C.2 METEOROLOGY

C.2.1 Climate

The climatic conditions in the representative stations in the lower and upper Choluteca river basin have been compiled and reviewed, including temperature, relative humidity, winds, sunshine hours and evaporation, as summarized hereunder.

1) Temperature:

Monthly mean temperature at Choluteca meteorological station indicates least monthly fluctuation throughout the year. It ranges from 27.1°C in September to 30.9°C in April. (Refer to Table C-03) The monthly maximum temperature ranges from 34.4°C in September to 39.1°C in April, while the monthly minimum temperature fluctuates between 19.1°C in December - January to 21.3°C in April. (Refer to Table C-04 and C-05)

Mean temperature in San Juan de Flores valley (El Porvenir station) averages around 24.9°C and fluctuate in the range of 22.6°C in December to 27.7°C in May. (Refer to Table C-06)

In Tegucigalpa, the monthly mean temperature in 1964-83 averages around 28°C, or ranges from 19.4°C in January to 23.3°C in May. The monthly maximum temperature also ranges from 29.3°C in December to 33.7°C in April, while the monthly minimum temperature fluctuates between 9.7°C in January to 15.5°C in June. (Refer to Table C-07 and C-08)

2) Relative Humidity:

Mean relative humidity at Choluteca station averages 66%. It fluctuates between 52% in February and 82% in September. On the other hand, the relative humidity at Tegucigalpa station averages 70%, and it ranges from 59% in March to 77% in October. (Refer to Table C-09 and C-10)

3) Winds:

The prevailing wind direction at Choluteca is north to north-east in the dry season, and south to west in the rainy season. The wind velocity averages 3.34 m/s or 12 km/hour. The monthly average of wind velocity ranges from 8 km/hour in October to 18 km/hour in January. The maximum wind velocity of 65 km/hour is recorded at Choluteca. On the other hand, the prevailing wind direction in Tegucigalpa is north to north-west in the dry season and north-east in the rainy season. The wind velocity averages around 3.8 m/s or 14 km/hour. The monthly average of wind velocity fluctuates between 12 km/hour in September to 15 km/hour in February. The maximum wind velocity recorded at Tegucigalpa was approximately 103 km/hour. (Refer to Table C-11 and C-12)

4) Sunshine Hour:

Sunshine hour has an influence on crop cultivation in the Choluteca plain. According to the record at Choluteca station, the sunshine hours exceed over 3,100 hours a year. Even in the rainiest month of June or September, the monthly sunshine hours are 216 hours on an average. (Refer to Table C-13)

5) Evaporation:

Annual evaporation measured by A-pan at the Choluteca station averaged around 2,900 mm in 1970-83. The monthly mean evaporation ranges from 158 mm in September to 340 mm in March. In San Juan de Flores valley (El Porvanir station), the annual evaporation averaged around 1,670 mm in 1977-83, with monthly evaporation ranging from 104 mm in October to 207 mm in March. Further, at La Venta station which is located close to the San Fernando dam and reservoir, the monthly evaporation fluctuates between 84 mm in November and 184 mm in March, with an average annual mean evaporation of around 1,550 mm. (Refer to Table C-14 to C-16)

C.2.2 Precipitation

Average precipitation in the Choluteca river basin is about 1,700-1,900 mm in the downstream basin, about 700-1,000 mm in the middle-stream basin and 900-1,000 mm in the upstream basin. For instance, annual precipitation averaged around 1,910 mm in Choluteca, 790 mm in Olopoli and 910 mm in Tegucigalpa. (Refer to Table C-17)

In Choluteca, more than 93% of the annual rainfall occur during the rainy season from May to October. During the driest 4 months from December to March, only 1% of the annual precipitation is recorded. As an average in the entire Choluteca river basin, more than 80% of the annual precipitation is concentrated in the rainy season.

The maximum daily precipitation at Choluteca ranges from 55 mm/day in 1967 to 186 mm/day in 1982. 80% probable maximum daily precipitation is estimated to be approximately 130 mm/day by means of the Gumbel method. (Refer to Table C-18)

Monthly precipitation decreases in July - August when the intermediate dry weeks (locally called "canicula") prevails in the river basin. Such a dry spell lasts for about 4 weeks in Choluteca. Effective rainfall for agriculture will be discussed in Annex H.

C.3 HYDROLOGY

C.3.1 Discharge at Choluteca

Long term hydrological record is unavailable at Choluteca. The existing Choluteca Bridge gauging station (catchment area of 6,964 km^2) was set up in 1978, and the recording period is insufficient for hydrological analysis. On the other hand, Los Eucuentros gauging station (catchment area of 6,370 km^2) was operated during the period from 1956 to 1973 (with interruption in 1960-64), and discontinued thereafter.

Available discharge at the possible intake site for irrigation, El Papalon (catchment area of 7,115 km^2), is estimated on the basis of the actual and estimated records at Choluteca and Los Encuentros gauging stations, as well as some referable hydrological records in the middle reach. Until year 1976, the discharge at El Papalon was estimated partly on the basis of discharge at Los Eucuentros and at Poza Grande. (1.1 times of Poza Grande discharge record to cover the remaining drainage area), and partly at the ratio of drainage area (El Papalon/Los Eucuentros). After 1979, the discharge record of the Choluteca Bridge gauging station was directly applied at the ratio of the drainage area (Choluteca/ El Papalon = 1.0217). During the period from 1977 to 1978, the discharge at El Papalon was estimated by referring to the record of Paso La Ceiba. (Refer to Table C-19 to C-22)

Available discharge at El Papalon is thus estimated as summarized on Table C-23. The annual mean discharge is estimated at around 1,480 MCM. The monthly mean discharge ranges from 13.9 MCM (or 5.2 m^3/s) in March to 354.7 MCM (132.4 m^3/s) in October. The maximum monthly mean discharge is 1,037 MCM (400.2 m^3/s) and the minimum monthly mean discharge is 4.7 MCM (1.8 m^3/s).

C.3.2 Discharge at San Fernando

Near the possible damsite at San Fernando, there is a hydrological gauging station at Hernando Lopez. The Hernando Lopez gauging station (catchment area = 1,565 km^2) has record for a period of 29 years, with some interrupted months. Discharge during the interrupted period was estimated by means of a Tank Model method on a monthly basis. (Refer to Table C-24)

The monthly discharge at the San Fernando damsite (catchment area of 1,665 km^2) has been estimated by making use of hydrological record at the Hernando Lopez gauging station. The San Fernando discharge is estimated at the rate of 1,064 of Hernando Lopez discharge (1,665 km^2/ 1,565 km^2). The annual mean runoff is estimated at around 400 MCM at the damsite. The monthly mean runoff ranges from 4.6 MCM (1.7 m^3/s) in March - April to 88.0 MCM (34.0 m^3/s) in September. (Refer to Table C-25)

C.3.3 Probable Maximum Flood

The probable maximum flood analysed in the previous study in 1977-78 has been reviewed by referring to the data compiled up to year 1983. In the previous study, the heavy storm at the time of hurricane Fifi in September 1974 was selected as the largest storm. The storm by hurricane Fifi is still found to be the largest even if the study period is extended up to 1983.

At the time of hurricane Fifi, precipitation was heaviest at La Ceiba. One-day precipitation exceeded over 400 mm in the center of the storm. Depth-area-duration (DAD) analysis was made on the case of hurricane Fifi, and the probable maximum precipitation (PMP) at the San Fernando damsite was estimated at 110 mm in 6 hours, 186 mm in 12 hours, 265 mm in 24 hours and 414 mm in 72 hours. Further, the unit hydrograph at the time of representative floods at Hernando Lopez was calculated and it was compared with the actual records. (Refer to Figure C-04) On the basis of the unit hydrograph and PMP, the probable maximum flood (PMF) at the San Fernando damsite was calculated as shown on Table C-26 and Figure C-05. The PMF is estimated to have a peak discharge of about 5,300 m^3/s.

C.3.4 Probable Flood Study

The recent flood records from 1976 to 1983 have been reviewed in addition to the annual maximum flood discharge at Hernando Lopez in 1954-75. The observed peak flood discharge is summarized on Table C-27. Calculation of occurrence probability of such flood discharges has been made by applying various methods of analysis, including Iwai method, Hazen method, Moment method, Order probability, Third type of Peason, Hazen and Chow, Gumbel and Chow's method, as shown on Table C-28. The largest discharge in the same return period has been selected and plotted by referring to a flood pattern formulated from the flood hydrographs at Hernando Lopez. Further, the probable flood discharge of Hernando Lopez is converted into discharge at the San Fernando damsite. A probable flood hydrograph at San Fernando is thus prepared as shown on Figure C-06, and summarized as follows:

Return Period	Probable Flood (m^3/s)
2 years	345
5 years	638
10 years	903
100 years	2,331
200 years	2,921

Probable flood discharge at El Papalon intake weir site is also estimated by referring to the available records at Choluteca and Los Encuentros gauging stations. Although the available record is limited at Choluteca station, a probable flood hydrograph at El Papalon is estimated at around 2,600 m^3/s for the return period of 100 years.

C.3.5 Sediment Yield

There is limited data available on sediment yield in the Choluteca river basin. In the previous study in 1977-78, sediment yield is presumed at 660 m^3/km^2/year by referring to the measurement for a limited period in 1967 in the Choluteca river, as well as some other studies made in other river basins in Honduras.

In recent years, study and design have been executed by SANAA for the construction of the Guacerique and other dams for water supply in the upstream reach of the Choluteca river. Sample survey of sediment has been conducted and it was estimated that the sediment yield will be around 420 m^3/km^2/year at Guacerique and around 600 m^3/km^2/year at Sabacuante. Further, sediment studies have been made by ENEE for design and construction of El Cajon dam, and the sediment yield at the rate of 800 m^3/km^2/year has been applied as design criteria. In view of the land use and vegetation in the catchment area, it is conservatively presumed that the sediment yield in the drain area at the San Fernando damsite will be 800 m^3/km^2/year at maximum.

TABLES

Table C-01 METEOROLOGICAL STATIONS IN AND AROUND THE CHOLUTECA BASIN

Station	Latitude North	Longitude West	Altitude (m.a.s.l)
Choluteca	13°18'	87°12'	48
El Corpus	13°17'	87°02'	370
El Picacho	14°02'30"	87°11'30"	1,373
El Sauce	13°55'	87°13'	1,318
El Triunfo	13°07'30"	86°59'30"	100
El Zamorano	14°00'	87°02'	793
Guacerique	14°02'30"	87°11'30"	1,007
Guinope	13°53'	86°56'10"	1,315
Hacienda Las Canadas	14°09'	87°03'	1,250
Hacienda San Isidro	13°52'	86°34'	750
La Venta	14°18'50"	87°10'15"	890
Liure	13°32'	87°05'	230
Los Encuentros	13°28'08"	87°05'29"	100
Maraita	13°53'00"	87°02'25"	940
Marcovia	13°17'10"	87°18'50"	10
Monjaras	13°12'	87°23'	3
Moroceli	14°08'	86°53'	616
Namasigue	13°12'	87°09'	40
Nueva Armenia	13°45'20"	87°09'50"	620
Nuevo Rosario	14°13'	87°05'	1,177
Ojojona	13°56'00"	87°17'50"	1,380
Oropoli	13°49'15"	86°49'15"	480
Paso La Ceiba/El Porvenir	14°15'00"	87°00'50"	630
Pespire	13°34'	87°22'	60
Potrerillos	14°00'00"	87°46'00"	747
Sabanagrande	13°49'	87°16'	1,020
San Antonio de Flores	13°43'15"	86°53'00"	790
San Lucas	13°44'25"	86°57'20"	1,270
Soledad	13°35'	87°07'	330
Tegucigalpa	14°05'35"	87°12'15"	960
Texiguat	13°38'50"	87°01'30"	320
Yuscaran	13°56'35"	86°51'10"	950
Yusguare	13°18'	87°06'	50
Zambrano	14°16'45"	87°24'27"	1,360

Table C-02 HYDROLOGICAL GAUGE STATIONS IN THE CHOLUTECA BASIN

Station	River	Longitude West	Latitude North	Drainage Area (km2)
Concepción	Choluteca	87°15'	14°00'	145.7
Las Calabazas	Choluteca	87°13'	14°00'	219.6
El Inciénso	Tatumbla	87°10'	14°02'	61.4
El Aguacate	Sabacuante	87°10'	14°01'	80.3
El Batallon	Guacerique	87°16'	14°04'	192.0
Satio de Presa	El Hombre	87°21'	14°14'	334.2
Hernando Lopez	Choluteca	87°11'	14°17'	1,564.6
Paso La Ceiba	Choluteca	87°08'	14°15'	1,742.5
Puente Ojo de Agua	Choluteca	86°52'	14°05'	2,270.0
Los Encuentros	Choluteca	87°05'	13°28'	6,370.0
Poza Grande	Orocuina	87°06'	13°25'	353.1
Puente Choluteca	Choluteca	87°12'	13°19'	6,964.0

Table C-03 MONTHLY MEAN TEMPERATURE AT CHOLUTECA

(Unit: °C)

Year	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.
1964	30.9	31.7	33.4	33.1	31.6	28.6	28.9	29.5	28.8	28.3	29.8	30.2
1965	30.3	32.0	32.6	32.9	32.4	29.8	31.2	28.4	27.2	27.2	28.1	28.6
1966	28.8	29.4	32.8	32.9	30.6	28.4	29.6	30.0	28.5	27.5	29.9	30.3
1967	31.0	31.3	30.5	29.6	30.9	27.3	28.1	28.4	26.3	26.9	28.1	28.3
1968	28.9	28.0	29.0	29.5	27.3	26.0	28.3	28.7	26.1	26.2	26.8	28.1
1969	28.6	28.7	30.3	30.4	28.7	26.9	28.1	26.3	26.7	26.3	27.8	28.3
1970	27.9	28.7	29.4	30.3	28.7	27.9	26.7	26.4	26.0	27.1	26.4	28.1
1971	28.6	28.7	30.3	30.4	28.7	26.9	28.1	26.3	26.7	26.3	27.8	28.3
1972	27.8	28.1	28.6	29.9	28.0	27.5	29.4	28.8	28.1	27.3	28.0	29.1
1973	28.8	29.8	30.2	30.8	29.1	27.4	27.7	26.5	26.2	26.0	27.8	26.5
1974	28.1	27.9	29.0	30.5	28.1	26.8	28.5	28.6	25.8	26.9	28.1	28.3
1975	28.2	28.2	29.3	30.5	28.6	28.2	27.6	27.2	25.6	26.1	26.6	26.2
1976	27.6	28.1	29.3	29.1	28.9	27.1	30.6	29.8	28.9	27.3	27.8	29.0
1977	28.0	31.7	31.6	31.8	29.3	28.5	30.8	30.0	28.3	28.3	28.0	28.7
1978	28.2	29.7	30.8	31.1	30.0	29.3	28.3	29.5	27.0	27.8	29.4	29.2
1979	28.8	30.7	31.0	31.6	29.5	28.4	28.8	28.6	26.7	27.7	27.8	28.4
1980	29.4	30.0	31.5	31.4	29.5	28.5	28.8	27.6	26.8	26.8	27.2	28.0
1981	27.7	22.9	30.8	31.5	28.6	27.1	28.1	27.8	27.6	27.2	28.3	28.3
1982	28.7	29.5	29.7	29.8	27.5	27.3	29.2	31.4	28.4	28.3	29.1	29.5
1983	29.1	29.4	30.0	30.5	31.5	28.3	29.0	28.9	27.1	27.8	28.1	29.1
Average	28.8	29.2	30.5	30.9	29.4	27.8	28.8	28.5	27.1	27.2	28.0	28.5

Table C-04 MONTHLY MAXIMUM TEMPERATURE AT CHOLUTECA

(Unit: °C)

Year	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.
1964	37.6	40.0	41.1	40.4	38.3	34.3	35.0	35.0	34.8	34.0	35.5	36.7
1965	37.3	38.6	39.5	39.8	40.6	36.8	37.3	–	37.2	–	–	–
1966	–	–	40.2	40.1	39.0	35.6	35.0	36.4	35.8	34.2	35.7	36.2
1967	38.8	39.9	39.8	39.9	40.0	38.2	35.8	37.6	35.7	35.6	36.3	36.0
1968	37.8	38.4	39.9	40.3	39.5	34.4	37.2	38.6	34.8	34.4	35.4	37.2
1969	37.4	39.4	40.0	40.3	37.6	35.6	36.2	35.5	36.2	35.1	36.1	36.7
1970	38.1	38.1	39.1	39.6	38.8	–	34.2	35.5	33.5	34.3	33.5	–
1971	37.0	38.5	39.0	38.4	39.2	34.4	36.2	33.6	33.2	33.2	34.0	34.0
1972	36.0	36.5	37.5	39.0	37.6	35.4	38.0	36.8	35.0	34.2	36.8	36.8
1973	38.1	37.7	38.9	40.0	40.8	35.2	35.6	33.7	33.2	33.5	35.0	34.7
1974	36.0	37.4	38.3	39.0	36.6	34.9	36.2	37.9	33.6	34.0	35.2	36.4
1975	36.2	36.1	38.2	39.6	37.8	36.1	36.3	35.4	33.2	33.2	33.4	33.7
1976	35.6	36.7	37.8	38.2	38.4	36.2	37.2	37.3	37.7	35.2	35.3	36.5
1977	36.8	38.0	38.8	40.0	38.7	36.0	37.8	37.5	37.2	35.0	36.2	36.6
1978	36.7	38.8	38.8	39.2	39.9	36.0	35.0	34.5	31.7	32.0	34.1	34.3
1979	34.6	36.1	36.4	37.0	33.7	32.5	33.3	33.5	30.8	32.0	33.2	34.0
1980	35.2	36.9	37.6	37.5	35.5	33.7	34.4	33.4	32.5	31.9	32.5	33.5
1981	33.9	35.8	36.3	36.5	32.5	31.2	33.0	32.5	32.1	31.6	33.2	33.8
1982	36.8	37.3	38.9	38.5	34.2	37.1	38.5	38.5	34.6	35.9	36.2	37.5
1983	38.5	40.0	40.1	39.4	40.6	37.4	37.2	38.0	35.6	34.9	34.5	36.0
Average	36.8	37.9	38.8	39.1	38.0	35.3	36.0	35.9	34.4	33.9	34.8	35.6

Table C-05 MONTHLY MINIMUM TEMPERATURE AT CHOLUTECA

(Unit: °C)

Year	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.
1964	18.6	18.3	19.4	20.6	19.4	18.9	19.5	19.0	19.4	18.2	18.1	16.9
1965	15.3	15.6	19.0	17.5	20.0	21.0	21.5	-	17.2	-	-	-
1966	-	-	20.0	20.5	21.6	21.3	21.0	20.8	21.6	21.0	19.3	17.8
1967	20.1	19.8	20.0	21.3	21.5	20.7	21.0	19.4	20.6	20.0	20.9	21.0
1968	22.0	16.4	19.0	21.3	20.0	22.0	22.0	22.2	21.6	21.4	21.1	20.0
1969	20.1	20.1	22.7	22.2	22.3	21.7	21.9	22.1	21.9	21.6	20.9	18.8
1970	17.5	20.5	20.4	21.0	19.5	-	21.6	20.9	21.6	22.0	19.6	-
1971	18.5	19.9	20.0	21.5	22.2	21.6	21.4	20.8	21.0	21.0	19.6	20.6
1972	19.5	20.0	21.0	23.0	22.0	22.4	22.6	22.6	22.0	22.2	21.0	20.9
1973	20.9	20.2	17.7	22.8	22.5	23.0	22.0	22.0	21.8	21.7	20.6	17.5
1974	17.3	18.0	20.4	22.0	21.6	21.4	20.5	20.5	21.0	21.0	20.6	19.6
1975	19.3	18.7	20.0	21.0	21.2	21.4	20.7	20.3	21.6	21.0	21.0	16.4
1976	18.3	19.1	20.0	20.5	21.0	21.8	23.0	20.7	21.2	21.4	21.2	19.0
1977	18.5	22.5	21.4	22.7	20.8	20.6	17.0	-	21.6	18.9	19.0	17.5
1978	18.9	19.0	18.5	20.5	21.5	22.4	21.0	22.1	21.0	20.9	20.0	19.2
1979	19.0	19.4	19.0	20.0	18.0	11.0	14.4	19.4	18.1	18.0	18.6	16.4
1980	16.8	15.5	18.0	19.7	21.5	20.5	20.0	21.5	21.8	22.0	21.0	19.2
1981	20.0	21.4	22.5	23.2	22.5	22.0	22.0	22.3	22.0	22.2	21.0	21.0
1982	21.5	22.6	21.8	20.5	21.2	22.4	22.4	23.5	21.3	21.0	22.4	22.0
1983	21.3	20.2	20.8	23.8	23.0	22.0	22.5	21.5	21.0	21.7	21.5	20.4
Average	19.1	19.3	20.1	21.3	21.2	21.0	20.9	21.2	21.0	20.9	20.4	19.1

Table C-06 MONTHLY MEAN TEMPERATURE AT EL PORVENIR

(Unit: °C)

Year	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.
1979	23.4	24.0	26.1	27.2	27.4	26.6	25.0	24.5	24.6	24.6	23.5	22.6
1980	23.0	24.0	25.5	26.8	28.0	25.8	25.3	25.3	25.1	24.4	23.6	21.7
1981	22.3	23.7	26.2	26.3	27.7	25.1	25.1	25.1	25.1	24.9	23.1	23.1
1982	23.6	24.5	25.1	27.0	26.7	25.5	24.3	24.8	24.8	24.0	23.2	23.2
1983	23.7	25.0	27.9	27.5	28.8	26.6	24.6	24.7	24.8	24.0	23.3	22.5
Average	23.2	24.2	26.2	27.0	27.7	25.9	24.9	24.9	24.9	24.4	23.3	22.6

Table C-07 MONTHLY MAXIMUM TEMPERATURE AT TEGUCIGALPA

(Unit: °C)

Year	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.
1964	29.4	31.7	33.9	32.5	34.4	31.1	31.0	32.0	32.0	29.0	29.0	29.0
1965	29.0	33.0	33.0	33.0	34.0	32.0	30.0	30.1	32.0	31.0	30.1	30.4
1966	31.0	33.0	34.2	34.0	32.2	31.3	30.6	31.1	30.7	30.8	28.1	29.1
1967	28.4	31.6	32.0	31.3	32.4	31.3	29.5	31.7	31.0	31.0	32.5	31.8
1968	27.5	32.0	32.8	33.4	34.5	31.1	29.9	31.1	31.7	30.0	29.1	29.4
1969	30.0	31.8	34.8	34.0	34.4	31.6	29.9	31.7	31.1	31.1	28.5	30.7
1970	30.1	30.0	32.8	34.9	33.3	31.4	30.7	30.8	30.2	30.2	28.2	28.3
1971	30.0	31.1	32.3	34.3	33.9	32.1	30.0	31.3	32.5	30.6	29.9	29.4
1972	30.1	31.1	35.0	35.0	33.4	32.8	30.6	30.6	31.4	32.1	30.9	31.1
1973	30.2	32.2	35.1	37.8	34.4	32.2	31.1	32.7	32.2	29.9	29.4	28.9
1974	27.2	31.4	32.6	32.1	32.3	31.7	30.0	31.0	31.1	28.9	27.8	29.4
1975	29.2	32.2	33.6	34.6	32.5	32.2	30.6	30.0	28.9	29.6	27.8	27.1
1976	27.3	27.6	31.8	32.6	32.6	31.0	28.8	31.4	31.1	29.4	28.2	30.2
1977	29.0	30.7	33.7	32.1	32.5	31.2	28.6	32.7	32.0	30.2	30.4	30.0
1978	30.2	32.8	36.0	33.0	33.0	30.5	30.0	31.2	30.2	30.3	28.2	29.1
1979	30.8	30.2	34.2	33.8	32.0	29.8	32.2	31.4	31.2	30.2	30.6	28.6
1980	30.4	32.4	33.6	33.8	33.6	31.8	30.0	30.8	31.6	30.4	29.2	26.0
1981	30.5	30.5	32.4	32.8	33.0	32.0	30.1	31.5	30.8	31.0	30.0	30.2
1982	30.0	30.7	33.1	33.7	32.2	32.4	29.4	30.4	30.8	30.1	29.0	29.2
1983	35.0	32.6	36.0	35.2	35.0	33.8	30.8	31.2	31.6	30.2	31.4	29.0
Average	29.8	31.4	33.6	33.7	33.3	31.7	30.2	31.2	31.2	30.3	29.4	29.3

Table C-08 MONTHLY MINIMUM TEMPERATURE AT TEGUCIGALPA

(Unit: °C)

Year	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.
1964	9.4	11.1	12.2	14.7	13.6	14.7	16.0	13.0	13.0	13.0	10.6	10.0
1965	7.0	11.0	10.0	10.0	14.0	17.0	14.0	13.9	15.0	12.7	12.2	10.5
1966	8.5	11.5	11.0	12.5	13.5	16.9	15.0	12.3	13.0	14.9	10.0	9.4
1967	9.9	11.2	8.0	12.8	13.5	15.8	12.7	15.0	14.2	14.1	12.0	10.6
1968	10.0	8.2	10.0	11.0	14.6	16.3	15.9	15.4	15.0	13.1	11.9	11.1
1969	9.2	10.6	12.8	15.3	16.5	17.4	15.4	17.0	14.6	15.4	9.4	9.6
1970	7.2	6.4	11.0	13.9	13.6	15.5	16.2	15.0	13.7	14.9	10.3	9.6
1971	8.9	8.9	9.8	11.3	13.6	14.1	12.8	13.3	14.3	13.1	10.4	9.7
1972	10.0	9.4	10.0	12.2	15.7	14.2	15.4	12.2	11.9	14.2	12.9	8.3
1973	11.1	11.4	13.4	13.2	13.1	13.5	15.1	13.9	15.7	14.8	12.8	7.5
1974	8.8	8.3	9.2	14.4	15.3	15.6	14.7	15.6	12.1	11.8	10.0	9.4
1975	10.0	9.6	11.2	12.0	15.2	15.5	13.2	14.0	15.8	16.6	12.8	7.5
1976	8.6	12.0	13.0	14.0	15.8	10.4	16.0	14.9	15.0	15.5	13.4	9.8
1977	7.8	11.0	13.6	15.0	16.0	15.8	14.9	16.5	16.6	15.6	13.0	12.0
1978	10.4	8.4	13.4	14.8	17.8	16.6	16.4	16.7	15.4	13.8	14.0	11.0
1979	11.0	13.2	14.8	14.8	15.8	18.7	17.0	17.0	17.8	14.0	14.8	9.4
1980	12.2	9.4	12.9	15.6	18.4	10.4	17.6	17.6	16.8	17.8	14.8	6.4
1981	8.2	12.1	13.4	14.8	15.4	17.8	16.3	16.4	16.4	14.0	10.5	10.4
1982	12.8	10.0	12.8	14.8	16.1	16.2	16.0	16.2	17.0	15.4	12.0	11.4
1983	12.8	12.4	12.0	14.6	16.8	17.8	16.8	16.2	17.0	15.6	13.8	12.3
Average	9.7	10.3	11.7	13.6	15.2	15.5	15.4	15.1	15.0	14.5	12.1	9.8

Table C-09 MEAN RELATIVE HUMIDITY AT CHOLUTECA

(Unit: %)

Year	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.
1964	44	44	46	45	55	73	72	70	75	70	57	50
1965	41	39	37	39	51	68	55	73	82	79	68	57
1966	52	50	45	47	62	75	67	65	73	71	51	46
1967	44	44	47	50	49	74	65	62	80	64	60	53
1968	42	45	44	50	73	84	63	61	83	79	71	53
1969	52	47	52	57	73	88	70	84	82	86	69	59
1970	56	48	57	56	74	79	81	83	87	84	78	65
1971	58	55	58	65	76	80	67	85	89	87	76	60
1972	56	57	59	60	78	80	64	67	73	77	69	51
1973	53	52	61	60	71	81	76	86	88	89	69	60
1974	57	54	55	52	74	82	64	66	87	73	59	59
1975	53	56	63	59	76	77	76	80	89	85	77	62
1976	58	53	53	66	72	84	63	65	69	79	67	57
1977	52	53	54	54	72	74	56	74	82	79	68	67
1978	52	50	52	55	70	69	72	67	82	79	66	57
1979	55	45	50	58	73	75	75	72	85	80	67	57
1980	55	51	48	60	81	79	72	84	90	89	85	46
1981	73	69	72	69	81	87	81	83	84	84	74	72
1982	64	60	60	67	81	83	-	-	80	72	62	57
1983	57	60	66	67	61	76	69	69	79	77	75	71
Average	54	52	54	57	70	78	69	73	82	79	68	60

Table C-10 MEAN RELATIVE HUMIDITY AT TEGUCIGALPA

(Unit: %)

Year	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.
1964	72	66	60	60	67	81	77	74	76	78	75	76
1965	69	66	59	54	64	76	73	72	75	78	76	77
1966	73	68	67	63	72	79	78	74	78	80	77	76
1967	74	69	62	67	64	76	76	73	79	75	76	73
1968	71	66	68	58	73	81	74	77	78	80	76	76
1969	74	62	61	60	72	79	74	77	78	80	76	76
1970	71	68	62	62	68	77	77	75	79	79	78	75
1971	71	67	53	60	64	69	69	69	77	77	76	72
1972	65	65	55	54	68	70	68	68	69	71	71	69
1973	66	61	55	57	63	70	70	71	75	77	74	71
1974	68	62	59	55	67	77	69	71	76	79	76	74
1975	71	63	57	53	71	64	64	71	78	79	78	72
1976	73	66	56	60	65	78	70	68	68	77	76	76
1977	67	63	55	62	65	75	69	69	71	73	76	72
1978	70	63	63	60	67	73	73	71	–	–	–	–
1979	68	64	61	63	68	77	73	73	77	76	76	76
1980	70	62	57	62	67	74	72	72	75	78	77	76
1981	68	68	62	62	68	79	73	75	77	77	74	76
1982	71	66	62	57	71	75	73	70	77	76	74	72
1983	69	64	58	62	56	73	73	71	73	76	77	75
Average	70	65	59	60	67	75	72	72	76	77	76	74

Table C-11 AVERAGE WIND VELOCITY AT CHOLUTECA

(Unit: m/s)

Year	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.
1970	4.8	6.6	4.1	4.0	3.4	3.4	3.3	3.2	2.6	2.7	5.1	7.8
1971	7.4	7.2	6.3	6.2	3.9	4.3	5.3	3.0	2.7	2.3	3.5	6.1
1972	6.8	6.8	4.8	4.2	3.0	3.2	5.3	4.9	3.6	3.1	2.9	5.4
1973	6.9	6.4	3.6	3.1	2.7	2.8	3.8	2.7	2.5	2.3	4.2	4.8
1974	5.0	5.8	4.6	7.2	4.5	3.4	3.7	3.3	2.0	3.0	4.1	4.8
1975	4.6	3.3	3.0	3.2	1.7	2.2	2.0	2.0	1.4	1.7	2.6	3.4
1976	4.1	3.6	2.4	1.8	1.8	1.5	3.1	2.3	2.2	1.5	3.4	3.1
1977	4.4	4.0	5.6	2.7	1.8	2.2	3.0	2.7	2.8	2.0	2.3	2.7
1978	3.3	2.3	2.0	1.4	1.3	1.3	1.5	2.1	1.6	1.3	1.8	2.8
1979	2.5	3.0	3.0	2.3	1.4	2.6	1.8	1.9	1.4	1.4	2.1	3.1
1980	3.0	3.3	2.5	1.7	1.1	1.5	1.8	1.8	1.7	2.1	3.0	5.1
1981	5.5	5.3	3.0	4.4	1.9	1.8	2.5	2.7	2.1	2.1	4.3	5.6
1982	5.1	5.2	4.7	3.8	2.2	2.5	5.3	5.8	2.6	2.3	4.2	5.7
1983	5.5	3.3	3.1	2.2	2.1	1.8	3.4	3.1	1.5	2.2	2.0	3.3
Average	4.9	4.7	3.8	3.4	2.3	2.5	3.3	3.0	2.2	2.1	3.3	4.6

Table C-12 AVERAGE WIND VELOCITY AT TEGUCIGALPA

(Unit: m/s)

Year	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.
1970	3.9	4.8	3.8	3.6	3.4	3.3	3.2	3.1	3.0	3.0	4.2	4.4
1971	4.2	3.8	4.5	4.7	3.3	3.6	3.6	3.2	3.2	3.0	3.4	3.6
1972	3.7	4.1	3.7	3.6	3.1	3.6	3.8	3.6	3.3	3.3	3.2	4.1
1973	4.2	4.5	3.6	4.0	3.6	3.0	3.3	3.2	3.2	2.9	3.8	3.8
1974	3.6	4.1	3.5	4.0	3.4	3.2	3.2	3.5	3.1	3.9	4.0	4.0
1975	3.9	3.6	3.6	4.0	3.2	3.4	3.5	3.3	3.0	3.0	3.8	4.3
1976	4.6	4.4	3.4	3.4	3.3	2.5	3.6	3.5	3.4	3.6	4.1	4.1
1977	4.2	3.9	3.7	4.0	3.2	3.3	3.9	3.2	3.0	3.3	3.8	3.5
1978	4.2	3.9	4.0	3.6	3.6	3.4	3.6	3.7	3.1	3.4	4.2	3.8
1979	4.8	4.7	4.6	3.7	3.4	3.4	3.4	3.6	3.5	3.5	4.5	4.4
1980	3.9	4.4	4.2	4.7	3.6	4.0	4.0	3.6	3.4	3.6	4.3	4.8
1981	4.3	4.8	4.1	4.4	3.6	3.5	3.8	3.9	3.3	3.6	4.6	4.1
1982	4.1	4.3	4.2	3.9	3.8	3.6	4.2	4.3	3.6	3.9	4.4	4.0
1983	4.3	3.9	4.5	4.1	3.8	3.4	4.0	4.0	2.4	3.6	3.3	4.0
Average	4.1	4.2	4.0	4.0	3.5	3.4	3.7	3.6	3.2	3.4	4.0	4.1

Table C-13 SUNSHINE HOUR AT CHOLUTECA

(Unit: Hours)

Year	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.
1970	294	287	291	284	269	225	239	253	232	254	248	262
1971	293	267	284	290	260	249	227	248	191	254	260	302
1972	303	307	324	299	227	248	267	267	247	276	264	289
1973	320	331	308	–	252	223	255	255	223	228	279	313
1974	288	289	273	312	263	213	242	242	219	239	285	219
1975	292	280	305	296	242	260	238	238	178	216	218	302
1976	282	304	321	269	188	188	269	269	233	266	260	273
1977	314	286	319	265	235	206	265	265	261	266	274	294
1978	316	287	303	257	261	168	242	221	–	221	280	292
1979	315	241	273	–	263	217	255	216	–	233	238	272
1980	292	221	295	288	277	233	242	242	203	221	237	283
1981	309	272	290	279	229	183	237	237	–	212	242	264
1982	286	266	297	261	168	209	282	282	185	250	269	285
1983	286	240	283	239	287	237	–	221	200	238	225	251
Average	299	277	298	278	244	216	251	247	216	241	256	279

Table C-14 MONTHLY EVAPORATION (A-PAN) AT CHOLUTECA

(Unit: mm)

Year	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Annual
1970	321.0	403.0	336.2	318.8	223.2	164.0	153.0	171.1	202.5	180.2	278.8	238.0	2,989.8
1971	313.5	254.1	355.9	295.1	191.3	203.4	183.6	143.2	104.1	144.4	146.9	219.6	2,555.1
1972	255.7	304.1	296.9	278.8	-	172.1	223.2	236.8	158.0	184.7	151.8	285.8	2,547.9
1973	330.8	322.4	272.8	242.5	223.0	148.4	175.0	151.7	114.2	103.4	178.9	234.2	2,497.3
1974	259.0	296.2	307.2	344.4	180.1	179.4	225.7	127.0	143.6	243.1	264.0	259.1	2,828.8
1975	270.1	247.3	306.1	307.1	206.4	174.2	230.2	169.4	159.4	137.9	187.9	231.7	2,627.7
1976	281.8	330.4	326.3	192.3	97,2	153.1	212.3	186.9	152.0	124.5	159.0	248.5	2,464.3
1977	310.0	310.8	384.4	357.0	241.8	207.0	269.7	257.3	198.0	207.7	216.0	275.9	3,235.6
1978	319.3	310.8	368.9	339.0	288.3	228.0	229.4	248.0	159.0	186.0	231.0	272.8	3,180.5
1979	279.0	327.6	368.9	336.0	195.3	165.0	207.7	251.1	144.0	186.0	210.0	275.9	2,946.5
1980	325.5	383.6	390.6	294.0	248.0	228.0	217.0	201.5	198.0	229.4	180.0	279.0	3,174.6
1981	319.3	330.4	362.7	375.0	213.9	174.0	189.1	204.6	135.0	204.6	210.0	275.9	2,994.5
1982	303.8	271.6	300.7	270.0	173.6	174.0	285.2	210.1	150.0	229.4	288.0	322.4	2,978.8
1983	331.7	313.6	336.9	300.0	337.9	237.0	257.3	266.6	195.0	198.4	156.0	266.6	3,197.0
Average	305.0	315.5	339.8	305.5	216.9	187.3	218.1	199.1	158.1	182.7	208.2	261.5	2,897.7

Table C-15 MONTHLY EVAPORATION (A-PAN) AT EL PORVENIR

(Unit: mm)

Year	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Annual
1979	121.6	158.9	210.4	182.0	154.2	108.2	122.1	111.0	111.1	104.7	89.2	88.7	1,562.1
1980	123.2	162.6	215.8	197.4	186.3	131.5	136.4	138.0	130.4	92.6	102.5	87.2	1,703.9
1981	111.1	135.5	194.8	170.3	168.1	118.0	133.7	134.2	123.5	109.6	114.0	99.1	1,611.9
1982	128.6	158.0	200.5	217.4	162.0	121.2	117.4	120.3	117.2	113.3	95.6	106.5	1,658.0
1983	123.3	170.5	212.8	210.3	197.8	119.7	149.2	152.4	137.8	125.9	117.1	109.8	1,826.6
Average	121.6	157.1	206.9	195.5	173.7	119.7	131.8	131.3	124.0	109.2	103.7	98.3	1,672.5

Table C-16 MONTHLY EVAPORATION (A-PAN) AT LA VENTA

(Unit: mm)

Year	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Annual
1972	103.1	128.8	201.5	182.5	154.9	183.9	149.6	139.4	153.1	136.6	96.8	108.3	1,738.5
1973	120.1	143.9	196.8	185.4	183.1	128.8	129.8	118.7	139.2	108.3	83.8	82.0	1,619.9
1974	86.9	118.7	160.5	188.0	154.1	141.7	116.8	126.0	111.5	97.5	78.0	87.5	1,467.2
1975	106.1	119.2	176.4	203.5	179.7	144.6	145.5	121.7	149.6	104.7	83.8	92.7	1,627.5
1976	73.2	107.6	179.0	176.0	157.8	116.8	124.1	143.7	133.5	107.5	77.3	73.7	1,470.2
1977	107.2	117.6	198.5	170.9	167.5	124.1	139.3	158.3	145.4	127.2	87.3	103.1	1,646.3
1978	116.6	168.0	169.8	196.1	183.6	122.9	120.5	138.1	124.9	124.3	95.8	88.5	1,649.1
1979	127.1	134.1	190.9	186.3	160.1	113.2	133.9	116.5	108.0	109.1	86.6	82.7	1,548.5
1980	105.5	138.2	201.0	186.9	178.4	119.1	119.9	123.3	117.0	88.0	69.8	67.3	1,514.4
1981	102.0	107.2	161.3	157.1	152.6	96.5	105.6	109.5	101.0	91.0	77.2	72.1	1,333.1
1982	93.4	119.9	170.9	186.0	130.7	110.9	94.9	111.7	107.7	91.7	79.0	90.6	1,387.4
1983	95.6	125.3	201.2	170.4	209.3	128.3	104.1	114.6	126.6	103.7	90.6	85.5	1,555.2
Average	103.1	127.4	184.0	182.4	167.7	127.6	123.7	126.8	126.5	107.5	83.8	86.2	1,546.4

Table C-17(1) MONTHLY PRECIPITATION AT CHOLUTECA

(Unit: mm)

Year	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Annual
1943	0	0	0	50	287	241	168	464	379	764	19	5	2,376
1944	0	0	2	8	118	421	305	282	534	98	4	0	1,772
1945	0	0	0	2	243	325	202	239	409	350	49	4	1,823
1951	0	0	5	8	325	282	317	261	346	243	38	4	1,829
1952	0	0	4	124	215	580	137	248	336	396	34	0	2,074
1953	0	0	0	56	704	276	96	215	528	240	0	11	2,126
1954	0	0	16	75	304	559	147	239	409	350	49	4	2,157
1955	0	0	23	15	201	259	687	381	646	757	38	4	3,011
1956	0	0	0	50	406	295	116	278	459	409	16	0	2,029
1957	0	23	38	86	305	335	203	81	371	193	20	0	1,655
1958	0	8	56	145	432	462	158	83	566	292	48	15	2,220
1959	0	0	16	50	186	207	23	135	233	444	12	0	1,306
1960	1	0	0	46	326	453	205	356	272	514	42	0	2,215
1961	0	1	1	1	4	381	136	67	346	211	134	25	1,307
1962	0	0	20	65	206	474	202	206	379	353	49	4	1,958
1963	0	0	0	50	277	381	188	206	308	214	304	0	1,827
1964	0	15	1	72	113	492	268	242	433	188	14	8	1,846
1965	0	0	0	0	224	432	137	239	550	350	49	4	1,985
1966	0	0	3	35	298	651	201	93	398	296	7	11	1,993
1967	0	1	54	67	7	314	98	182	283	122	10	5	1,143
1968	0	0	0	13	504	584	77	131	571	483	54	1	2,418
1969	12	0	33	129	299	439	199	465	444	602	73	0	2,695
1970	0	0	0	71	265	201	469	430	488	281	79	2	2,286
1971	1	2	0	1	358	178	110	307	413	341	132	1	1,844
1972	0	0	97	30	320	224	194	180	131	261	55	0	1,492
1973	0	0	3	2	233	274	262	450	564	551	8	34	2,386
1974	0	0	0	0	211	370	29	168	520	117	44	1	1,460
1975	1	0	4	0	311	140	213	184	529	403	201	0	1,986
1976	0	0	0	172	134	337	32	76	125	339	41	0	1,256
1977	0	0	0	10	265	296	6	252	127	143	96	2	1,197
1978	3	8	5	18	398	171	232	78	434	178	73	20	1,618
1979	0	3	0	80	260	297	257	389	379	307	80	0	2,052
1980	4	0	1	9	391	201	171	150	549	361	114	0	1,951
1981	0	0	89	41	193	645	214	359	209	468	2	23	2,243
1982	31	23	5	117	893	204	23	0	323	164	31	6	1,820
1983	0	43	1	20	90	345	120	230	345	221	110	3	1,528
Mean	1	4	13	48	286	354	183	232	398	333	56	5	1,913

Table C-17(2) MONTHLY PRECIPITATION AT MARCOVIA

(Unit: mm)

Year	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Annual
1966	-	-	-	-	-	-	-	40	133	135	2	1	-
1967	0	2	19	20	2	168	34	42	148	47	9	0	491
1968	0	0	0	21	146	179	36	66	148	138	62	1	796
1969	5	0	7	-	31	41	154	426	441	277	25	0	-
1970	-	-	1	11	185	255	366	439	380	224	64	0	-
1971	0	0	0	0	308	166	105	353	272	414	88	0	1,706
1972	1	0	2	26	318	229	193	126	236	171	57	0	1,359
1973	0	0	0	50	194	265	245	446	608	503	15	0	2,326
1974	0	0	0	0	277	497	130	503	1,135	314	2	0	2,858
1975	1	0	5	0	186	104	164	395	558	276	354	0	2,043
1976	0	0	0	30	146	324	44	86	133	466	29	0	1,258
1977	0	0	0	20	270	241	5	271	137	123	117	4	1,188
1978	0	5	22	29	243	214	224	-	481	-	-	-	-
1979	0	0	2	59	267	350	315	374	380	359	26	0	2,132
1980	13	0	17	10	-	253	154	282	589	377	112	0	1,807
1981	0	0	23	163	438	485	226	367	284	428	0	26	2,440
1982	3	77	85	26	767	176	86	50	367	288	37	43	2,005
1983	0	0	4	25	185	308	57	138	344	338	57	1	1,457
Mean	1	5	11	31	248	250	149	216	376	287	62	4	1,705

Table C-17(3) MONTHLY PRECIPITATION AT LOS ENCUENTROS

(Unit: mm)

Year	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Annual
1958	-	-	-	-	-	-	-	49	145	108	20	4	-
1960	0	-	-	-	-	-	-	-	-	-	-	-	-
1964	-	-	-	-	-	-	-	110	306	-	0	0	-
1965	1	0	0	0	259	119	11	6	301	218	0	0	915
1966	0	7	0	1	446	438	164	32	168	230	15	0	1,501
1967	0	0	40	37	2	292	44	96	284	31	3	0	829
1968	0	0	0	10	423	376	68	69	309	208	20	0	1,483
1969	6	1	24	35	341	290	129	197	292	318	2	9	1,644
1970	0	0	4	27	276	101	197	278	431	189	69	0	1,572
1971	0	0	0	0	236	60	34	278	297	256	21	0	1,182
1972	0	0	0	0	125	247	33	99	35	131	20	0	690
1973	0	0	0	0	168	200	109	277	269	374	5	0	1,402
1974	0	0	0	0	386	190	12	112	443	11	0	0	1,154
1975	0	0	19	5	262	58	79	103	345	173	164	0	1,208
1976	0	0	0	11	129	337	43	30	114	297	20	0	981
1977	0	0	0	5	300	168	5	68	199	59	18	0	822
1978	2	0	6	11	318	107	77	53	235	98	0	2	909
1979	0	5	1	173	78	258	111	246	374	259	10	0	1,515
1980	6	0	0	85	204	163	49	91	286	305	23	0	1,212
1981	0	0	15	22	229	243	87	283	106	190	11	4	1,190
1982	2	8	2	94	547	164	18	0	219	117	29	0	1,200
1983	0	0	5	35	84	271	51	75	156	139	76	3	895
Mean	1	1	6	29	253	209	70	122	253	186	25	1	1,174

Table C-17(4) MONTHLY PRECIPITATION AT TEXIGUAT

(Unit: mm)

Year	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Annual
1965	0	0	0	0	40	31	26	14	100	44	7	0	262
1966	0	0	0	5	54	62	36	30	71	46	3	1	308
1967	0	0	33	84	7	76	20	5	124	49	6	0	404
1968	0	0	0	0	137	109	13	15	123	94	4	0	495
1969	4	0	15	18	103	85	42	121	137	180	7	0	612
1970	0	0	0	20	81	17	98	73	121	46	9	0	465
1971	0	0	0	0	5	12	27	24	40	35	24	0	167
1972	0	0	0	0	34	32	5	4	18	20	8	0	121
1973	0	0	0	10	32	40	30	28	39	64	0	1	234
1974	1	0	0	0	45	32	10	30	449	74	0	0	641
1975	0	2	0	3	261	53	102	87	255	150	104	0	1,017
1976	0	0	0	27	189	409	15	33	56	316	6	0	1,066
1977	0	0	0	22									-
1978	3	3	2	6	470	132	124	47	246	65	0	1	1,099
1979	0	4	0	143	66	150	139	151	191	185	30	0	1,057
1980	0	0	0	73	322	124	90	239	212	381	77	0	1,518
1981	0	0	38	29	325	520	88	250	190	209	9	9	1,737
1982	5	0	4	11	492	157	85	2	227	133	24	0	1,141
1983	0	0	10	29	132	236	116	131	193	83	24	4	958
Mean	1	0	5	25	155	134	63	76	164	128	20	1	782

Table C-17(5) MONTHLY PRECIPITATION AT SAN ANTONIO DE FLORES

(Unit: mm)

Year	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Annual
1956	13	12	11	10	161	228	63	33	303	32	20	23	909
1957	20	7	2	103	313	151	73	119	135	177	33	-	-
1958	-	-	0	0	357	321	177	242	70	81	-	-	-
1966	-	-	-	-	-	-	74	169	196	210	29	6	-
1967	19	3	7	174	7	138	81	82	135	46	31	9	812
1968	15	2	4	0	73	152	90	82	-	-	-	-	-
1969	-	8	3	4	82	55	70	154	101	154	20	35	-
1970	13	-	3	50	191	-	262	166	305	148	28	26	-
1971	9	10	4	0	264	131	90	247	143	174	60	30	1,162
1972	7	3	1	2	133	156	64	63	61	144	24	14	672
1973	9	0	0	46	149	226	175	210	192	478	27	1	1,513
1974	29	3	4	7	321	168	153	168	420	53	10	7	1,343
1975	39	22	1	5	160	53	114	192	371	219	97	15	1,288
1976	16	3	5	27	156	240	76	62	132	214	67	7	1,005
1977	1	1	0	31	160	203	36	99	275	-	45	5	-
1978	20	1	8	13	265	194	242	93	199	90	16	17	1,158
1979	3	9	7	110	104	247	126	189	204	189	25	21	1,234
1980	2	2	33	30	385	264	218	182	224	275	18	9	1,642
1981	0	64	45	2	215	347	93	233	191	106	8	41	1,345
1982	7	9	6	48	275	217	92	34	140	109	42	4	983
1983	2	30	6	56	71	277	121	239	226	125	38	10	1,201
Mean	12	10	7	36	192	186	119	146	201	159	29	16	1,162

Table C-17(6) MONTHLY PRECIPITATION AT OROPOLI

(Unit: mm)

Year	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Annual
1966	-	-	-	-	-	-	29	58	118	102	11	3	-
1967	0	0	3	25	3	83	51	40	101	21	16	4	347
1968	0	3	0	1	112	59	35	66	130	59	26	3	494
1969	30	0	7	0	63	166	28	123	94	102	6	0	619
1970	0	0	9	10	68	31	96	-	93	46	24	11	-
1971	2	0	0	0	77	37	23	82	81	65	11	0	378
1972	5	0	0	0	47	40	34	25	-	-	-	-	-
1973	-	0	0	0	70	92	74	54	100	244	12	0	646
1974	7	0	0	0	172	105	96	69	143	93	11	0	696
1975	14	5	4	0	102	31	65	56	282	135	236	0	930
1976	0	0	0	112	153	229	56	52	70	156	28	1	857
1977	0	0	0	11	282	268	21	39	170	42	44	0	877
1978	4	0	0	9	256	57	156	79	256	69	16	0	902
1979	0	0	0	112	23	177	85	146	119	86	21	25	794
1980	0	0	0	42	229	223	155	106	202	284	69	10	1,320
1981	0	25	0	8	162	263	132	227	115	143	5	30	1,110
1982	0	0	10	29	197	208	80	20	176	57	34	6	817
1983	2	25	3	49	58	259	54	230	142	116	26	17	981
Mean	4	3	2	24	122	137	71	87	133	107	35	6	785

Table C-17(7) MONTHLY PRECIPITATION AT YUSCARAN

(Unit: mm)

Year	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Annual
1951	-	-	2	19	83	248	143	80	219	171	27	6	-
1952	9	22	40	58	144	532	155	187	173	207	35	5	1,567
1953	27	9	0	13	100	166	149	100	339	148	15	40	1,106
1954	2	19	8	8	274	442	108	136	306	228	4	3	1,538
1955	1	13	8	29	56	70	276	183	301	726	25	20	1,708
1956	-	13	10	1	124	330	218	41	201	109	41	19	1,107
1957	6	-	6	24	4	50	68	79	213	136	38	4	628
1965	24	29	22	50	198	123	61	66	316	149	44	40	1,122
1966	24	26	61	59	324	225	170	149	202	306	36	22	1,604
1967	15	13	74	76	3	151	132	136	294	90	19	25	1,028
1968	6	18	4	5	275	182	137	213	249	294	74	27	1,434
1969	77	13	28	26	166	413	178	373	294	264	73	27	1,932
1970	8	8	17	10	150	135	243	179	309	246	57	49	1,411
1971	26	15	2	21	215	78	114	280	167	285	38	35	1,276
1972	19	8	2	0	148	74	109	97	53	47	9	6	572
1973	3	2	1	88	161	269	175	181	210	454	80	4	1,628
1974	55	16	7	10	335	170	147	174	382	157	26	7	1,486
1975	59	31	2	0	67	26	113	142	444	393	27	0	1,304
1976	29	0	0	26	48	400	91	71	104	189	54	9	1,021
1977	2	5	0	44									
1978	20	2	12	3	249	99	174	187	187	128	40	37	1,138
1979	5	14	27	112	26	362	154	179	206	170	52	29	1,335
1980	6	4	6	55	404	370	196	149	238	316	32	8	1,782
1981	2	24	10	10	226	392	118	169	187	70	15	17	1,239
1982	17	8	5	19	227	272	183	84	290	127	34	14	1,281
1983	2	17	3	68	56	227	194	226	382	135	100	40	1,449
Mean	19	16	14	32	166	249	152	158	258	222	40	20	1,321

Table C-17(8) MONTHLY PRECIPITATION AT EL ZAMORANO

(Unit: mm)

Year	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Annual
1944	9	6	0	22	86	425	180	204	183	42	38	5	1,199
1945	14	6	11	18	175	241	79	198	337	145	62	24	1,309
1946	19	50	7	4	110	107	87	132	207	150	56	12	942
1947	21	13	7	3	28	163	221	159	149	195	118	35	1,111
1948	13	10	4	7	164	364	184	77	193	176	42	13	1,247
1949	11	7	0	2	43	262	113	56	216	256	35	19	1,021
1950	43	0	6	0	41	311	182	128	144	308	56	0	1,219
1951	0	0	0	4	99	277	125	51	209	87	18	9	879
1952	10	4	68	51	144	506	159	125	186	92	53	2	1,399
1953	0	10	1	15	127	84	60	133	276	179	3	27	914
1954	10	5	6	22	176	407	147	187	251	182	3	6	1,403
1955	0	5	6	45	70	101	393	331	324	352	45	17	1,688
1956	2	9	24	25	160	233	142	55	212	78	58	15	1,013
1957	25	0	0	83	254	257	112	102	218	72	40	9	1,172
1958	0	0	0	41	361	283	319	116	185	0	0	0	1,305
1959	-	26	1	-	126	142	57	123	39	141	4	0	659
1960	43	0	0	187	344	221	95	211	193	202	87	14	1,597
1961	22	21	3	15	22	237	192	93	96	100	66	28	894
1962	7	0	0	7	15	236	134	80	100	95	28	0	700
1963	26	12	16	11	47	139	174	106	121	197	103	0	952
1964	5	12	0	59	92	268	173	182	215	59	62	8	1,138
1965	6	26	6	21	212	190	127	93	191	-	42	15	929
1966	-	-	-	49	-	206	167	129	189	187	20	9	-
1972	13	3	2	1	168	103	99	102	91	100	35	20	737
1973	22	5	8	7	137	128	66	134	138	342	44	61	1,092
1974	13	0	0	3	30	0	110	153	132	96	2	-	539
1977	0	0	0	20	-	-	51	70	212	27	64	9	452
1978	5	1	4	18	142	118	144	129	156	24	37	24	800
1979	4	12	12	96	101	269	111	123	154	101	135	29	1,145
1980	3	7	3	33	304	270	214	125	221	238	8	7	1,433
1981	4	25	15	-	166	231	112	351	114	121	15	40	1,194
1982	7	11	4	31	276	223	109	67	188	103	21	9	1,048
1983	3	13	8	26	46	146	165	205	214	74	70	20	989
Mean	12	10	7	30	138	223	146	137	183	141	44	15	1,103

Table C-17(9) MONTHLY PRECIPITATION AT PASO LA CEIBA

(Unit: mm)

Year	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Annual
1969	5	0	1	1	26	85	89	30	218	268	59	13	794
1970	10	2	0	35	178	160	210	103	174	82	31	44	1,029
1971	18	5	0	3	95	80	95	192	123	171	49	18	849
1972	10	2	0	1	134	132	59	92	44	27	26	6	533
1973	9	0	0	38	158	134	140	121	71	237	19	11	938
1974	12	1	6	7	152	89	69	128	218	145	35	17	879
1975	30	7	11	0	58	-	-	-	-	-	-	124	-
1976	9	4	4	19	60	301	75	65	38				
Mean	13	3	3	13	100	141	101	112	136	158	36	36	852

* Discontinued thereafter.

Table C-17(10) MONTHLY PRECIPITATION AT LA VENTA

(Unit: mm)

Year	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Annual
1955	0	23	4	32	78	99	331	137	153	276	65	29	1,229
1956	10	20	1	92	131	188	122	72	184	82	31	50	983
1957	18	41	42	31	196	215	86	55	182	116	10	30	1,022
1958	6	1	55	0	205	211	194	88	139	106	24	11	1,040
1959	44	0	1	32	196	36	46	93	42	98	88	19	695
1964	-	-	-	-	80	288	136	98	218	93	53	66	-
1965	12	7	0	19	65	153	88	50	184	133	128	131	970
1966	42	23	65	10	242	167	155	88	230	134	13	14	1,184
1967	48	19	45	69	30	125	93	49	181	141	17	25	842
1968	9	5	4	48	310	234	60	109	264	273	92	28	1,436
1969	13	5	35	16	238	275	146	295	279	346	101	34	1,783
1970	12	7	0	0	138	60	148	142	240	213	70	31	1,061
1971	12	30	3	1	166	64	92	172	112	227	79	31	989
1972	12	21	6	10	112	200	65	43	115	164	51	13	812
1973	5	6	0	12	-	87	104	120	156	334	50	86	-
1974	11	9	2	13	146	127	83	99	161	151	42	29	873
1975	43	8	15	0	94	40	89	82	411	228	244	25	1,279
1976	22	3	1	49	41	318	52	62	9	419	36	44	1,056
1977	5	11	1	34	148	175	36	71	153	43	55	10	742
1978	42	0	43	59	70	129	104	39	106	105	81	56	834
1979	12	8	12	145	68	255	97	136	199	237	86	54	1,309
1980	9	2	0	18	157	315	174	89	146	134	38	37	1,119
1981	7	92	55	19	124	184	84	150	132	121	26	71	1,065
1982	6	20	25	20	326	164	88	70	212	117	25	20	1,093
1983	22	15	0	36	69	196	94	78	142	128	96	34	910
Mean	18	16	17	32	143	172	111	99	174	177	64	39	1,058

Table C-17(11) MONTHLY PRECIPITATION AT ZAMBRANO

(Unit: mm)

Year	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Annual
1955	0	11	3	27	100	126	229	102	137	442	36	43	1,257
1956	4	0	0	0	125	281	51	47	97	-	17	26	-
1957	26	8	5	11	241	207	89	50	152	85	10	6	890
1958	8	0	1	4	313	213	148	39	161	88	12	4	991
1968	10	5	5	19	395	387	24	70	223	234	54	13	1,429
1969	38	17	12	20	260	382	83	253	200	278	58	10	1,611
1970	1	7	0	107	178	64	307	157	307	137	59	49	1,373
1971	5	11	6	12	174	70	88	213	163	122	37	13	914
1972	14	9	1	37	134	94	30	45	111	120	27	6	628
1973	4	4	1	76	160	222	94	82	152	198	29	3	1,025
1974	9	8	2	3	406	176	54	81	249	277	11	8	1,284
1975	23	1	0	11	89	27	115	49	456	263	130	3	1,167
1976	13	0	0	47	103	461	62	49	34	305	17	17	1,108
1977	0	1	0	52	267	140	18	57	186	47	71	33	872
1978	11	0	5	49	187	101	83	65	171	65	31	21	789
1979	5	7	7	132	105	247	98	80	285	134	26	30	1,156
1980	1	0	2	18	141	195	171	106	182	97	10	49	972
1981	2	67	33	21	193	314	99	278	160	109	12	24	1,312
1982	17	21	8	28	210	139	42	46	169	100	30	4	814
1983	6	8	3	39	91	277	83	65	186	87	44	19	908
Mean	10	9	5	36	194	206	98	97	189	168	36	19	1,079

Table C-17(12) MONTHLY PRECIPITATION AT GUACERIQUE

(Unit: mm)

Year	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Annual
1944	-	-	-	-	-	569	113	282	314	41	30	19	-
1945	4	0	5	0	234	196	95	97	334	182	53	8	1,208
1946	15	9	7	13	213	142	45	77	271	118	81	26	1,017
1947	11	17	9	0	0	210	235	362	168	95	69	12	1,188
1948	5	3	18	23	137	47	66	60	124	41	40	4	568
1949	-	-	-	-	81	254	107	108	186	156	57	15	-
1950	9	0	4	1	107	360	94	222	152	319	75	11	1,354
1964	12	0	0	0	131	415	249	0	177	115	36	0	1,135
1965	0	0	12	30	271	147	74	79	272	153	26	0	1,064
1966	7	0	0	76	202	189	209	70	206	218	30	4	1,211
1967	16	0	21	97	24	108	70	60	117	49	4	0	566
1968	0	0	0	8	259	294	45	74	235	81	57	4	1,057
1969	-	0	0	0	177	440	230	-	277	321	37	0	-
1970	0	0	0	5	105	156	251	181	115	83	95	0	991
1971	-	-	-	-	272	66	-	161	224	193	-	-	-
1972	-	-	-	-	136	93	14	57	83	126	38	6	-
1973	0	0	0	17	171	171	90	112	174	232	17	13	997
1974	0	0	0	105	175	113	145	130	240	97	7	3	1,015
1975	12	0	0	3	154	18	136	121	294	148	101	0	987
1976	5	0	0	58	123	369	34	49	30	177	20	23	888
1977	0	-	1	85	212	206	43	27	114	35	50	10	-
1978	-	0	7	28	174	113	116	88	142	32	3	5	-
Mean	6	2	5	31	160	213	117	115	193	137	44	8	1,016

Table C-17(13) MONTHLY PRECIPITATION AT TEGUCIGALPA

(Unit: mm)

Year	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Annual
1938	13	18	5	15	55	53	32	86	181	125	91	5	679
1939	14	10	5	2	160	141	63	67	271	74	0	0	807
1940	0	0	3	1	126	171	33	52	224	187	25	41	863
1941	4	8	5	50	56	3	40	91	207	208	153	47	872
1942	45	12	9	12	309	176	80	112	233	83	41	32	1,144
1943	19	5	16	46	80	27	95	42	201	409	39	53	1,032
1944	3	6	0	6	197	311	68	130	170	37	28	6	962
1945	64	27	14	5	275	208	77	139	232	278	71	3	1,393
1946	26	4	2	7	159	95	48	93	235	114	34	12	829
1947	9	6	42	0	130	164	186	239	134	114	56	16	1,096
1948	5	0	50	7	100	185	95	37	63	99	54	28	723
1949	6	7	0	2	44	218	76	77	40	218	85	34	807
1950	9	6	11	2	103	76	45	75	63	167	24	0	633
1951	6	0	0	8	96	146	43	115	241	78	18	2	752
1952	4	1	49	132	168	355	112	35	190	80	26	4	1,152
1953	2	2	0	77	170	90	75	39	277	81	7	8	827
1954	9	5	2	16	208	330	71	61	337	125	5	5	1,173
1955	0	11	2	6	65	95	275	268	263	201	25	10	1,278
1956	2	6	0	8	135	177	75	63	132	39	41	10	689
1957	5	0	2	34	162	140	90	61	215	39	13	18	777
1958	5	0	2	7	222	201	169	62	77	213	12	2	971
1959	21	0	5	72	294	146	31	126	103	107	42	3	944
1960	28	0	11	37	143	174	65	143	137	191	27	5	961
1961	14	10	9	37	67	149	114	57	155	69	84	8	773
1962	10	1	0	142	149	190	63	135	161	202	6	1	1,064
1963	5	7	2	13	160	148	163	67	118	97	101	1	882
1964	1	2	3	1	111	255	168	70	176	63	39	3	892
1965	2	6	0	25	157	90	35	39	262	113	20	16	765
1966	2	4	35	33	268	181	132	50	136	186	14	5	1,047
1967	12	4	15	104	55	144	61	35	155	40	8	6	640
1968	3	5	0	3	300	243	26	82	237	87	29	13	1,025
1969	17	2	19	27	177	266	53	168	262	178	22	5	1,197
1970	9	1	0	90	113	67	143	101	293	109	53	22	1,001
1971	5	5	0	10	151	38	39	129	159	174	33	7	750
1972	4	4	0	15	136	101	33	21	39	58	26	15	452
1973	6	1	1	86	135	137	91	104	227	262	20	13	1,083
1974	1	2	0	2	121	169	82	77	201	104	6	2	858
1975	11	2	4	1	189	10	141	84	341	196	77	0	1,075
1976	3	0	0	25	127	296	29	38	33	161	24	19	755
1977	0	8	0	58									
1978	17	1	10	43	145	110	125	92	145	24	5	14	731
1979	1	2	16	131	67	231	137	121	176	157	142	24	1,205
1980	6	0	0	56	199	162	133	49	222	141	33	5	1,006
1981	1	34	61	25	168	254	64	216	155	78	17	44	1,117
1982	4	3	8	23	185	155	44	34	148	79	12	6	701
1983	3	4	17	5	17	196	48	98	166	78	81	12	725
Mean	6	5	10	41	150	162	81	88	182	124	35	30	914

Table C-18 MAXIMUM DAILY PRECIPITATION AT CHOLUTECA

(Unit: mm)

Year	Max. Daily Rainfall
1964	84
1965	n.a.
1966	117
1967	55
1968	109
1969	99
1970	92
1971	83
1972	119
1973	139
1974	148
1975	89
1976	93
1977	63
1978	154
1979	78
1980	108
1981	91
1982	186
1983	80
Probability:/1	
90% (1/10 years)	157
80% (1/5 years)	134
50% (1/2 years)	100

Note: /1: Probability analysis by the Gumbel method

Table C-19 DISCHARGE RECORD AT CHOLUTECA BRIDGE

C.A = 6,964 km^2

(Unit: MCM)

Year	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Total
1979	22.6	15.1	15.1	32.8	82.2	350.3	163.7	99.6	520.1	577.3	150.7	63.5	2,093.0
1980	32.2	13.5	7.5	20.3	252.9	496.0	159.9	165.4	343.2	978.7	121.7	75.3	2,666.6
1981	43.4	29.7	26.5	16.8	93.7	1,010.3	188.0	184.0	393.8	152.9	61.6	41.3	2,242.0
1982	20.4	33.7	35.9	27.9	138.6	282.4	93.1	59.4	100.3	203.1	48.6	183.4	1,226.8
1983	15.9	9.7	5.6	12.8	25.5	100.3	73.8	62.1	168.4	304.0	126.2	65.0	969.3
Mean	26.9	20.3	18.1	22.1	118.6	447.8	135.7	114.1	305.2	443.2	101.8	85.7	1,839.5

Table C-20 DISCHARGE RECORD AT LOS ENCUENTROS

C.A. = 6,370 km^2

Year	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Total
1956											59.5	32.2	-
57	43.5	29.5	22.2	19.2	144.5	224.7	44.3	61.0	219.5	198.9	39.5	27.6	1,074.4
58	18.4	10.7	9.6	8.7	165.8	370.2	248.7	124.2	81.8	223.9	42.6	22.4	1,327.0
59	18.8	12.2	8.0	5.6	41.2	71.2	19.5	45.2	42.1	205.8	38.7	15.7	524.0
1960*	14.1	7.4	5.5	5.5	97.4	237.9	124.7	193.4	232.9	310.6	96.6	35.1	1,361.1
61*	30.4	24.4	19.2	15.2	13.4	146.9	156.6	80.6	128.6	146.4	74.8	30.6	888.1
62*	26.4	17.6	11.8	10.2	68.9	159.3	90.2	85.4	141.0	192.7	31.0	22.4	856.9
63*	19.5	12.0	10.9	10.3	9.2	87.6	94.4	50.2	120.8	208.2	156.4	27.1	806.5
64	19.3*	12.2*	11.9*	10.9*	9.6*	335.4*	246.6*	74.5	166.7	292.2	41.3	27.2	1,247.8
65	12.1	5.3	5.1	4.4	84.2	133.7	54.6	50.9	368.1	281.3	94.7	36.7	1,131.1
66	23.3	14.3	12.7	17.1	138.6	394.2	286.8	128.0	175.0	393.8	65.9	35.9	1,685.6
67	26.8	19.8	17.0	36.1	14.7	89.6	56.4	48.7	153.4	111.3	39.5	22.6	635.9
68	20.1	12.8	8.6	8.6	145.0	560.1	108.4	74.5	329.2	209.9	118.0	45.8	1,740.0
69	39.0	16.7	14.7	12.7	51.8	580.8	206.2	471.4	534.0	784.9	154.8	44.2	2,911.2
1970	17.9	9.5	6.9	7.8	34.1	32.1	137.3	218.3	436.8	329.5	107.6	45.0	1,382.8
71	29.1	17.7	12.9	10.1	71.6	52.8	32.9	111.4	318.8	353.6	68.5	31.9	1,111.3
72	21.6	14.1	9.8	8.7	50.0	134.5	23.0	28.4	28.8	32.8	20.4	12.0	384.1
73	9.1	5.5	4.2	5.6	33.6	89.4	97.2	72.6	240.3	592.0	170.3*	35.7*	1,355.5
74*	18.6	9.0	7.1	6.4	238.9	205.2	103.3	105.4	507.8	334.6	74.1	21.8	1,632.2
75*	12.5	6.9	6.7	6.7	27.9	8.8	33.9	51.1	592.1	544.1	375.6	73.8	1,740.1
76*	24.8	13.8	8.6	7.3									-
Mean	22.3	13.6	10.7	10.9	75.8	206.0	113.9	109.2	253.6	307.7	94.5	32.3	1,250.5

Note: * Discharge estimated by rainfall-runoff studies

Table C-21 DISCHARGE RECORD AT POZA GRANDE

C.A. = 353 km^2

Year	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Total
1956											2.3	1.8	-
57	0.3	0.1	0.1	0.9	1.1	1.6	0.8	0.7	8.8	1.2	0.6	0.4	16.6
58	0.5	0.3	0.4	0.3	2.6	6.3	1.6	0.9	1.7	3.1	0.7	0.5	18.9
59	1.6	1.2	1.0	1.0	4.1	5.7	1.3	2.1	2.1	16.6	2.3	1.2	40.2
65											0.8	0.3	-
66					27.3	42.6	15.5	3.0	12.6	15.9	1.6	1.5	-
67	1.2	0.6	0.6	0.8	0.4	9.7	1.9	0.4	12.2	6.4	1.2	0.7	36.1
68	0.5	0.4	0.3	0.2	7.1	29.3	0.7	0.1	17.2	25.6	3.0	0.7	85.1
69	0.9	0.1	0.1	0.1	4.5	38.7	4.7	42.2	58.1	55.9	21.2	4.6	231.1
70	4.1	1.6	1.2	1.1	2.0	2.4	2.2	30.6	52.6	34.2	8.2	2.9	143.1
71	2.0	1.9	2.1	1.7									

Table C-22 DISCHARGE RECORD AT PASO LA CEIBA

C.A. = 1,743 km^2

(Unit: MCM)

Year	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Total
1977	7.3	5.6	4.8	5.2	15.5	128.9	9.6	8.2	19.7	11.3	8.5	5.8	230.4
1978	5.4	4.4	3.8	5.5	22.7	43.4	43.3	14.8	70.6	21.5	8.2	9.9	253.5
1979	6.2	5.5	6.3	10.7	31.2	106.9	75.8	38.0	152.2	180.7	31.8	19.0	664.2
1980	7.4	5.7	5.7	4.4	34.1	136.8	57.4	53.4	97.1	127.4	24.1	15.1	568.6
1981	7.5	9.3	9.2	4.7	-	-	-	-	-	-	-	-	-
Mean	6.8	6.1	6.0	6.1	25.9	104.0	46.5	28.6	84.9	85.2	18.2	12.5	429.2

Table C-23 DISCHARGE ESTIMATED AT EL PAPALON

C.A. = 7,115 km^2

(Unit: MCM)

Year	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Total
1956											64.4	36.0	-
1957	44.1	29.7	22.4	21.1	146.8	228.1	46.0	62.5	238.1	201.4	40.8	28.4	1,109.4
1958	19.5	11.3	10.4	9.3	171.3	383.5	252.1	126.1	85.4	230.4	44.1	23.5	1,366.9
1959	22.2	14.7	10.1	7.7	49.9	83.2	22.2	49.6	46.5	240.8	43.6	18.2	608.7
1960	15.7	8.3	6.1	6.1	108.8	265.7	139.3	216.0	260.1	346.9	107.9	39.2	1,520.1
1961	34.0	27.3	21.4	17.0	15.0	164.1	174.9	90.0	143.6	163.5	105.9	34.2	990.9
1962	29.5	19.7	13.2	11.4	77.0	177.9	100.7	95.4	157.5	215.2	34.6	25.0	957.1
1963	21.8	13.4	12.2	11.5	10.3	97.8	105.4	56.1	134.9	232.5	174.7	30.3	900.9
1964	21.6	13.6	13.3	12.2	10.7	374.6	275.4	83.2	186.2	326.4	46.1	30.4	1,393.7
1965	13.5	5.9	5.7	4.9	94.0	149.3	61.0	56.9	411.2	314.2	96.4	37.3	1,250.3
1966	26.0	16.0	14.2	19.1	196.2	484.1	319.5	134.3	201.6	427.4	69.3	39.1	1,946.8
1967	29.3	21.1	18.3	37.8	15.5	110.1	60.4	49.5	179.1	124.8	42.0	24.1	712.0
1968	21.2	13.6	9.2	9.0	160.0	621.9	109.9	74.7	365.5	362.9	124.3	47.3	1,919.5
1969	40.9	16.9	14.9	12.9	61.3	662.5	216.1	560.5	656.6	902.9	199.5	53.9	3,398.9
1970	26.6	12.9	9.4	10.1	38.3	37.2	141.9	282.9	547.8	401.7	124.9	51.1	1,684.8
1971	33.3	21.7	17.3	13.7	80.0	59.0	36.7	124.4	356.1	395.0	76.5	35.6	1,249.3
1972	24.1	15.7	10.9	9.7	55.8	150.2	25.7	31.7	32.2	36.6	22.8	13.4	428.8
1973	10.2	6.1	4.7	6.3	37.5	99.9	108.6	81.1	268.4	661.2	190.2	39.9	1,514.1
1974	20.8	10.1	7.9	7.1	266.8	229.2	115.4	117.7	567.2	373.7	82.8	24.3	1,823.0
1975	14.0	7.7	7.5	7.5	31.2	9.8	37.9	57.1	661.3	607.7	419.5	82.4	1,943.6
1976	27.7	15.4	9.6	8.2	73.3	1,016.2	211.1	47.2	35.1	603.4	61.3	55.6	2,164.1
1977	29.7	22.7	19.4	21.0	63.1	202.9	34.9	33.6	80.4	46.1	34.7	23.7	612.2
1978	22.0	18.0	15.5	22.5	92.7	177.2	176.8	60.4	288.0	87.8	33.5	40.4	1,034.8
1979	23.2	15.5	15.5	33.7	84.4	359.7	168.1	102.3	534.0	592.7	154.7	65.2	2,149.0
1980	33.1	13.9	7.5	20.8	259.7	509.2	164.2	169.8	352.4	1,004.8	124.9	77.3	2,737.6
1981	44.6	30.5	27.2	17.2	96.2	1,037.3	193.0	188.9	404.3	157.0	63.2	42.4	2,301.8
1982	20.9	34.6	36.9	28.6	142.3	289.9	95.6	61.0	103.0	208.5	49.9	188.3	1,259.5
1983	26.3	20.0	15.7	23.1	26.2	103.0	75.8	63.8	172.9	312.1	129.6	66.7	1,035.2
Mean	25.8	16.9	13.9	15.2	91.3	299.4	128.5	114.0	276.6	354.7	98.6	45.5	1,480.4
Max.	44.6	34.6	36.9	33.7	266.8	1,037.3	319.5	560.5	661.3	1,004.8	419.5	188.3	3,398.9
Min.	10.2	5.9	4.7	4.9	10.3	9.8	22.2	31.7	32.2	36.6	22.8	13.4	612.2
(m^3/s)													
Mean	9.6	7.0	5.2	5.9	34.1	115.5	48.0	42.6	106.7	132.4	38.0	17.0	
Max.	16.7	14.3	13.8	13.0	99.6	400.2	119.3	209.3	255.1	375.1	161.8	70.3	
Min.	3.8	2.4	1.8	1.9	3.8	3.8	8.3	11.8	12.4	13.7	8.8	5.0	

Table C-24 DISCHARGE AT HERNANDO LOPEZ

C.A. = 1,565 km²

(Unit: MCM)

Year	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Total
1954								36.3	195	162	19.2	7.9	-
1955	6.5	5.8	5.7	5.4	5.0	7.0	120	67.5	129	231	55.1	19.7	657.7
1956	11.4	8.0	5.6	5.3	14.3	88.7	48.6	15.4	39.4	36.2	14.7	12.7	300.3
1957	12.5	7.6	5.5	5.1	28.1	75.5	18.4	19.4	50.5	40.8	10.5	9.5	283.4
1958	5.7	3.8	3.7	3.0	62.4	135	61.5	32.0	25.4	62.8	10.0	7.5	412.8
1959	7.7	5.5	4.5	3.9	23.9	36.1	12.4	23.3	18.9	54.7	16.6	10.5	218.0
1960*	5.0	3.7	3.3	3.1	13.7	104	19.1	39.7	88.1	123	17.5	10.3	430.5
1961*	9.8	7.9	6.9	5.4	5.5	23.6	30.2	15.6	39.3	31.0	28.9	11.5	215.6
1962*	10.9	7.1	5.6	5.3	21.1	64.1	17.5	32.1	69.3	129	12.2	10.8	385.0
1963*	8.1	5.6	4.9	4.5	4.4	25.1	30.1	12.3	30.7	45.9	42.4	6.2	220.2
1964	5.1*	3.7*	3.5*	3.1*	2.9*	85.2	104	15.1	54.7	70.1	7.1	5.8	360.3
1965	2.6	2.8	1.8	1.5	21.4	43.0	16.5	11.5	247	78.2	35.3	12.5	474.1
1966	7.4	4.5	4.6	4.4	48.3	80.5	74.1	26.3	39.1	63.0	12.7	7.9	372.8
1967	6.8	5.2	4.5	10.4	3.5	13.3	14.2	9.4	32.8	33.0	10.0	5.7	148.8
1968	4.5	2.7	1.9	1.8	51.8	160	27.6	21.9	86.6	64.2	37.6	11.9	472.5
1969	9.6	3.9	3.0	1.9	16.8	204	72.4	130	181	203	38.5	21.3	885.4
1970	9.7	6.2	3.9	8.1	15.4	19.9	50.6	91.2	176	75.6	28.5	14.5	499.6
1971	6.8	4.6	3.2	2.8	23.5	16.7	16.1	40.8	102	96.0	18.5	7.8	338.8
1972	5.5	3.2	2.2	2.4	13.9	37.7	7.7	8.4	9.7	8.5*	4.3*	3.3*	106.8
1973	3.2*	2.8*	3.0*	2.8*	17.3	45.5	43.1	29.2	88.9	175	40.4	9.8	461.0
1974	6.0	5.1	4.5	3.2	86.9*	41.7	19.3	8.4	104.7*	39.9	12.0	9.9	341.6
1975	9.1	6.5	4.9	3.6	14.3	8.0	16.5*	5.2*	220.2*	154	176	12.6	630.9
1976	8.5	6.0	5.1	4.9	8.3	164.8	40.0	10.4	7.5	65.2	12.3	11.3	344.26
1977	5.9	3.9	3.1	3.6	17.1	83.4	9.4	8.1	17.6	10.4	8.9	5.2	176.6
1978	4.2	3.6	2.7	3.7	19.9	36.2	35.8	14.9	56.8	20.6	8.0	9.5	215.9
1979	5.1	3.4	3.4	7.4	22.4	79.3	57.0	30.1	119.9	118.9	23.8	13.9	484.6
1980	7.2	4.4	3.2	3.5	24.4	122.6	51.4	43.1	74.5	88.6	16.3	11.9	451.1
1981	6.2	6.6	8.5	3.8	21.2	125.5	56.5	68.6	88.9	34.5	13.9	9.3	443.5
1982	4.6	7.6	8.1	6.3	28.1	67.2	19.0	17.5	28.1	59.0	16.0	11.8	273.3
1983	9.8	6.4	6.8	6.3	5.4	37.6	39.0	21.1	59.9	66.6	35.5	14.7	309.1
Mean	7.1	5.1	4.4	4.4	22.1	70.0	38.9	30.2	82.7	81.4	26.1	10.6	376.4
(m^3/s)	2.6	2.1	1.6	1.7	8.3	27.0	14.5	11.3	31.9	30.4	10.1	3.9	

Table C-25 DISCHARGE ESTIMATED AT SAN FERNANDO DAMSITE

(C.A. = 1,665 km^2)

(Unit: MCM)

Year	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Total
1954								38.6	207.0	172.0	20.4	8.4	-
1955	6.9	6.2	6.1	5.7	5.3	7.4	128.0	71.8	137.0	246.0	58.6	21.0	700.0
1956	12.1	8.5	6.0	5.6	15.2	94.4	51.7	16.4	41.9	38.5	15.6	13.5	319.4
1957	13.3	8.1	5.9	5.4	29.9	80.3	19.6	20.6	53.7	43.4	11.2	10.1	301.5
1958	6.1	4.0	3.9	3.2	66.4	144.0	65.4	34.0	27.0	66.8	10.6	8.0	439.4
1959	8.2	5.9	4.8	4.1	25.4	38.4	13.2	24.8	20.1	58.2	17.7	11.2	232.0
1960	5.3	3.9	3.5	3.3	14.6	111.0	20.3	42.2	93.7	131.0	18.6	11.0	458.4
1961	10.4	8.4	7.3	5.7	5.9	25.1	32.1	16.6	41.8	33.0	30.7	12.2	229.2
1962	11.6	7.6	6.0	5.6	22.4	68.2	18.6	34.2	73.7	137.0	13.0	11.5	409.4
1963	8.6	6.0	5.2	4.8	4.7	26.7	32.0	13.1	32.7	48.8	45.1	6.6	234.3
1964	5.4	3.9	3.7	3.3	3.1	90.6	111.0	16.1	58.2	74.6	7.6	6.2	383.7
1965	2.8	3.0	1.9	1.6	22.8	45.7	17.6	12.2	263.0	83.2	37.6	13.3	504.7
1966	7.9	4.8	4.9	4.7	51.4	85.6	78.8	28.0	41.6	67.0	13.5	8.4	396.6
1967	7.2	5.5	4.8	11.1	3.7	14.1	15.1	10.0	34.9	35.1	10.6	6.1	158.2
1968	4.8	2.9	2.0	1.9	55.1	170.0	29.4	23.3	92.1	68.3	40.0	12.7	502.5
1969	10.2	4.1	3.2	2.0	17.9	217.0	77.0	138.0	193.0	216.0	41.0	22.7	942.1
1970	10.3	6.6	4.1	8.6	16.4	21.2	53.8	97.0	187.0	80.4	30.3	15.4	531.1
1971	7.2	4.9	3.4	3.0	25.0	17.8	17.1	43.4	109.0	102.0	19.7	8.3	360.8
1972	5.9	3.4	2.3	2.6	14.8	40.1	8.2	8.9	10.3	9.0	5.0	3.5	114.0
1973	3.4	3.0	3.2	3.0	18.4	48.4	45.9	31.1	94.6	186.0	43.0	10.4	490.4
1974	6.4	5.4	4.8	3.4	92.5	44.4	20.5	8.9	111.4	42.4	12.8	10.5	363.4
1975	9.7	6.9	5.2	3.8	15.2	8.5	17.6	5.5	234.3	164.0	187.0	13.4	671.1
1976	9.0	6.4	5.4	5.2	8.8	175.3	42.6	11.1	8.0	69.4	13.0	12.0	366.2
1977	6.3	4.1	3.3	3.8	18.2	88.7	10.0	8.6	18.7	11.1	9.5	5.5	187.8
1978	4.5	3.8	2.9	3.9	21.2	38.5	38.1	15.9	60.4	21.9	8.5	10.1	229.7
1979	5.4	3.6	3.6	7.9	23.8	84.4	60.6	32.0	127.6	126.5	25.3	14.8	515.5
1980	7.7	4.7	3.4	3.7	26.0	130.4	54.7	45.9	79.3	94.3	17.3	12.7	480.1
1981	6.6	7.0	9.0	4.0	22.6	133.5	60.1	73.0	94.6	36.7	14.8	9.9	471.8
1982	4.9	8.1	8.6	6.7	29.9	71.5	20.2	18.6	29.9	62.8	17.0	12.6	290.8
1983	10.4	6.8	7.2	6.7	5.7	40.0	41.5	22.4	63.7	70.9	37.8	15.6	328.7
Mean	7.6	5.4	4.6	4.6	23.6	74.5	41.4	32.1	88.0	86.5	27.8	11.3	400.5
(m^3/s)	2.8	2.2	1.7	1.7	8.8	28.7	15.5	12.0	34.0	32.3	10.7	4.2	

Table C-26 PROBABLE MAXIMUM FLOOD AT SAN FERNANDO DAMSITE

T (hr)	Q (m^3/s)	T (hr)	Q (m^3/s)	T (hr)	Q (m^3/s)
0	60	26	1,980	52	3,610
	60		1,960		3,305
2	60	28	1,940	54	3,000
	70		1,945		2,730
4	80	30	1,950	56	2,460
	90	32	2,070		2,170
6	100		2,210	58	1,880
	150	34	2,350		1,655
8	200		2,580	60	1,430
	215	36	2,810		1,290
10	230		3,190	62	1,150
	325	38	3,570	64	930
12	420		4,085		845
	465	40	4,610	66	760
14	510		4,865		700
	570	42	5,120	68	640
16	630		5,200		590
	730	44	5,280	70	540
18	830		5,175		490
	1,030	46	5,070	72	440
20	1,230		4,890		410
	1,440	48	4,710	74	380
22	1,650		4,485		350
	1,790	50	4,260	76	320
24	1,930		3,935		300
	1,955			78	280

Table C-27 OBSERVED PEAK FLOOD DISCHARGES

(At Hernando Lopez: 1,565 km2)

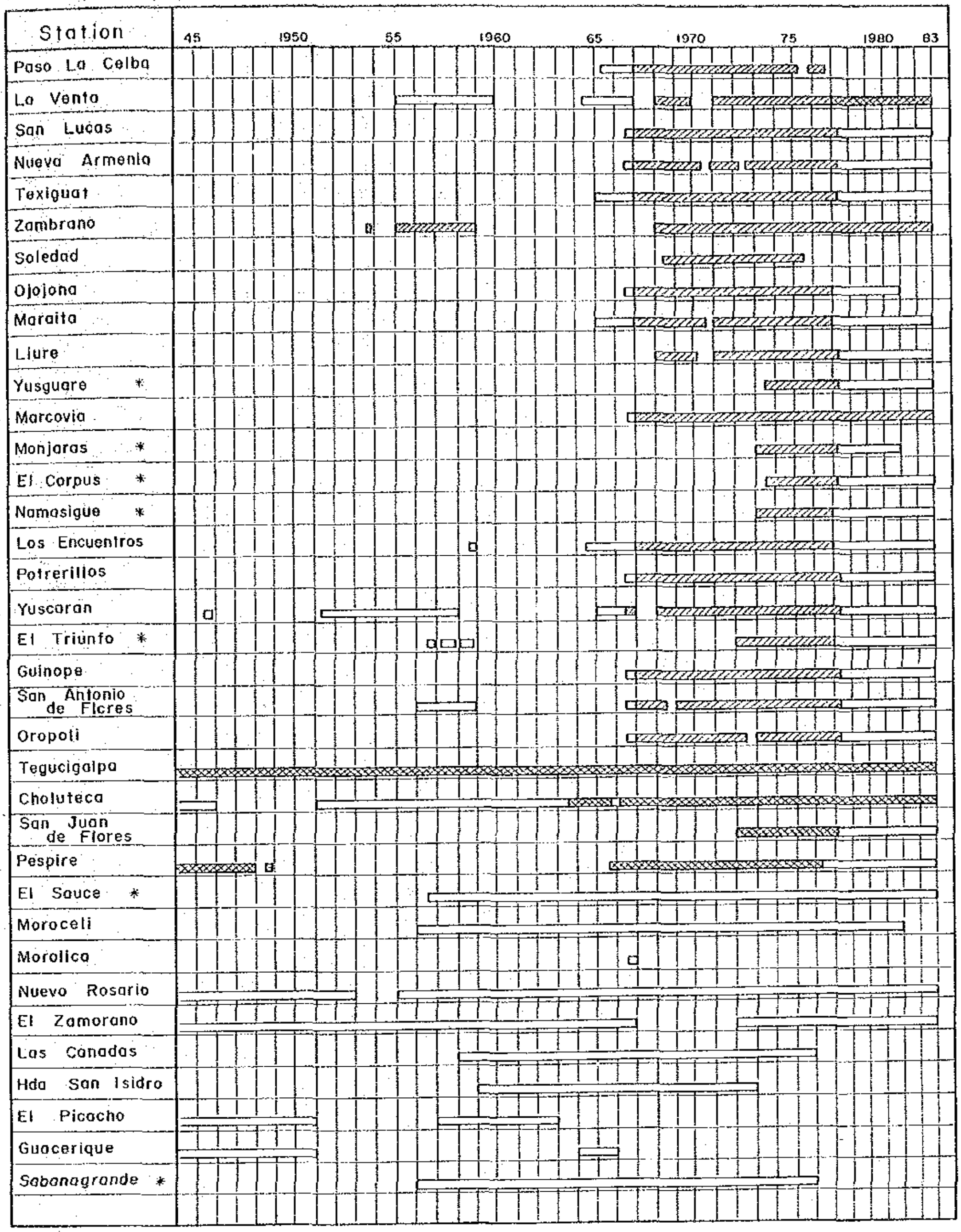
Year	Date	Peak Discharge (m^3/s)	Order
1954	Sep. 27	652	7
55	Oct. 26	247	15
56	Jun. 18	156	18
57	Oct. 1	116	22
58	Jun. 7	482	10
59	Jun. 1	106	24
1964	Jul. 25	149	19
65	Sep. 26	962	1
66	Jul. 11	120	20
67	Sep. 21	61	26
68	May 31	543	8
69	Sep. 30	654	6
70	Sep. 29	750	4
71	Oct. 21	498	9
72	Jun. 11	79	25
73	Oct. 26	395	13
74	Jun. 21	119	21
75	Oct. 19	397	12
76	Jun. 27	467	11
77	Jun. 1	920	2
78	Sep. 6	108	23
79	Oct. 12	257	14
1980	Jun. 13	686	5
81	Jul. 18	160	17
82	Jun. 13	876	3
83	Sep. 30	187	16

Table C-28 PROBABLE FLOOD DISCHARGE AT HERNANDO LOPEZ

Area: 1,565 km^2
Period: Sep. 1954 - Sep. 1983 (26 samples)

Return Period	Proba-bility	Iwai	Hazen	Moment	Order-Probability	Third Type of Peason	Hazen & Chow	Gumbel	Chow's Method
1.01	0.9901	33.4	50.6	-	26.5	36.7	-	-	-
1.50	0.6667	182.4	239.7	212.8	175.8	182.4	211.6	206.0	218.9
2.00	0.5000	262.4	325.0	309.3	262.4	262.4	303.4	319.7	316.1
5.00	0.2000	529.8	559.3	553.9	568.3	533.9	545.1	599.5	555.2
10.00	0.1000	763.0	722.8	718.9	848.6	774.0	714.1	784.7	713.6
20.00	0.0500	1,030.3	880.9	879.1	1,180.7	1,051.7	881.9	962.4	865.4
30.00	0.0333	1,204.3	971.5	972.2	1,401.7	1,233.7	981.0	1,064.7	952.8
40.00	0.0250	1,336.3	1,035.1	1,038.3	1,571.5	1,372.2	1,052.1	1,136.7	1,014.4
50.00	0.0200	1,443.7	1,084.0	1,089.7	1,711.0	1,485.2	1,107.7	1,192.4	1,062.0
80.00	0.0125	1,685.2	1,185.8	1,198.7	2,028.2	1,740.1	1,226.4	1,309.4	1,162.0
100.00	0.0100	1,807.4	1,233.6	1,250.7	2,190.4	1,869.4	1,283.6	1,364.8	1,209.3
200.00	0.0050	2,219.6	1,379.8	1,414.5	2,745.6	2,307.5	1,465.3	1,536.5	1,356.1

FIGURES



NOTE:

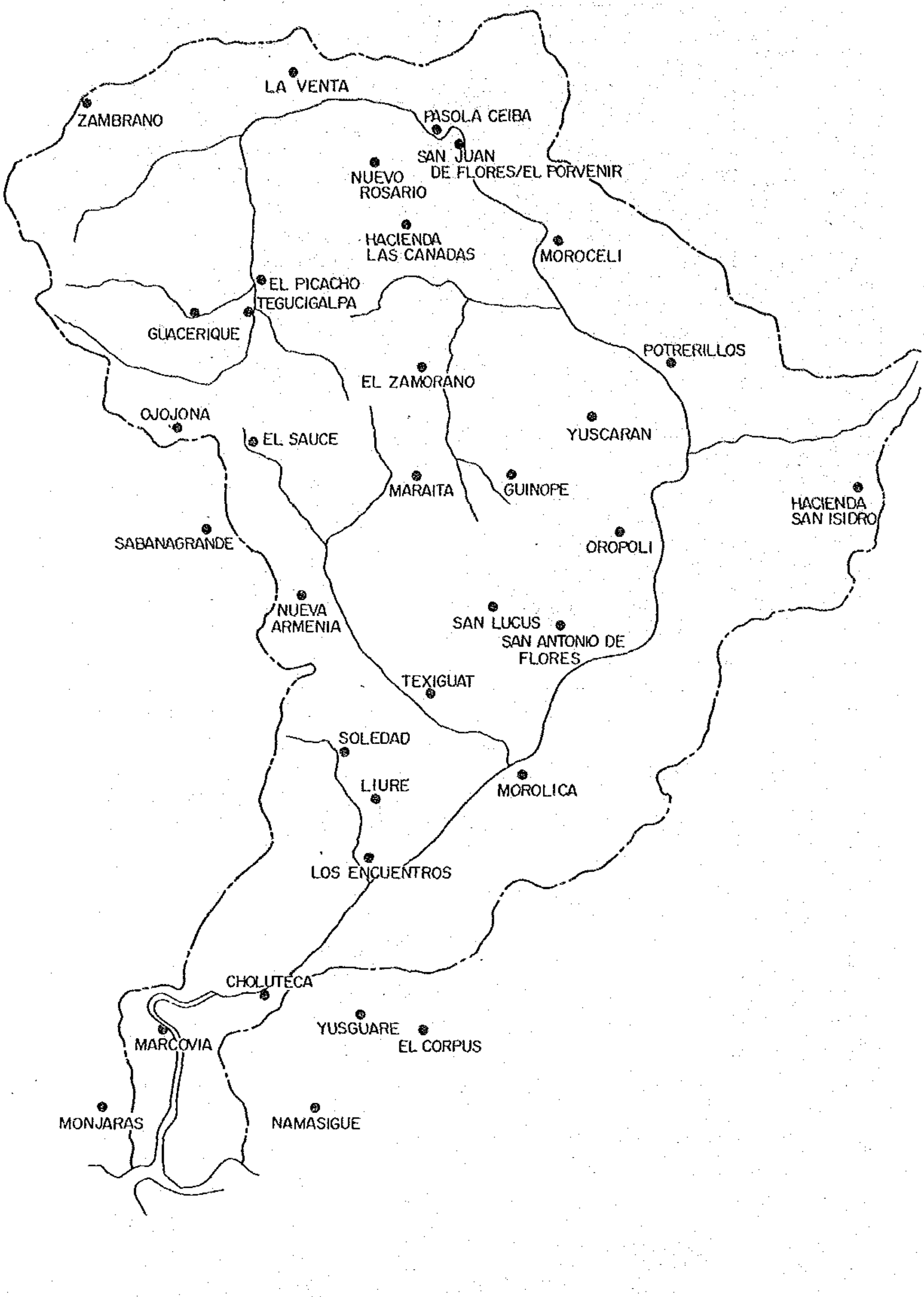
Daily data collected

6-hr data collected

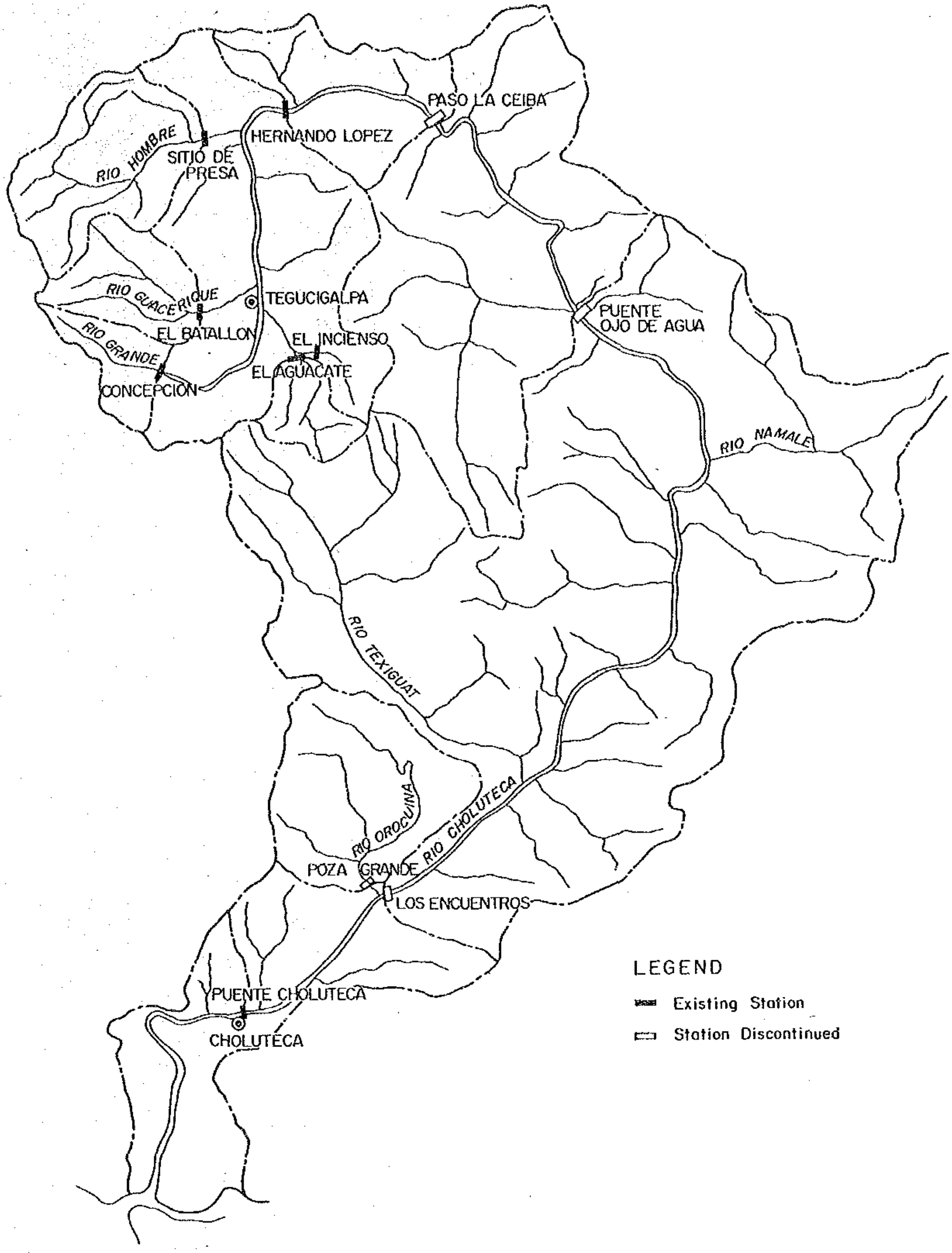
Monthly data collected

* Stations located out of the Choluteca river basin

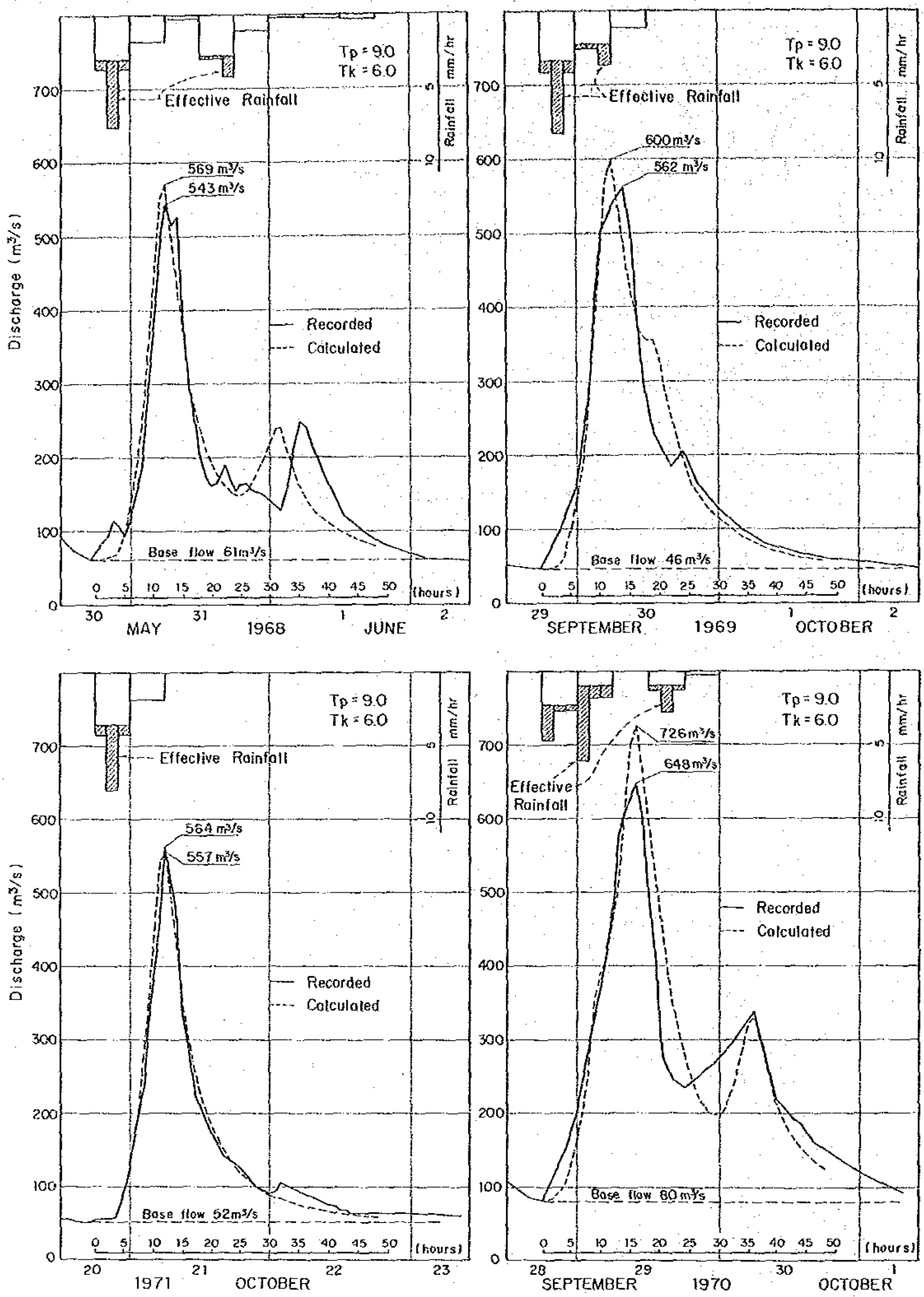
GOVERNMENT OF THE REPUBLIC OF HONDURAS MINISTRY OF NATURAL RESOURCES CHOLUTECA RIVER BASIN AGRICULTURAL DEVELOPMENT PROJECT JAPAN INTERNATIONAL COOPERATION AGENCY	Fig. C-01	AVAILABLE RAINFALL DATA



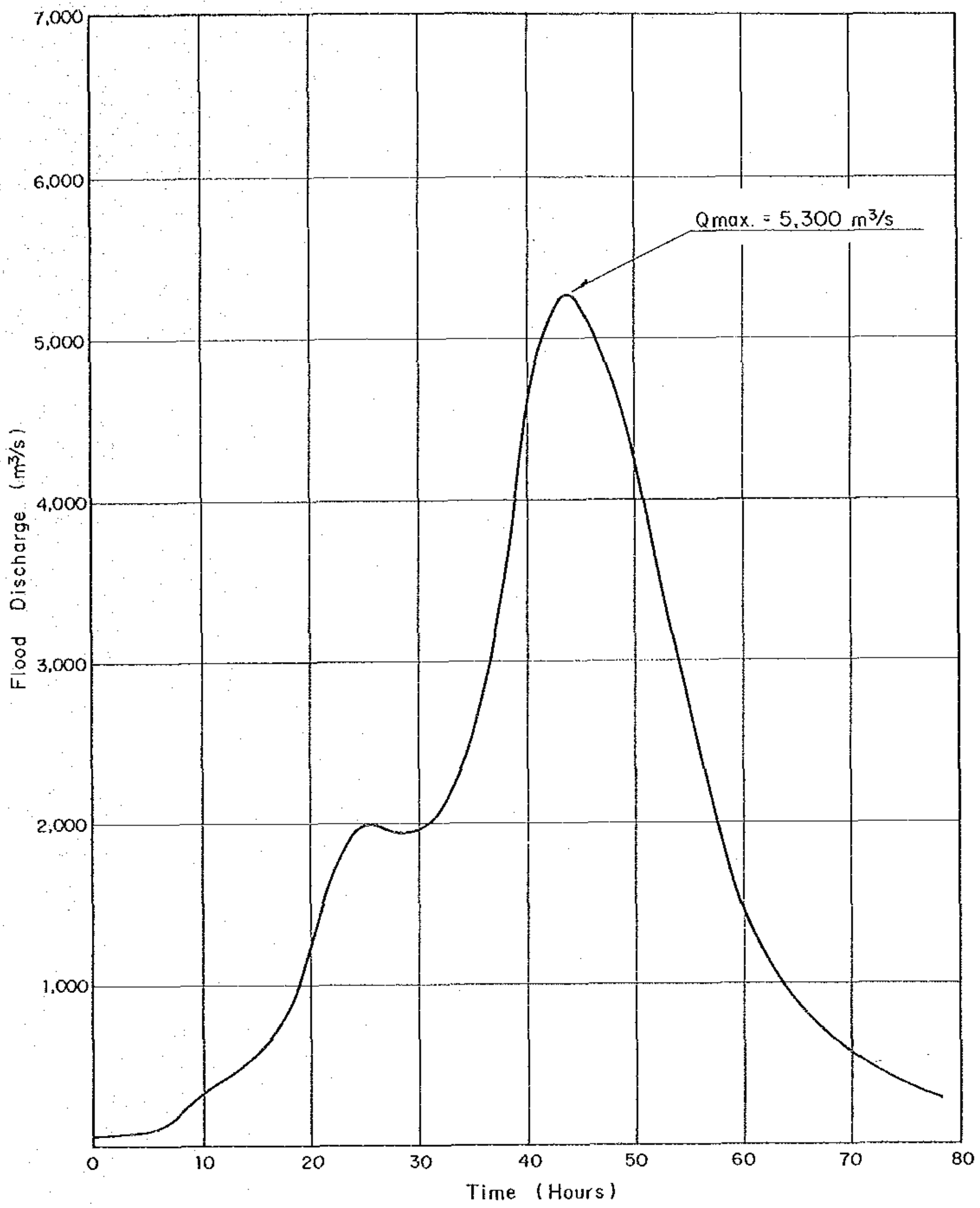
GOVERNMENT OF THE REPUBLIC OF HONDURAS MINISTRY OF NATURAL RESOURCES	Fig.	
CHOLUTECA RIVER BASIN AGRICULTURAL DEVELOPMENT PROJECT	C-02	LOCATION OF CLIMATOLOGICAL STATIONS
JAPAN INTERNATIONAL COOPERATION AGENCY		



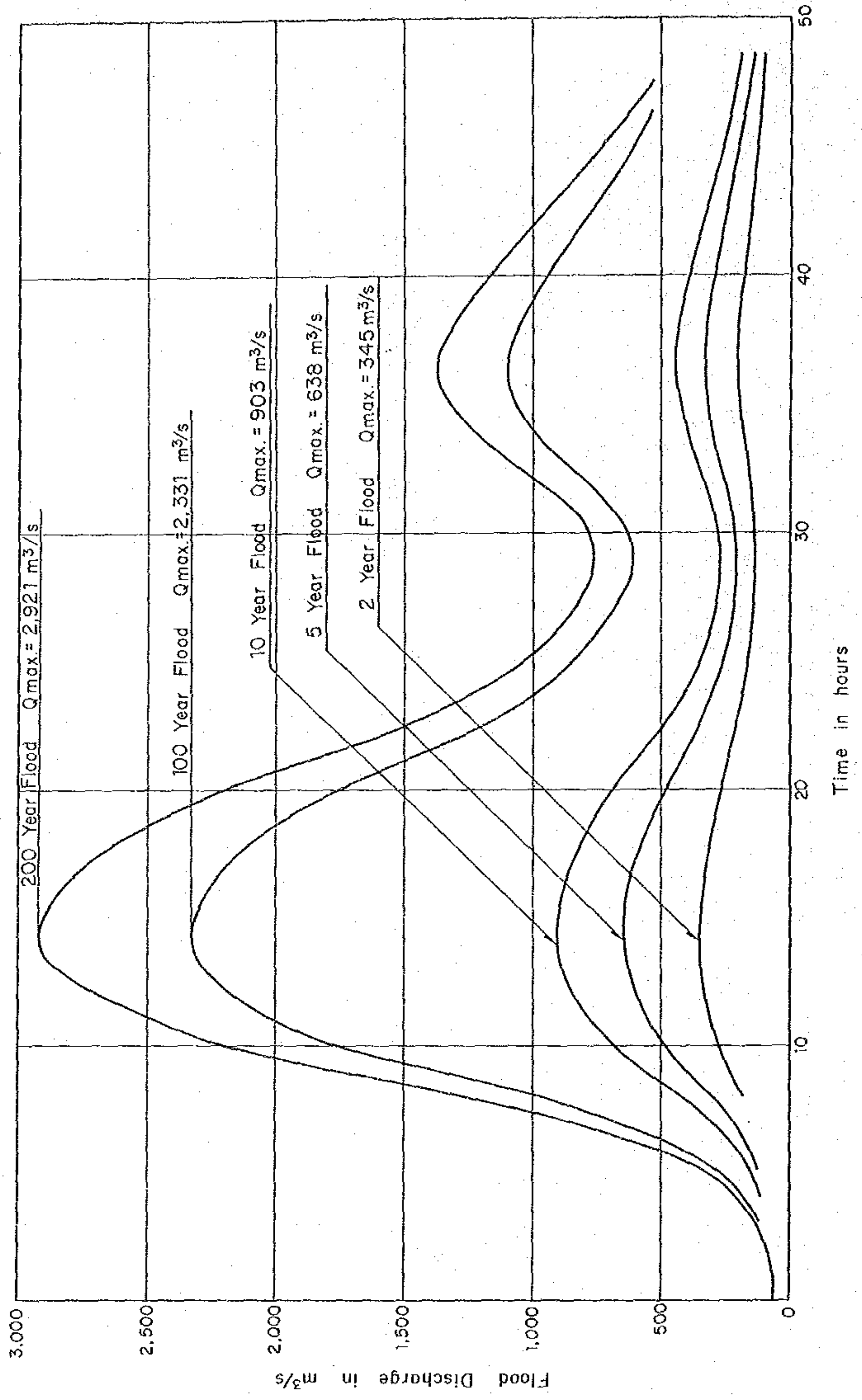
GOVERNMENT OF THE REPUBLIC OF HONDURAS MINISTRY OF NATURAL RESOURCES	Fig. C-03	LOCATION OF DISCHARGE GAUGING STATIONS
CHOLUTECA RIVER BASIN AGRICULTURAL DEVELOPMENT PROJECT		
JAPAN INTERNATIONAL COOPERATION AGENCY		



GOVERNMENT OF THE REPUBLIC OF HONDURAS MINISTRY OF NATURAL RESOURCES	Fig.	
CHOLUTECA RIVER BASIN AGRICULTURAL DEVELOPMENT PROJECT	C-04	HYDROGRAPHS AT HERNANDO LOPEZ
JAPAN INTERNATIONAL COOPERATION AGENCY		



GOVERNMENT OF THE REPUBLIC OF HONDURAS MINISTRY OF NATURAL RESOURCES	Fig. C-05	PROBABLE MAXIMUM FLOOD AT SAN FERNANDO DAMSITE
CHOLUTECA RIVER BASIN AGRICULTURAL DEVELOPMENT PROJECT		
JAPAN INTERNATIONAL COOPERATION AGENCY		



GOVERNMENT OF THE REPUBLIC OF HONDURAS MINISTRY OF NATURAL RESOURCES	Fig. C-06	PROBABLE FLOOD HYDROGRAPHS AT SAN FERNAND DAMSITE
CHOLUTECA RIVER BASIN AGRICULTURAL DEVELOPMENT PROJECT		
JAPAN INTERNATIONAL COOPERATION AGENCY		

ANNEX D

GEOLOGY AND SOILS

ANNEX - D

GEOLOGY AND SOILS

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D. GEOLOGY AND SOILS

D.1 GENERAL GEOLOGY AND TOPOGRAPHY

D.1.1 General Geology

The geological basement of Honduras is formed of undifferentiated Paleozoic metamorphic rocks. They are exposed in the northern and eastern part of the country, and are partially depressed and covered by Mesozoic sedimentary series. These areas of pre-Tertiary rocks are dissected by the northerly river systems which debouch into the Caribbean sea. On the other hand, the southwestern part of the country is extensively covered with Tertiary volcanic rocks, which form highlands of several hundred meters to more than 1,500 m in elevation. Drainage systems are predominantly south-bound in the Tertiary zone. (Refer to Figure D-01)

The Choluteca river basin is located in the eastern part of the Tertiary zone. The Tertiary rocks are dominantly composed of acidic pyroclastic rocks of various grain sizes, ranging from volcanic breccia to fine tuff, some of which are welded. Lava flows of rhyolite, andesite and basalt are also prevalent member of the Tertiary zone. Pyroclastic rocks are, in general, horizontally bedding or mildly folding. Two trends of faulting, NW-SE to NWW-SEE and NE-SW, are dominant.

In addition to the Tertiary rocks of Jutiapa formation, a narrow belt of Jurasic - Cretaceous sedimentary rock formation of conglomerate, sandstone, shale, limestone and other calcareous rocks are developed through the ridge between the basin of Talanga and the Choluteca river, as well as through the San Juan de Flores area to the eastern part of Tegucigalpa.

In the Choluteca valley, Tertiary sedimentary rocks and Quaternary volcanic rocks are also observed in places. Quaternary sediments are deposited extensively in the flat plains of the lower Choluteca river basin. (Refer to Figure D-02)

D.1.2 General Topography

Honduras is mostly formed of hill masses. Flat plains are limited to extend in the inter-mountain basins, along river courses and in coastal areas. The Choluteca river originates in the ridges of hill masses with 1,400 - 2,000 m in elevation extending to the south of Tegucigalpa. The river takes its course first to the north through the city of Tegucigalpa, then to the east to San Juan de Flores, and to the southeast to reach Oropoli, and finally to the southwest toward the Choluteca plain. The valley is, in general, fairly wide open, except for a deep narrow gorge located downstream from the Hernando Lopez bridge.

Topography in the lower Choluteca river basin is classified into hill masses, terraces and alluvial plain. The hill masses in the northern and north-eastern part of the lower basin are carved mostly from the Matagalpa volcanic rocks and Padre Miquel welded tuffs, and they are broken into a cluster of fault blocks. Hill masses are lower in the south, especially in the vicinity of the flat plain. Isolated hills in the plain are thought to be the extension of the major hill masses.

Terraces extend along the lower Choluteca river. Near the city of Choluteca, the terraces are observed in three levels, namely higher terrace, middle terrace and lower terrace. The higher terrace occur in the south-western area of Choluteca city. It shows an undulating narrow plain inclined toward the southwest, with elevation ranging from 30 to 50 m. The higher terrace is presumed to be formed of the Tertiary volcanic rocks. On the other hand, the middle terrace occurs extensively over the flat plain, which is underlain by laharic deposits, terrace deposits and volcanic rocks. To the northeast of Choluteca city, the middle terrace is developed on both sides of the Choluteca river, with slight undulation in the elevation of 50 - 60 m. The middle terrace also extends to the southeast of Choluteca city, where the terrace resembles a fan slope area between the Choluteca river and Sampile river, with elevation ranging from 10 m to 45 m. The lower terrace of 2 - 5 m above the river bed is developed along the Choluteca river. The lower terrace is commonly flat and covered with sand and pebbles from river deposits, and it is covered with fertile soils.

Alluvial plain occurs at the talus skirts of the hill masses, in the river courses, in the flat plains of lower reach of the river, and in and around the littoral zone. The alluvial plain at the skirt of hill masses is commonly formed of thin talus deposits, while the alluvial plain in the river courses is formed of the recent river deposits. The major alluvial plain extends on the right bank of the Choluteca river. In the area extending from Los Llanos to Monjaras, the alluvial plain is flat, with a gradient of about 0.8 m/km. The lower littoral area of the alluvial plain forms swamp, affected by tidal inundations.

D.2 GEOLOGY AT STRUCTURE SITES

D.2.1 San Fernando Damsite

Through the study conducted in 1977-78, the San Fernando damsite was selected as most recommendable site for construction of dam and reservoir on the Choluteca river. The proposed damsite is located at N14°17'25" and W87°09'42", and approximately 20 km to the north of Tegucigalpa or 2.5 km downstream from Hernando Lopez bridge.

1) Topography:

The damsite is topographically characterized by steep cliffs of 70° - 80° in inclination and partly vertical or overhanging on both banks, up to reach a terrace at EL. 835 m. On the left bank, the terrace is about 50 m in width and the slope rises from the terrace end up to EL. 1,100 m. On the right bank, the terrace is about 200 m in width, and the slope behind rises up to more than EL. 1,300 m. The river bed is 20 - 30 m in width, with river bed elevation at EL. 742 m.

A short steep gully is formed on the left abutment of the damsite down to EL. 765 m, but a steep rock wall stands from EL. 742 m to EL. 765 m. Another gulley is formed on the right bank, which starts at the foot of the slope behind the terrace and runs down to reach the river at around 300 m upstream of the damsite. No water flow is observed in these gullies, except for a short time run-off under heavy rainfall.

2) Geology:

Exposed rocks at the San Fernando damsite and rhyolitic welded tuffs which are hard to moderately hard. Bedding planes strike N-W to N20°E and dip 10° - 15° to southeast. Vertical joints or steeply inclined joints are developed. Major trends of joints are N-S/90°, N20 - 25°W/ 75 - 80°NE and E-W/60°S, and generally accord with the directions of river course and the gully on the left bank. Further, joints of N40°E/85°SE are rather dominant on the right bank. These vertical joints are apt to be open in the upper parts of the cliffs because of stress relief.

A fault line is assumed to run along the gully behind the terrace on the right bank. (Refer to Figure D-03)

A core drilling from EL. 835 m on the left bank revealed slight weatherings in the welded tuff in the section up to 22 m in depth from the surface and a few openings with brown water stains at the depth of 23 - 25 m, though the rock condition is generally sound enough below 15 m in depth. Water leakage condition showed a high value of 18 Lugeon unit at 30 m in depth, with the implication of developing open cracks. However, treatment by grouting can be effective as cut-off works against leakage.

On the right bank, a core drilling from EL. 835 m revealed that the white rhyolitic welded tuff was moderately hard from the surface, but it was more or less weathered to the bottom of the drilling hole at 48 m in depth and bore vertically elongated open void with 1 to 10 mm in width. These voids were, however, not always continuous. Below 38 m, some distortion of lamination was observed in rather porous sandy tuff of moderate hardness, and the rock was almost homogenously stained in light orange colour due presumably to permeation of water.

The core drilling from EL. 770 m or at the end of short gully on the left bank revealed a noticeable fact that a thick bed of green altered tuff with very thin shale layers at the top and the buttom was intercalated in the level of 9 to 22 m below the river bed. This altered tuff was horizontally stratified, comparatively dense and massive, but liable to break. It has a tendency of slaking or collapsing when soaked in water in unconfined conditions. The layer is 12.75 m in thickness, and is underlain by solid grey muddy tuff and propylitic tuff. (Refer to Figure D-04 and D-05)

The shear strength of rocks was obtained on the basis of tests on drill core test pieces which were more homogeneous than the actual condition of the rock bed. The actual value of shear strength of rock bed should be far less than the test results. Though in-situ shear test has not been executed to-date, it is empirically probable that the in-situ test would give shear strength of not more than 10 kg/cm^2.

3) Engineering Geologic Remarks:

The San Fernando damsite offers favorable topographic condition for construction of arch dam or concrete gravity dam. However, some difficulties are foreseen for construction of such a gravity or arch dam due to strength of foundation. However, there may still be a possibility of constructing these types of dam, by adjusting the dam section or thrust direction. Construction of a full-type dam has least difficulty in foundation strength, but involves problems in steep slopes in both abutment and in availability of full materials. In any case, the altered tuff layer below the river bed should not be exposed to water because of its slaky nature.

The geological investigation executed to-date at the San Fernando damsite is not sufficient to prepare detailed design. It is required to carry out addition drilling campaign, geophysical exploration, in-situ rock tests and grouting tests in the design stage.

4) Design Earthquake Acceleration:

Although no earthquake centered in the south region of Honduras has been recorded in the past, the Pacific coastal area has experienced earthquakes of considerable magnitudes. A seismic hazard analysis are the country was executed by stanford University in 1979, and the design criteria for El Cajon hydroelectric project was prepared by referring to such an analysis. For El Cajon project, a basic design acceleration of 0.16 g was adopted. Although the previous study in 1977-78 adopted a value of 0.12 g at the San Fernando damsite, the earthquake acceleration of 0.16 g, including some safe measure, will be applied in the updating study.

5) Reservoir Geology:

The construction of San Fernando dam will create a reservoir in a wide open valley with mild inclination of slopes composed of massive Tertiary tuff. There will be no problem of leakage through thin ridges or porous rock beds. No possibility of large scale sliding or collapse of slopes, such as to jeopardize the dam structures, is foreseen in the wide open valley developed in the reservoir area.

D.2.2 Intake Weir Site

Intake weir was planned to locate at El Papalon or alternatively at Las Bases, on the lower Choluteca river. El Papalon weir site is located at about 7.8 km to the west of Choluteca city, or in the northern boundary of the alluvial plain. The hill masses of Tertiary tuff and rhyolite are developed at about 150 m from the river brink on the right bank. Flat alluvial plain of around EL. 28 m is developed extensively on the left bank. A small isolated hill on the left bank is about 20 m in height from the river bed. The river bed is EL. 21.0 m in elevation and 100 m in width. Natural river bank is 5 to 7 m higher than the river bed.

The right bank flat is composed of volcanic breccia, but dacitic andesite crops out near the river brink. The isolated hill on the left bank consists of dacitic tuff in the downstream portion and of rhyolite in the upstream portion. The river deposit of sand and gravel of andesite, dacite, rhyolite and tuff, reaches to the weathered andesite at 9.4 m in depth, and to the solid andesite at 13.1 m in depth. The weathered andesite is stable enough for foundation of a low weir structure. However, it will be worthwhile to consider a weir of floating dam type and avoid deep excavation. (Refer to Figure D-05)

The alternative weir site at Las Bases is located at about 5 km to the northeast of Choluteca city. The river bed is at EL. 37 m. Flood plain at EL. 50 m is developed for 350 m in width on the left bank and 850 m in width on the right bank. A low hill rises behind the flood plain on the left bank, while a flat land of 5 - 10 m in elevation from the flood plain develops on the right bank. A core drilling at the end of flood plain close to the river brink on the left bank revealed that the river deposit is 13.7 m in thickness and is underlain by massive and moderately hard tuff breccia. A weir of floating dam type is also recommendable at Las Bases, in view of uneconomical deep excavation and large volume of concrete for foundation or the bed rock.

D.3 CONSTRUCTION MATERIALS

D.3.1 Materials for Dam Construction

Sand for concrete aggregate is obtainable from the river deposit on the Choluteca river in the upstream reaches of Hernando Lopez bridge, where the valley is flat and river channel is wider. River gravels available in the river bed, however, are not usable for the coarse aggregate, because around 20% of tuffaceous soft gravels are involved. The nearest source of coarse aggregate has been identified on the hill located at about 10 km from the damsite or extended to the east of Tegucigalpa - Talanga highway at around 27 km from Tegucigalpa, where hard dacite flow of at least 400,000 m^3 in volume is discernible. Another source of coarse aggregate is identified at a hill extending to the east of the highway at around 21 km from Tegucigalpa, where andesite lava flow develops extensively.

With respect to construction materials for fill-type dam, rock materials are obtained from hard welded tuff bed within 3 km from the damsite. However, since the hardness of welded tuff bed tends to vary widely, materials usable for embankment will be substantially low in proportion. Further, appropriate materials for impervious core are not found in sufficient quantity within a reasonable distance from the damsite.

D.3.2 Materials for Weir Construction and Canal Embankment

The Choluteca river deposit shows similar conditions as noted in D.3.1 above. The river deposit is good for fine aggregate, but unsuitable for coarse aggregate. A quarry site of coarse aggregate is found at a small rhyolite hill on the right bank of Quebrada Grande, or 300 m to the north of Panamerican highway at about 7 km from Choluteca. The quarry site is 4 km from El Papalon and 12 km from Las Bases.

The alluvial plain to the south of Choluteca city is covered with relatively fine materials, which is deemed to be classified into ML or CL.

Such materials are not always considered as good materials for compaction and stability of canal embankment. However, no better materials being available in the area, they will have to be utilized by mixing them with coarser materials or by making an embankment slope in lower gradient.

For the detailed design of weir and canal embankment, it is required to carry out additional investigation and tests, including core drillings at quarry sites, concrete aggregate tests, concrete trial mix, as soil mechanic tests of embankment earth materials.

D.4 SOILS IN CHOLUTECA PLAIN

D.4.1 Soils

Soil surveys in the Choluteca river basin have been executed several times. They include:

a) Reconnaissance soil survey by MRN in 1952

b) Semi-detailed soil survey (1/50,000) by MRN-IECO in 1968

c) Semi-detailed soil survey (1/250,000, 1/20,000) by CONSUPLANE

d) Soil checking survey by JICA in 1977-78

Through the surveys, soils in the Choluteca plain have been classified in conformity with the Soil Taxonomy Standard, U.S. Department of Agricultural Soil Conservation Services. Their results can be inferred as being reliable, and no specific change has been observed since the latest survey in 1977-78.

Soils in the Choluteca plain originate from volcanic rock, ash and shale of sedimentary rock. According to the Soil Taxonomy Standard, the soils in the plain are primarily identified as Inceptisols, Entisols, Mollisols, Alfisols, Vertisols and Ultisols. Their distribution is, in general, related to the topographic conditions as noted in Chapter D.1.2. Inceptisols, Entisols and Mollisols are developed in the alluvial plain, while Alfisols, Vertisols and Ultisols are found in the terraces. A part of hill masses is also coursed by Alfisols. A soil map in the Choluteca plain is illustrated on Figure D-06.

Inceptisols are recent fluventic soils developed at some places in the alluvial plain along the Choluteca river and its old river courses. The land coursed with Inceptisols extends over 410 ha in the Western plain and 180 ha in the Eastern plain. Their texture is loam to fine loam in surface soil, and fine loam to silty clay or clay in subsoil. These soils have a cambic horizon with ochric epipedon. Groundwater table is generally deep. The soils are fertile and well drained, and are presently used for sugar cane, cotton, maize, etc. The Inceptisols are suitable, without limitation, for all upland crops under irrigated conditions. A limitation in rice cultivation is poor water retention.

Entisols are also recent fluventic soils widely developed in the alluvial plain. They cover 2,770 ha in the Western plain and 690 ha in the Eastern plain. Texture is sandy loam to silty loam in surface soil, and fine loam to silty clay or clay in subsoil. The pedogenetic horizon is indistinct. The Entisols are fertile and well drained, and are cultivated at present for sugar cane, cotton, maize and sorghum. The soils are suitable for irrigated farming of all upland crops, but has limitation in poor water retention for rice cultivation.

Mollisols are recent alluvial deposits of older age than Inceptisols and Entisols. They develop in the alluvial plain of 15,960 ha in the Western plain and 180 ha in the Eastern plain. Texture is fine sandy loam to loam in surface soil, and loamy to loamy clay in subsoil. Mollisols have a cambic horizon with mollic epipedon. Some Mollisols have seasonal influence of groundwater table in deep profile. Mollisols are fertile to moderately fertile, and moderately to imperfectly drained. They are suitable for all upland crops under irrigation with proper drainage, as well as for rice cultivation.

Alfisols develop over a greater part of terraces on the left bank (Eastern plain), as well as in the hill masses in the northern part of Choluteca plain. Alfisols in the Eastern plain (10,930 ha) are sandy loam in surface, and silty clay to clay in subsoil. They have an ochric or mollic epipedon in the surface and an argillic horizon in subsoil. They are stony, in general, and groundwater is moderately to seasonally shallow. The soils are moderately fertile to infertile, and imperfectly drained. They are suitable for cultivation of upland crop and rice, except for shallow soils and soils containing much gravel. Upland farming under irrigation requires certain drainage. Alfisols in the hill masses are fragmental loam with gravels. Such soils are infertile, and are presently used for pasture land. Shallow soil and relatively steep slopes are limitations for upland crop cultivation.

Vertisols mainly develop in the Ola district (1,410 ha) in the northwestern corner of the plain. Vertisols have texture of clay to fine clay in surface, and fine clay in subsoil. They show gilgai micro-relief in surface, and have parallel-piped structure in subsoil. The subsoils are generally abundant in small calcium concretions and faint mottlings. Groundwater table is moderately to seasonally shallow. Vertisols are fertile, but imperfectly drained. They are suitable for upland crop cultivation with proper drainage, except for the cultivation of sugar cane and vegetables. Vertisols have no limitation in rice cultivation.

Ultisols develop in the left bank terraces with limitted extension (320 ha). Texture is sandy clay in both surface and sub-soil. An albic horizon is underlain by argillic horizon. The soils are fertile to moderately fertile, but imperfectly drained. Ultisols are also suitable for upland crop cultivation, except for sugar cane and vegetables, under irrigation and proper drainage. There is no limitation in rice cultivation.

As a whole, Mollisols are predominant and represent around 71% of soils in the Western plain, while Alfisols prevail and account for about 81% of land in the Eastern plain. (Refer to Table D-01)

D.4.2 Land Capability

Land capability has been evaluated in accordance with the USBR standard, as follows:

Class I : Highly suitable for irrigated farming, without limitation.

Class II : Moderately suitable for irrigated farming, with moderate limitation due to coarse texture, rather steep slope, or impermeable subsoil.

Class III : Rather suitable for irrigated farming, with limitation due to shallow soil, gravelly or stony soils or low fertility.

Class IV : Marginally or conditionally suitable for irrigated farming, with relatively serious limitation due to very shallow soil, steep slope or imperfect drainability.

Class VI : Unsuitable for irrigated farming, with serious limitations.

A land capability map of the Choluteca plain is illustrated on Figure D-07. As a whole, the land of 31,960 ha or 89% of the Choluteca plain falls in Class I to Class III for irrigated farming. In the Western plain, the land of 13,490 or 60% is classified under Class I to Class II. The land of Class IV and VI is limited to 390 ha. On the other hand, nearly 70% of the land in the Eastern plain is classified under Class III. About 2,500 ha in the Eastern plain are classified to be marginally suitable or unsuitable. (Refer to Table D-02)

The land Class I is highly suitable for irrigated farming of upland crops. For cultivation of rice, however, the land will be rather unsuitable because of low water retaining capacity due to coarser texture and rapid percolation throughout the soil profile. The land Class II is suitable for both upland crops and rice cultivation. For cultivation of upland crops, control of drainage will be required, particularly in the land of Mollisols. The land Class III is also suitable for cultivation of both upland crops and rice. The land graded into Class IV has limitation in crop cultivation, and it is recommended to be utilized for pasture land.

D.5 SOILS IN MIDDLE REACH VALLEYS

D.5.1 San Juan de Flores Valley

Soils in the San Juan de Flores area are characterized by soils in the alluvial plain, soils in the lower terrace and higher terrace, and soils in the hill masses. Soils in the alluvial plain are classified into Entisols in order, Fluvents in sub-order, Ustifluvents in great soil group and Typic Ustifluvents in sub-group. The Typic Ustifluvents are further defined into the fine loam-mixed-isohyperthermic-slop of less than 3% in family. The soils are highly suitable for irrigated farming, except for a small area where sandy soils extend nearby the river. In the lower terrace, soils are classified into Mollisols in order, Ustolls in sub-order, Haplustolls in great soil group and Fluvaquentic Haplustolls in sub-group. The soils, in general, have a mollic epipedon in the surface and cambic horizon in sub-soil. They also have groundwater and abundant ferric mottles of low chroma. Generally, Fluvaquentic Haplustolls are rather fertile and of mild alkalinity. Texture is loamy in the surface and sandy clayey to clayey in the sub-soil. The land will be highly suitable for irrigated farming.

The higher terraces or fans are also composed of Mollisols in order, Ustolls in sub-order and Haplustolls in great soil group. The soils are primarily defined as Aquic Haplustolls in sub-group. Aquic Haplustolls have poor soil fertility, mild alkalinity and fragmental loamy texture throughout the profile. Groundwater is commonly deep. The land appears to be marginally suitable for irrigated farming. The soils in the hill masses are Alfisols in order and Haplustalfs in great soil group. A soil map of the San Juan de Flores valley is shown on Figure D-08.

The land capability is classified into Class I (340 ha), Class II (640 ha) and Class III (760 ha), in accordance with the USBR standard, as illustrated on Figure D-08.

D.5.2 Middle Reach Valleys

Soils in Orocuina area, Morolica area and Oropoli area in the middle reach valley of the Choluteca river have been reviewed. In general, these soils are broadly classified into Entisols in the alluvial plain, Inceptisols in the recent alluvial fans, and Mollisols, Alfisols and Vertisols in the terraces.

In the Orocuina area of about 1,620 ha, soils are composed of Entisols (220 ha), Inceptisols (470 ha), Mollisols (330 ha), Ultisols (110 ha), Vertisols (260 ha) and Alfisols (230 ha). All the soils have mild alkalinity throughout the profile, rich mineral compounds especially calcium carbonate, but rather poor organic matters even in the surface. The arable land will be suitable for irrigated farming with considerable crop productivity.

The Morolica area of about 350 ha is principally composed of Inceptisols (Fluventic Ustropepts in sub-group) and partly of Entisols (Typic Ustifluvents in sub-group). Soils in the Oropoli area of around 210 ha are composed of Mollisols (Fluventic Haplustolls in sub-group). A soil map in the Morolica and Oropoli areas, as well as in the Orocuina area, is shown on Figure D-09.

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4) Seismic Hazard Analysis of Honduras, Stanford University, August, 1979

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TABLES

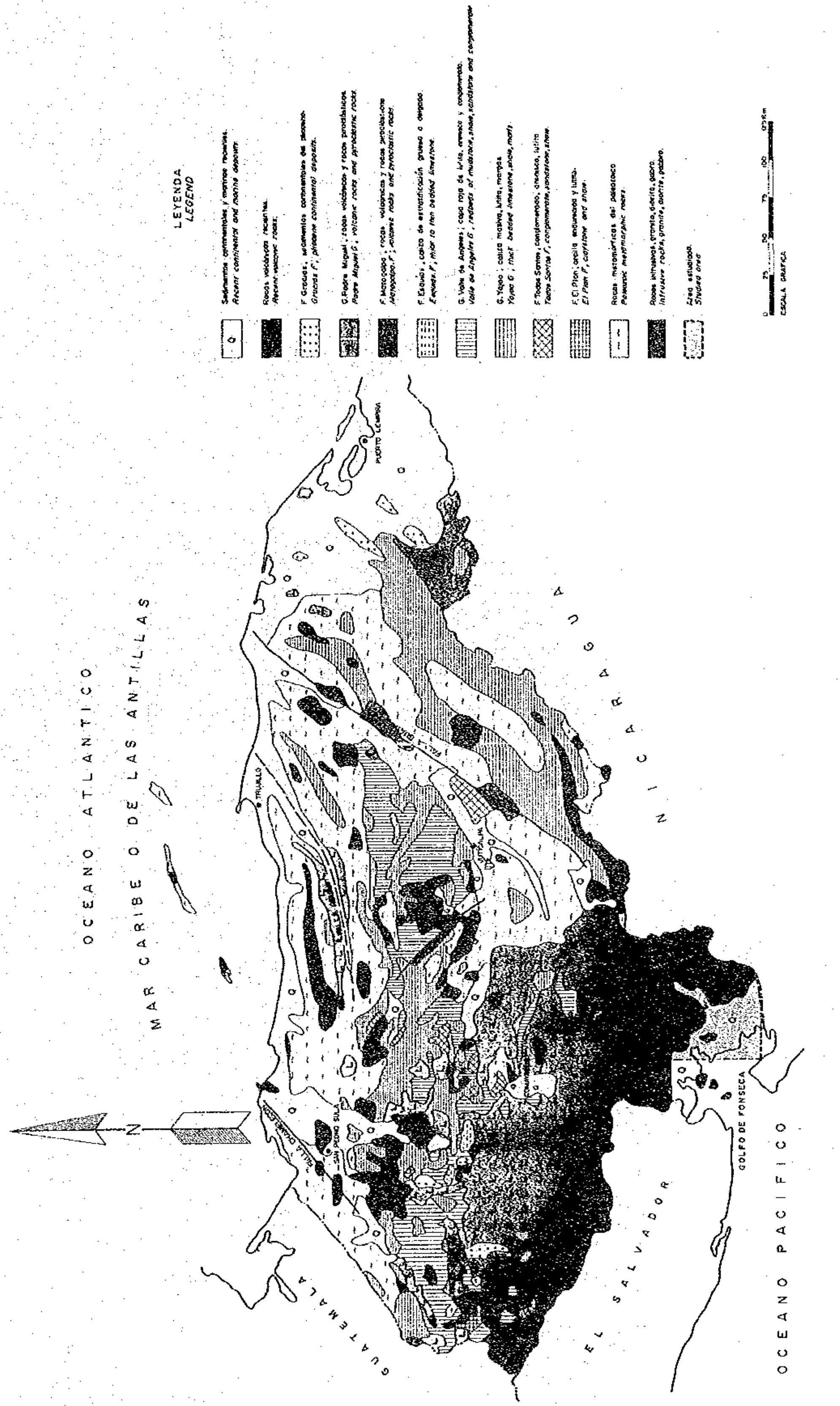
Table D-01 SOILS IN CHOLUTECA PLAIN

Classification Order/Sub-Group	Topography	Western Plain		Eastern Plain		Total	
		Ha	(%)	Ha	(%)	Ha	(%)
Inceptisols: Fluventic Ustropepts	alluvial plain	410	(1.8)	180	(1.3)	560	(1.6)
Entisols: Typic Ustifluvent	alluvial plain	2,770	(12.4)	690	(5.1)	3,460	(9.7)
Mollisols Fluventic Haplustolls Aquic Haplustolls Fluvaquentic Haplustolls	alluvial plain	15,960	(71.3)	180	(1.3)	16,140	(44.8)
Alfisols: Aquic Haplustalfs Vertic Tropaqualfs	terraces	620	(2.8)	10,930	(80.4)	11,550	(32.1)
Vertisols: Typic Pollusterfs	terraces	1,410	(6.3)	290	(2.1)	1,700	(4.7)
Ultisols: Udic Paleustalfs	terraces	-	-	320	(2.4)	320	(0.7)
Alfisols: Udic Haplustalfs	hill masses	300	(1.3)	790	(5.8)	1,090	(3.0)
—	water	930	(4.1)	220	(1.6)	1,150	(3.2)
Total		22,400	(100.0)	13,600	(100.0)	36,000	(100.0)

Table D-02 LAND CAPABILITY CLASSIFICATION IN CHOLUTECA PLAIN

Class	Western Plain		Eastern Plain		Total	
	Ha	(%)	Ha	(%)	Ha	(%)
I	6,740	(30.0)	110	(0.8)	6,850	(19.0)
II	6,750	(30.1)	1,420	(10.4)	8,170	(22.7)
III	7,590	(33.9)	9,350	(68.8)	16,940	(47.0)
IV	130	(0.6)	2,200	(16.2)	2,330	(6.5)
VI	260	(1.2)	300	(2.2)	560	(1.6)
Water	930	(4.2)	220	(1.6)	1,150	(3.2)
Total	22,400	(100.0)	13,600	(100.0)	36,000	(100.0)

FIGURES



GOVERNMENT OF THE REPUBLIC OF HONDURAS MINISTRY OF NATURAL RESOURCES	Fig.	
CHOLUTECA RIVER BASIN AGRICULTURAL DEVELOPMENT PROJECT	D-01	GENERAL GEOLOGICAL MAP
JAPAN INTERNATIONAL COOPERATION AGENCY		

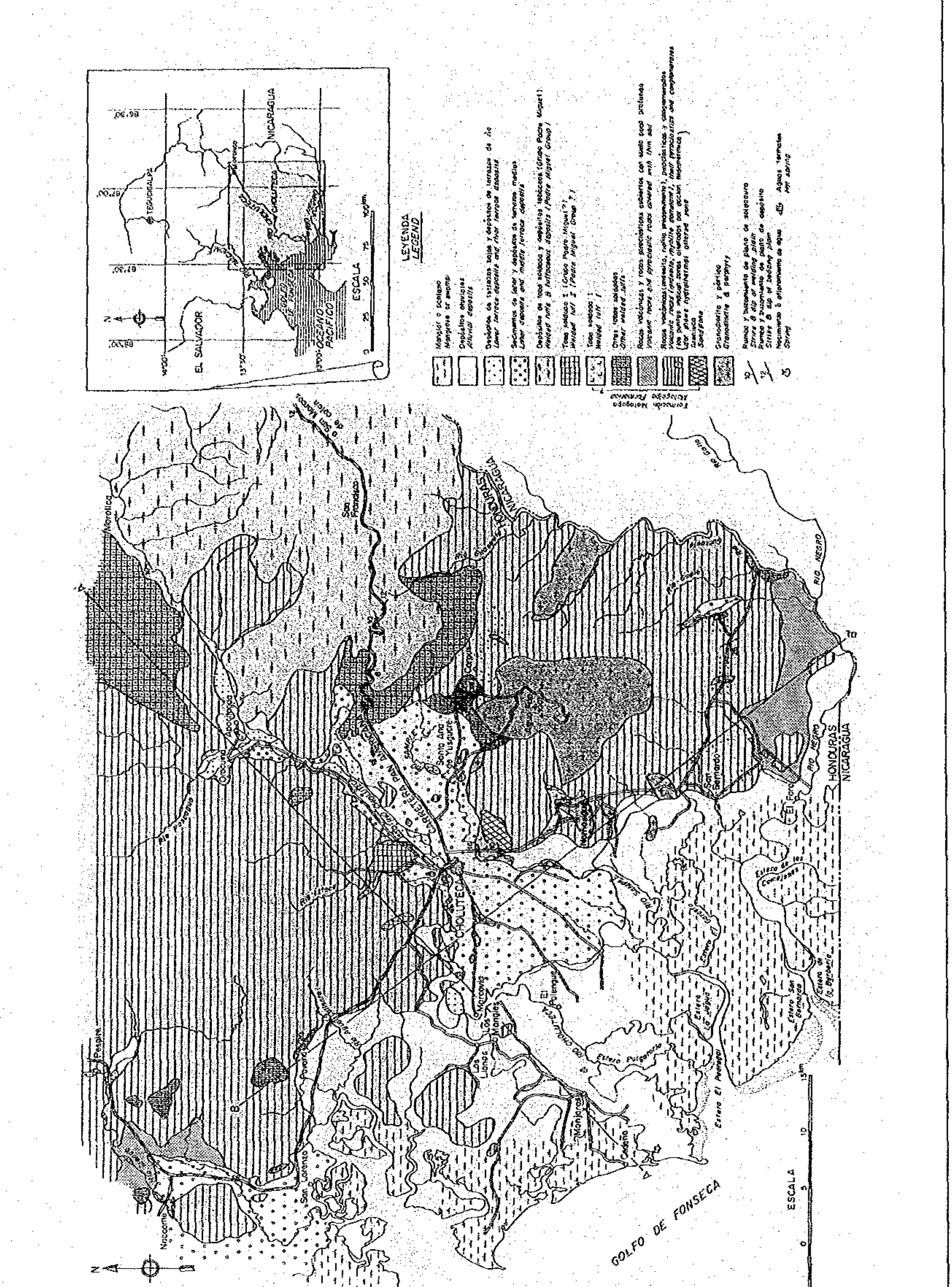


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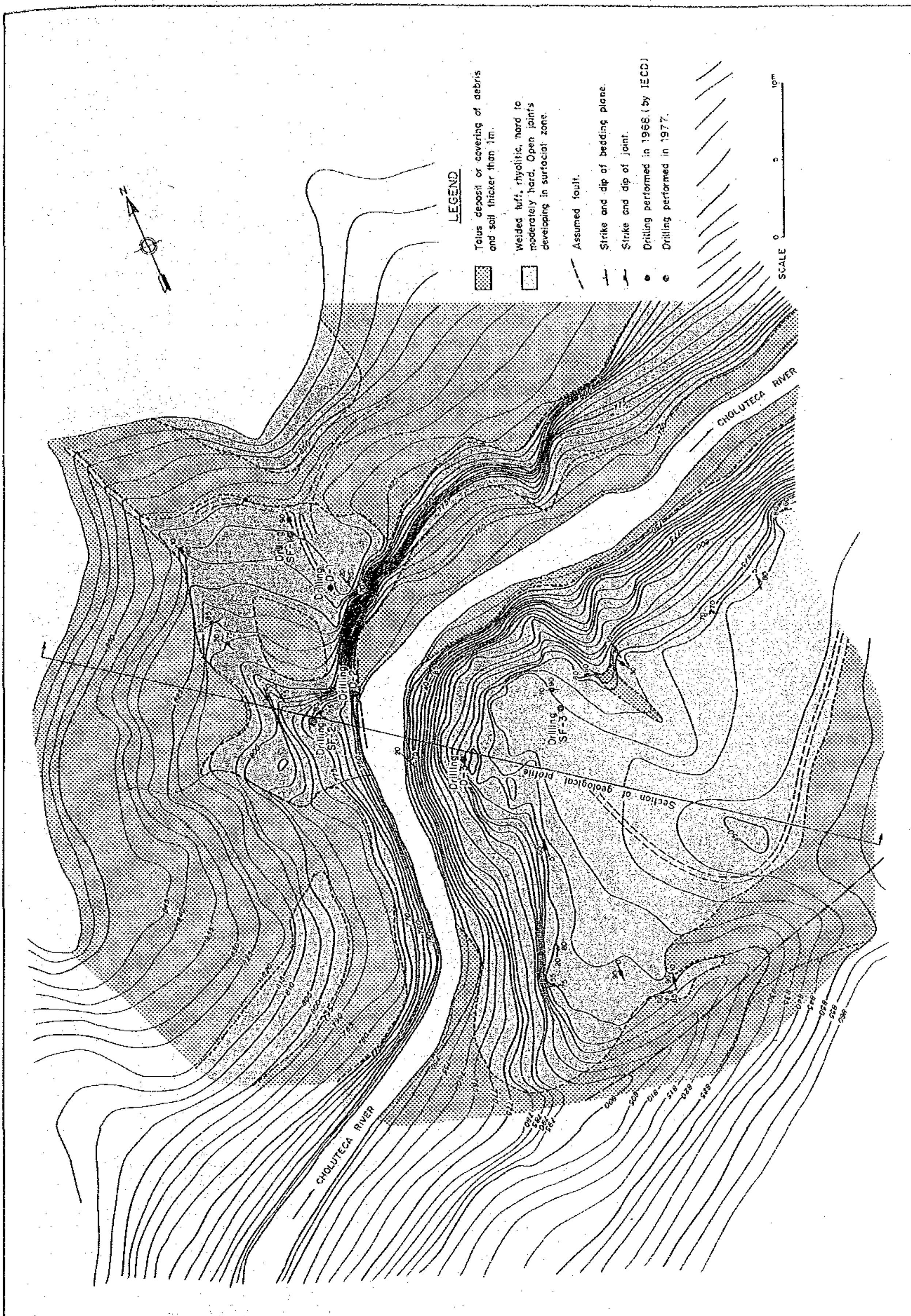
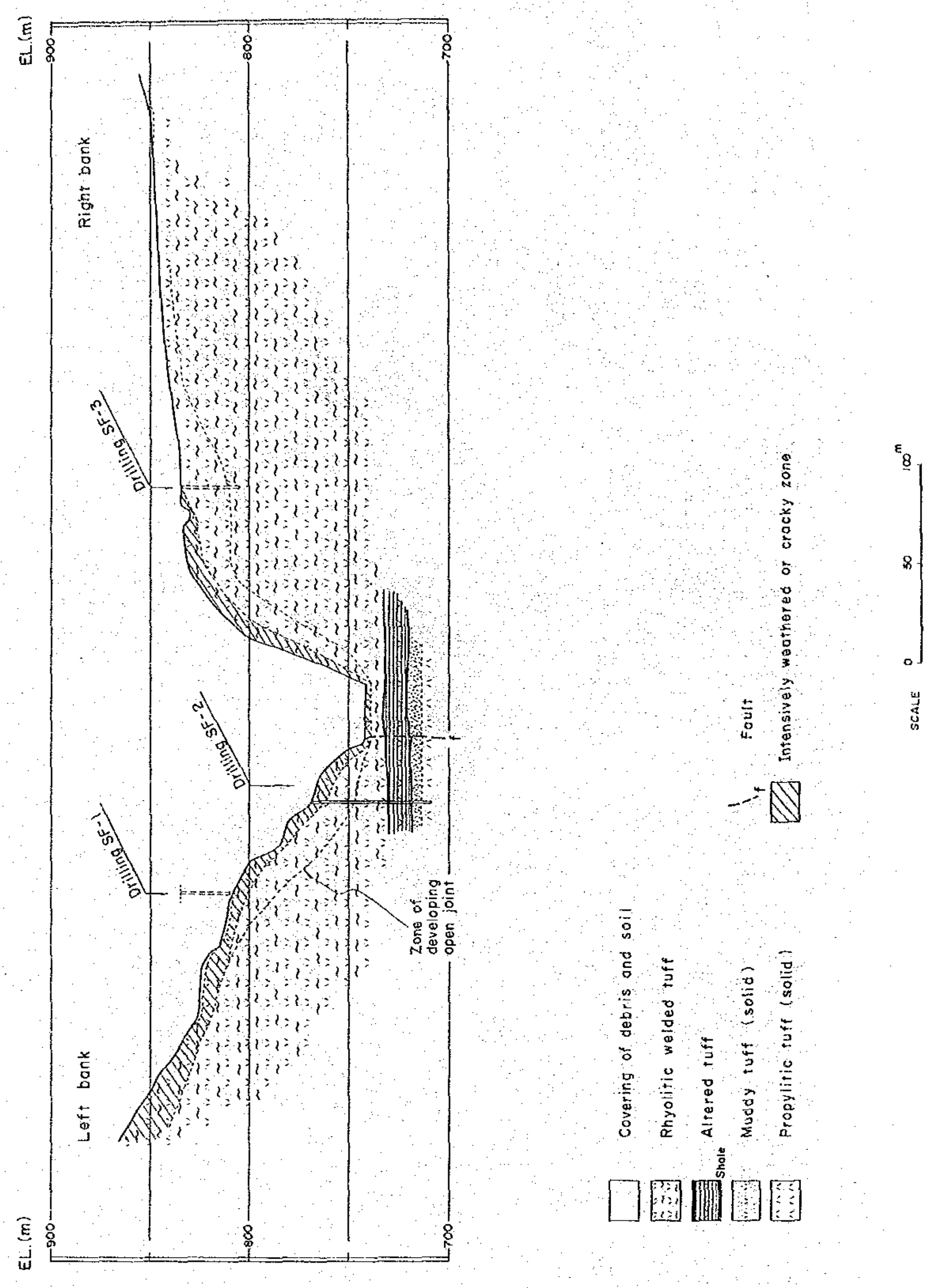
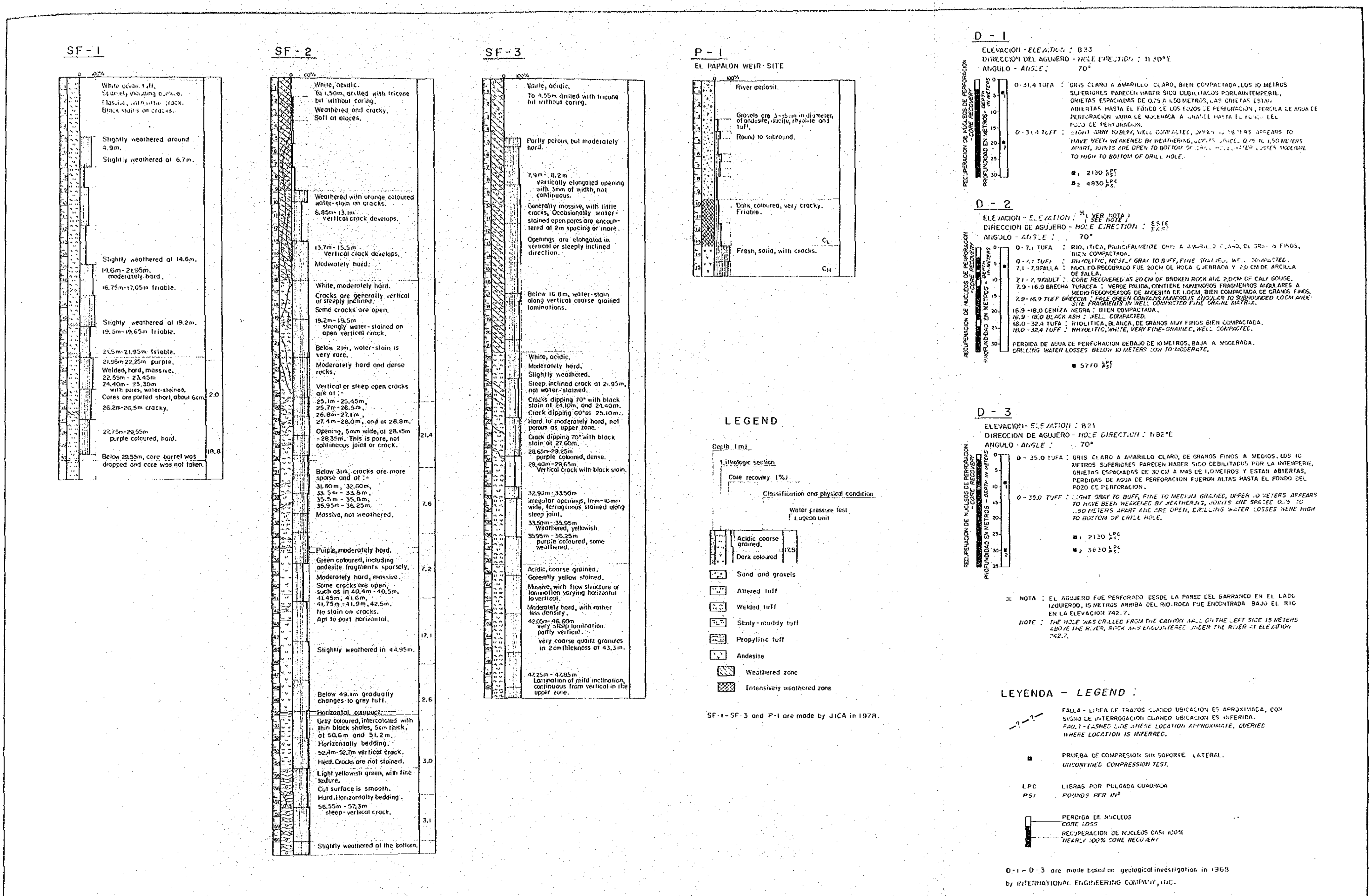
Fig. D-02 GEOLOGIC MAP OF PROJECT AREA



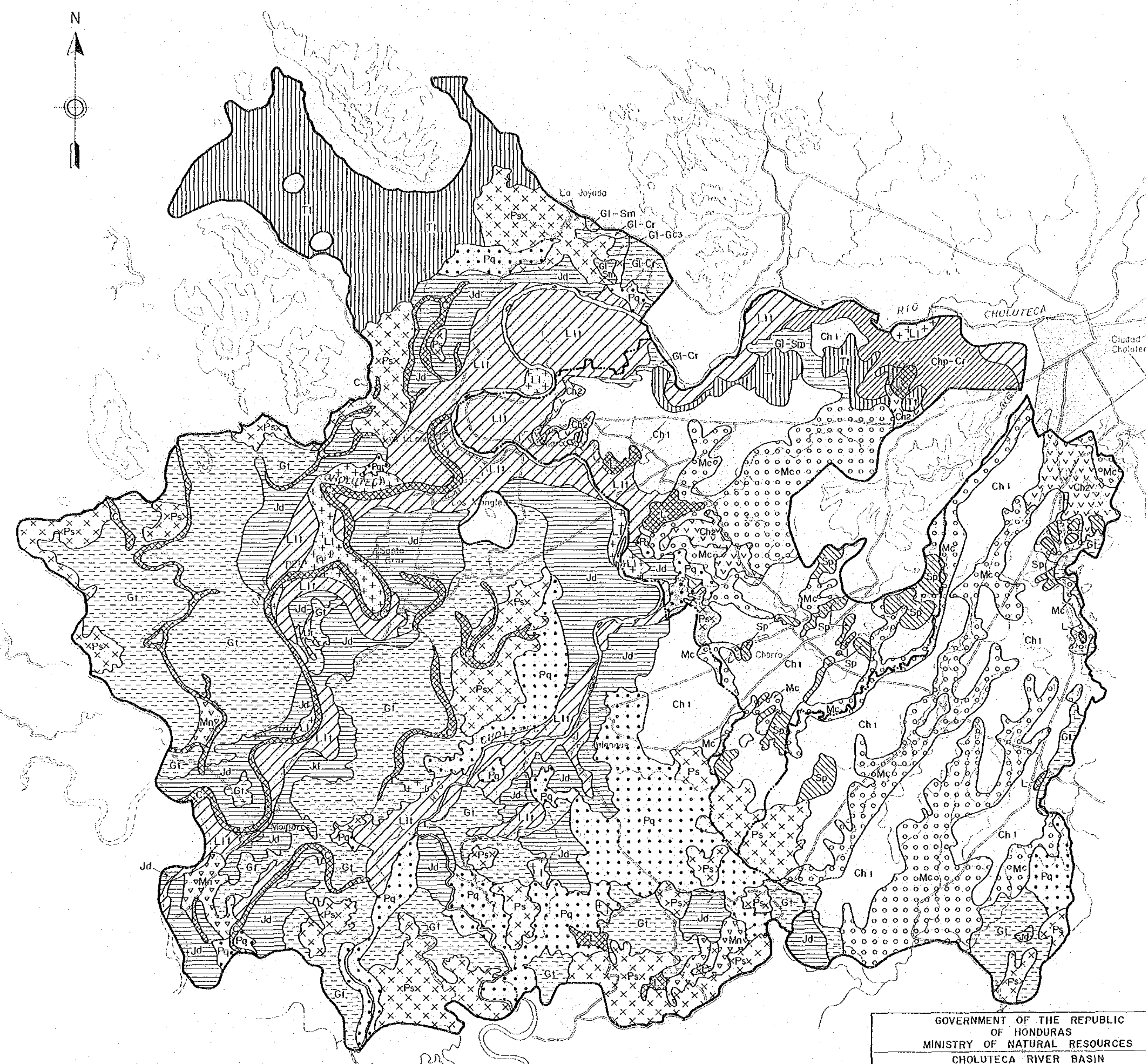
GOVERNMENT OF THE REPUBLIC OF HONDURAS MINISTRY OF NATURAL RESOURCES	Fig. D-03	SAN FERNANDO DAMSITE GEOLOGICAL MAP
CHOLUTECA RIVER BASIN AGRICULTURAL DEVELOPMENT PROJECT		
JAPAN INTERNATIONAL COOPERATION AGENCY		



GOVERNMENT OF THE REPUBLIC OF HONDURAS MINISTRY OF NATURAL RESOURCES CHOLUTECA RIVER BASIN AGRICULTURAL DEVELOPMENT PROJECT JAPAN INTERNATIONAL COOPERATION AGENCY	Fig. D-04	SAN FERNANDO DAMSITE GEOLOGICAL PROFILE



GOVERNMENT OF THE REPUBLIC OF HONDURAS MINISTRY OF NATURAL RESOURCES	Fig.	DRILLING PROFILE
CHOLUTECA RIVER BASIN AGRICULTURAL DEVELOPMENT PROJECT	D-05	
JAPAN INTERNATIONAL COOPERATION AGENCY		



Mapping Symbol	Soil Classification		Western Plain ha	Western Plain %	Eastern Plain ha	Eastern Plain %	Total ha	Total %
(Li)	Fluventic Ustropepts	Inceptisols	410	(1.8)	180	(1.3)	560	(1.6)
(Lit)	Typic Ustifluvents	Entisols	2,770	(12.4)	690	(5.1)	3,460	(9.7)
(Jd)	Fluventic Haplustolls	Molisols	15,960	(71.3)	180	(1.3)	16,140	(44.8)
(Gt)	Aquic Haplustolls							
(Mn)	Fluventic Haplustolls							
(Pq)	Fluvaquentic Haplustolls							
(Ps)	Fluvaquentic Haplaquolls							
(Ch1)	Aquic Haplustalfs	Alfisols	620	(2.8)	10,930	(80.4)	11,550	(32.1)
(Ch2)	Aquic Haplustalfs							
(Mc)	Vertic Tropaqualfs							
(Tt)	Typic Pellusterts	Vertisols	1,410	(6.3)	290	(2.1)	1,700	(4.7)
(Chp-Cr)	Udic Haplustalfs	Alfisols	300	(1.3)	790	(5.8)	1,090	(3.0)
(Gl-Cr) (Gl-GC3) (Gl-Sm)	Udic Haplustalfs							
(Sp)	Udic Paleustalfs	Ultisols	—	—	320	(2.4)	320	(0.7)
(C) (L)	Pond, Water Riverbed	Others	930	(4.1)	220	(1.6)	1,150	(3.2)
	Total		22,400	(100.0)	13,600	(100.0)	36,000	(100.0)

Project Boundary

SCALE 0 1 2 3 4 5 km

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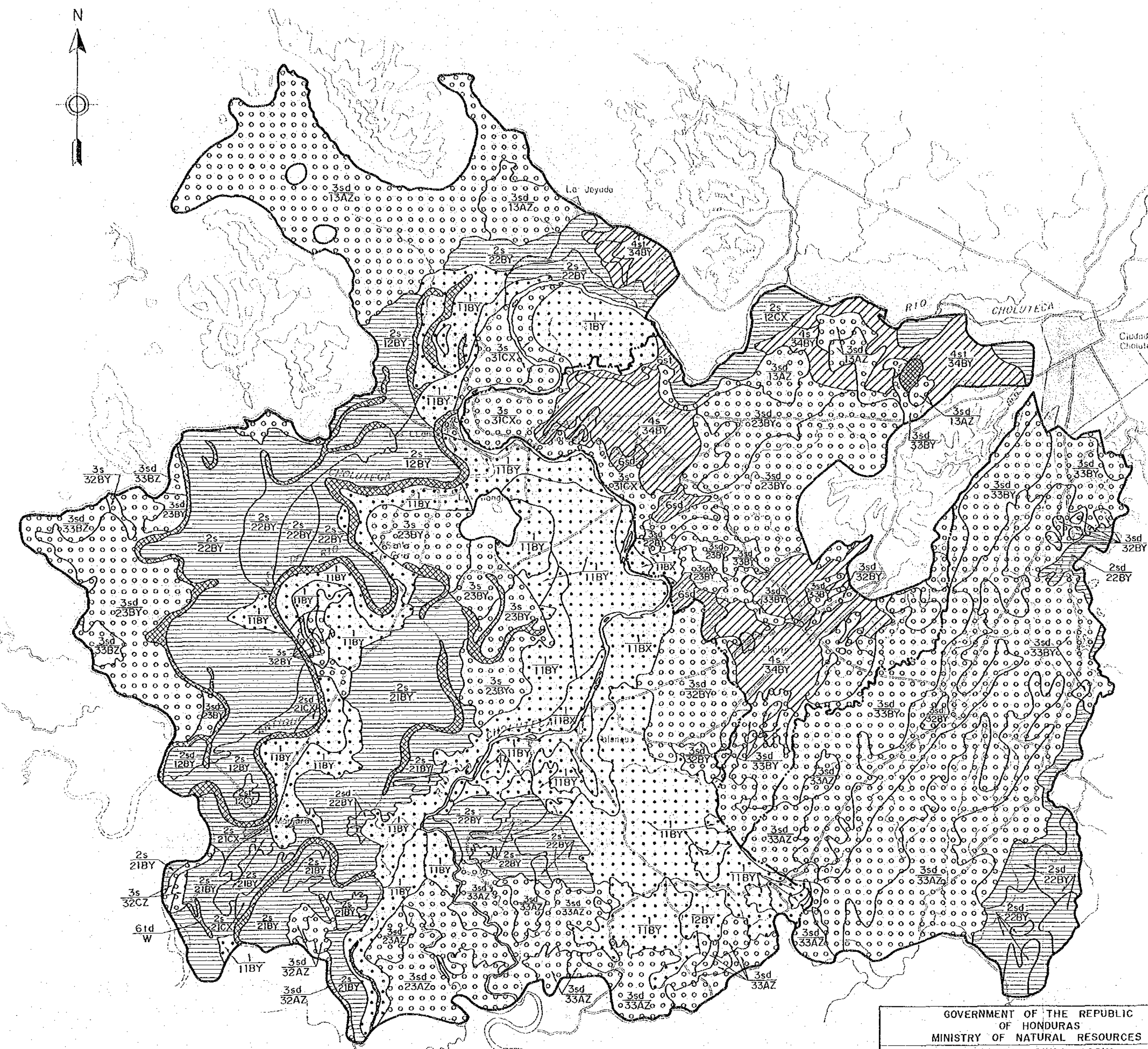
Fig. D-06 SOIL MAP OF CHOLUTECA PLAIN



EXSAMPLE OF STANDARD MAPPING SYMBOL

Land Class — Soil Deficiency — Topography Deficiency — Drainage Deficiency

3sld
22BX

Productivity — Land Development — Form Water Requirement — Land Drainobility

Productivity and Development : 1,2,3,4 or 6 denoting land class level factor, such as : class 2 productivity, class 2 development cost - "22"

Form Water Requirement A - Low, B - Mediom, C - High

Land Drainability : X - Good, Y - Restrict, Z - Poor or negligible

Mapping Symbol	Land Classification	Western Plain ha	Western Plain %	Eastern Plain ha	Eastern Plain %	Total ha	Total %
(dots)	Class I	6,740	30.0	110	0.8	6,850	19.0
(horizontal lines)	Class II	6,750	30.1	1,420	10.4	8,170	22.7
(circles)	Class III	7,590	33.9	9,350	68.8	16,940	47.0
(wide hatching)	Class IV	130	0.6	2,200	16.2	2,330	6.5
(dense hatching)	Class VI	260	1.2	300	2.2	560	1.6
(cross-hatching)	Water	930	4.2	220	1.6	1 150	3.2
	Total	22,400	100.0	13,600	100.0	36,300	100.0

LEGEND

Project Boundary

SCALE 0 1 2 3 4 5 km

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Fig. D-07

LAND CAPABILITY MAP OF CHOLUTECA PLAIN