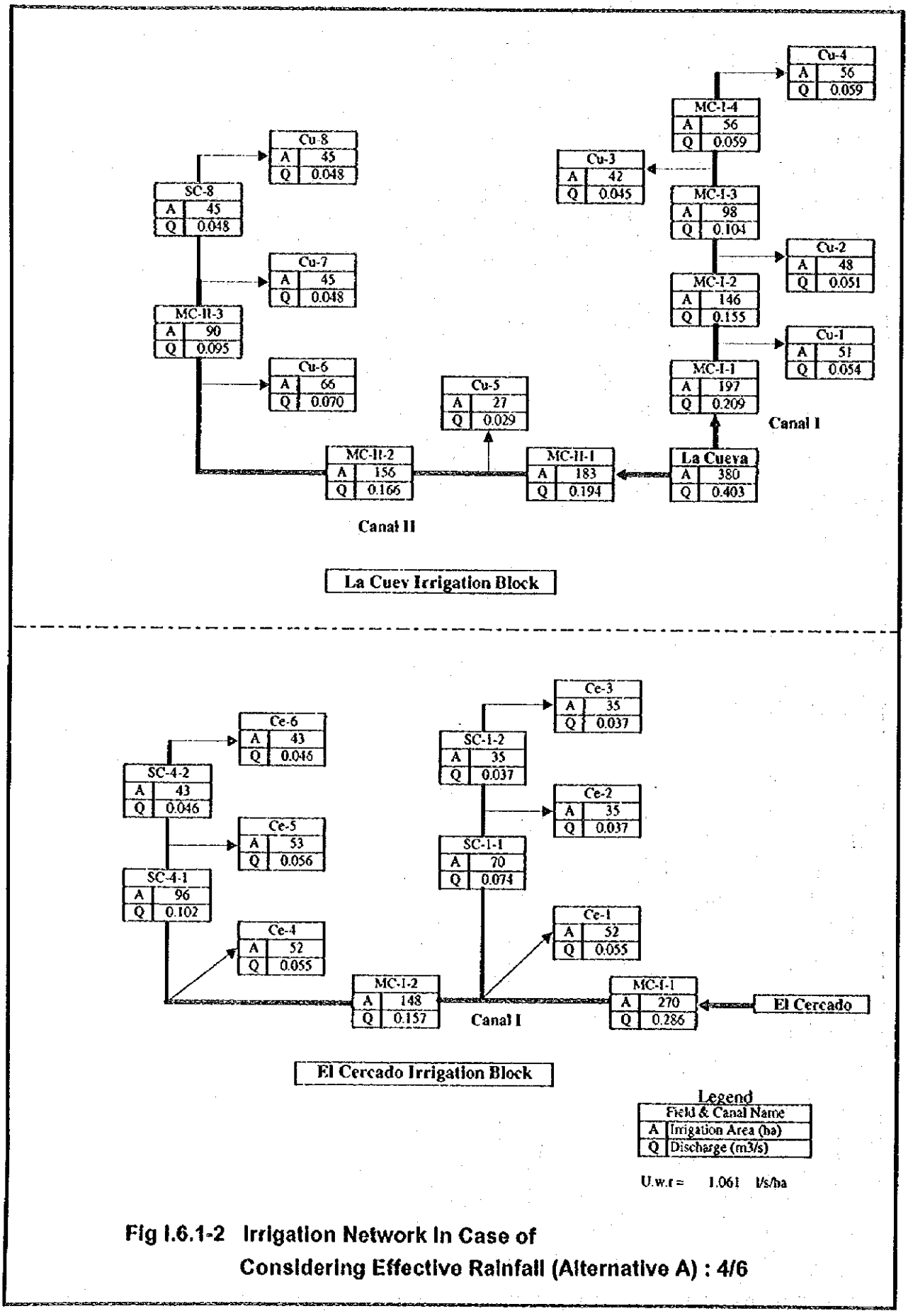


Fig I.6.1-2 Irrigation Network In Case of Considering Effective Rainfall (Alternative A) : 4/6

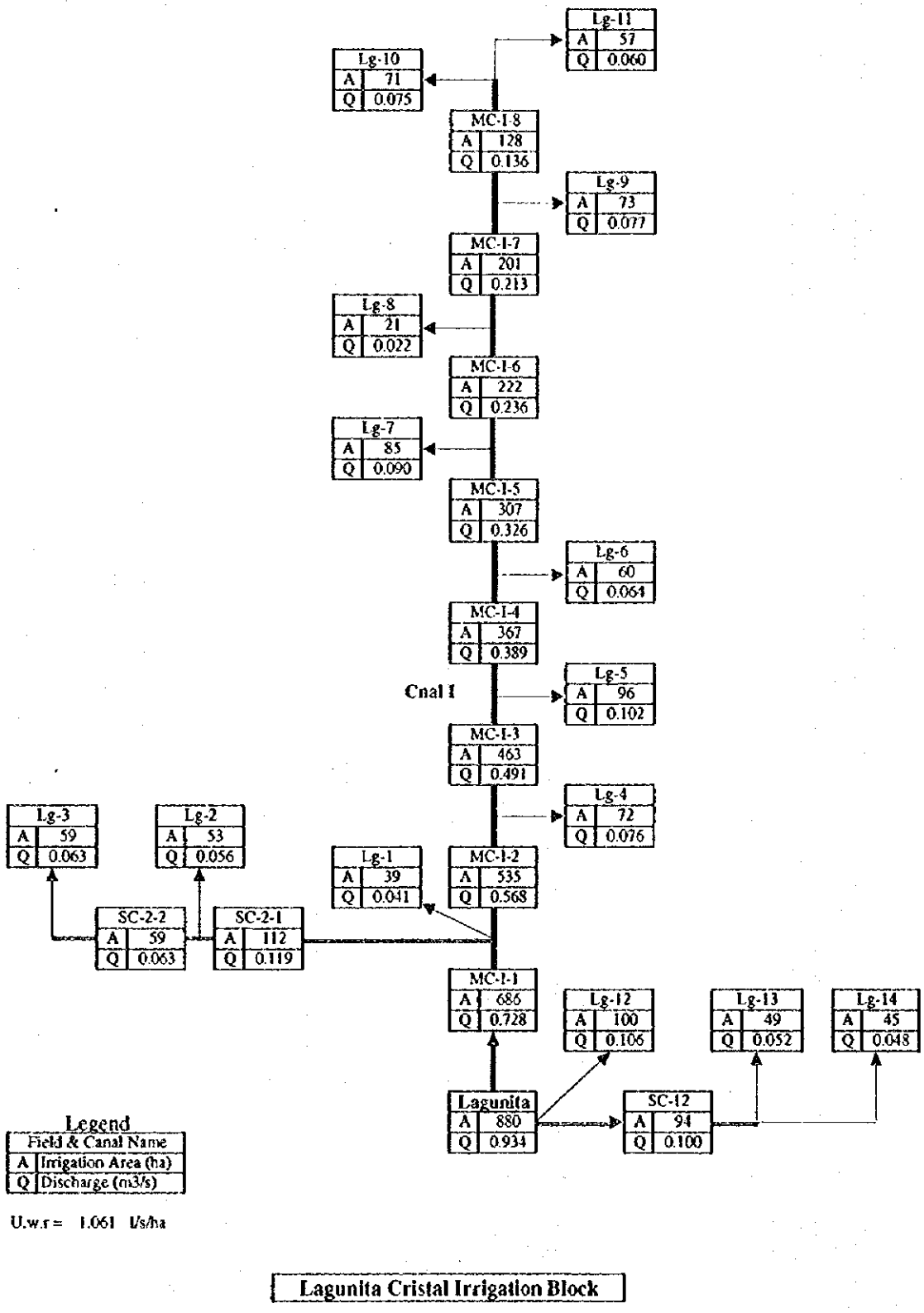


Fig I.6.1-2 Irrigation Network in Case of Considering Effective Rainfall (Alternative A) : 5/6

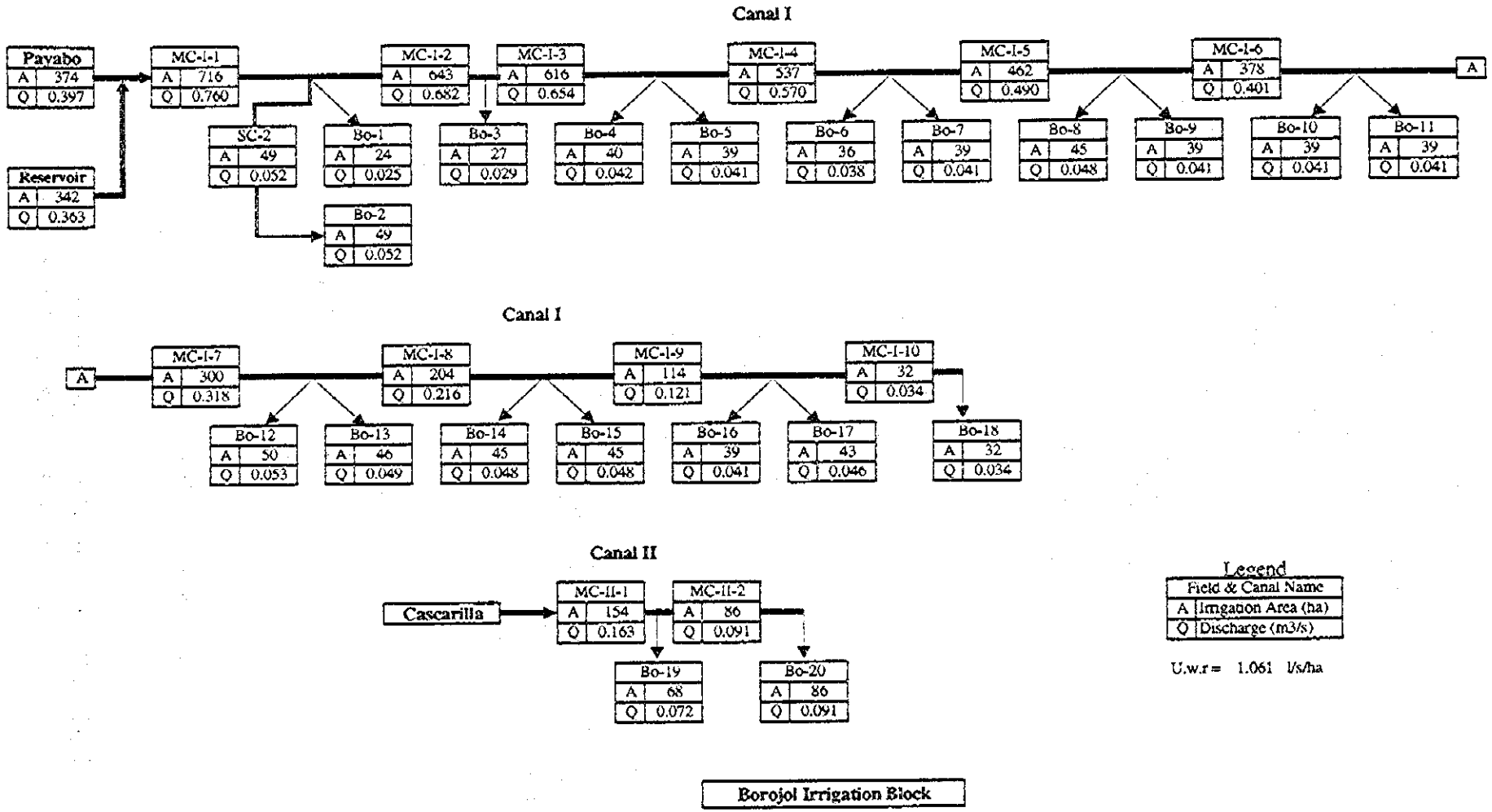


Fig I.6.1-2 Irrigation Network in Case of Considering Effective Rainfall (Alternative A) : 6/6

Fig I.6.2-1 Irrigation Block (Alternative B)

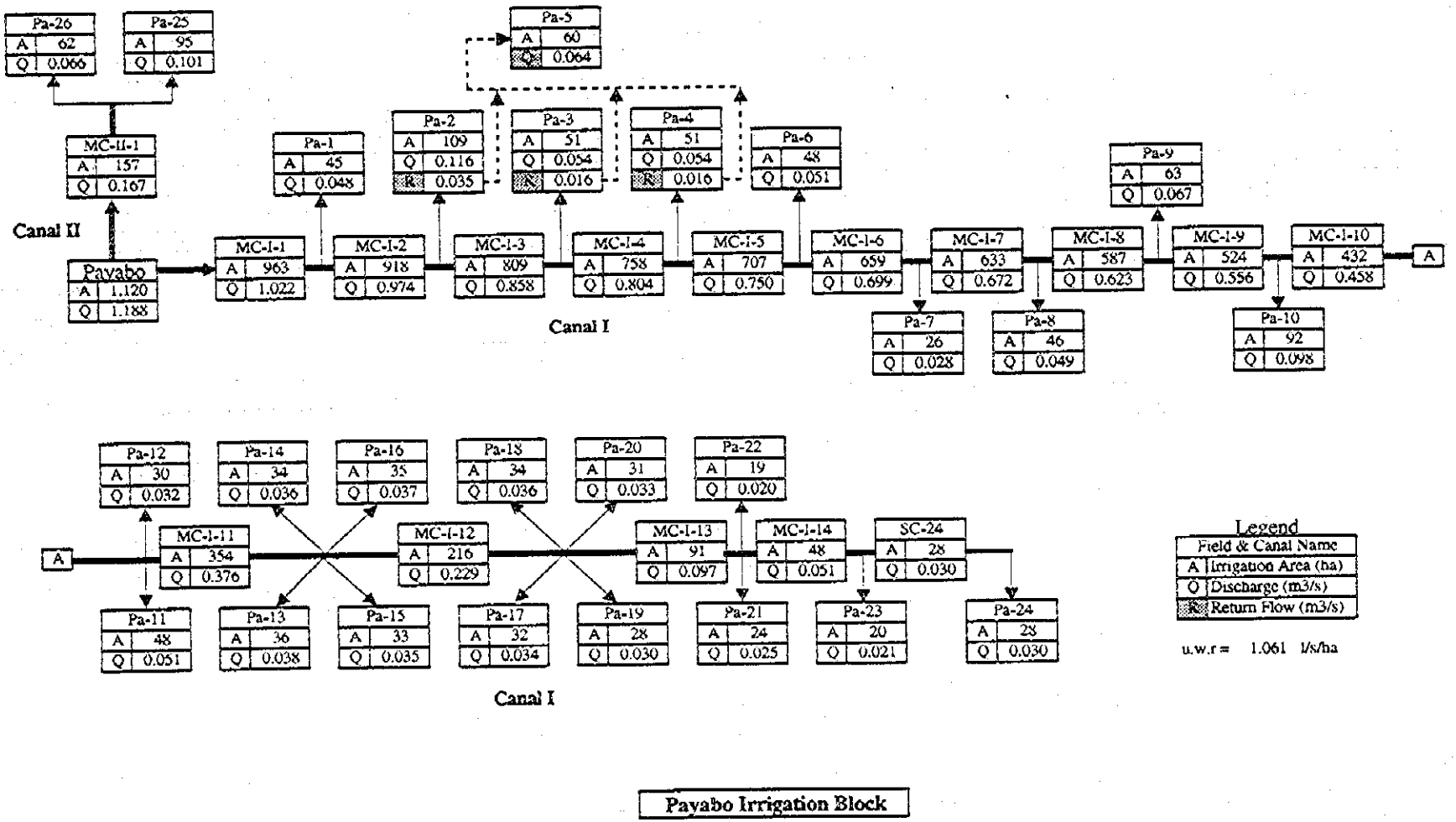


Fig I.6.2-2 Irrigation Network In Case of Considering Effective Rainfall (Alternative B) : 1/6

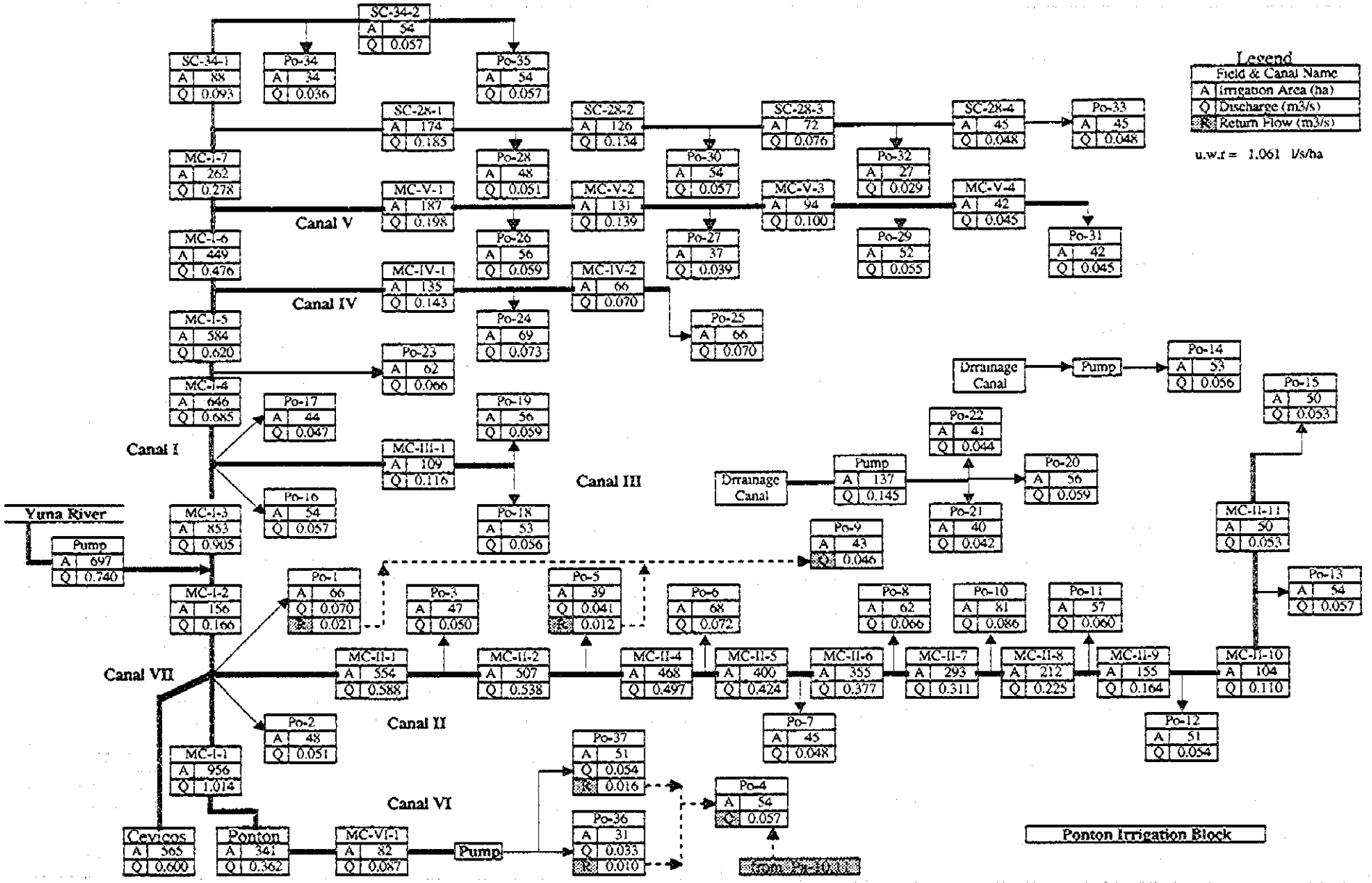


Fig I.6.2-2 Irrigation Network in Case of Considering Effective Rainfall (Alternative B) : 2/6

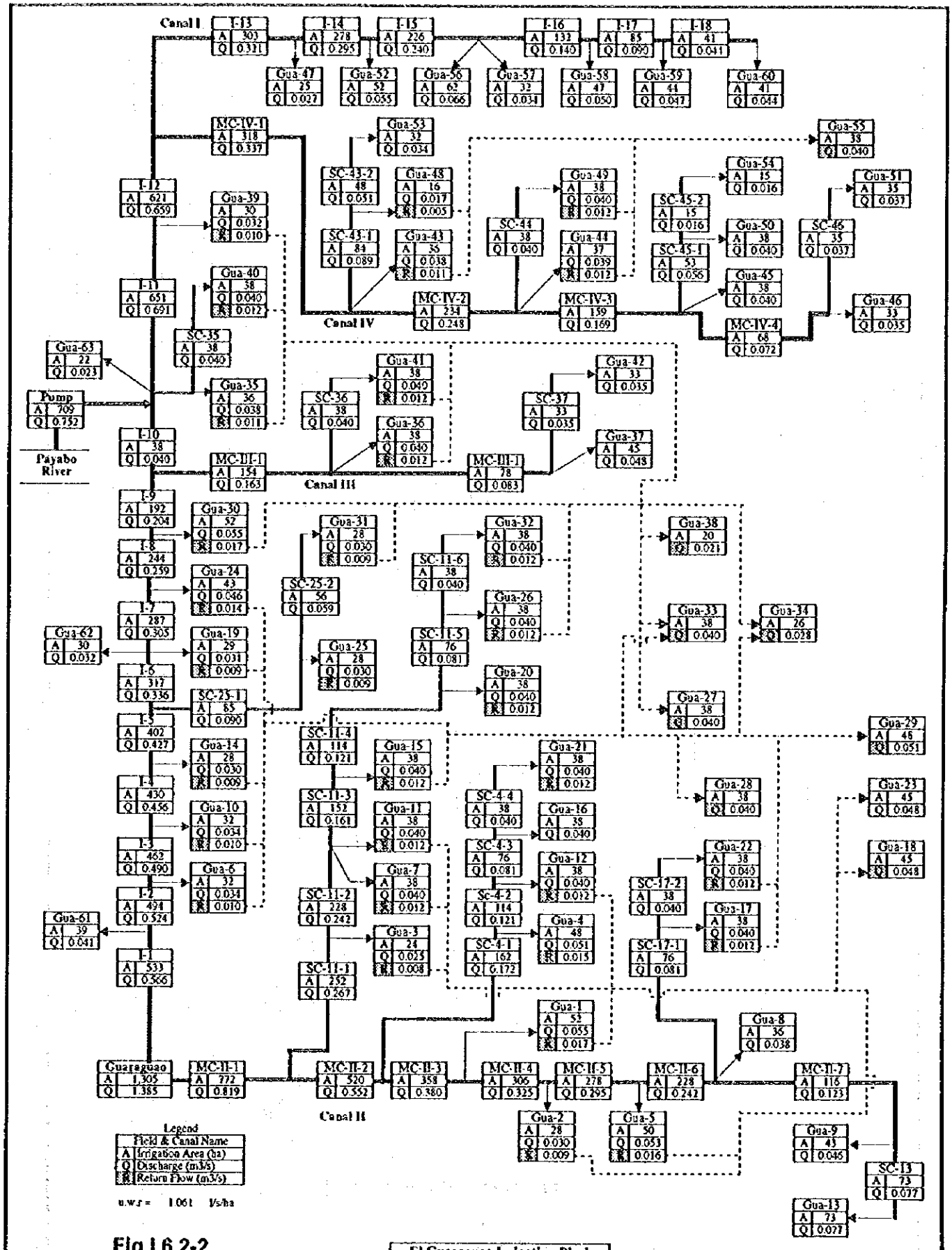
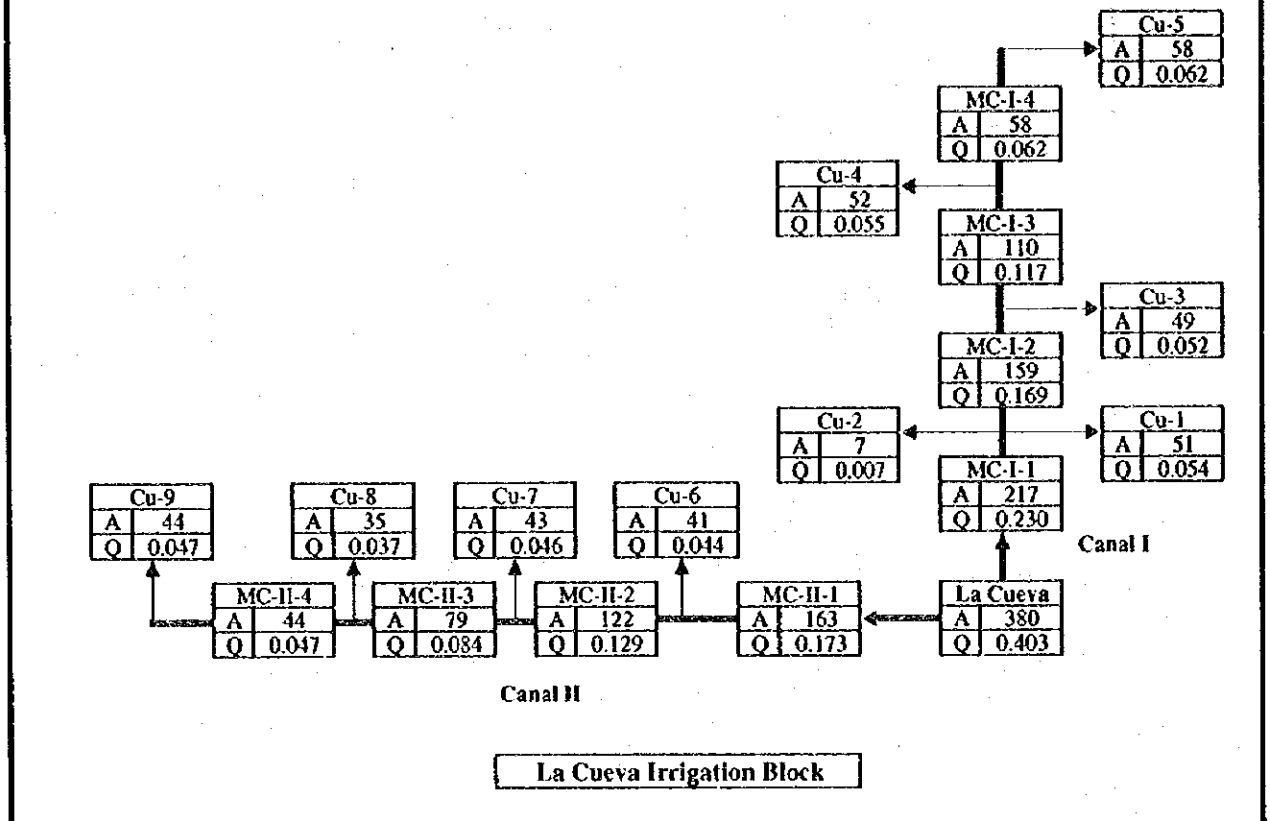


Fig I.6.2-2 El Guaraguao Irrigation Block

Irrigation Network In Case of Considering Effective Rainfall (Alternative B) : 3/6



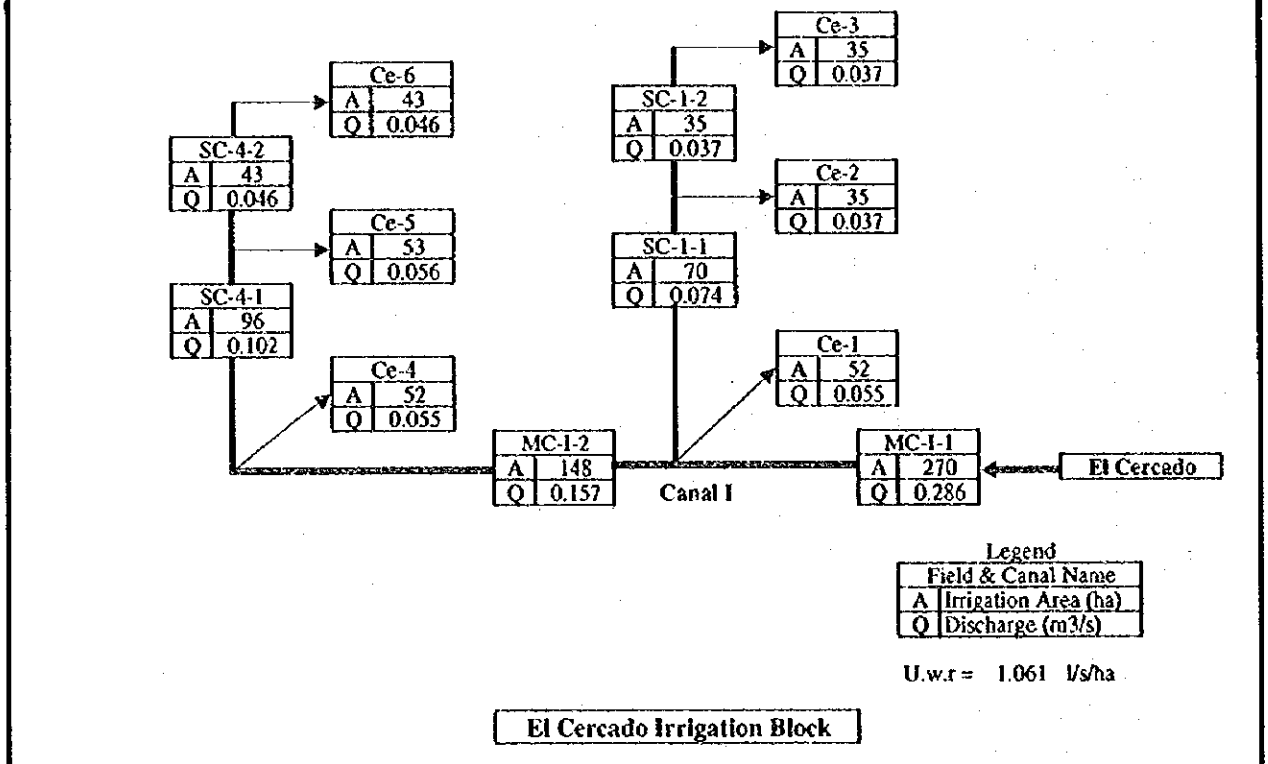


Fig I.6.2-2 Irrigation Network In Case of Considering Effective Rainfall (Alternative B) : 4/6

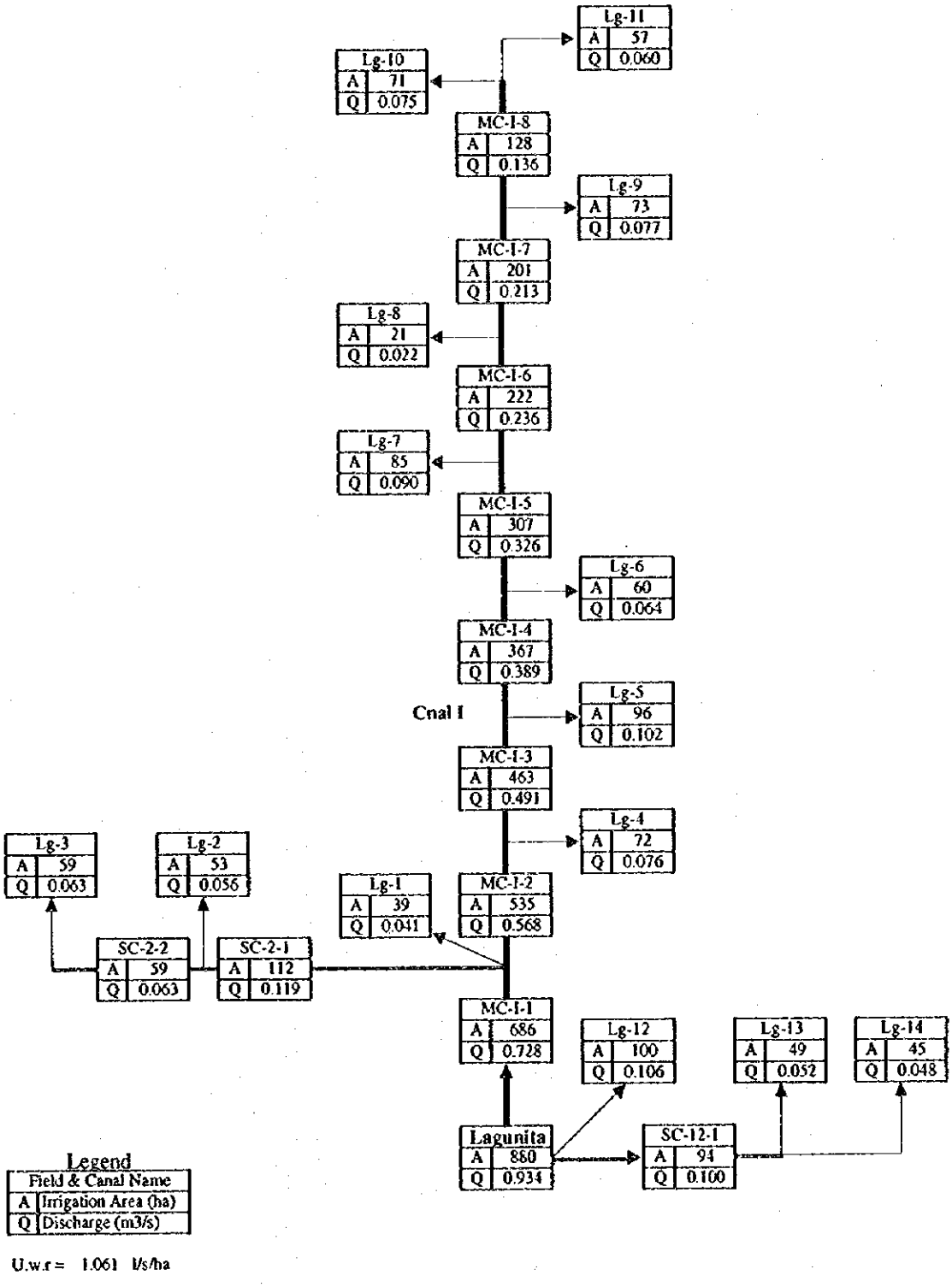


Fig I.6.2-2 Irrigation Network In Case of Considering Effective Rainfall (Alternative B) : 5/6

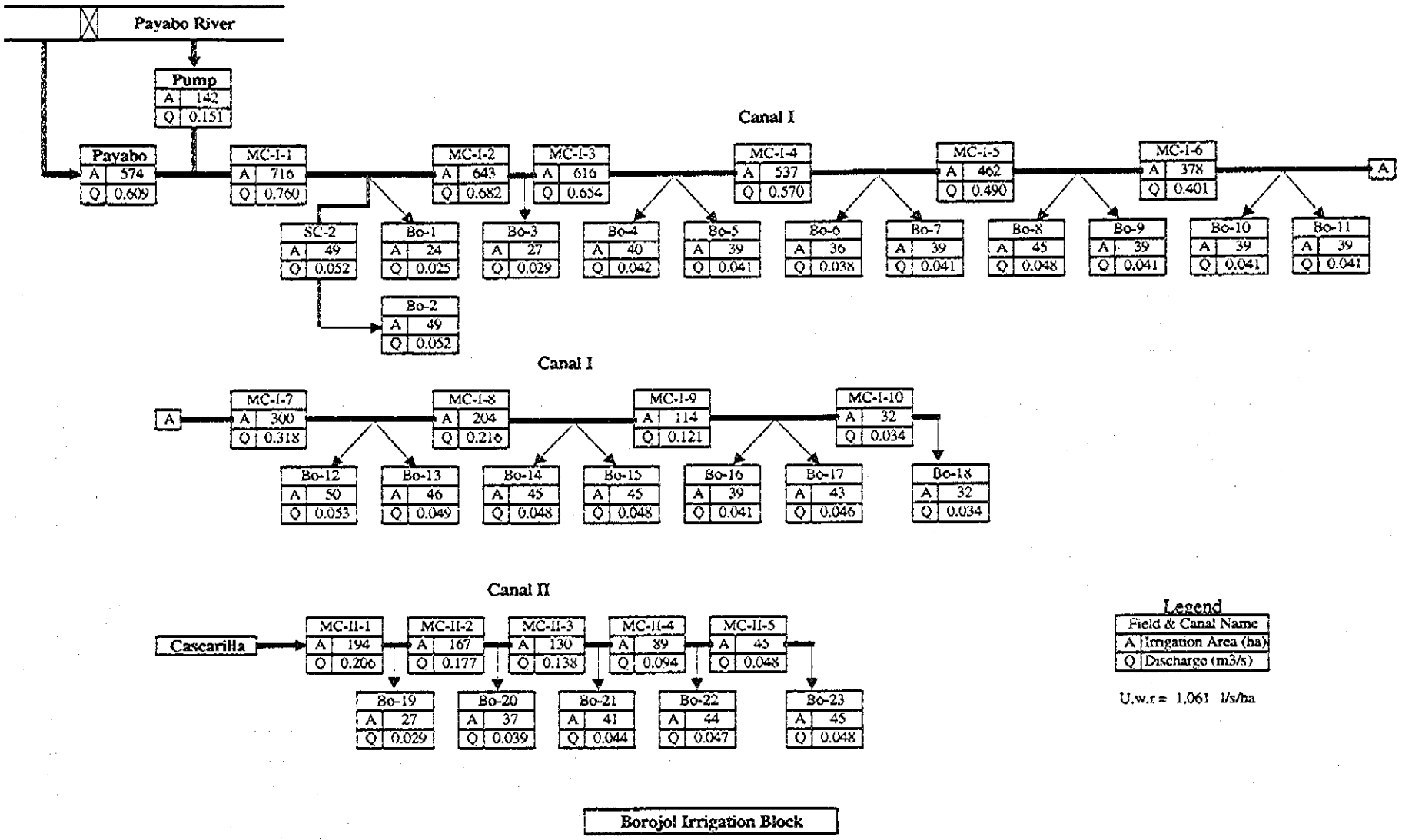


Fig I.6.2-2 Irrigation Network In Case of Considering Effective Rainfall (Alternative B) : 6/6

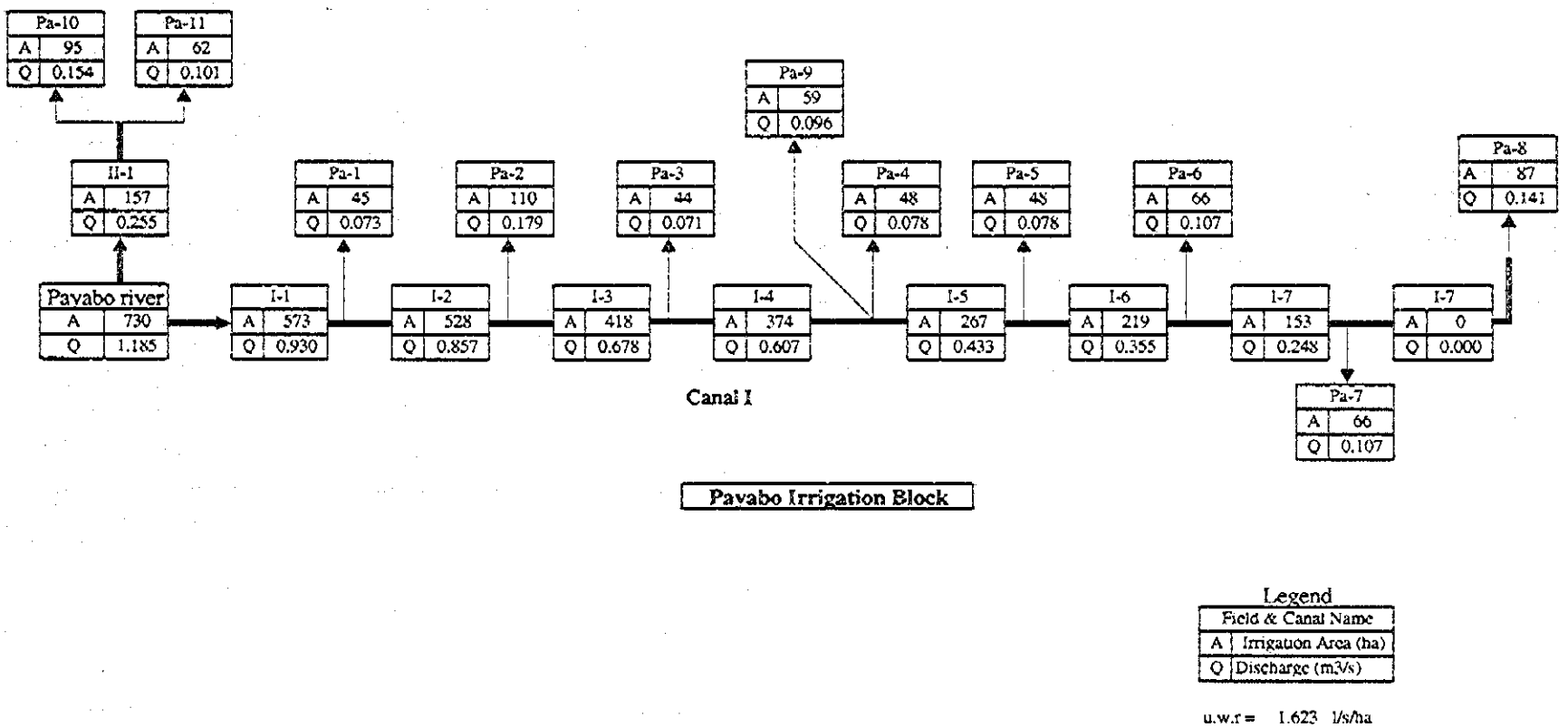


Fig I.6.3 Irrigation Network In Case of Without Considering Effective Rainfall (Alternative A) : 1/6

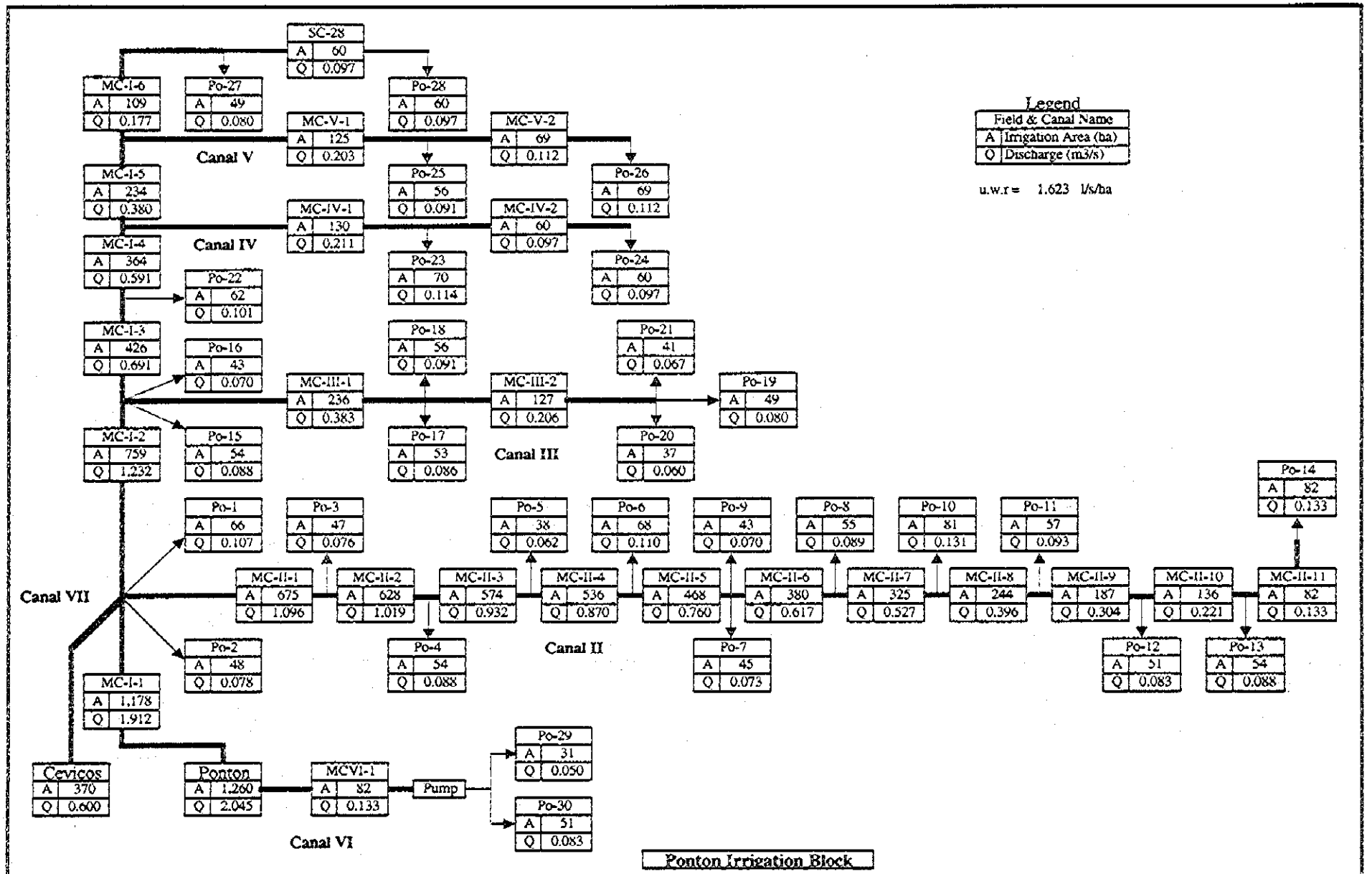
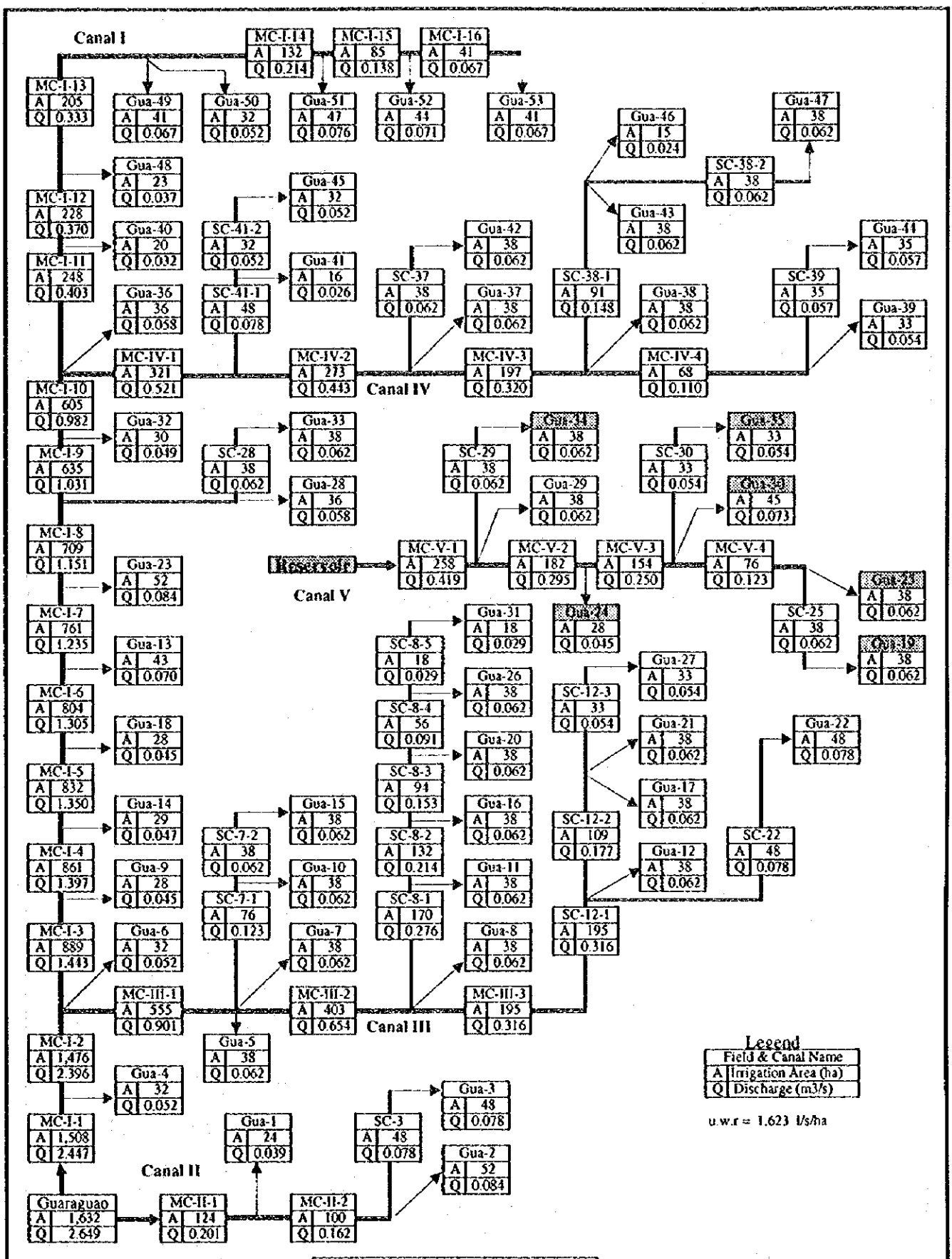


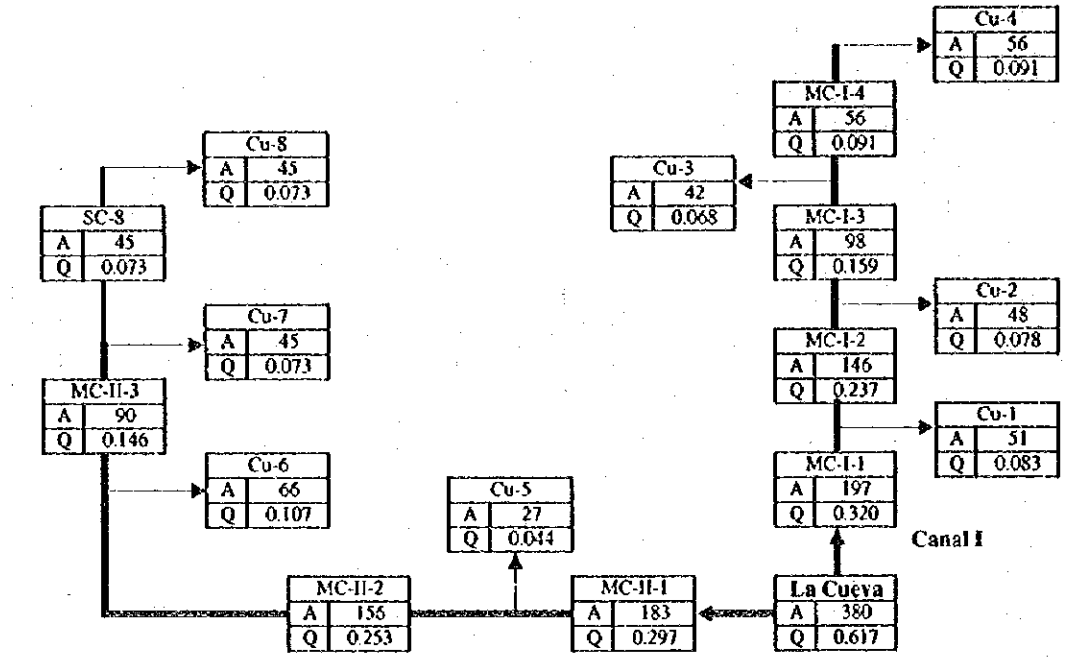
Fig I.6.3 Irrigation Network in Case of Without Considering Effective Rainfall (Alternative A) : 2/6



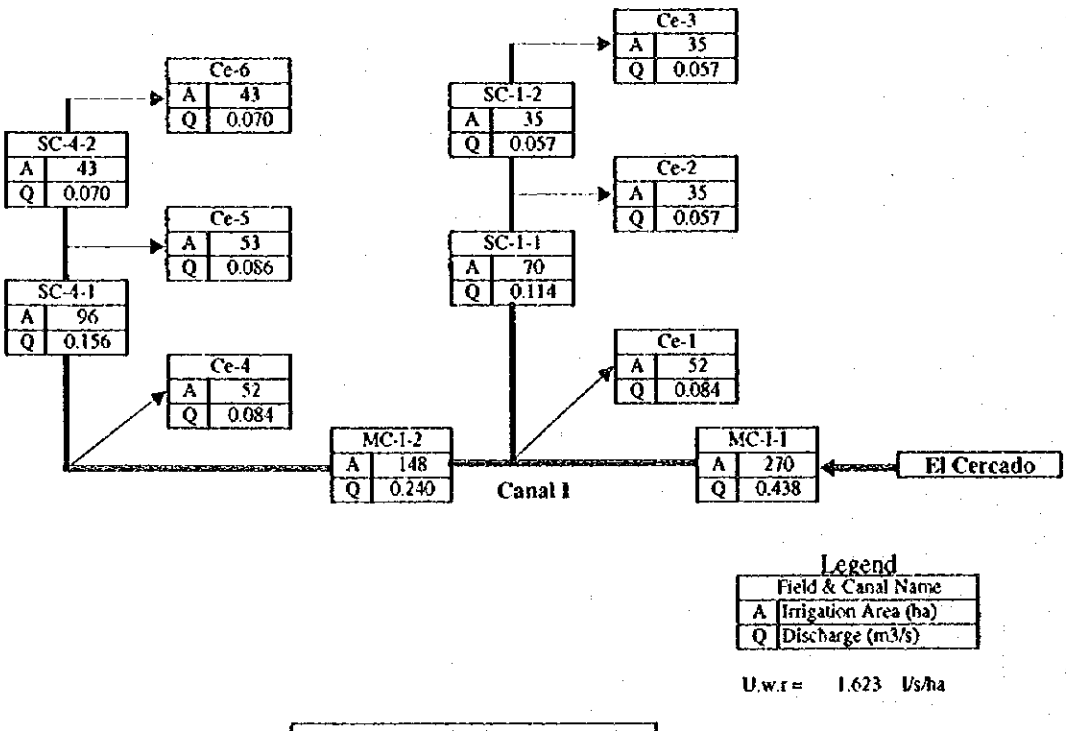
El Guaraguao Irrigation Block

Fig I.6.3

Irrigation Network in Case of Without Considering Effective Rainfall (Alternative A) : 3/6



La Cueva Irrigation Block



El Cercado Irrigation Block

Fig I.6.3 Irrigation Network In Case of Without Considering Effective Rainfall (Alternative A) : 4/6

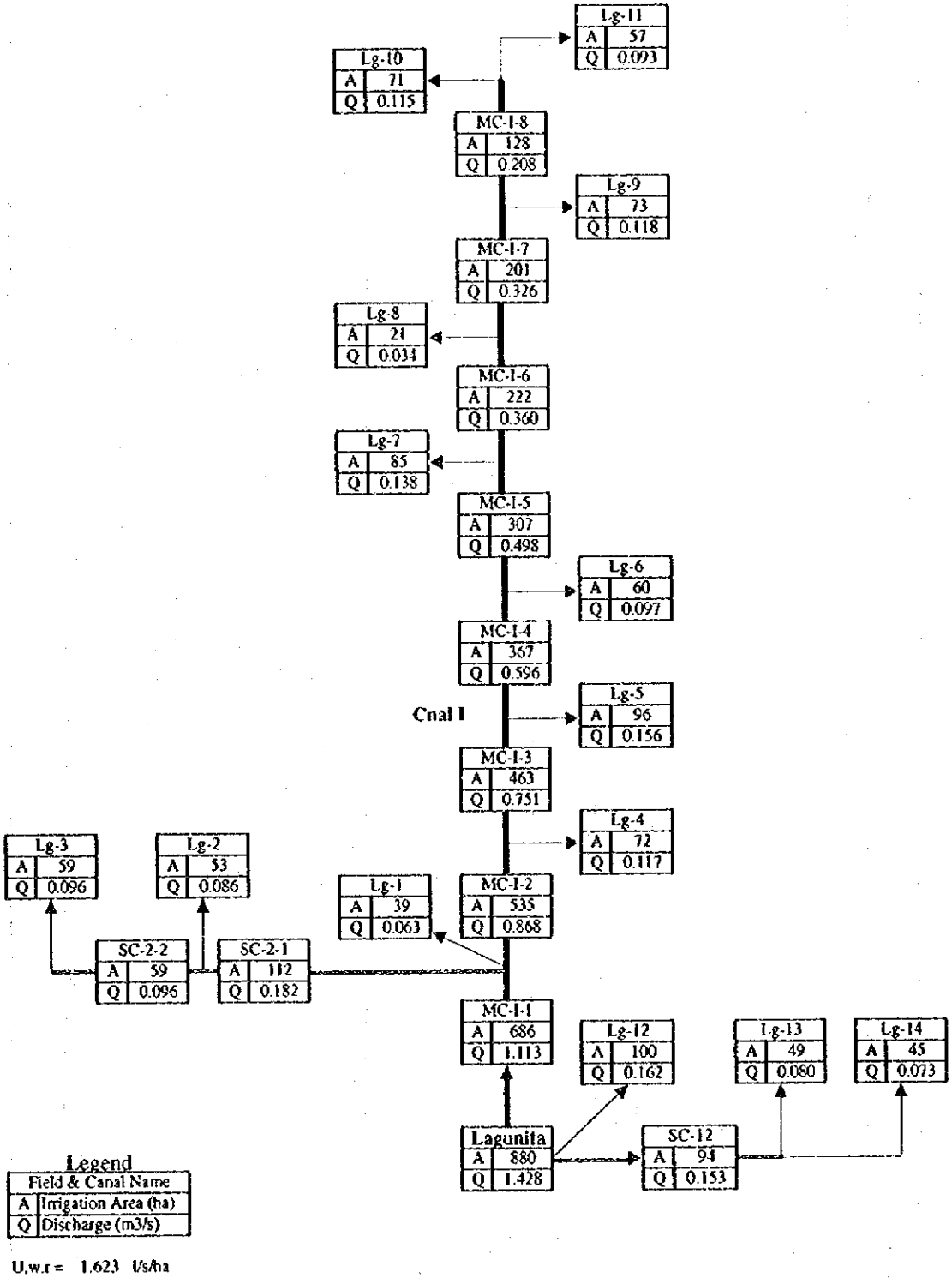


Fig I.6.3 Irrigation Network in Case of Without Considering Effective Rainfall (Alternative A) : 5/6

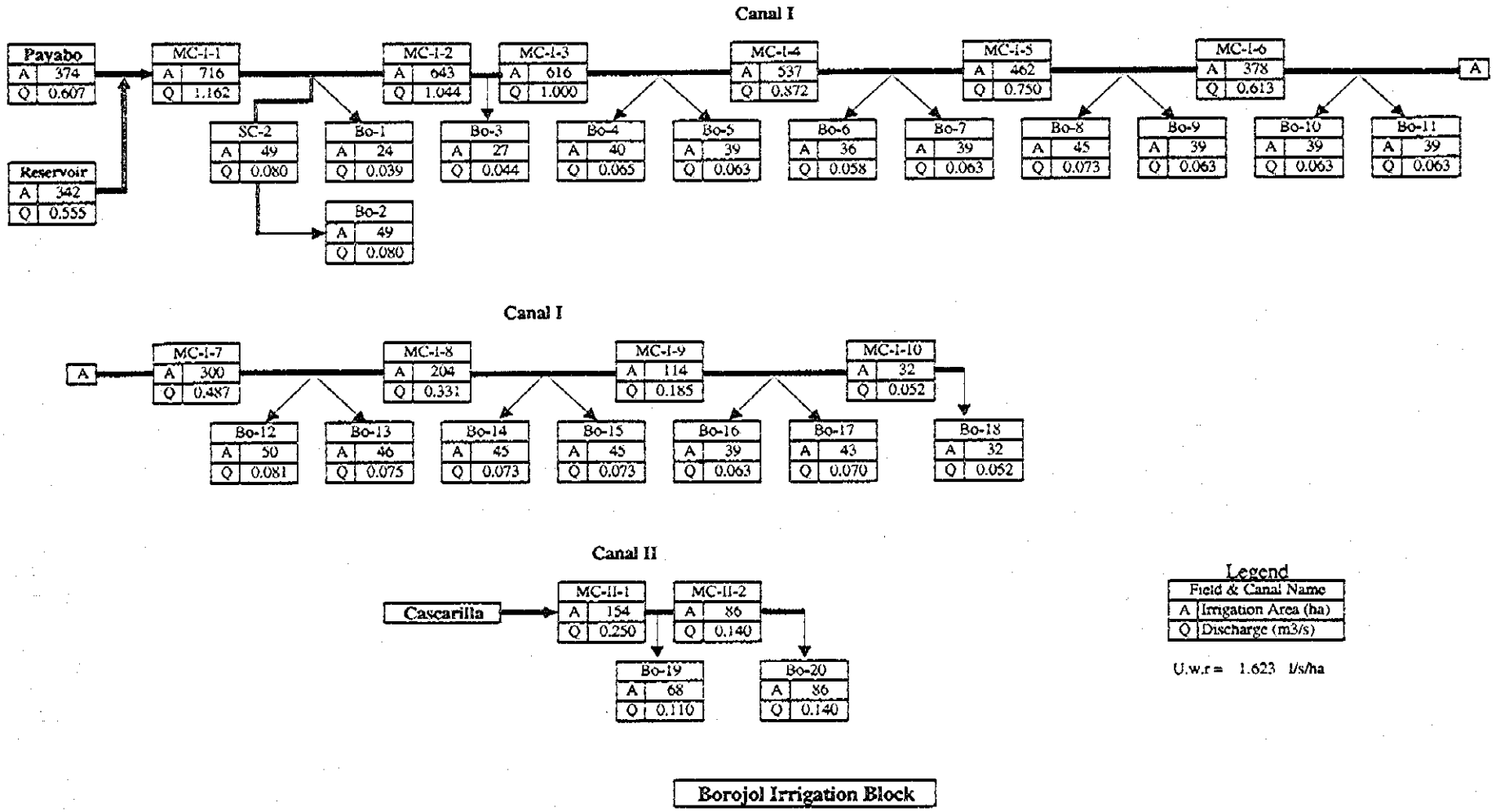


Fig I.6.3 Irrigation Network In Case of Without Considering Effective Rainfall (Alternative A) : 6/6

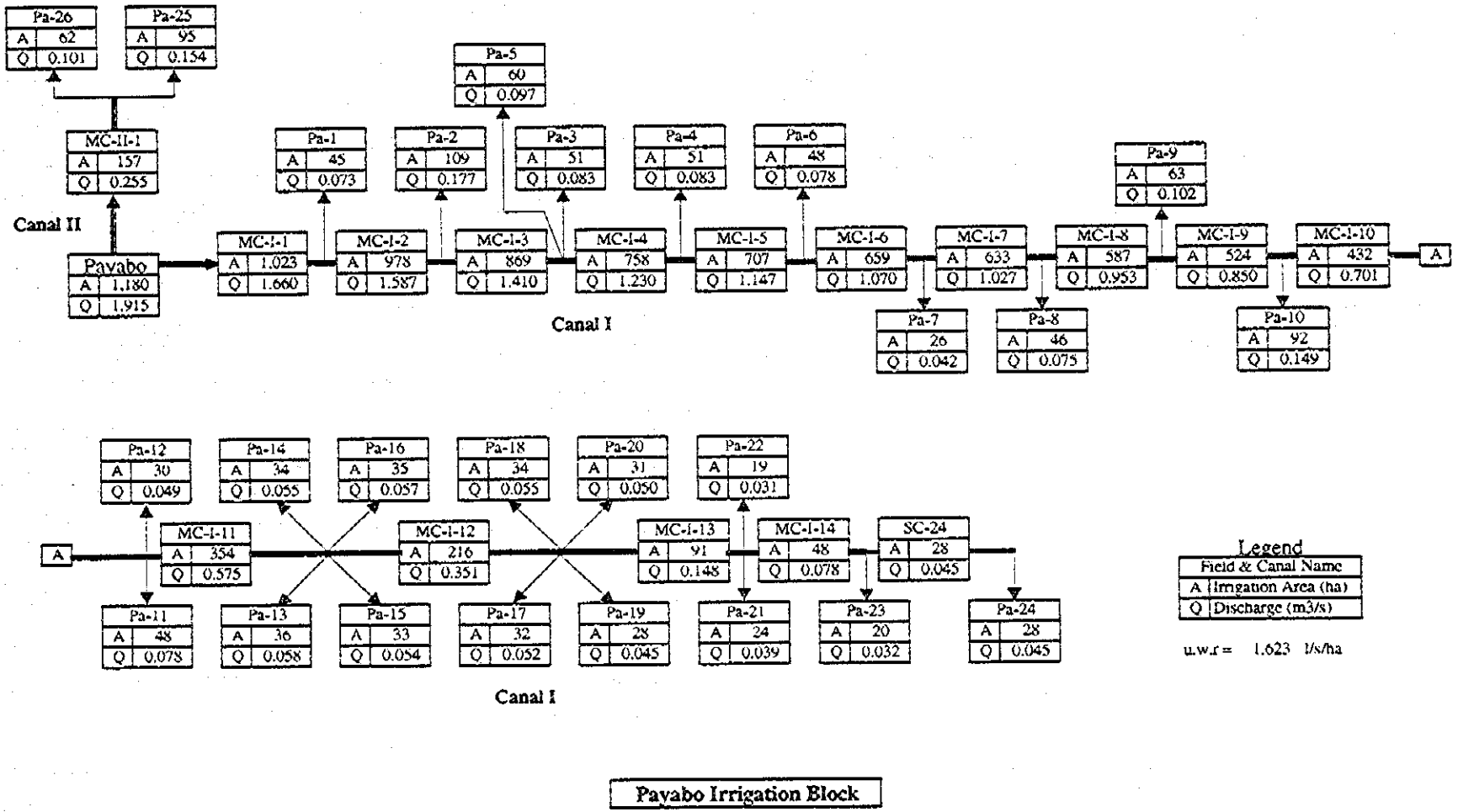


Fig I.6.4 Irrigation Network In Case of Without Considering Effective Rainfall (Alternative B) : 1/6

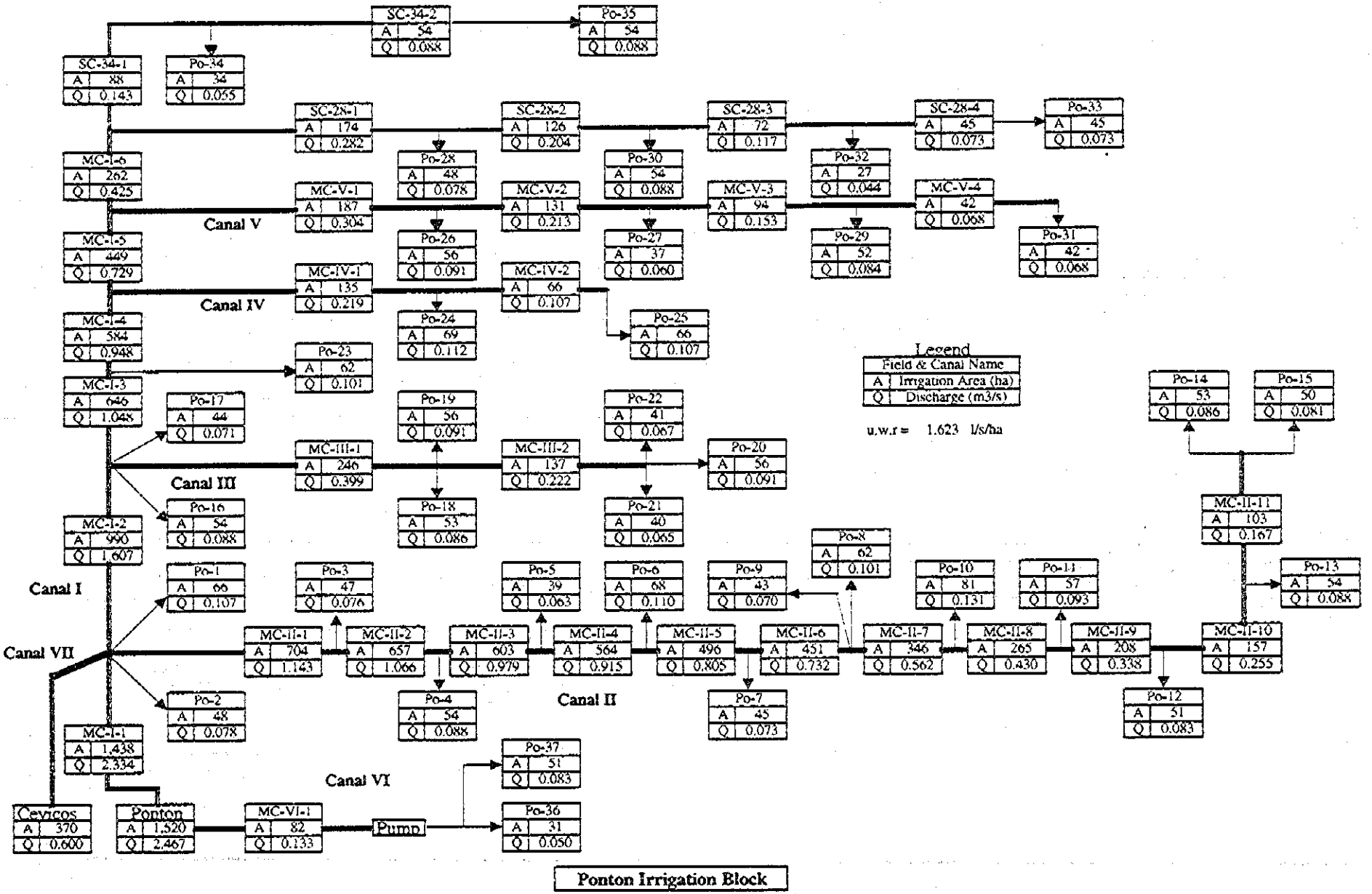


Fig I.6.4 Irrigation Network In Case of Without Considering Effective Rainfall (Alternative B) : 2/6

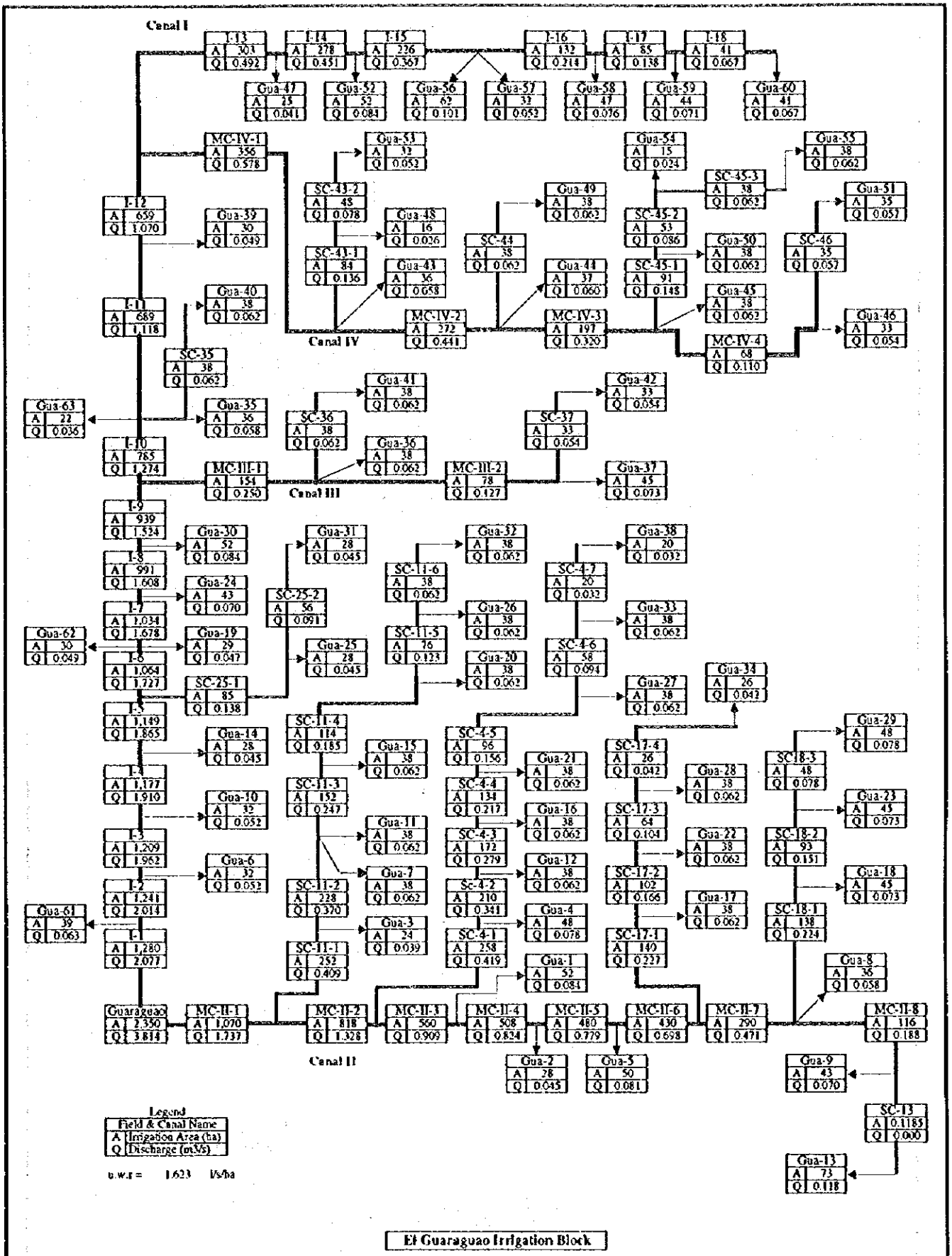
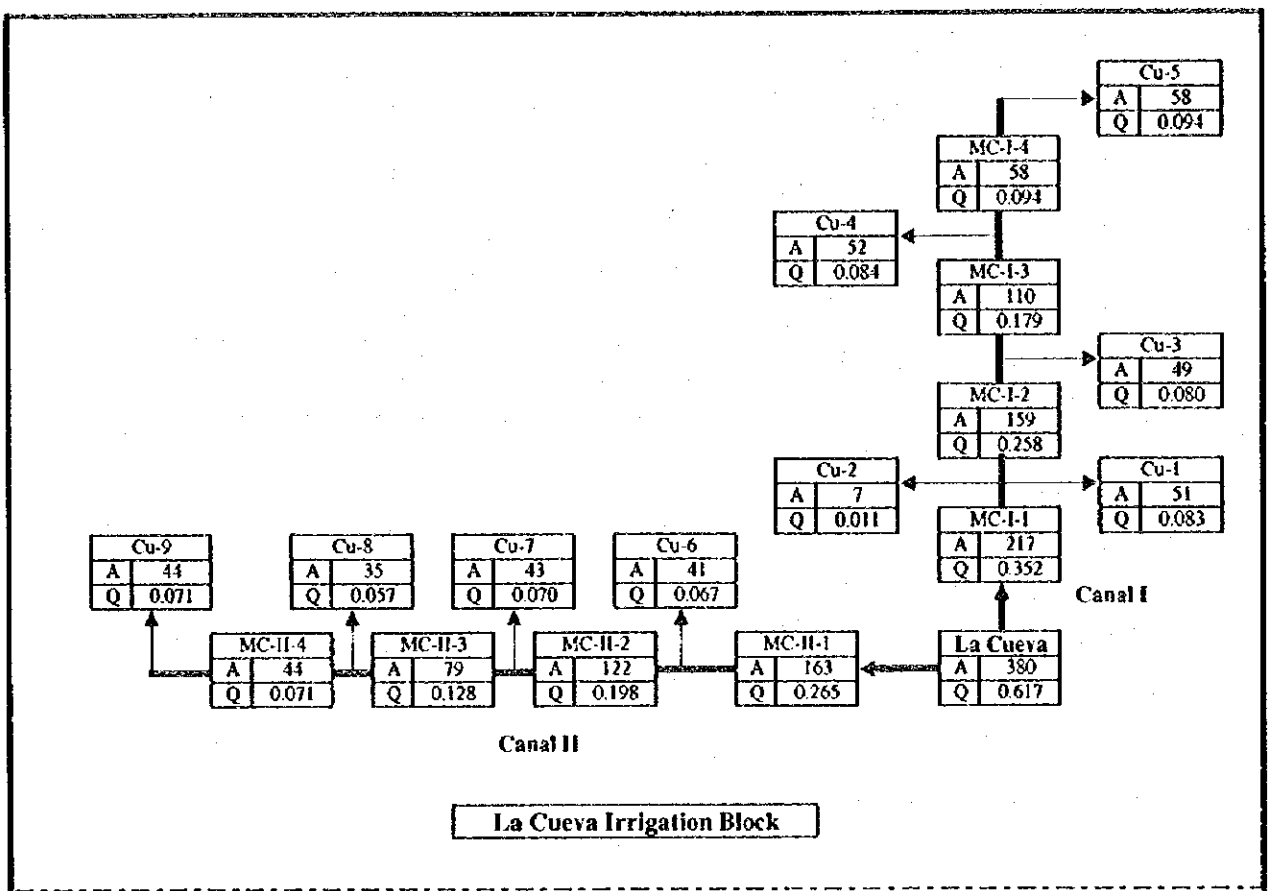


Fig I.6.4 Irrigation Network In Case of Without Considering Effective Rainfall (Alternative B) : 3/6



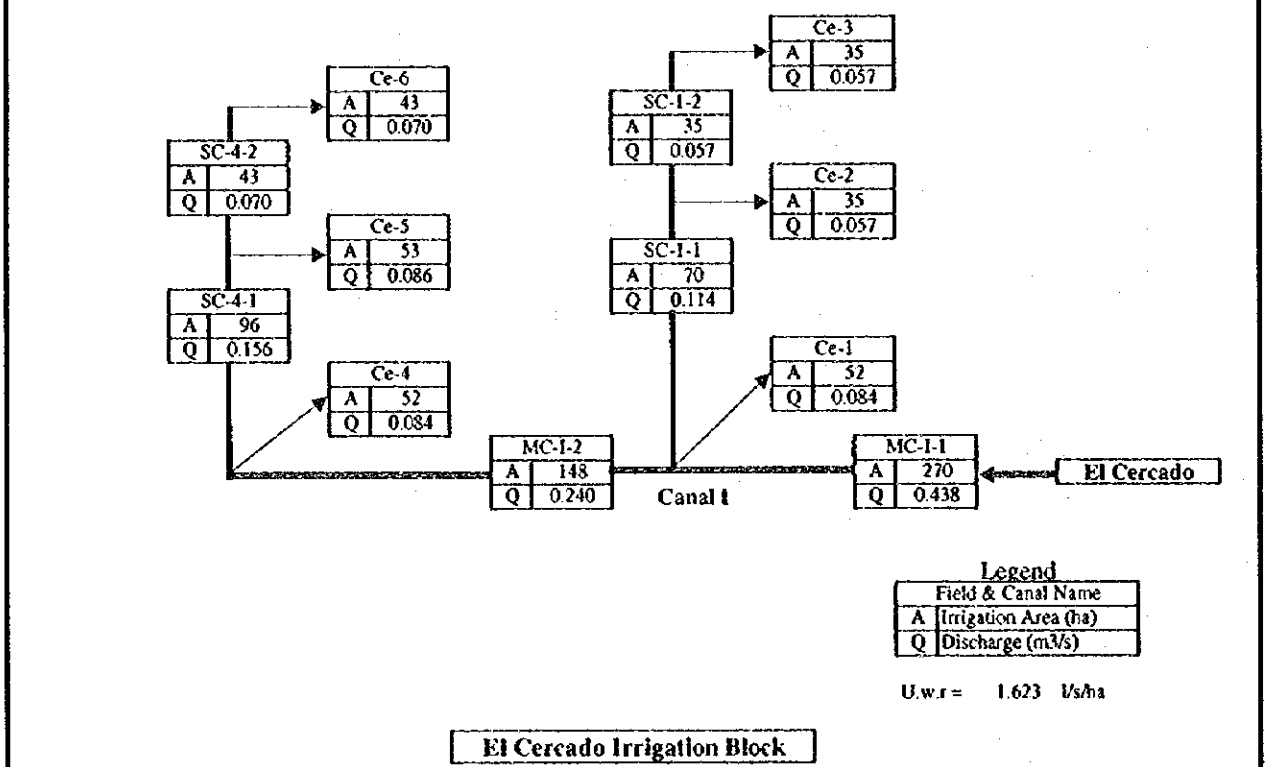


Fig I.6.4 Irrigation Network In Case of Without Considering Effective Rainfall (Alternative B) : 4/6

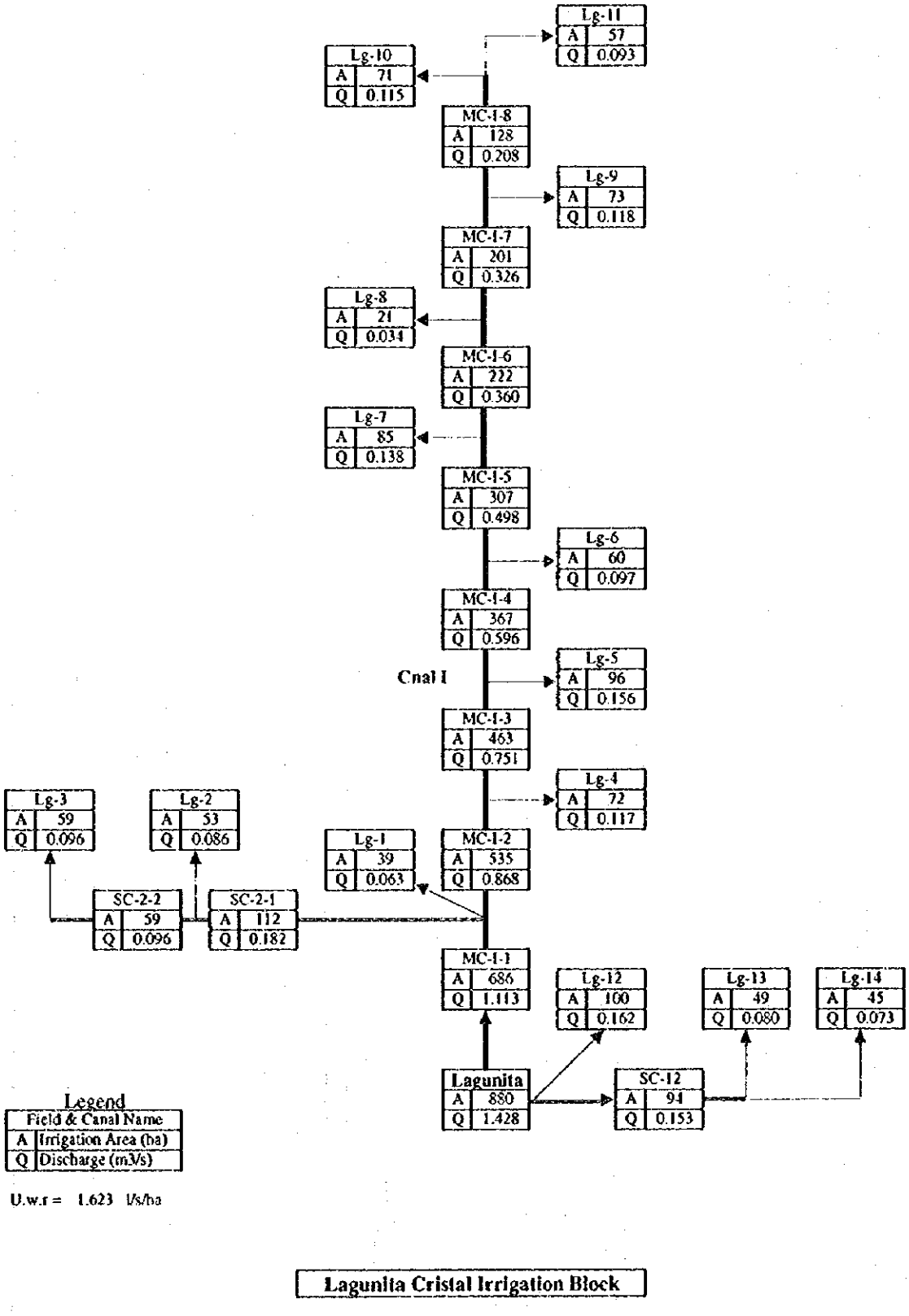


Fig I.6.4 Irrigation Network In Case of Without Considering Effective Rainfall (Alternative B) : 5/6

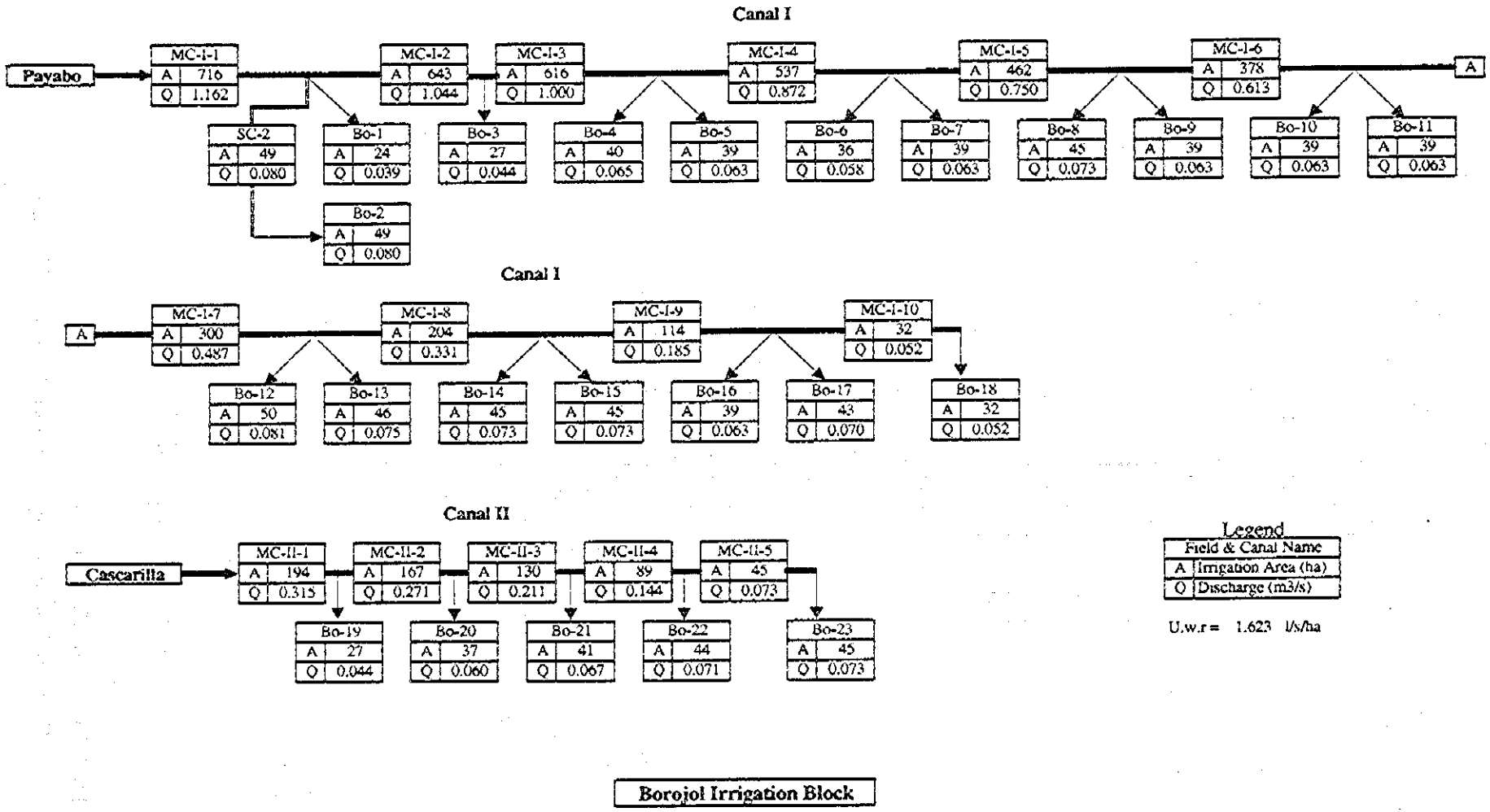


Fig I.6.4 Irrigation Network In Case of Without Considering Effective Rainfall (Alternative B) : 6/6

ANNEX J : FLOOD MITIGATION

ANNEX J : FLOOD MITIGATION

TABLE OF CONTENTS

List of Tables

List of Figures

ANNEX J : FLOOD MITIGATION

J.1 Introduction

J.1.1 Objective of the Study

The main objective of the flood mitigation study is to clarify the present flood condition in the Study area and to establish the optimum counter measure considering the cost and benefit for the farming activity. It is possible to design the structures for perfect flood control technically, however, it may be in-feasible to construct that kind of structures with consideration of present flood condition in the Area. The main crop in the area is paddy and some rang of the inundation period and depth might be allowed based on the influence for the crop production.

On the other hand, there exist two types of flood problems in the area, one is the inundation caused by direct runoff from rainfall, the another is the flood caused by the flood discharge of the Payabo river. Therefore, the flood mitigation plans for both problems should be studied.

J.1.2 Summary of the Study

According to above objective, the present condition for flood problem in the Study area and its countermeasures is studied. Summary of the study are as follows:

(1) Present analysis of rivers

Yuna River:	Water level of flood discharge on each return period
Barracote River:	Water level of flood discharge on each return period
Payabo River:	Flow capacity
	Influence of high water from Yuna river
	Flood condition of flood discharge and maximum rainfall
Cascarilla Canal:	Flow capacity
	Influence of high water from Barracote river
	Flood condition of maximum rainfall

(2) The study of inundation area in the Study area

Payabo River Block:

Case 1: Inundation area by high water from Yuna river
Case 2: Inundation area by flood discharge from the upper reach
Case 3: Inundation area by maximum rainfall in the Payabo block

Cascarilla River Block:

Case 1: Inundation area by high water from Barracote river
Case 2: Inundation area by maximum rainfall in the Cascarilla block

(3) Flood Mitigation Plan

Flood mitigation plan is studied on the basis of the actual flood analysis as follow:

Payabo River:
Countermeasure of high water from the Yuna river
Case 1: Installation of water gate at the confluence of the Yuna river with Payabo river to cut off return flow
Case 2: Embankment of the Payabo river

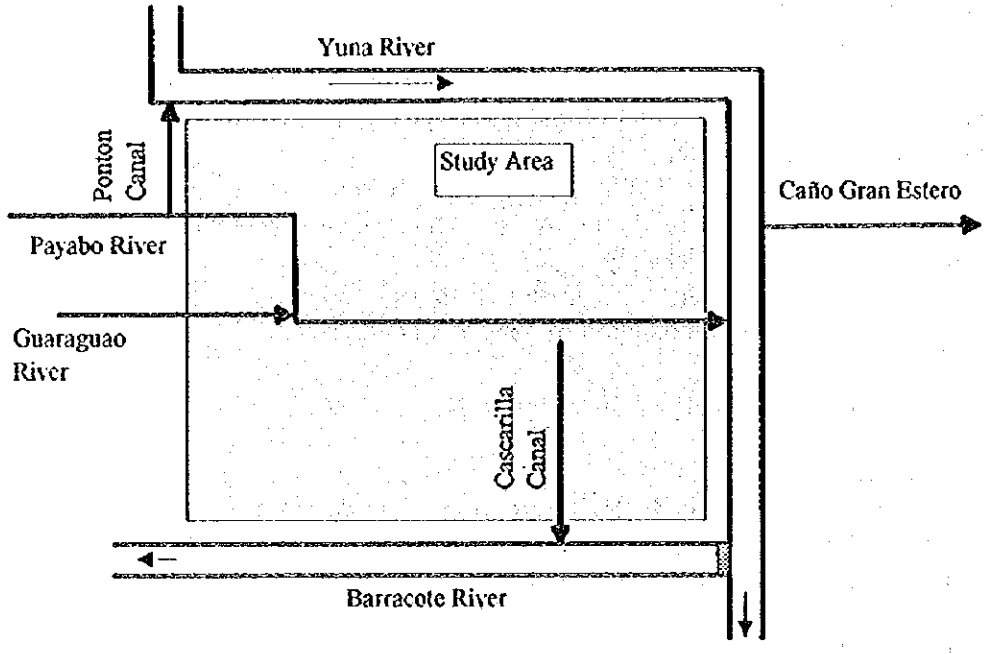
Countermeasure of flood from upper reach of payabo river
Case 1: Installation of diversion flow to the Cascarilla canal
Case 2: Expansion of the section for diversion canals
Case 3: Installation of flood mitigation dam

Cascarilla River: Countermeasure of high water from the Barracote river

J.2 Present Condition

J.2.1 General

The present condition of the drainage system in the Study area is summarized as below;



The flow capacity of the Yuna river at down stream from the Arenoso was estimated as approximately 750 m^3/s and the surplus flood water over 750 m^3/s is drained to Escocesa Bay through the Caño Gran Estero. The flood water of the Yuna river does not flow into the Study area but the drainage capacity of the Study area is influenced by the water level of the Yuna and Barracote rivers. There is one dike works at the

diversion point with the Barracote river and, when the amount of river discharge of the Yuna river become to more or less 80 m^3/s, some amount of discharge is started to divert to the Barracote river from the Yuna river. The water of the Yuna and Barracote rivers is drained to the Samana Bay where is more than 30 km far from the Study area and the influence of the tidal wave is not expected.

The Payabo river is one of the main rivers flowing in the Study area and present flow capacity is estimated as more or less 80 m^3/s. Usually some amount of river discharge is diverted to the Ponton canal from the Payabo river and this water is drained to the Yuna river through the Cevicos river. The drainage capacity of the Payabo river is always influenced by the water level at the confluence with the Yuna river.

The Cascarilla canal is the main drainage canal in the Study area and the drainage capacity is quite low due to the moderate longitudinal canal slope. This capacity is also influenced by the water level at the confluence with the Barracote river.

J.2.2 Present Flow Condition of Main Drainage

(1) Yuna River

Using the uniform flow and non-uniform flow calculation method, the present mean and flood flow condition of the Yuna river was analyzed as shown in Fig. J.2.1 and the result are summarized as below;

Summary of Mean Flow Analysis
Discharge 100 m3/s

Section	Accumulated Distance (km)	Elevation of River Bed (m)	Elevation of River Bank (m)	Water Level (m)
Diversion Point with Barracote	0.00	-2.200	5.200	2.524
El Limon	11.00	0.922	9.500	4.558
Confluence with Payabo	19.00	3.130	11.963	6.271
Viila Riva	34.00	7.373	15.278	9.616
Junco Verde	35.60	7.800	16.200	10.235
El Atoro	47.20	9.100	18.100	13.448

Summary of Flood Flow Analysis

Return Period	1/2	1/5	1/10	1/20
Flood Discharge (m3/s)	530	650	715	750
Section	Water Level (m)			
Diversion Point with Barracote	4.207	4.725	5.023	5.150
El Limon	7.848	8.541	8.998	9.238
Confluence with Payabo	10.534	11.275	11.645	11.838
Viila Riva	13.446	14.189	14.551	14.736
Junco Verde	13.859	14.588	14.946	15.128
El Atoro	16.697	17.413	17.777	17.965

(2) Barracote River

There is one dike structure at the diversion point from the Yuna river and, when the amount of river discharge of the Yuna river become to more or less 80 m^3/s, some amount of discharge is started to divert from the Yuna river. The amount of diverted discharge is always varied depending on the water level of the Yuna river and, applying over flow formula, the diverted amount was estimated as shown below;

	Flooding Time				Usall time
Return Period	1/2	1/5	1/10	1/20	1/2
Discharge at the Yuna (m^3/s)	530	650	715	750	100
Water Level at the Yuna (m)	4.207	4.725	5.023	5.15	2.524
Diverted amount to Barracote (m^3/s)	379	483	550	577	18
Rate against total discharge	71.55%	74.36%	76.92%	76.98%	17.81%

Using the uniform flow and non-uniform flow calculation method, the mean and flood flow condition of the Barracote river was estimated. The result are summarized as below;

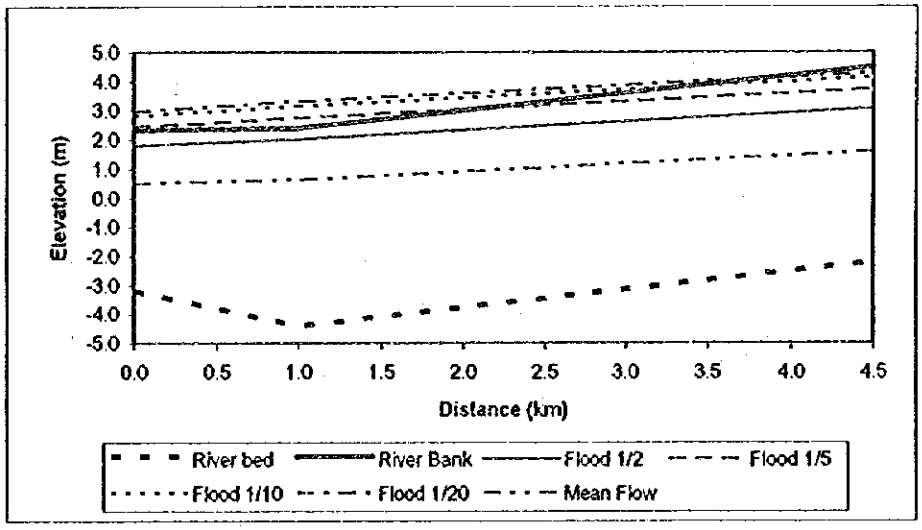
Summary of Mean Flow Analysis

Discharge 18 m^3/s

Section	Accumulated Distance (km)	Elevation of River Bed (m)	Elevation of River Bank (m)	Water Level (m)
Confluence With Rio Cristales	0.00	-3.200	2.310	0.518
Confluence with Caño Cascarilla	1.00	-4.400	2.400	0.632
200m down stream from Dike	4.50	-2.200	4.500	1.610

Summary of Flood Flow Analysis

Return Period	1/2	1/5	1/10	1/20
Flood Discharge (m^3/s)	379	483	550	577
Section	Water Level (m)			
Confluence With Rio Cristales	1.800	2.442	2.815	2.960
Confluence with Caño Cascarilla	2.031	2.748	3.164	3.323
200m down stream from Dike	3.065	3.744	4.141	4.291



(3) Payabo River

1) Flow Capacity of the Payabo River

The flow capacity of the Payabo river was analyzed based on the non uniform calculation as shown in Fig. J.2.2. In the calculation, the mean water level of the Yuna river (6.271 m) at the confluence with the Payabo river was applied. The result is summarized as shown below:

Section (Distance from Confuluence km)	Flow Capacity (m^3/s)
0.0 ~ 4.5	80
4.5 ~ 7.5	60
7.5 ~ 18.5	40
18.5 ~ 21.5	10
21.5 ~ 24.0	5

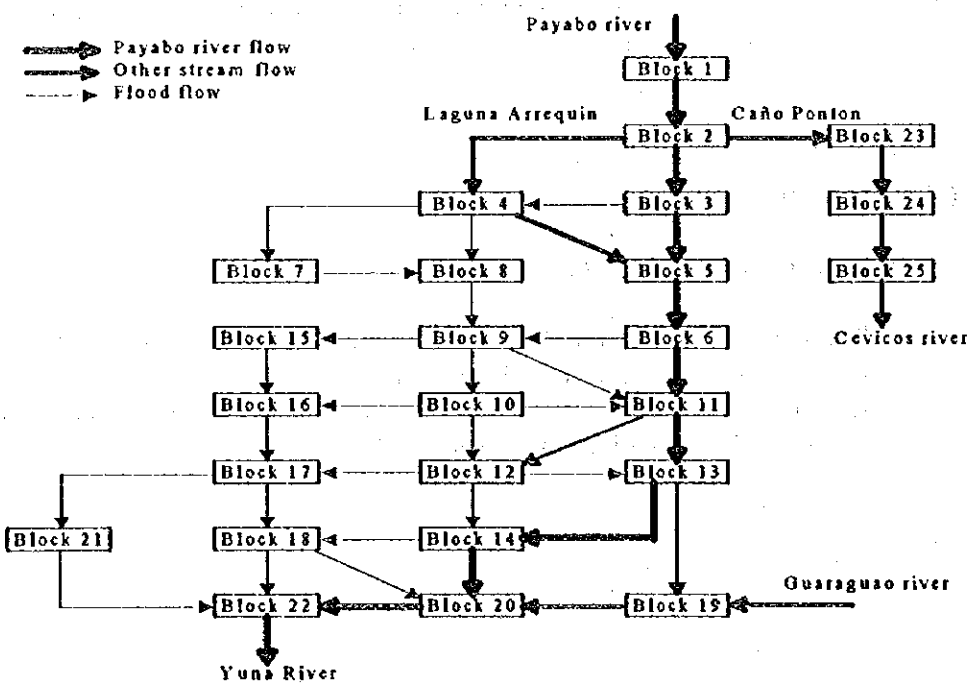
2) Influence of the Yuna River High Water Level

The flow condition of the Payabo river is always influenced of the water level at the Yuna river. The flow condition in the Yuna river flood period was also analyzed applying the high water level at the confluence as shown in Fig. J.2.2. This influence is summarized as shown below:

Return Period for the Yuna	Water Level at at the Yuna (m)	Influenced Distance From the Confluence (km)
1/2	10.534	15.0
1/5	11.275	17.0
1/10	11.645	17.5
1/20	11.838	18.0

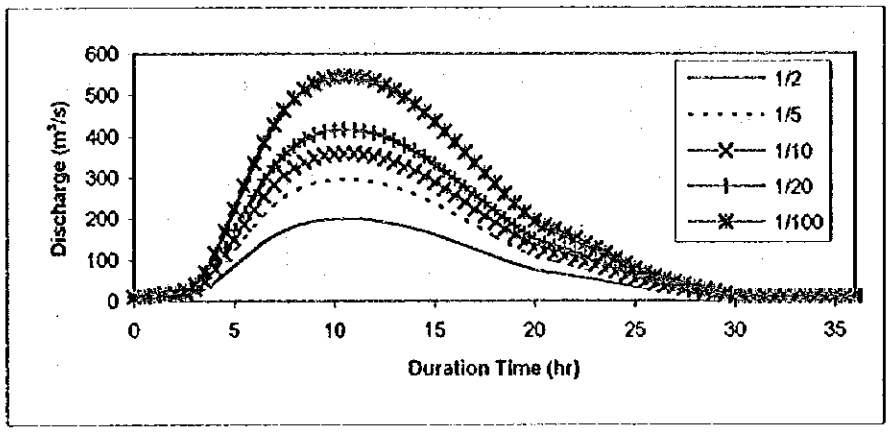
3) Flood Condition

There are two types of the flood in the Payabo river, one is coursed by the flood discharge from the upper basin of the Payabo river and the another is coursed by the direct runoff from rainfall in the Study area. For the analysis of flood condition, the Payabo river basin in the Study area was divided into 25 blocks as shown in Fig. J.2.3 and flow connection is summarized below:



a) Flood Flow Coursed by the Flood Discharge

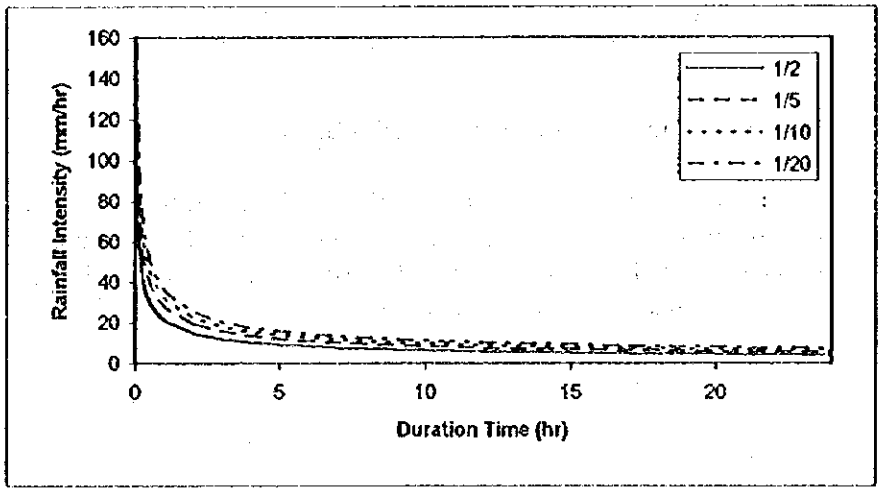
From the result of high flow analysis in Annex B, the flood hydrograph for 2, 5, 10, 20, and 100 year return period was estimated as shown below:



Applying these discharge as the inflow to Block 1, the flood discharge condition at each Block was analyzed as shown in Fig. J.2.4 and J.2.5. These result are summarized as shown in Table J.2.1.

b) Flood Discharge coursed by Rainfall

The rainfall intensity duration curve of 24 hr maximum rainfall for 2, 5, 10 and 20 year return period were estimated as shown below based on the result of rainfall analysis described in Annex B.



Considering the duration time for each Block, the rainfall was distributed and the direct runoff from the rainfall was estimated as shown in Fig. J.2.6. Applying these runoff discharge as the inflow to each Block, the flood condition was analyzed as shown in Fig. J.2.4 and J.2.5. These result are summarized as shown in Table J.2.1.

(4) Cascarilla Canal

1) Flow Capacity of Cascarilla Canal

The flow capacity of Cascarilla Canal was analyzed based on the non uniform calculation as shown in Fig. J.2.7. In the calculation, the mean water level (0.650 m) at the confluence with the Barracote river was applied. The result is summarized as shown below:

Section (Distance from Confuluence km)	Flow Capacity (m^3/s)
0.0 ~ 1.8	30
1.8 ~ 8.0	20
8.0 ~ 14.6	10
14.6 ~ 15.0	5

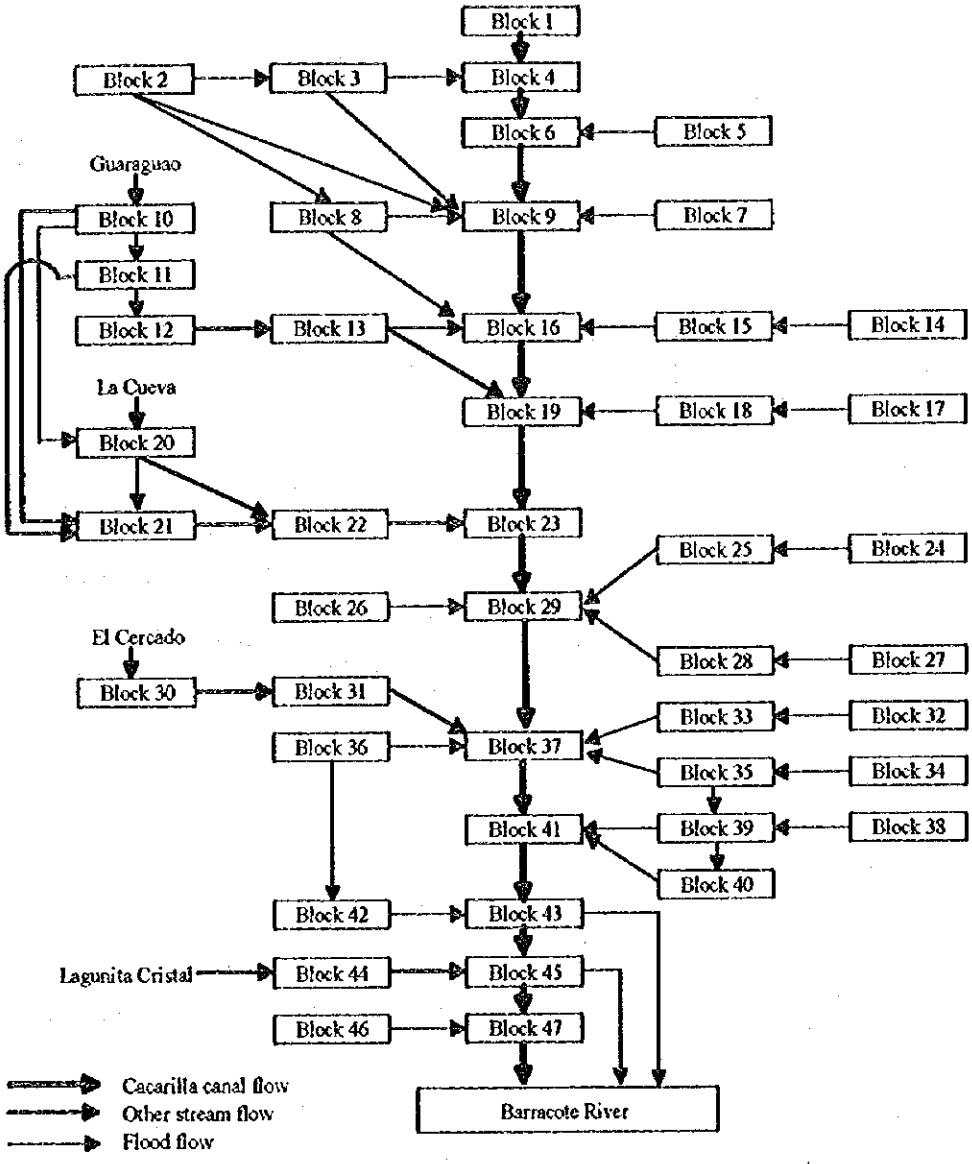
2) Influence of the High Water Level at the Barracote River

The flow condition of Cascarilla canal is always influenced of the water level at the Barracote river. The flow condition in the Barracote river flood period was also analyzed applying the high water level at the confluence as shown in Fig. J.2.7. This influence is summarized as shown below:

for Barracote	at the Barracote river (m)	From the Confluence (km)
1/2	2.031	10.4
1/5	2.748	11.1
1/10	3.164	11.9
1/20	3.323	12.2

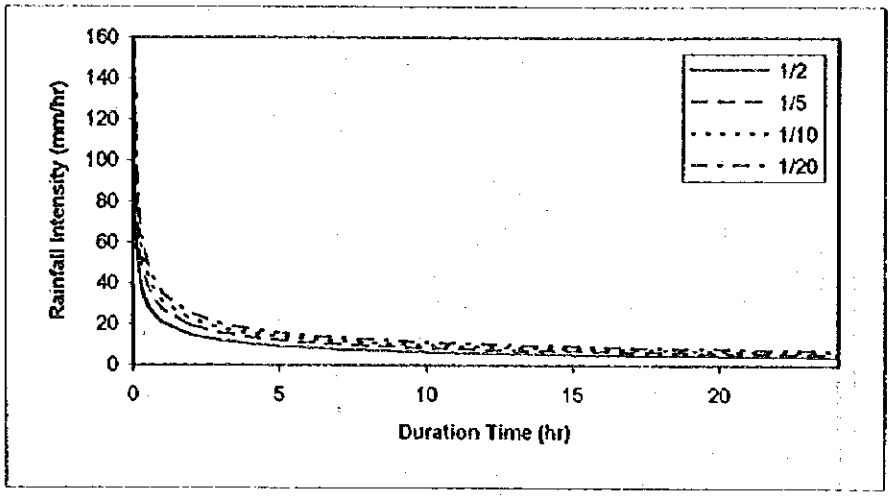
3) Flood Condition of the Cascarilla Basin

The flood in the Cascarilla Canal is the type coursed by the direct runoff from rainfall in the Study area. For the analysis of flood condition, the Cascarilla Canal basin in the Study area was divided into 47 blocks as shown in Fig. J.2.3 and flow connection is summarized below:



Flood Discharge coursed by Rainfall

The rainfall intensity duration curve of 24 hr maximum rainfall for 2, 5, 10 and 20 year return period were estimated as shown below based on the result of rainfall analysis described in Annex B.



Considering the duration time for each Block, the rainfall was distributed and the direct runoff from the rainfall was estimated as shown in Fig. J.2.8. Applying these runoff discharge as the inflow to each Block, the flood condition was analyzed as shown in Fig. J.2.9 and J.2.10. These result are summarized as shown in Table J.2.2.

J.2.3 Expected Inundation Area

There are 3 kind of inundation problems in the Study area as below:

- inundation coursed by high water level in the Yuna and Barracote rivers
- inundation coursed by the flood discharge from the upper Payabo basin
- inundation coursed by the direct runoff from rainfall in the Study area

From the result of flood condition analysis described in J.2.2, the inundation area can be expected and summarized as follows.

(1) Inundation coursed by High Water Level in the Yuna and Barracote Rivers

The inundation area coursed by the high water level was expected for 2, 5, 10, and 20 year return period as shown in Fig J.2.11 and those area are summarized below.

Inundation Area Coursed by Back Water (ha)

Payabo River				
Return Period	1/2	1/5	1/10	1/20
Water Level at the Yuna River (m)				
	10.534	11.275	11.645	11.834
Land Use	Inundation Area (ha)			
Paddy	577	778	1,738	1,885
Upland	5	5	15	15
Pasture	461	650	661	669
Forest	217	247	246	251
Total	1,260	1,680	2,660	2,820
Cacarilla Canal				
Return Period	1/2	1/5	1/10	1/20
Water Level at the Barracote River (m)				
	2.031	2.748	3.164	3.323
Land Use	Inundation Area (ha)			
Paddy	49	187	528	618
Upland	0	0	0	0
Pasture	49	165	172	172
Forest	126	126	126	126
Wetland	66	72	74	74
Total	290	550	900	990

(2) Inundation coursed by the Payabo River Flood

The inundation area coursed by the flood of Payabo river was expected for 2, 5, 10, and 20 year return period as shown in Fig J.2.12 and those area are summarized below.

Inundation Area coursed by the Payabo River Flood				
Return Period	1/2	1/5	1/10	1/20
Maximum Ponding Depth (m)	0.99	1.12	1.21	1.28
Inundation Area of Paddy Field (ha)	49	146	152	257
Total Inundation Area (ha)	49	207	236	348

(3) Inundation coursed by the Maximum Rainfall

The inundation area of Payabo river block and Cascarilla canal block coursed by the Maximum Rainfall was expected for 2, 5, 10, and 20 year return period as shown in Fig J.2.13 and those area are summarized below.

Inundation Area coursed by the Maximum Rainfall (Payabo River Block)				
Return Period	1/2	1/5	1/10	1/20
Maximum Ponding Depth (m)	0.69	0.78	0.82	0.84
Inundation Area of Paddy Field (ha)	0	0	0	0
Total Inundation Area (ha)	0	0	43	68

Inundation Area coursed by the Maximum Rainfall (Cascarilla Canal Block)				
Return Period	1/2	1/5	1/10	1/20
Maximum Ponding Depth (m)	0.23	0.45	0.56	0.64
Inundation Area of Paddy Field (ha)	0	0	0	0
Total Inundation Area (ha)	0	0	41	41

J.3 Flood Mitigation Plan

J.3.1 Basic Concept of Flood Mitigation Plan

Flooding within the Study area is caused by backwater stemmed from flooding of the Yuna river and the Barracote river as well as by overflow of the Payabo river. The flood mitigation plan is formulated on the basis of the analysis on actual performance of backwater.

For controlling overflow of the Payabo river, it is necessary to take two measures: (1) to regulate backwater coming from the Yuna river and (2) to alleviate flood at the head of the stream of the Payabo river, meanwhile flooding of the Cascarrilla canal should be mitigated by taking action against backwater of the Barracote river. The flood mitigation plan in this development study is delineated subject to the following allowable submergence.

Allowable submergence: Submergence deeper than 30 cm should take place within 24 hours provided that this depth should not exceed 80 cm taking the height of paddy plant

J.3.2 Flood Mitigation Plan for the Flood coursed by Back Water

(1) Payabo River

Backwater of the Payabo river may be controlled by means of: (1) to install water gate at the confluence of the Yuna river with Payabo river to cut off return flow or (2) to elevate embankment of the Payabo river higher than the flood water level. In the present plan, the latter is adopted supported by the following technical justifications.

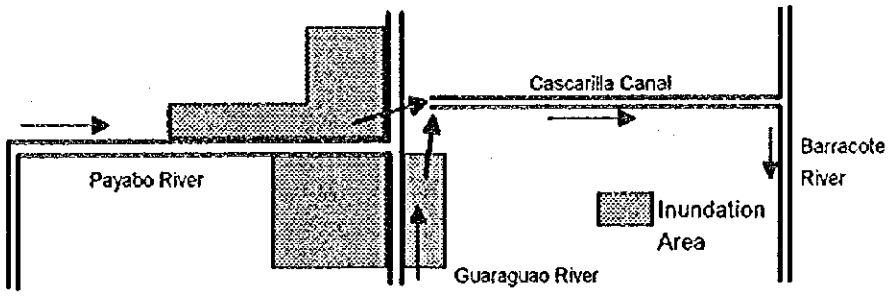
a. Within the context of flood mitigation plan to cover the whole basin of the Payabo river, it is indispensable to elevate embankment in view of upgrading flowing capacity of the river; the former measures requires additional cost for installation of water gate.

b. The operation of water gate in time of flooding demands sophisticated technique which evokes anxiety in its operation and maintenance.

The elevation of embankment will lead to strengthen flowing capacity of the Payabo river in the following manner.

Distance from the Confluence with Yuna (km)	Actual Capacity (m^3/s)	Enhanced Capacity (m^3/s)
0.0 - 4.5	80	100
4.5 - 7.5	60	80
7.5 - 18.5	40	60

With elevation of embankment overflow of river water can be prevented, but this measure will result in increasing river water level, which will make it impossible to discharge excess water of paddy fields situated both margins of the river. For solving this problem proposal will be made to divert surface water of the paddy fields cited above to the Cascarrilla canal. The connection of the Payabo river with the Cascarrilla canal will be made at two sections as illustrated below. Detailed design condition will be established in accordance with flood analysis data of the Payabo river.



Structures required for the above proposal are as mentioned hereinafter.

a. A siphon (box culvert type) will be installed crossing the Payabo river from the left margin to the right margin.

b. An access canal to divert flow of the Guaraguao river to the Cascarrilla canal will be placed with installation of roller gate with flap to cut off return flow at the confluence of the Guaraguao river with the Cascarrilla. This canal shall be a spillway type to comply with diversion function mentioned before.

(2) Cascarilla Canal

The flood water level of the Cascarrilla canal is 2.75 m under the return period of 1/5, so damages on agricultural production caused by inundation may be evaded if paddy is not planted at lands lower than 2 m.a.s.l. in view of the fact that the maximum submergence depth is 0.75 m. It is recommended to install roller gate with flap at the connection of the canal with drainage canal so that return flow from the canal into paddy fields should not be taken place.

J.3.3 Measures to mitigate flooding at upper stream of the Payabo river

The analysis on prevailing flooding implies that the frequency of flooding to surpass allowable submergence and period is very little. This suggests that with small expansion of the actual river section paddy fields will be kept within allowable submergence depth. Study on viability to construct flood mitigation dam at upper basin of the Study area will be carried out at the same time.

(1) Expansion of the section for diversion canals

The flooding discharge can be diverted to the Payabo river as well as to the Cevicos river and the flowing capacity of these two systems is estimated with regard to the nine cases of submergence depth. The result of this estimation is summarized in the table below.

The result of these calculation are shown in Table J.3.A, Fig J.3.A1 and Fig J.3.A2.

Case	Diverted Destination	Driving Capacity (m^3/s)[1/]	Submergence Depth (m)/hour[2/] A[3/]	B[4/]
1	Payabo	20		
	Ponton	20	0.94/12.0	0.74/20.5
2	Payabo	20		
	Ponton	40	0.93/11.5	0.72/19.0
3	Payabo	20		
	Ponton	60	0.90/10.5	0.70/17.0
4	Payabo	40		
	Ponton	20	0.96/13.5	0.73/19.0
5	Payabo	40		
	Ponton	40	0.93/12.5	0.71/17.0
6	Payabo	40		
	Ponton	60	0.90/11.5	0.69/15.5
7	Payabo	60		
	Ponton	20	0.94/14.5	0.69/15.0
8	Payabo	60		
	Ponton	40	0.91/13.0	0.69/15.5
9	Payabo	60		
	Ponton	60	0.90/12.0	0.67/14.5

Note: 1/ Based on the section of the upper reach for the Payabo river and on the diversion canal for the Caño Ponton
2/ Deeper than 30 cm
3/ Lands with deepest submergence
4/ Land with the second deepest submergence

The deepest submergence is identified with the lands at the lower reach of the Guaraguao river, which is followed by the lands at the point where flood originated from the Los Haitises National Park inflows the Study area; reasons for deeper submergence are explained by the lower elevation of lands (used as grazing land) for the former and by the increasing discharge just in front of the diversion point. The former lands are suffered from consistent inundation deeper than 80 cm and for this fact they will not be developed as paddy fields in the Alternative A (soil dressing works is necessary to develop these lands for paddy field).Because expected benefits to be produced by upgrading flowing

capacity will be insignificant, an improvement of the flowing capacity up to the case 1 shall be sufficient.

(2) Diversion flow to the Cascarrilla canal

Judging from the flowing capacity of the Cascarrilla canal, the flooding volume which may be diverted from the Payabo river to the Cascarrilla canal will be 30 m^3/s in total, which is consists of:

10 m^3/s :	through the siphon to across the Payabo river, and
20 m^3/s :	through the access canal to distribute flow of the Guaraguao river to the Cascarrilla canal

The result of calculation are shown in Table J.3.B, Fig J.3.B1 and Fig J.3.B2.

(3) Flood mitigation dam

The relation between dimension of structure and expected effect for the construction of dam was studies subject to the following three premises.

a. Flowing capacity of the Payabo river: 10 m^3/s
   Elevation of embankment will contribute to raise this capacity from 5 m^3/s of the actual capacity.

b. Capacity of diversion canal of Ponton: 20 m^3/s
   This canal will function as spillway of the Caño Ponton, so this capacity will be endowed.

c. Design criteria
   - Return period: 1/20
   - Spillway : Return period of 1/100 (Design discharge = 546 m^3/s)
   - Submergence analysis on the benefittable area shall be made with return period of 1/5

	Case 1	Case 2	Case 3
1. Design discharge (m^3/s)	42.8	96.7	194.9
2. Decreasing ratio of peak discharge (%)	85.6	67.5	34.4
3. Deepest allowable submergence (m)	0.27	0.52	0.71
4. Submergence time deeper than 30 cm (hr.)	0	47.0	17.0
5. Maximum water level (m)			
- Return period: 1/5	21.84	20.72	19.04
- Return period: 1/20	22.97	22.19	20.42
6. Overflow depth of spillway (m)	1.4	1.4	1.4
7. Free board (m)	1.6	1.6	1.6
8. Extra banking (m)	0.3	0.3	0.3
9. Height of crest (m)	26.27	25.49	23.72
10. Dam height (m)	14.77	13.99	12.22
11. Embankment volume (m^3)	310,186	278,215	209,308
12. Concrete volume (m^3)	18,680	18,680	18,680
13. Cost of construction works (RD$ x 1000)	199,200	184,500	152,900

The result of these calculation are shown in Table J.3.C, Fig J.3.C0, Fig J.3.C1 and Fig J.3.C2.

As shown in the table above, the construction of a dam aiming at mitigating flooding damage will have remarkable effect; with decrease of peak discharge by 34% the maximum allowable submergence can be elevated to 71% and with decrease by 85% no land covering the whole development area will be inundated deeper than 30 cm. The definite constrain on development of this proposal is extremely elevated construction cost against tangible benefit of it, which leads to the conclusion that the construction of a flood mitigation dam is not economically feasible.

(4) Selection of the optimum flood mitigation measure

Proposed amount of soils to be excavated shall be 400,000 m^3 in case that the flood mitigation plan contemplates only river improvement works and 200,000 m^3 if dam construction is included in the said plan; this balance in soils excavation amount is estimated to be approximately RD$ 9,000,000 if converted into construction cost and is meaningless in comparison with the construction cost of dam.

The discussion conducted herein together with analysis made in previous sub-sections J.3.3 (1) through (3) leads to the conclusion that the optimum plan to mitigate flooding damages shall be to expand section of the Payabo river in such dimension as to attain the flowing capacity of 20 m^3/s and to divert flow discharge from the Caño Ponton to the Cevicos river at the rate of 20 m^3/s.

The construction of a dam, which promises higher benefits, will not be justified within context of paddy fields development project.

(5) River Improvement Plan

According to above selection, river improvement plan was proposed.
Distribution of design discharge at Payabo river and Cascarilla Canal is decided with actual flow capacity and catchment area at river point.

The summary of river improvement plan is shown in Table J.3.1. Distribution of design discharge in the study area are shown in Fig J.3.1 and J.3.2.

ANNEX J : TABLES

Table J.2.1 Summary of Present Flood Condition at the Payabo Block (1/5)

Coursed by Payabo River

Block No.	Maximum Discharge (m3/s)	Ground Level (m)	Maximum Water Level (m)	Maximum Water Depth (m)	Maximum Inundation Area (km2)	Inundation Time	
						Depth>0.0 m (hr)	Depth>0.3 m (hr)
Return Period 1/2							
1	200.00	15.30	16.30	1.00	0.49	30.0	25.0
2	192.03	15.20	15.89	0.69	0.30	27.0	23.5
3	113.14	15.00	15.56	0.56	0.90	25.5	21.5
4	49.28	15.50	15.62	0.12	0.18	16.5	
5	160.30	14.40	14.66	0.26	0.45	26.0	
6	160.19	13.90	14.21	0.31	0.36	21.0	3.5
7	0.00	15.20					
8	1.56	14.10	14.12	0.02	0.05	13.0	
9	30.92	13.30	13.53	0.23	0.50	16.5	
10	0.00	12.10					
11	160.56	11.30	11.75	0.45	1.37	18.5	9.0
12	57.38	11.40	11.60	0.20	1.26	16.0	
13	115.14	11.30	11.57	0.27	0.07	17.0	
14	106.86	10.30	11.20	0.89	0.82	25.5	18.5
15	0.00	13.30					
16	0.00	12.20					
17	0.00	10.60					
18	8.25	11.10	11.13	0.03	1.12	15.5	
19	39.13	10.80	11.34	0.54	0.74	20.5	15.5
20	131.60	9.20	10.19	0.99	0.92	24.5	22.0
21	0.00	10.10					
22	131.76	9.60					
23	39.69	15.50	16.35	0.84	0.39	19.5	15.5
24	30.56	16.00	16.30	0.30	0.30	17.0	
25	28.70	16.50					
Return Period 1/5							
1	297.00	15.30	16.49	1.19	0.56	31.5	26.5
2	286.54	15.20	15.97	0.77	0.30	28.5	25.0
3	177.35	15.00	15.60	0.60	0.90	27.0	23.5
4	85.09	15.50	15.65	0.15	0.22	19.0	
5	259.00	14.40	14.72	0.32	0.54	27.5	4.5
6	258.70	13.90	14.23	0.33	0.38	23.5	8.0
7	0.00	15.20					
8	3.15	14.10	14.14	0.04	0.08	15.5	
9	39.59	13.30	13.57	0.27	0.54	19.0	
10	0.00	12.10					
11	260.16	11.30	11.97	0.67	1.72	21.5	14.5
12	101.83	11.40	11.76	0.36	1.70	20.0	6.5
13	155.75	11.30	11.73	0.43	0.14	20.0	9.5
14	168.73	10.30	11.42	1.12	0.90	27.5	21.5
15	0.00	13.30					
16	0.00	12.20					
17	2.63	10.60					
18	42.29	11.10	11.30	0.20	1.56	26.5	
19	61.13	10.80	11.41	0.61	1.02	23.5	19.5
20	179.66	9.20	10.26	1.06	1.21	27.5	25.0
21	0.99	10.10	10.17	0.06	1.53		
22	214.49	9.60					
23	40.31	15.50	16.37	0.87	0.40	21.5	17.0
24	29.89	16.00	16.35	0.35	0.35	19.0	5.5
25	29.56	16.50					

Table J.2.1 Summary of Present Flood Condition at the Payabo Block (2/5)

Coursed by Payabo River

Return Period 1/10

Block No.	Maximum Discharge (m3/s)	Ground Level (m)	Maximum Water Level (m)	Maximum Water Depth (m)	Maximum Inundation Area (km2)	Inundation Time Depth>0.0 m (hr)	Inundation Time Depth>0.3 m (hr)
1	360.00	15.30	16.60	1.30	0.60	31.5	26.5
2	347.37	15.20	16.02	0.82	0.30	28.5	25.5
3	209.14	15.00	15.62	0.62	0.90	27.5	23.5
4	104.27	15.50	15.66	0.16	0.24	19.5	
5	308.53	14.40	14.75	0.35	0.59	28.5	8.0
6	308.27	13.90	14.24	0.34	0.39	24.0	10.5
7	0.00	15.20					
8	4.35	14.10	14.16	0.06	0.10	18.0	
9	43.93	13.30	13.59	0.29	0.56	21.0	
10	0.00	12.10					
11	311.42	11.30	12.09	0.79	1.76	22.5	16.5
12	126.11	11.40	11.86	0.46	1.88	21.5	10.5
13	185.13	11.30	11.81	0.51	0.38	21.5	12.0
14	192.61	10.30	11.51	1.21	0.90	28.5	23.0
15	0.00	13.30					
16	0.00	12.20					
17	12.70	10.60	10.69	0.09	0.33	10.0	
18	59.19	11.10	11.37	0.27	1.56	30.0	
19	75.78	10.80	11.45	0.65	1.09	24.5	20.5
20	200.58	9.20	10.33	1.13	1.46	28.5	26.5
21	10.74	10.10	10.14	0.04	1.52	24.5	
22	251.42	9.60					
23	47.40	15.50	16.54	1.04	0.45	22.0	18.5
24	34.87	16.00	16.45	0.45	0.44	20.0	5.0
25	34.31	16.50					

Return Period 1/20

Block No.	Maximum Discharge (m3/s)	Ground Level (m)	Maximum Water Level (m)	Maximum Water Depth (m)	Maximum Inundation Area (km2)	Inundation Time Depth>0.0 m (hr)	Inundation Time Depth>0.3 m (hr)
1	417.00	15.30	16.71	1.41	0.64	32.0	27.5
2	402.38	15.20	16.07	0.87	0.30	29.0	26.0
3	244.96	15.00	15.64	0.64	0.90	27.5	24.0
4	127.35	15.50	15.68	0.18	0.26	20.0	
5	366.17	14.40	14.78	0.38	0.64	28.5	10.0
6	365.90	13.90	14.25	0.35	0.40	24.5	11.0
7	0.00	15.20					
8	6.09	14.10	14.17	0.07	0.12	18.5	
9	49.04	13.30	13.60	0.30	0.57	21.5	3.0
10	0.00	12.10					
11	369.75	11.30	12.20	0.90	1.76	23.5	17.5
12	148.19	11.40	11.93	0.53	1.98	23.0	12.0
13	214.31	11.30	11.89	0.59	0.60	22.5	14.0
14	216.16	10.30	11.59	1.28	0.90	29.5	24.0
15	0.00	13.30					
16	0.00	12.20					
17	25.89	10.60	10.76	0.16	0.38	13.5	
18	75.74	11.10	11.41	0.31	1.56	31.5	3.5
19	86.90	10.80	11.49	0.69	1.15	26.5	22.0
20	215.32	9.20	10.41	1.21	1.64	29.0	27.5
21	24.82	10.10	10.20	0.10	1.55	32.5	
22	287.13	9.60	9.73	0.13	2.60	8.5	
23	51.79	15.50	16.55	1.05	0.46	23.0	19.5
24	36.16	16.00	16.50	0.50	0.49	20.5	10.0
25	34.21	16.50					

Table J.2.1 Summary of Present Flood Condition at the Payabo Block (3/5)

Coursed by Payabo River

Return Period 1/100							
Block No.	Maximum Discharge (m3/s)	Ground Level (m)	Maximum Water Level (m)	Maximum Water Depth (m)	Maximum Inundation Area (km2)	Inundation Time	
						Depth>0.0 m (hr)	Depth>0.3 m (hr)
1	546.00	15.30	16.95	1.65	0.73	33.0	28.0
2	526.40	15.20	16.21	1.01	0.30	30.0	26.0
3	315.13	15.00	15.69	0.69	0.90	28.5	25.0
4	175.77	15.50	15.72	0.22	0.32	22.0	
5	479.12	14.40	14.88	0.48	0.80	29.5	12.0
6	478.82	13.90	14.28	0.38	0.42	25.0	13.5
7	0.00	15.20					
8	10.97	14.10	14.20	0.10	0.16	20.5	
9	61.28	13.30	13.63	0.33	0.59	23.0	8.0
10	0.00	12.10					
11	488.49	11.30	12.40	1.10	1.76	25.5	20.0
12	200.89	11.40	12.08	0.68	2.08	25.0	16.0
13	278.20	11.30	12.02	0.72	1.00	24.5	17.0
14	261.67	10.30	11.73	1.43	0.90	31.0	26.0
15	0.00	13.30					
16	0.00	12.20					
17	60.51	10.60	10.86	0.25	0.46	18.0	
18	116.59	11.10	11.51	0.41	1.56	34.5	10.0
19	116.08	10.80	11.56	0.76	1.26	28.5	24.0
20	246.21	9.20	10.64	1.44	2.18	30.5	29.0
21	59.94	10.10	10.29	0.19	1.59	36.5	
22	372.70	9.60	10.02	0.42	3.03	13.5	7.0
23	56.55	15.50	16.75	1.25	0.61	23.5	20.0
24	46.26	16.00	16.60	0.59	0.53	22.0	10.5
25	42.72	16.50					

Table J.2.1 Summary of Present Flood Condition at the Payabo Block (4/5)

Coursed by Maximum Rainfall

Return Period 1/2

Block No.	Maximum Discharge (m3/s)	Ground Level (m)	Maximum Water Level (m)	Maximum Water Depth (m)	Maximum Inundation Area (km2)	Inundation Time	
						Depth>0.0 m (hr)	Depth>0.3 m (hr)
1	18.19	15.30	15.51	0.21	0.15	12.0	
2	16.72	15.20	15.22	0.02	0.06	1.5	
3	7.48	15.00					
4	7.73	15.50					
5	16.44	14.40	14.44	0.04	0.12	3.5	
6	18.28	13.90					
7	1.80	15.20					
8	3.62	14.10	14.14	0.04	0.08	28.0	
9	4.67	13.30					
10	1.42	12.10					
11	28.13	11.30					
12	4.70	11.40					
13	31.99	11.30					
14	34.26	10.30	10.59	0.29	0.37	13.0	
15	1.80	13.30	13.31	0.01	0.46	0.5	
16	3.34	12.20	12.27	0.07	0.14	19.0	
17	8.12	10.60	10.67	0.07	0.31	15.0	
18	3.62	11.10					
19	14.49	10.80	11.24	0.44	0.28	25.0	16.5
20	52.12	9.20	9.89	0.69	0.04	15.5	11.5
21	16.10	10.10	10.18	0.08	1.54		
22	72.44	9.60					
23	9.51	15.50					
24	11.21	16.00					
25	12.16	16.50					

Return Period 1/5

Block No.	Maximum Discharge (m3/s)	Ground Level (m)	Maximum Water Level (m)	Maximum Water Depth (m)	Maximum Inundation Area (km2)	Inundation Time	
						Depth>0.0 m (hr)	Depth>0.3 m (hr)
1	19.45	15.30	15.54	0.24	0.16	18.5	
2	18.46	15.20	15.31	0.11	0.30	4.0	
3	8.16	15.00					
4	9.42	15.50					
5	18.37	14.40	14.49	0.09	0.19	6.0	
6	21.15	13.90					
7	2.26	15.20					
8	4.29	14.10	14.15	0.05	0.09	28.5	
9	5.91	13.30					
10	1.98	12.10					
11	34.28	11.30					
12	6.31	11.40					
13	39.52	11.30					
14	40.95	10.30	10.67	0.36	0.41	21.5	3.5
15	2.26	13.30	13.32	0.01	0.46	24.5	
16	4.27	12.20	12.28	0.08	0.15	26.0	
17	10.98	10.60	10.68	0.08	0.32	27.5	
18	4.82	11.10	11.15	0.05	1.23		
19	19.54	10.80	11.25	0.45	0.35	32.0	23.0
20	63.40	9.20	9.98	0.78	0.04	24.0	19.5
21	20.51	10.10	10.19	0.09	1.54		
22	94.92	9.60					
23	10.33	15.50					
24	12.45	16.00					
25	13.88	16.50					

Table J.2.1 Summary of Present Flood Condition at the Payabo Block (5/5)

Coursed by Maximum Rainfall

Return Period 1/10

Block No.	Maximum Discharge (m3/s)	Ground Level (m)	Maximum Water Level (m)	Maximum Water Depth (m)	Maximum Inundation Area (km2)	Inundation Time	
						Depth>0.0 m (hr)	Depth>0.3 m (hr)
1	20.55	15.30	15.58	0.28	0.18	23.5	
2	19.80	15.20	15.37	0.17	0.30	5.5	
3	9.07	15.00	15.04	0.04	0.01	3.0	
4	10.34	15.50					
5	19.93	14.40	14.50	0.10	0.20	8.0	
6	24.87	13.90	13.91	0.01	0.10	1.0	
7	2.85	15.20					
8	5.18	14.10	14.16	0.06	0.10	30.5	
9	7.72	13.30	13.32	0.02	0.16	2.5	
10	2.18	12.10					
11	39.35	11.30	11.32	0.02	0.30	1.5	
12	8.18	11.40					
13	44.92	11.30	11.32	0.02	0.06	1.0	
14	44.49	10.30	10.72	0.42	0.44	24.0	5.0
15	2.85	13.30	13.32	0.02	0.46	27.0	
16	5.15	12.20	12.29	0.09	0.16	28.0	
17	13.03	10.60	10.70	0.10	0.33	29.0	
18	5.53	11.10	11.15	0.05	1.27		
19	24.61	10.80	11.27	0.47	0.43	33.5	25.0
20	71.01	9.20	10.02	0.82	0.11	26.0	22.5
21	24.32	10.10	10.20	0.10	1.55		
22	104.04	9.60					
23	10.81	15.50					
24	12.76	16.00					
25	14.20	16.50					

Return Period 1/20

Block No.	Maximum Discharge (m3/s)	Ground Level (m)	Maximum Water Level (m)	Maximum Water Depth (m)	Maximum Inundation Area (km2)	Inundation Time	
						Depth>0.0 m (hr)	Depth>0.3 m (hr)
1	21.79	15.30	15.60	0.30	0.19	26.5	1.0
2	21.17	15.20	15.42	0.22	0.30	7.5	
3	9.70	15.00	15.08	0.08	0.01	4.0	
4	11.36	15.50					
5	21.44	14.40	14.51	0.11	0.22	9.5	
6	28.08	13.90	13.95	0.05	0.10	2.5	
7	3.16	15.20					
8	5.66	14.10	14.16	0.06	0.10	31.0	
9	9.36	13.30	13.34	0.04	0.20	3.5	
10	2.35	12.10					
11	44.57	11.30	11.35	0.05	0.36	3.0	
12	10.67	11.40					
13	50.90	11.30	11.36	0.06	0.06	2.0	
14	49.19	10.30	10.76	0.46	0.47	26.5	6.0
15	3.16	13.30	13.32	0.02	0.47	27.0	
16	5.65	12.20	12.29	0.09	0.16	29.0	
17	14.81	10.60	10.71	0.11	0.34	30.0	
18	6.26	11.10	11.16	0.06	1.31		
19	26.18	10.80	11.28	0.47	0.45	34.0	24.5
20	76.43	9.20	10.04	0.84	0.23	28.0	24.5
21	28.38	10.10	10.21	0.11	1.56		
22	114.12	9.60					
23	11.25	15.50					
24	13.37	16.00					
25	15.28	16.50					

Table J.2.2 Summary of Present Flood Condition at the Cascarilla Block (1/4)

Coursed by Maximum Rainfall

Return Period 1/2							
Block No.	Maximum Discharge (m3/s)	Ground Level (m)	Maximum Water Level (m)	Maximum Water Depth (m)	Maximum Inundation Area (km2)	Inundation Time	
						Depth>0.0 m (hr)	Depth>0.3 m (hr)
1	6.94	8.30					
2	4.46	8.50					
3	4.93	7.90					
4	6.79	7.30					
5	3.37	7.30	7.35	0.05	0.39	47.0	
6	12.63	7.00					
7	0.92	7.40	7.41	0.01	0.33	0.5	
8	5.18	5.80					
9	10.99	5.00					
10	6.14	8.00	8.18	0.18	1.21	47.0	
11	8.01	7.60	7.67	0.07	0.30	3.5	
12	8.53	8.90					
13	7.19	5.60					
14	2.09	5.80					
15	3.93	5.50	5.67	0.17	0.29	46.5	
16	20.41	5.00					
17	2.67	5.70					
18	4.58	4.10	4.19	0.09	0.53	47.5	
19	11.91	3.50					
20	7.94	7.00	7.07	0.07	3.04		
21	9.05	5.20					
22	12.52	3.30	3.37	0.07	0.28	33.5	
23	25.39	3.10					
24	3.00	5.20					
25	3.56	3.50	3.64	0.14	0.51	46.0	
26	3.24	3.90	4.05	0.15	0.41	31.5	
27	3.27	5.40					
28	3.33	2.50	2.66	0.16	0.24	47.5	
29	27.74	2.90					
30	4.60	5.50	5.67	0.17	0.67	46.5	
31	3.20	4.00					
32	3.43	4.30					
33	2.59	3.00					
34	0.95	4.20					
35	2.97	2.80	2.96	0.16	0.42	47.0	
36	5.33	4.70	4.78	0.08	0.57	25.5	
37	26.62	2.00					
38	2.39	4.20					
39	3.67	2.65					
40	1.56	2.50	2.63	0.13	0.35	46.5	
41	28.77	1.50	1.73	0.23	0.38	22.0	
42	3.52	3.20	3.21	0.01	0.43	8.0	
43	24.56	1.50	1.54	0.03	0.42	8.0	
44	4.17	3.80					
45	22.21	1.50					
46	2.93	2.80	3.02	0.21	0.41	47.0	
47	22.71	1.50					

Table J.2.2 Summary of Present Flood Condition at the Cascarilla Block (2/4)

Coursed by Maximum Rainfall

Return Period 1/5							
Block No.	Maximum Discharge (m3/s)	Ground Level (m)	Maximum Water Level (m)	Maximum Water Depth (m)	Maximum Inundation Area (km2)	Inundation Time	
						Depth>0.0 m (hr)	Depth>0.3 m (hr)
1	9.55	8.30					
2	5.99	8.50					
3	10.21	7.90	7.93	0.03	0.50	3.5	
4	11.56	7.30					
5	4.43	7.30	7.36	0.06	0.40	47.0	
6	19.03	7.00					
7	1.23	7.40	7.41	0.01	0.33	0.5	
8	7.04	5.80					
9	25.22	5.00	5.17	0.17	0.10	12.5	
10	8.13	8.00	8.22	0.21	1.19	47.0	
11	10.68	7.60	7.81	0.21	0.35	7.0	
12	10.97	8.90					
13	12.86	5.60					
14	2.65	5.80					
15	5.65	5.50	5.70	0.19	0.30	47.0	
16	39.17	5.00	5.12	0.12	0.89	11.0	
17	3.41	5.70					
18	5.83	4.10	4.21	0.11	0.53	47.5	
19	16.21	3.50					
20	10.88	7.00	7.10	0.10	3.04	47.0	
21	13.44	5.20					
22	17.27	3.30	3.39	0.09	0.28	35.5	
23	34.03	3.10					
24	3.93	5.20					
25	5.84	3.50	3.74	0.24	0.54	46.5	
26	4.29	3.90	4.08	0.18	0.41	35.5	
27	4.33	5.40					
28	5.64	2.50	2.69	0.19	0.26	47.5	
29	40.82	2.90					
30	5.95	5.50	5.72	0.22	0.75	47.0	
31	3.93	4.00					
32	4.52	4.30					
33	3.58	3.00					
34	1.28	4.20					
35	4.09	2.80	3.02	0.22	0.32	47.5	
36	6.97	4.70	4.80	0.10	0.62	28.5	
37	32.05	2.00	2.09	0.09	0.24	13.5	
38	3.04	4.20					
39	6.08	2.65	2.71	0.06	0.61	24.0	
40	2.61	2.50	2.71	0.21	0.32	47.0	
41	34.27	1.50	1.96	0.45	0.41	27.5	19.0
42	6.19	3.20	3.32	0.12	0.40	24.5	
43	30.34	1.50	1.75	0.25	0.58	24.0	
44	5.33	3.80					
45	28.42	1.50	1.53	0.03	0.54	11.5	
46	3.69	2.80	3.02	0.22	0.41	47.0	
47	28.54	1.50					

Table J.2.2 Summary of Present Flood Condition at the Cascarilla Block (3/4)

Coursed by Maximum Rainfall

Return Period 1/10							
Block No.	Maximum Discharge (m3/s)	Ground Level (m)	Maximum Water Level (m)	Maximum Water Depth (m)	Maximum Inundation Area (km2)	Inundation Time Depth>0.0 m (hr)	Inundation Time Depth>0.3 m (hr)
1	11.14	8.30					
2	6.89	8.50					
3	12.85	7.90	7.95	0.05	0.52	4.5	
4	16.37	7.30					
5	4.94	7.30	7.37	0.07	0.40	47.0	
6	24.87	7.00					
7	1.29	7.40	7.41	0.01	0.33	0.5	
8	8.24	5.80					
9	36.69	5.00	5.35	0.35	0.14	17.0	2.5
10	9.34	8.00	8.23	0.23	1.19	47.0	
11	12.32	7.60	7.88	0.28	0.38	9.0	
12	12.87	8.90					
13	18.79	5.60					
14	3.32	5.80					
15	6.69	5.50	5.71	0.21	0.31	47.0	
16	51.99	5.00	5.25	0.25	0.78	15.0	
17	4.41	5.70					
18	6.76	4.10	4.22	0.11	0.53	47.0	
19	35.67	3.50	3.54	0.04	0.24	2.5	
20	11.49	7.00	7.11	0.11	3.04		
21	17.90	5.20					
22	21.59	3.30	3.41	0.10	0.28	36.5	
23	48.78	3.10	3.21	0.11	0.53	7.0	
24	4.39	5.20					
25	7.67	3.50	3.82	0.32	0.55	47.0	18.0
26	4.88	3.90	4.10	0.20	0.41	37.0	
27	4.93	5.40					
28	6.51	2.50	2.80	0.30	0.33	47.5	
29	51.86	2.90	2.91	0.01	0.81	1.0	
30	6.65	5.50	5.74	0.24	0.79	47.0	
31	4.94	4.00					
32	5.07	4.30					
33	4.89	3.00					
34	1.56	4.20					
35	4.85	2.80	3.07	0.27	0.32	47.0	
36	7.96	4.70	4.81	0.11	0.63	30.0	
37	37.34	2.00	2.21	0.20	0.48	24.0	
38	3.85	4.20					
39	8.42	2.65	2.77	0.12	0.65	25.5	
40	3.59	2.50	2.76	0.26	0.29	47.0	
41	37.73	1.50	2.06	0.56	0.41	29.5	24.0
42	8.49	3.20	3.39	0.19	0.38	26.0	
43	38.01	1.50	1.88	0.38	0.69	25.0	17.5
44	5.95	3.80					
45	37.49	1.50	1.74	0.24	0.48	23.0	
46	4.69	2.80	3.03	0.23	0.41	47.5	
47	34.66	1.50	1.61	0.11	0.55	15.5	

Table J.2.2 Summary of Present Flood Condition at the Cascarilla Block (4/4)

Coursed by Maximum Rainfall

Return Period 1/20							
Block No.	Maximum Discharge (m3/s)	Ground Level (m)	Maximum Water Level (m)	Maximum Water Depth (m)	Maximum Inundation Area (km2)	Inundation Time	
						Depth>0.0 m (hr)	Depth>0.3 m (hr)
1	12.76	8.30					
2	7.83	8.50					
3	14.75	7.90	7.96	0.06	0.54	5.5	
4	20.12	7.30					
5	5.58	7.30	7.37	0.07	0.40	47.0	
6	29.52	7.00					
7	1.56	7.40	7.42	0.01	0.33	0.5	
8	9.39	5.80					
9	46.34	5.00	5.45	0.45	0.17	19.0	4.0
10	10.58	8.00	8.24	0.24	1.18	47.5	
11	14.04	7.60	7.95	0.35	0.41	11.5	2.0
12	14.84	8.90					
13	23.86	5.60					
14	3.69	5.80					
15	7.23	5.50	5.72	0.21	0.32	47.0	
16	66.52	5.00	5.30	0.30	0.73	16.5	1.0
17	4.95	5.70					
18	7.55	4.10	4.22	0.12	0.53	47.0	
19	65.09	3.50	3.87	0.37	0.51	8.0	3.0
20	13.34	7.00	7.12	0.12	3.04	46.5	
21	23.08	5.20					
22	27.27	3.30	3.52	0.22	0.30	37.0	
23	69.48	3.10	3.46	0.36	0.45	13.5	5.0
24	4.88	5.20					
25	8.68	3.50	3.86	0.36	0.56	47.5	23.0
26	5.49	3.90	4.11	0.21	0.41	38.5	
27	5.55	5.40					
28	7.53	2.50	2.92	0.41	0.40	47.5	15.0
29	61.49	2.90	3.12	0.22	0.89	11.5	
30	7.47	5.50	5.77	0.27	0.83	47.0	
31	5.55	4.00					
32	5.69	4.30					
33	5.74	3.00					
34	1.64	4.20					
35	6.38	2.80	3.12	0.32	0.32	47.5	2.5
36	8.98	4.70	4.82	0.12	0.65	31.5	
37	45.52	2.00	2.30	0.30	0.50	24.5	
38	4.31	4.20					
39	9.49	2.65	2.80	0.15	0.68	27.0	
40	4.38	2.50	2.78	0.28	0.29	47.0	
41	44.78	1.50	2.14	0.64	0.40	30.5	25.0
42	9.74	3.20	3.43	0.23	0.37	27.5	
43	47.00	1.50	1.98	0.48	0.77	26.0	23.0
44	6.63	3.80					
45	45.59	1.50	1.88	0.38	0.45	24.0	16.5
46	5.24	2.80	3.03	0.23	0.41	47.5	
47	40.88	1.50	1.79	0.29	0.43	22.5	

Table J.3.A Summary of Frood Condition at the Payabo Block with Improved of Drainage Capacity (1/5)

Design Flow Capacity (Return Period 1/5)							
	Payabo	20	m3/s	Ponton	20	m3/s	
Block No.	Maximum Discharge (m3/s)	Ground Level (m)	Maximum Water Level (m)	Maximum Water Depth (m)	Maximum Inundation Area (km2)	Inundation Time Depth>0.0 m (hr)	Inundation Time Depth>0.3 m (hr)
1	297.00	15.30	16.40	1.10	0.53	23.0	20.5
2	286.73	15.20	15.93	0.73	0.30	23.0	20.5
3	173.80	15.00	15.59	0.59	0.90	22.0	19.5
4	69.28	15.50	15.64	0.14	0.20	15.0	
5	240.25	14.40	14.70	0.30	0.51	22.0	
6	239.90	13.90	14.23	0.33	0.38	20.5	8.0
7	0.00	15.20					
8	2.37	14.10	14.14	0.04	0.07	17.0	
9	20.54	13.30	13.46	0.16	0.42	14.5	
10	0.00	12.10					
11	241.42	11.30	11.81	0.51	1.51	14.0	10.0
12	79.49	11.40	11.64	0.24	1.35	13.0	
13	184.22	11.30	11.58	0.28	0.07	12.0	
14	181.69	10.30	11.09	0.78	0.73	13.5	10.5
15	0.00	13.30					
16	0.00	12.20					
17	1.05	10.60	10.60	0.00	0.25	0.5	
18	0.03	11.10					
19	40.65	10.80	11.34	0.53	0.71	15.0	11.0
20	213.27	9.20	10.20	1.00	0.93	15.0	13.5
21	0.46	10.10	10.16	0.06	1.53	7.5	
22	215.17	9.60					
23	48.54	15.50	16.15	0.65	0.36	17.5	11.5
24	42.32	16.00	16.13	0.13	0.15	12.0	
25	42.39	16.50					

Design Flow Capacity (Return Period 1/5)							
	Payabo	40	m3/s	Ponton	20	m3/s	
Block No.	Maximum Discharge (m3/s)	Ground Level (m)	Maximum Water Level (m)	Maximum Water Depth (m)	Maximum Inundation Area (km2)	Inundation Time Depth>0.0 m (hr)	Inundation Time Depth>0.3 m (hr)
1	297.00	15.30	16.39	1.09	0.53	20.5	19.0
2	286.10	15.20	15.92	0.72	0.30	21.0	19.0
3	181.38	15.00	15.58	0.58	0.90	20.5	18.0
4	62.73	15.50	15.63	0.13	0.20	13.0	
5	241.92	14.40	14.69	0.29	0.49	19.5	
6	241.56	13.90	14.22	0.32	0.38	19.0	7.0
7	0.00	15.20					
8	2.08	14.10	14.13	0.03	0.06	15.0	
9	19.48	13.30	13.45	0.15	0.39	13.0	
10	0.00	12.10					
11	243.13	11.30	11.79	0.49	1.47	14.0	9.0
12	73.62	11.40	11.62	0.22	1.31	12.5	
13	189.73	11.30	11.57	0.27	0.07	12.0	
14	185.37	10.30	11.09	0.78	0.73	13.5	11.0
15	0.00	13.30					
16	0.00	12.20					
17	1.04	10.60	10.61	0.01	0.26	16.5	
18	1.00	11.10					
19	39.57	10.80	11.33	0.53	0.68	15.0	11.0
20	213.46	9.20	10.19	0.99	0.91	16.0	14.5
21	0.77	10.10					
22	212.17	9.60					
23	50.38	15.50	16.15	0.65	0.36	15.5	10.5
24	41.56	16.00	16.12	0.12	0.14	10.5	
25	40.89	16.50					

Table J.3.A Summary of Frood Condition at the Payabo Block with Improved of Drainage Capacity (2/5)

Design Flow Capacity (Return Period 1/5)							
	Payabo	60	m3/s	Ponton	20	m3/s	
Block No.	Maximum Discharge (m3/s)	Ground Level (m)	Maximum Water Level (m)	Maximum Water Depth (m)	Maximum Inundation Area (km2)	Inundation Time Depth>0.0 m (hr)	Inundation Time Depth>0.3 m (hr)
1	297.00	15.30	16.33	1.03	0.51	19.0	17.0
2	285.65	15.20	15.89	0.69	0.30	17.5	15.5
3	194.07	15.00	15.56	0.56	0.90	17.5	15.0
4	49.29	15.50	15.62	0.12	0.18	10.5	
5	240.43	14.40	14.66	0.26	0.45	16.5	
6	240.08	13.90	14.21	0.31	0.37	15.5	4.0
7	0.00	15.20					
8	1.55	14.10	14.12	0.02	0.05	12.5	
9	17.05	13.30	13.43	0.13	0.36	10.0	
10	0.00	12.10					
11	240.69	11.30	11.72	0.42	1.29	14.5	7.0
12	56.52	11.40	11.58	0.18	1.20	12.0	
13	198.07	11.30	11.53	0.23	0.07	12.5	
14	185.98	10.30	11.10	0.80	0.74	15.5	12.0
15	0.00	13.30					
16	0.00	12.20					
17	1.01	10.60	10.61	0.01	0.26	0.5	
18	0.36	11.10					
19	35.52	10.80	11.32	0.52	0.63	14.0	10.0
20	211.60	9.20	10.19	0.99	0.91	17.0	15.5
21	0.72	10.10					
22	210.71	9.60					
23	48.15	15.50	16.04	0.54	0.34	12.5	8.5
24	41.72	16.00	16.07	0.07	0.10	7.0	
25	41.55	16.50					

Design Flow Capacity (Return Period 1/5)							
	Payabo	20	m3/s	Ponton	40	m3/s	
Block No.	Maximum Discharge (m3/s)	Ground Level (m)	Maximum Water Level (m)	Maximum Water Depth (m)	Maximum Inundation Area (km2)	Inundation Time Depth>0.0 m (hr)	Inundation Time Depth>0.3 m (hr)
1	297.00	15.30	16.39	1.09	0.53	20.5	19.0
2	286.56	15.20	15.93	0.73	0.30	21.0	19.0
3	170.81	15.00	15.58	0.58	0.90	20.0	17.5
4	67.28	15.50	15.63	0.13	0.20	13.5	
5	235.59	14.40	14.69	0.29	0.49	20.0	
6	235.28	13.90	14.22	0.32	0.38	19.0	6.5
7	0.00	15.20					
8	2.25	14.10	14.14	0.04	0.07	15.0	
9	20.26	13.30	13.46	0.16	0.41	13.0	
10	0.00	12.10					
11	237.08	11.30	11.79	0.49	1.47	13.5	9.0
12	78.23	11.40	11.62	0.22	1.31	12.0	
13	183.06	11.30	11.56	0.26	0.07	11.5	
14	179.46	10.30	11.04	0.74	0.69	12.0	9.0
15	0.00	13.30					
16	0.00	12.20					
17	1.04	10.60	10.61	0.01	0.26	0.5	
18	0.00	11.10					
19	38.70	10.80	11.33	0.52	0.67	14.0	10.0
20	207.65	9.20	10.18	0.98	0.87	14.0	13.0
21	0.76	10.10	10.10	0.00	1.50		
22	206.18	9.60					
23	54.33	15.50	15.95	0.45	0.32	17.5	7.5
24	57.30	16.00					
25	57.42	16.50					

Table J.3.A Summary of Frood Condition at the Payabo Block with Improved of Dralnage Capacity (3/5)

Design Flow Capacity (Return Period 1/5)							
	Payabo	40	m3/s	Ponton	40	m3/s	
Block No.	Maximum Discharge (m3/s)	Ground Level (m)	Maximum Water Level (m)	Maximum Water Depth (m)	Maximum Inundation Area (km2)	Inundation Time Depth>0.0 m (hr)	Inundation Time Depth>0.3 m (hr)
1	297.00	15.30	16.34	1.04	0.51	19.0	17.5
2	286.60	15.20	15.91	0.71	0.30	19.0	17.5
3	178.18	15.00	15.57	0.57	0.90	19.0	16.5
4	61.41	15.50	15.63	0.13	0.19	12.0	
5	237.09	14.40	14.67	0.27	0.47	18.5	
6	236.58	13.90	14.22	0.32	0.37	18.0	6.5
7	0.00	15.20					
8	1.97	14.10	14.13	0.03	0.06	14.5	
9	19.15	13.30	13.45	0.15	0.40	12.0	
10	0.00	12.10					
11	237.74	11.30	11.76	0.46	1.41	13.5	8.0
12	71.47	11.40	11.61	0.21	1.28	12.0	
13	187.46	11.30	11.55	0.25	0.07	11.5	
14	180.87	10.30	11.05	0.75	0.70	13.0	10.5
15	0.00	13.30					
16	0.00	12.20					
17	1.03	10.60	10.61	0.01	0.26	0.5	
18	0.00	11.10					
19	37.22	10.80	11.32	0.52	0.63	14.0	10.0
20	207.91	9.20	10.18	0.98	0.87	15.0	13.5
21	0.74	10.10	10.10	0.00	1.50		
22	206.82	9.60					
23	52.60	15.50	15.87	0.37	0.31	16.0	6.0
24	50.96	16.00					
25	51.00	16.50					

Design Flow Capacity (Return Period 1/5)							
	Payabo	60	m3/s	Ponton	40	m3/s	
Block No.	Maximum Discharge (m3/s)	Ground Level (m)	Maximum Water Level (m)	Maximum Water Depth (m)	Maximum Inundation Area (km2)	Inundation Time Depth>0.0 m (hr)	Inundation Time Depth>0.3 m (hr)
1	297.00	15.30	16.30	1.00	0.49	18.0	15.5
2	285.60	15.20	15.89	0.69	0.30	18.0	15.5
3	182.64	15.00	15.56	0.56	0.90	17.5	15.5
4	52.77	15.50	15.62	0.12	0.18	10.5	
5	233.18	14.40	14.66	0.26	0.45	16.5	
6	232.28	13.90	14.21	0.31	0.37	16.5	5.0
7	0.00	15.20					
8	1.65	14.10	14.13	0.03	0.05	13.0	
9	17.76	13.30	13.44	0.14	0.37	10.5	
10	0.00	12.10					
11	232.64	11.30	11.72	0.42	1.30	13.5	7.0
12	61.55	11.40	11.58	0.18	1.18	11.0	
13	189.10	11.30	11.53	0.23	0.07	11.5	
14	178.87	10.30	11.04	0.73	0.69	13.5	10.5
15	0.00	13.30					
16	0.00	12.20					
17	1.01	10.60	10.61	0.01	0.26	14.0	
18	0.00	11.10					
19	34.21	10.80	11.30	0.50	0.58	13.5	9.5
20	203.18	9.20	10.18	0.98	0.84	16.0	14.5
21	0.71	10.10	10.10	0.00	1.50		
22	202.22	9.60					
23	52.82	15.50	15.93	0.43	0.32	14.5	6.0
24	56.42	16.00					
25	56.62	16.50					

Table J.3.A Summary of Frood Conditlon at the Payabo Block with Improved of Drainage Capacity (4/5)

Design Flow Capacity (Return Period 1/5)							
	Payabo	20	m3/s	Ponton	60	m3/s	
Block No.	Maximum Discharge (m3/s)	Ground Level (m)	Maximum Water Level (m)	Maximum Water Depth (m)	Maximum Inundation Area (km2)	Inundation Time Depth>0.0 m (hr)	Inundation Time Depth>0.3 m (hr)
1	297.00	15.30	16.33	1.03	0.50	19.0	17.5
2	285.98	15.20	15.91	0.71	0.30	19.0	17.0
3	163.58	15.00	15.57	0.57	0.90	18.5	16.0
4	61.66	15.50	15.63	0.13	0.19	12.0	
5	222.59	14.40	14.67	0.27	0.47	18.0	
6	222.18	13.90	14.22	0.32	0.37	17.0	5.5
7	0.00	15.20					
8	1.97	14.10	14.13	0.03	0.06	14.5	
9	19.39	13.30	13.45	0.15	0.40	12.5	
10	0.00	12.10					
11	223.31	11.30	11.74	0.44	1.35	12.0	8.0
12	69.64	11.40	11.59	0.19	1.21	11.5	
13	181.18	11.30	11.52	0.22	0.07	10.0	
14	170.32	10.30	10.95	0.65	0.62	11.5	8.0
15	0.00	13.30					
16	0.00	12.20					
17	1.01	10.60	10.61	0.01	0.26	0.5	
18	0.00	11.10					
19	34.89	10.80	11.31	0.51	0.60	13.0	9.0
20	196.26	9.20	10.16	0.96	0.76	13.5	11.5
21	0.70	10.10	10.10	0.00	1.50		
22	194.93	9.60					
23	66.25	15.50	15.76	0.26	0.29	16.5	
24	66.14	16.00					
25	66.13	16.50					
Design Flow Capacity (Return Period 1/5)							
	Payabo	40	m3/s	Ponton	60	m3/s	
Block No.	Maximum Discharge (m3/s)	Ground Level (m)	Maximum Water Level (m)	Maximum Water Depth (m)	Maximum Inundation Area (km2)	Inundation Time Depth>0.0 m (hr)	Inundation Time Depth>0.3 m (hr)
1	297.00	15.30	16.29	0.99	0.49	18.0	15.5
2	285.82	15.20	15.89	0.69	0.30	18.0	15.5
3	169.94	15.00	15.56	0.56	0.90	17.5	15.5
4	55.10	15.50	15.62	0.12	0.18	10.5	
5	222.60	14.40	14.66	0.26	0.46	16.5	
6	221.73	13.90	14.21	0.31	0.37	16.0	5.0
7	0.00	15.20					
8	1.69	14.10	14.13	0.03	0.05	13.0	
9	18.23	13.30	13.44	0.14	0.38	11.0	
10	0.00	12.10					
11	222.76	11.30	11.70	0.40	1.26	12.0	7.0
12	62.02	11.40	11.56	0.16	1.15	11.0	
13	183.85	11.30	11.51	0.21	0.07	10.0	
14	170.25	10.30	10.95	0.64	0.62	12.0	8.0
15	0.00	13.30					
16	0.00	12.20					
17	0.99	10.60	10.61	0.01	0.25	0.5	
18	0.00	11.10					
19	32.56	10.80	11.30	0.50	0.55	12.5	8.5
20	193.56	9.20	10.15	0.95	0.72	14.0	12.5
21	0.67	10.10	10.10	0.00	1.50	18.0	
22	192.19	9.60					
23	66.21	15.50	15.76	0.26	0.29	15.5	
24	66.15	16.00					
25	66.13	16.50					

Table J.3.A Summary of Frood Condition at the Payabo Block with Improved of Drainage Capacity (5/5)

Design Flow Capacity (Return Period 1/5)							
Payabo	60	m3/s	Ponton	60	m3/s		
Block No.	Maximum Discharge (m3/s)	Ground Level (m)	Maximum Water Level (m)	Maximum Water Depth (m)	Maximum Inundation Area (km2)	Inundation Time Depth>0.0 m (hr)	Inundation Time Depth>0.3 m (hr)
1	297.00	15.30	16.25	0.95	0.47	16.0	14.0
2	285.58	15.20	15.88	0.68	0.30	16.5	14.5
3	175.52	15.00	15.55	0.55	0.90	16.5	13.5
4	48.92	15.50	15.62	0.11	0.17	9.5	
5	221.96	14.40	14.65	0.25	0.44	15.5	
6	221.52	13.90	14.21	0.31	0.37	14.5	4.0
7	0.00	15.20					
8	1.47	14.10	14.12	0.02	0.05	12.0	
9	17.18	13.30	13.43	0.13	0.36	9.5	
10	0.00	12.10					
11	221.97	11.30	11.67	0.37	1.18	12.0	5.5
12	53.58	11.40	11.54	0.14	1.08	10.0	
13	189.64	11.30	11.50	0.20	0.07	10.0	
14	173.37	10.30	10.97	0.67	0.64	12.5	9.0
15	0.00	13.30					
16	0.00	12.20					
17	0.98	10.60					
18	0.00	11.10					
19	30.97	10.80	11.29	0.49	0.52	12.5	8.5
20	194.54	9.20	10.15	0.95	0.74	15.0	13.0
21	0.39	10.10	10.17	0.06	1.53	8.0	
22	198.47	9.60					
23	66.41	15.50	15.76	0.26	0.29	14.0	
24	65.65	16.00					
25	65.66	16.50					

Table J.3.B Summary of Flood Condition at the Payabo Block with Improvement of Drainage Capacity and By-path to Cascarilla

Design Flow Capacity (Return Period 1/5)							
	Payabo	20	m3/s	Ponton	40	m3/s	
Block No.	Maximum Discharge (m3/s)	Ground Level (m)	Maximum Water Level (m)	Maximum Water Depth (m)	Maximum Inundation Area (km2)	Inundation Time Depth>0.0 m (hr)	Depth>0.3 m (hr)
1	297.00	15.30	16.38	1.08	0.52	20.5	19.0
2	286.54	15.20	15.92	0.72	0.30	21.0	19.0
3	171.28	15.00	15.57	0.57	0.90	20.0	17.5
4	67.35	15.50	15.63	0.13	0.19	13.5	
5	236.15	14.40	14.68	0.28	0.49	20.0	
6	235.63	13.90	14.22	0.32	0.38	19.0	7.0
7	0.00	15.20					
8	2.23	14.10	14.14	0.03	0.06	15.0	
9	20.22	13.30	13.46	0.16	0.41	13.0	
10	0.00	12.10					
11	237.03	11.30	11.77	0.47	1.43	13.0	9.0
12	75.27	11.40	11.61	0.21	1.27	12.5	
13	188.45	11.30	11.54	0.24	0.07	10.5	
14	182.35	10.30	10.95	0.65	0.62	11.5	8.5
15	0.00	13.30					
16	0.00	12.20					
17	1.03	10.60					
18	0.00	11.10					
19	35.79	10.80	11.31	0.51	0.62	13.0	9.5
20	199.68	9.20	10.13	0.93	0.64	13.5	11.5
21	0.41	10.10	10.16	0.06	1.53	7.5	
22	184.09	9.60					
23	54.74	15.50	15.91	0.41	0.31	18.0	11.0
24	50.38	16.00					
25	50.23	16.50					

Design Flow Capacity (Return Period 1/5)							
	Payabo	40	m3/s	Ponton	20	m3/s	
Block No.	Maximum Discharge (m3/s)	Ground Level (m)	Maximum Water Level (m)	Maximum Water Depth (m)	Maximum Inundation Area (km2)	Inundation Time Depth>0.0 m (hr)	Depth>0.3 m (hr)
1	297.00	15.30	16.39	1.09	0.53	20.5	19.0
2	285.77	15.20	15.93	0.73	0.30	21.0	19.0
3	181.21	15.00	15.58	0.58	0.90	20.5	18.0
4	62.65	15.50	15.63	0.13	0.20	13.0	
5	241.35	14.40	14.68	0.28	0.49	20.0	
6	240.80	13.90	14.22	0.32	0.38	19.0	6.5
7	0.00	15.20					
8	2.09	14.10	14.14	0.03	0.06	15.5	
9	19.53	13.30	13.45	0.15	0.39	13.0	
10	0.00	12.10					
11	242.61	11.30	11.79	0.49	1.47	14.0	9.0
12	72.74	11.40	11.62	0.22	1.31	12.5	
13	190.70	11.30	11.56	0.26	0.07	12.0	
14	186.36	10.30	11.07	0.77	0.72	13.5	10.0
15	0.00	13.30					
16	0.00	12.20					
17	1.04	10.60					
18	0.29	11.10					
19	38.72	10.80	11.33	0.53	0.68	14.5	10.5
20	214.69	9.20	10.16	0.96	0.76	15.0	13.5
21	0.42	10.10	10.17	0.06	1.53	8.0	
22	198.25	9.60					
23	50.84	15.50	16.21	0.70	0.37	15.5	11.0
24	40.92	16.00	16.15	0.15	0.17	10.0	
25	41.40	16.50					

Table J.3.C Summary of Flood Condition at the Payabo Block with Reservoir (1/2)

Design Flow Capacity (Return Period 1/5) with Dam							
	Payabo	10	m3/s	Ponton	20	m3/s	
Block No.	Maximum Discharge (m3/s)	Ground Level (m)	Maximum Water Level (m)	Maximum Water Depth (m)	Maximum Inundation Area (km2)	Inundation Time Depth>0.0 m (hr)	Inundation Time Depth>0.3 m (hr)
1	0.00	15.30					
2	96.69	15.20	15.76	0.56	0.30	51.5	49.5
3	46.24	15.00	15.52	0.52	0.90	50.5	47.0
4	14.38	15.50	15.61	0.10	0.16	38.0	
5	60.18	14.40	14.55	0.15	0.28	50.0	
6	60.09	13.90	14.12	0.22	0.25	48.5	
7	0.00	15.20					
8	0.30	14.10	14.11	0.01	0.02	20.5	
9	4.41	13.30	13.31	0.01	0.14	13.0	
10	0.00	12.10					
11	60.31	11.30					
12	0.00	11.40					
13	60.31	11.30					
14	60.30	10.30					
15	0.00	13.30					
16	0.00	12.20					
17	0.00	10.60					
18	0.00	11.10					
19	0.00	10.80					
20	56.61	9.20					
21	0.00	10.10					
22	55.84	9.60					
23	37.79	15.50	15.71	0.21	0.28	42.0	
24	36.60	16.00					
25	36.63	16.50					

Design Flow Capacity (Return Period 1/5) with Dam							
	Payabo	10	m3/s	Ponton	20	m3/s	
Block No.	Maximum Discharge (m3/s)	Ground Level (m)	Maximum Water Level (m)	Maximum Water Depth (m)	Maximum Inundation Area (km2)	Inundation Time Depth>0.0 m (hr)	Inundation Time Depth>0.3 m (hr)
1	0.00	15.30					
2	194.87	15.20	15.87	0.67	0.30	25.5	23.5
3	111.46	15.00	15.56	0.56	0.90	26.0	23.5
4	41.90	15.50	15.62	0.12	0.18	20.0	
5	151.98	14.40	14.65	0.25	0.44	25.5	
6	152.06	13.90	14.21	0.31	0.37	24.0	12.5
7	0.00	15.20					
8	1.30	14.10	14.12	0.02	0.04	22.5	
9	16.08	13.30	13.43	0.13	0.36	20.0	
10	0.00	12.10					
11	153.33	11.30	11.63	0.33	1.07	19.5	8.0
12	46.29	11.40	11.51	0.11	0.99	16.5	
13	143.13	11.30	11.44	0.14	0.06	17.0	
14	133.23	10.30	10.56	0.25	0.36	13.5	
15	0.00	13.30					
16	0.00	12.20					
17	0.00	10.60					
18	0.00	11.10					
19	16.88	10.80	11.25	0.45	0.34	16.5	12.5
20	140.45	9.20	9.91	0.71	0.04	19.0	17.0
21	0.00	10.10					
22	126.39	9.60					
23	44.42	15.50	16.07	0.57	0.34	22.5	19.0
24	41.38	16.00	16.12	0.11	0.14	18.0	
25	41.28	16.50					

Table J.3.C Summary of Flood Condition at the Payabo Block with Reservoir (2/2)

Design Flow Capacity (Return Period 1/5) with Dam							
	Payabo	10	m3/s	Ponton	20	m3/s	
Block No.	Maximum Discharge (m3/s)	Ground Level (m)	Maximum Water Level (m)	Maximum Water Depth (m)	Maximum Inundation Area (km2)	Inundation Time	
						Depth>0.0 m (hr)	Depth>0.3 m (hr)
1	0.00	15.30					
2	42.77	15.20	15.47	0.27	0.30	50.0	
3	16.40	15.00					
4	1.14	15.50					
5	17.54	14.40					
6	17.53	13.90					
7	0.00	15.20					
8	0.00	14.10					
9	0.00	13.30					
10	0.00	12.10					
11	17.52	11.30					
12	0.00	11.40					
13	17.52	11.30					
14	17.52	10.30					
15	0.00	13.30					
16	0.00	12.20					
17	0.00	10.60					
18	0.00	11.10					
19	0.00	10.80					
20	16.81	9.20					
21	0.00	10.10					
22	16.80	9.60					
23	24.90	15.50					
24	24.87	16.00					
25	24.87	16.50					

Table J.3.1 The Summary of River Improvement Plan

1. Alternative A: By-path

(1) Payabo River

Section	Station	Distance L (m)	Discharge Q (m3/s)	Gradient	Elevation of River bed (El.m)
A	No.0 - No.14	7,000	100	1/3,200	2.000 - 4.200
B	No.14 - No.22+250m	4,250	80	1/2,800	4.200 - 5.700
C	No.22+250m - No.32	4,750	60	1/2,000	5.700 - 8.100
D	No.32 - No.36+300m	2,300	40	1/1,500	8.100 - 9.650
E	No.36+300m - No.45	4,200	20	1/1,100	10.250 - 14.050
Total		22,500			

(2) Cascarilla Canal

Section	Station	Distance L (m)	Discharge Q (m3/s)	Gradient	Elevation of River bed (El.m)
A	No.0 - No.12	6,000	35	1/7,500	-1.100 - -0.300
B	No.12 - No.24	6,000	35	1/2,600	-0.300 - 2.000
C	No.24 - No.29	2,500	35	1/900	2.000 - 4.750
D	No.29 - No.38	4,500	35	1/1,400	4.750 - 6.700
Total		19,000			

2. Alternative B: Reservoir

(1) Payabo River

Section	Station	Distance L (m)	Discharge Q (m3/s)	Gradient	Elevation of River bed (El.m)
A	No.0 - No.14	7,000	100	1/3,200	2.000 - 4.200
B	No.14 - No.22+250m	4,250	10	1/2,800	4.200 - 5.700
C	No.22+250m - No.32	4,750	10	1/2,000	5.700 - 8.100
D	No.32 - No.36+300m	2,300	10	1/1,500	8.100 - 9.650
E	No.36+300m - No.45	4,200	10	1/1,100	10.250 - 14.050
Total		22,500			

(2) Cascarilla Canal

Section	Station	Distance L (m)	Discharge Q (m3/s)	Gradient	Elevation of River bed (El.m)
A	No.0 - No.12	6,000	35	1/7,500	-1.100 - -0.300
B	No.12 - No.24	6,000	35	1/2,600	-0.300 - 2.000
C	No.24 - No.29	2,500	35	1/900	2.000 - 4.750
D	No.29 - No.38	4,500	35	1/1,400	4.750 - 6.700
Total		19,000			

ANNEX J : FIGURES

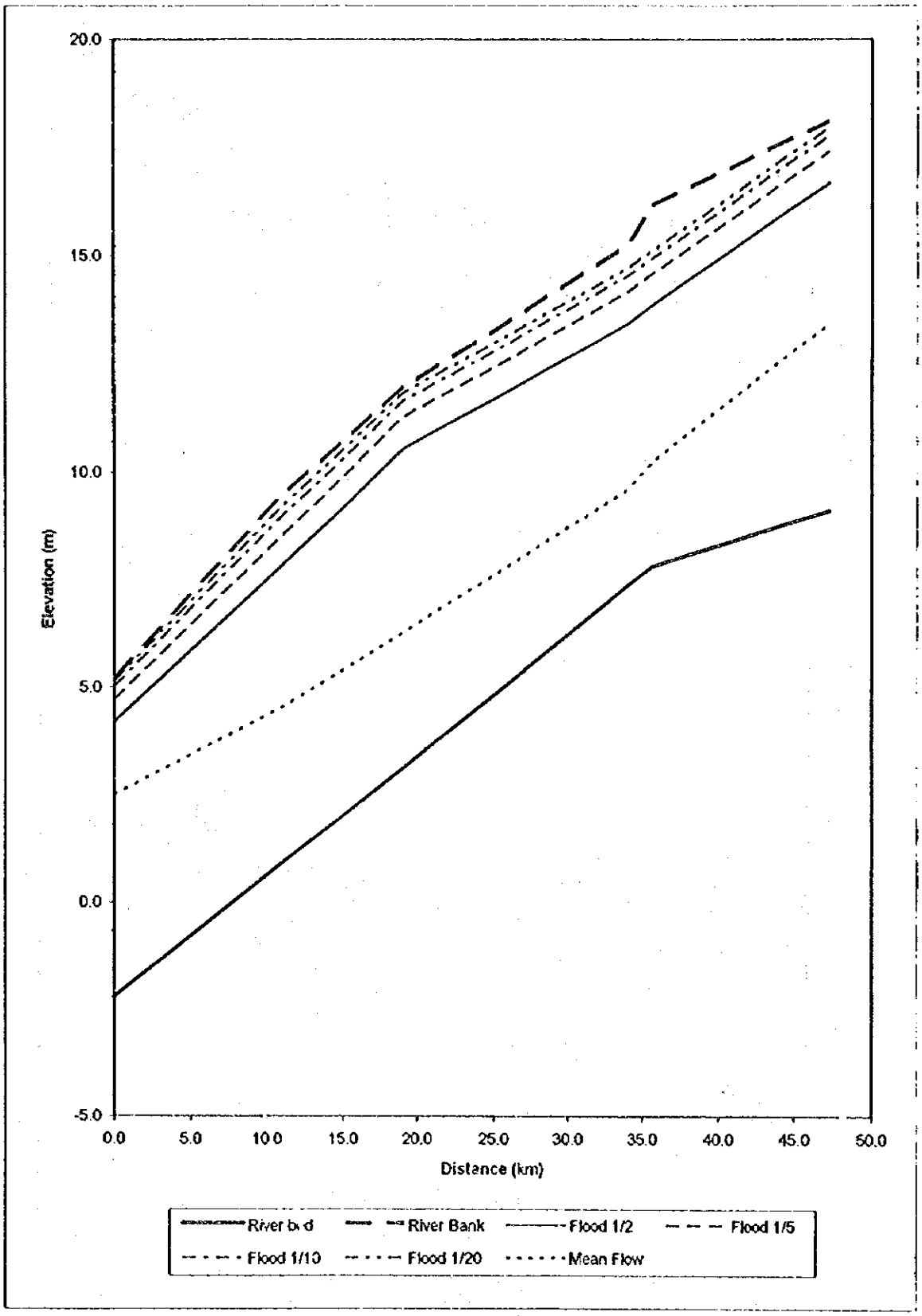


Fig. J.2.1 Flow Condition of The Juna River

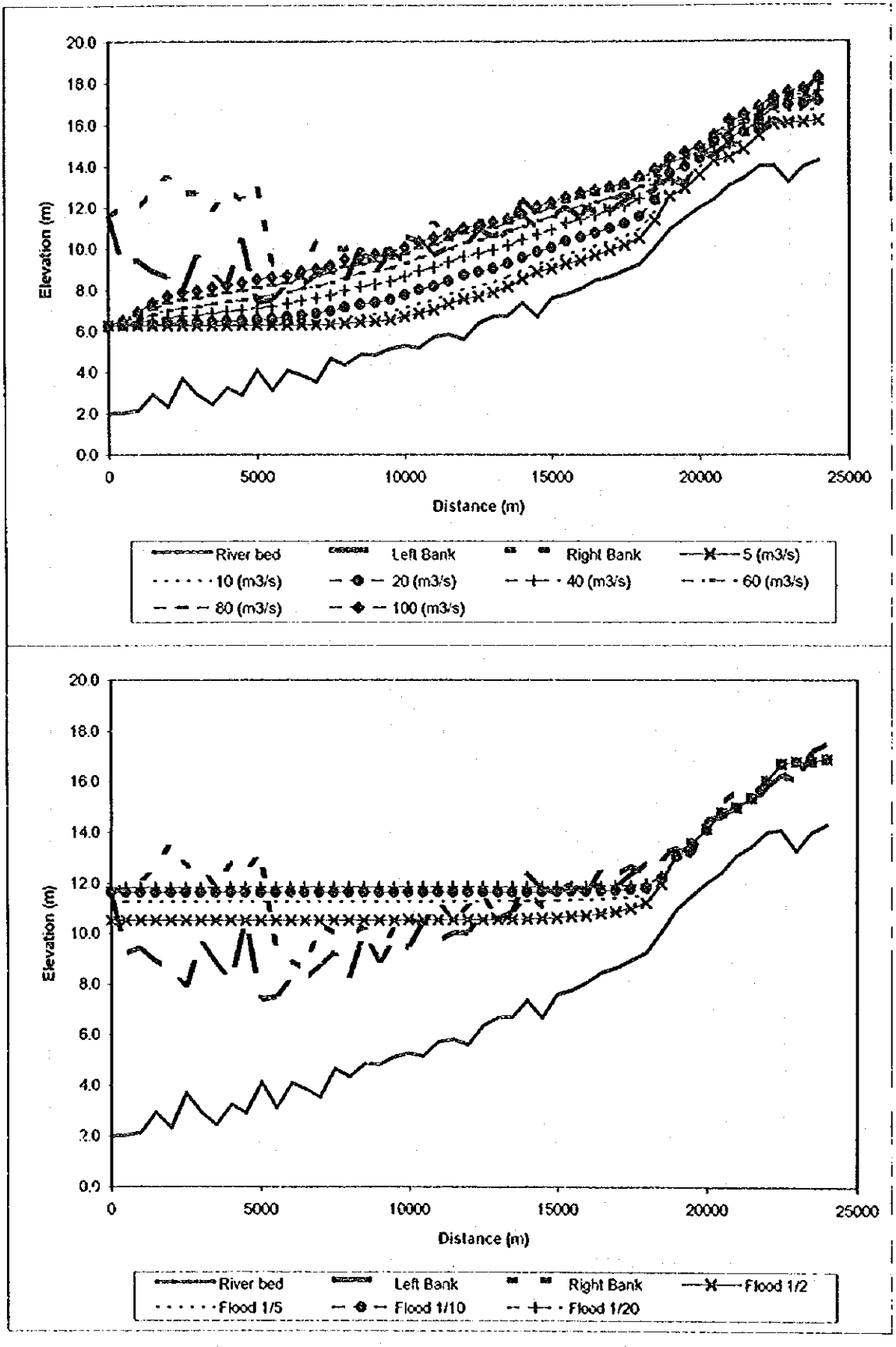
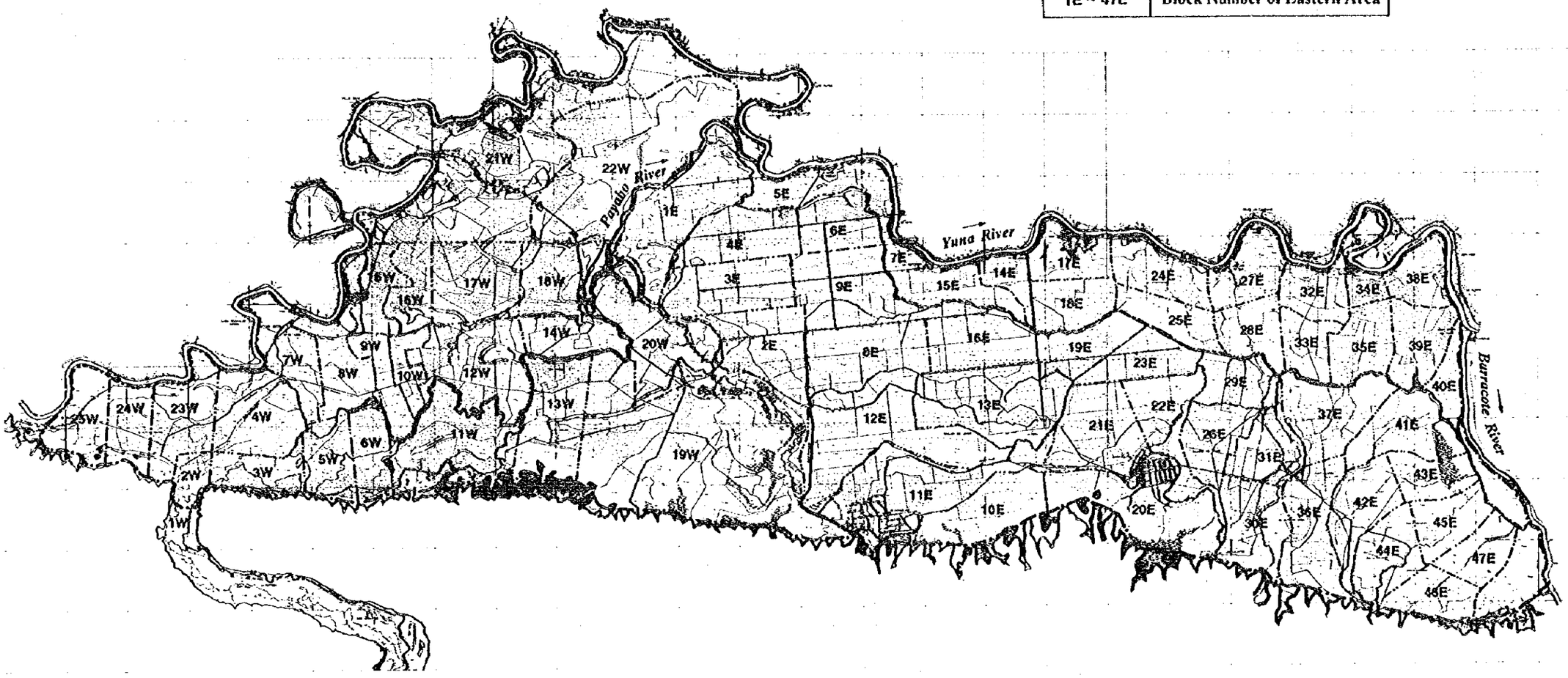


Fig. J.2.2 Result of Non-uniform Flow Calculation for the Payabo River

LEGEND	
1W ~ 22W	Block Number of Western Area
1E ~ 47E	Block Number of Eastern Area



J.2.3 Divided Blocks for the Flood Analysis