

APPENDIX B

HYDROLOGY

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APPENDIX B HYDROLOGY

CHAPTER I CLIMATE AND RAINFALL

1.1 Basin Division and River System

1.1.1 Basin Division

The Study Area covers a total drainage basin of 1,752 km² in the Ubate-Chiquiquira Valley. It is divided into nine (9) sub-basins as shown in Fig. B.1.1, of which each sub-basin area is calculated in Table B.1.1.

1.1.2 River System

(1) Upper Part of the Ubate-Chiquiquira Valley

The upper part of the Ubate-Chiquiquira Valley is drained by the Ubate River and its tributaries : Suta River, Cucunuba Channel and Lenguazaque River. The Ubate River originating on the mountains situated to the southwest of the Valley flows down 29 km through Ubate City to the Lake Fuquene. The River drains 225 km² in the upper part of the River with a distance of 19 km (upstream basin of Cubio Gate: upper Ubate River basin).

The Suta River discharges an area of 112 km² into the Ubate River at 5 km downstream of Ubate City. To the east of the Suta River basin is located the Cucunuba Lake basin with an area of 92 km². The Cucunuba Lake basin is drained by the Cucunuba Channel into the lower end of the Lenguazaque River. The Lenguazaque River with an area of 293 km² joins to the Ubate River at the upstream of Cubio Gate from the east.

After confluence of these rivers and channel, the water flows down the lower part of the Ubate River with a 10 km distance to enter the Lake Fuquene. No additional area is discharged into the Ubate River for this 10 km river reaches and the flood plains of the River are directly drained into the Lake Fuquene. Then, the Ubate River drains a total area of 722 km² along with its tributaries.

(2) Central Part of the Ubate-Chiquiquira Valley

The Lake Fuquene is situated in the central part of Ubate-Chiquiquira Valley, with an elevation of 2,540 meters. The Lake covering a surface area of 3,000 ha has only one (1) outlet: Suarez River. The water level is controlled by Tolon Gate, located 18 km downstream in the Suarez River. The Lake collects the water of the Fuquene Lake basin (270 km²) in addition to the basins of Ubate, Suta, Cucunuba, Lenguazaque. The total drainage area is 992 km².

The major rivers and streams of the Fuquene basin are Honda, Tagua, Simiento and Fuquene. The former three (3) rivers and streams independently enter the Lake from the east, while Fuquene discharges into it from west.

(3) Lower Part of the Ubate-Chiquiquira Valley

In the lower part of the Ubate-Chiquiquira Valley (downstream of the outlet of the

Lake), the Suarez River is joined by Susa (64 km²) and Simijaca (153 km²) rivers from west before Tolon Gate and immediately after the gate, joined by Chiquinquirá River (1130 km²) also from west. The Suarez River further flows down southward through the site of Merchan Gate* located 10 km downstream of Tolon Gate to Garavito (northern end of Ubaté-Chiquinquirá Valley). *: washed away by the 1990 flood.

Salient features of the rivers and streams are summarized in Table B.1.2. The longitudinal profile of the main river course of the Ubaté-Fuquene-Suarez River is shown Fig. B.1.2.

1.2 Meteorology

1.2.1 Available Data

The meteorology in the Study Area has been observed at more than 40 stations by CAR and IDEAM (Hydrology, Meteorology and Environmental Studies Institute). However in this Study, the observatory data of CAR are employed since the stations of IDEAM are mostly located near by those of CAR.

The meteorological observation by CAR has been done for a comparatively long time at 33 stations among which the oldest observation dates back to 1959. Locations of the above 33 stations are shown in Fig. B.1.3. Inventory of the respective stations are shown in Table B.1.3.

According to CAR, the data before 1966 are not always reliable and further, some data are missing. Hence, the meteorological analysis in this Study is conducted based on the data available during the period after 1966. The meteorological data to be analyzed include rainfall, evaporation, temperature, humidity, solar (radiation, brightness) and wind (speed, direction). Observation period of the above meteorological data at the respective stations are shown in Table B.1.4.

1.2.2 Climatic Characteristics of the Study Area

(1) Temperature

Temperature of the Study Area is almost constant throughout the year. The monthly mean temperature is 12.0-13.2 °C at Sta. Novilleros and 12.4-13.5 °C at Sta. Esclusa Tolon. The extreme maximum and minimum temperatures recorded during 1966-1998 are -5.0 °C at Sta. Novilleros and nearly 30 °C at Sta. Esclusa Tolon.

(2) Humidity

Humidity of the Study Area little varies throughout the year. The monthly mean humidity is 70.2-76.4% at Sta. Novilleros and 73.6-79.1% at Sta. Esclusa Tolon.

(3) Rainfall

The Study Area is characterized by two (2) dry and two (2) rainy seasons which alternately occur. The dry periods are December-February and July-August. The rainy periods are March- June and September-November. See, Fig. B.1.4.

The average annual rainfalls at Sta. Novilleros and Sta. Esclusa Tolon are 712.0 mm and 961.9 mm. Among them, approximately 67% occur during rainy season.

(4) Solar Bright and Radiation

Solar bright and radiation are observed at three (3) stations (Novilleros, Simijaca, Esclusa Tolon). The average solar bright was recorded to be about 5.3 hour/day (about 2000 hour/year) at each station. The solar radiation at the above stations is 11-13 cal/cm²/day.

(5) Evaporation

Evaporation of the Study Area little varies throughout the year. The average monthly evaporation is in the range of 66.7-98.6 mm, averaging 81.2 mm at Novilleros and 80.0-98.1 mm, averaging 88.5 mm at Esclusa Tolon.

(6) Wind Velocity and Prevailing Wind Direction

Wind Velocity and Prevailing Wind Direction are observed at four (4) stations (Novilleros, Simijaca, Esclusa Tolon, Boqueron). Higher wind velocity present between June and August on the whole. The annual average wind speed at Sta. Novilleros and Sta. Esclusa Tolon is 1.3 m/s and that velocity at Sta. Simijaca and Sta. Boqueron is 2.2 m/s and 3.4 m/s. The prevailing winds are from SE except for that at Sta. Novilleros.

The above climatic data at the following eight (8) principal stations in the Study Area are given in Table B.1.5 and Fig. B.1.5.

- La Boyera, Novilleros, El Hato, Statausa, Isla del Santuario, Simijaca, Boqueron and Esclusa Tolon

1.3 Rainfall

1.3.1 Available Data

Inventory of the available data is described in the above Section.

1.3.2 Average Yearly Rainfall

The yearly rainfall depth in the Ubate-Chiquinquira Valley increases from south to north ranging from 700 mm in Cucunuba Lake basin to 1,500 mm in the lower part of the Suarez River basin. The central part of the Valley, including Lake Fuquene, is endowed with 1,000 mm. On the other hand, rainfall partly concentrates on the mountain areas located in the upper Ubate River basin with a depth of 1,300 mm. The isohyetal map of the Study Area in 1986 is shown in Fig. B.1.6.

1.3.3 Historical Change of Rainfall

(1) Yearly Rainfall

The historical change of yearly rainfall during 54 years, 1945-1998, at the representative stations of the Study Area (Novilleros, Isla del Santuario and Esclusa Tolon) are shown in Fig. B.1.7. As shown in the figure, neither a significant increase nor a decrease trend has been recognized, although rainfall fluctuates at a certain interval. The historical change of yearly rainfall in each sub-basin is given in Table

B.1.6.

(2) Distribution of Rainfall in Dry and Wet seasons.

Rainfall ditribution in dry and wet seasons is shown in Fig. B.1.8. As shown in the figure, neither significant increasing nor decreasing trend is recognized although it fluctuates with a certain interval.

In addition to this, it is carried out to count annual rainy days, shown in Fig. B.1.9. Based on the result of this counting, the same trend aas the rainfall distribution is recognized.

CHAPTER II DISCHARGE AND WATER LEVEL

2.1 River Discharge

2.1.1 Available Data

CAR is the principal agency responsible for the water level and discharge measurement in rivers of the Study Area. There are 51 water level and discharge stations which are operated by CAR in the Study Area. They are listed in Table B.2.1.

Among the above 51 stations, 31 are selected for this Study, taking into account their location and observation periods. The discharge data after 1966 are used for the hydrological analysis in principle, conforming to the period of rainfall analysis. Availability of discharge data at the 31 stations are shown in Table B.2.2. Location of the stations is given in Fig. B.2.1.

2.1.2 Seasonal Variation of River Discharge and Annual Average Discharge

The river flow varies seasonally corresponding with the seasonal change of rainfall. The variation of monthly mean discharge at the principal stations is shown in Fig. B.2.2. The river flow at all the stations marks the peak in May and November, while the lowest in February and August.

Annual average discharge data at principal stations after 1966 are shown in Table B.2.3. Average discharge is estimated to be 3.9 m³/s at the Colorado station located in the lower end of the Ubate River and 10.2 m³/s at the Garavito station (lower boundary of the Study Area).

2.1.3 Runoff Ratio

The runoff ratios (runoff/rainfall) are estimated at principal stations in order to analyze the relationship between rainfall and runoff discharge. The results of runoff ratio analysis are summarized in Table B.2.4.

The runoff ratio of the Ubate River basin (0.4) is much higher than that of the other river basins of Suta and Lenguazaque (0.2 respectively). This is considered mainly due to the richer rainfall.

2.1.4 Flow Regime

Based on daily discharge data available at principal stations in the Study Area, the annual average flow regimes after 1966 at the stations are presented in the Table B.2.5.

In the rainy season average discharge is estimated 6.21 m³/s at the Colorado station and 16.12m³/s at the Garavito station. In the dry season they are estimated 2.27 m³/s and 4.90 m³/s.

2.2 Lake Water Level

2.2.1 Fuquene

The surface water level of the Lake Fuquene has been observed at Isla del Santuario since 1966. The yearly average, yearly maximum and yearly minimum water levels in the past are shown in Fig. B.2.3.

The average water level of the Lake during 33 years of 1966-1998 was 2,538.99 m.s.n.m above sea level. The yearly average water level varied within a range of 71 cm during the same period.

The water level in the past 33 years recorded the peak of 2,540.50 m.s.m.n and the lowest of 2,537.99 m.s.n.m.

2.2.2 Cucunuba

The surface water level of the Lake Cucunuba has been observed at Penas de Palacio since 1966. The yearly average, yearly maximum and yearly minimum water levels in the past are shown in Fig. B.2.4.

The average water level of the Lake during 33 years of 1966-1998 was 2,543.15 m above sea level. The water level in the past 33 years recorded the peak of 2,544.29 m.s.m.n and the lowest of 2,541.80 m.s.m.n.

2.3 Flooding Area around the Fuquene Lake

Small dikes are provided, encompassing the Lake at present. The surrounding low-lying areas of the Lake are protected from floods over the banks up to a certain high water level. However, the low-lying areas are inundated by the piping effects of the Lake water (the lake water springs from the underground).

Based on the existing topographic map and flood records in the past, CAR estimated the water level-flood prone area curve around the Fuquene Lake, as shown Fig. B.2.5.

2.4 Groundwater Level

2.4.1 Available Data

In the Study Area, there are 25 groundwater level stations which are operated by CAR, as shown in Table B.2.6. Among them, 22 are used for this Study, taking into account their location and observation periods. Availability of the groundwater level data at the 22 stations are shown in Table B.2.6. Location of the stations is given in Fig. B.2.6.

2.4.2 Variation of Groundwater Level

Monthly mean groundwater level at the principal stations of Ubate-Chiquinquirá Valley: La María, Tichauribe, Esmelarda III and Sugamuxi are shown in Fig. B.2.7. As shown in the figure, the groundwater level little varies throughout the year. The variation at the four (4) stations is in the range of 15 cm to 40 cm.

Yearly mean groundwater level during 30 years of 1968-1998 at the above four (4) stations are shown in Fig. B.2.8. The data show that the historical change of the groundwater level at the all stations is very small.

CHAPTER III HYDRAULIC ANALYSIS

3.1 Outflow Discharge Capacity of the Lake Fuquene

The water level of the Lake is dammed up to a considerable extent by the backwater effects of the Suarez River since the River has a gentle longitudinal slope and a comparatively small cross section. Hence, the relationship between the water level and outflow discharge of the Lake is obtained by estimating the river water profiles corresponding to various discharges of the River. In this estimation, non-uniform flow calculation method is applied.

3.1.1 Conditions for Hydraulic Calculation

(1) Objective River Reaches

The non-uniform flow of the Suarez River is calculated from the point 1.0 km upstream of the Garavito gauging station up to the outlet of the Lake for the river reaches of 36 km distance.

(2) Water Depth at the Starting Point of Calculation

The river section at the starting point of calculation (1.0 m upstream of Garavito gauging station) is assumed to give the hydraulic critical water depth, taking into consideration the steep riverbed slope (1/122) at this river section. The water levels corresponding to various discharges at this point are determined by a hydraulic formula.

(3) Discharge Distribution

The river discharge of the Suarez River increases downwards by collecting the tributaries. The discharge distribution of the River is determined based on the observed discharge data at the principal stations (Garavito, La Balsa, Pte Pinilla, Pte Guzman, and Pte Peralonso) in the past.

(4) River Cross Section

The cross sections measured by CAR in 1986 are used for the calculation.

(5) Manning's Roughness Coefficient

The Manning's roughness coefficient under the existing river channel is determined to be 0.036 so that the calculated river water level may coincide with the observed water level at the principal stations.

(6) Estimated water level profile

The water level profile estimated corresponding to the average discharge of rainy season (at Sta. Garavito : $16.12 \text{ m}^3/\text{s}$) as shown Fig. B.3.1.

3.1.2 Relationship Between Water Level and Discharge of the Lake

(1) Existing Condition

The relationship between the water level and outflow discharge of the Lake is estimated as shown Fig. B.3.2 through the above-mentioned non-uniform flow calculations.

(2) After Improvement of Suarez River

From the viewpoint of flood regulation, the outflow discharge of the Lake after improvement of Suarez River (From Esclusa Tolon to outlet of the Lake) is estimated, as shown Fig. B.3.3. The cases of the river improvement are summarized below.

Case	Dredging From Existing River Bed (m)	Amount of Dredging (m ³)	Exclusion of the Elodea	Manning's Coefficient
Case1	0.0	0	Exclusion	0.025
Case2	0.5	1,130,809	No	0.036
Case3	0.5	1,130,809	Exclusion	0.025

REFERENCES

- 1) Estudio de Aprovechamiento Hidraulico del Sistema Cucunuba–Fuquene–Rio Suarez, Informe General Etapa I, CAR.
- 2) Boletin Estadistico de Hidrologia y Meteorologia, CAR
- 3) Estudio Para la Determination de Modulos de Consumo Para Beneficio Hidrico Informe Final, Volumen II, CAR

Table B.1.1 Catchment Areas of Sub-basin

No.	CAR Code	Basin	Catchment Area (km ²)
1	2	Upper Ubate River Basin	225
2	3	Suta River Basin	112
3	4	Cucunuba Lake Basin	92
4	5	Lenguazaque River Basin	293
5	6	Fuquene Lake Basin	270
6	7	Susa River basin	64
7	8	Simijaca River Basin	153
8	9	Chiquinquira River basin	130
9	10	Suarez River Basin	413
Total			1,752

Table B.1.2 Dimension of Major Rivers

Basin	River	Length (Km)	Origin EL. (m)	End EL. (m)	Remarks
Upper Ubate	R. Ubate	19	3,550	2,800	
Fuquene Lake	R. Ubate	10	2,800	2,540	
Suta	R. Suta	21	3,100	2,550	
Cucunuba	Cucunuba Channel	16	2,950	2,550	
Lenguazaque	R. Lenguazaque	23	3,400	2,600	
Susa	R. Susa	18	3,200	2,540	
Simijaca	R. Simijaca	31	3,300	2,540	
Chiquinquira	R. Chiquinquira	19	2,800	2,540	
Suarez	R. Suarez	36	2,540	2,525	to Sta. Gravito

Table B.1.3 Inventory of Meteorological Stations

No	Basin	Himat Code	Station Name	Municipal	Installation		Elevation (m.s.n.m)	Rain		Evaporation	Temperature		Humidity		Solar		Wind
					Start	End		M ¹	G ²		Atmosphere	Ground	Radiation	Brightness			
1	Upper Ubate	2401002	Carupa Hospital	Carupa	1961.10	not suspend	2,960	○	○								
2	Upper Ubate	2401035	El Hato	Carupa	1962.10	not suspend	2,900	○	○								
3	Upper Ubate	2401052	Hato No.1	Carupa	1972.10	not suspend	2,985	○									
4	Upper Ubate	2401053	Hato No.2	Carupa	1972.10	not suspend	2,974	○									
5	Upper Ubate	2401054	Hato No.3	Carupa	1972.10	not suspend	3,398	○									
6	Upper Ubate	2401055	Hato No.4	Carupa	1972.10	not suspend	3,465	○									
7	Upper Ubate	2401056	Hato No.5	Carupa	1972.10	not suspend	3,360	○									
8	Upper Ubate	2401057	Hato No.6	Carupa	1972.10	not suspend	3,105	○									
9	Upper Ubate	2401058	Hato No.7	Carupa	1972.10	not suspend	3,271	○									
10	Upper Ubate	2401059	Hato No.8	Carupa	1972.10	not suspend	2,963	○									
11	Upper Ubate	2401511	La Boyera	Ubate	1960.03	not suspend	2,610	○	○								
12	Upper Ubate	2401519	Novilleros	Ubate	1965.12	not suspend	2,550	○	○								
13	Suta	2120138	El Encanto	Tausa	1959.08	not suspend	3,150	○	○								
14	Suta	2401027	El Pino	Sutatausa	1960.03	not suspend	2,575	○									
15	Suta	2401049	El Pedregal	Sutatausa	1966.08	not suspend	2,900	○									
16	Suta	2401521	Sutatausa	Sutatausa	1965.04	not suspend	2,700	○	○								
17	Lenguazaque	2401028	Tapis	Lenguazaque	1960.03	not suspend	2,585	○	○								
18	Lenguazaque	2401033	El Espino	Lenguazaque	1961.10	not suspend	2,550	○	○								
19	Lenguazaque	2401038	El Puente	Guacheta	1962.12	not suspend	2,810	○	○								
20	Lenguazaque	2401039	El Triangulo	Lenguazaque	1963.01	not suspend	2,800	○	○								
21	Fuquene	2401036	Monserrate	Fuquene	1962.12	not suspend	2,865	○	○								
22	Fuquene	2401051	El Zarzal	Guacheta	1966.08	not suspend	2,900	○	○								
23	Fuquene	2401110	Isla del Santuario	Fuquene	1960.04	not suspend	2,580	○	○								
24	Susa	2401044	Tres Esquinas	Susa	1965.12	not suspend	3,130	○									
25	Simijaca	2401037	Socota	Carupa	1962.12	not suspend	3,080	○									
26	Simijaca	2401513	Simijaca 8	Simijaca	1984.11	not suspend	2,572	○	○								
27	Chiquinquira	2401042	Caldas	Chiquinquira	1964.11	not suspend	2,655	○									
28	Chiquinquira	2401524	Boqueron	Caldas	1967.12	not suspend	2,840										
29	Suarez	2401031	Los Arrayanes	San Miguel	1960.12	not suspend	2,575	○									
30	Suarez	2401043	Esclusa Merchan	Saboya	1965.10	not suspend	2,550	○	○								
31	Suarez	2401068	Central No.2	Carupa	1960.03	not suspend	2,145	○	○								
32	Suarez	2401518	Esclusa Tolon	Chiquinquira	1963.05	not suspend	2,545	○	○								
33	Suarez	2401520	Alto Saboya	Saboya	1965.02	not suspend	3,360	○	○								

*1 Rain Measure Glass

*2 Pluviograph

Table B.1.4 (1/2) Observation Period of Meteorological Data (Rainfall)

No	Basin	Himat Code	Station Name	Municipio	Instalation		Elevation (m.s.n.m)	Year																															
					Start	End		66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97
1	Upper Ubate	2401002	Carupa Hospital	Carupa	1961.10	not suspend	2,960	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
2	Upper Ubate	2401035	El Hato	Carupa	1962.10	not suspend	2,900	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
3	Upper Ubate	2401052	Hato No.1	Carupa	1972.10	not suspend	2,985																																
4	Upper Ubate	2401053	Hato No.2	Carupa	1972.10	not suspend	2,974																																
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6	Upper Ubate	2401055	Hato No.4	Carupa	1972.10	not suspend	3,465																																
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8	Upper Ubate	2401057	Hato No.6	Carupa	1972.10	not suspend	3,105																																
9	Upper Ubate	2401058	Hato No.7	Carupa	1972.10	not suspend	3,271																																
10	Upper Ubate	2401059	Hato No.8	Carupa	1972.10	not suspend	2,963																																
11	Upper Ubate	2401511	La Boyera	Ubate	1960.03	not suspend	2,610	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
12	Upper Ubate	2401519	Novilleros	Ubate	1965.12	not suspend	2,350	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
13	Suta	2120138	El Encanto	Tausa	1959.08	not suspend	3,150																																
14	Suta	2401027	El Pino	Sutausa	1960.03	not suspend	2,575	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
15	Suta	2401049	El Pedregal	Sutausa	1966.08	not suspend	2,900	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
16	Suta	2401521	Sutausa	Sutausa	1965.04	not suspend	2,700	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
17	Lenguazaque	2401028	Tapis	Lenguazaque	1960.03	not suspend	2,585	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
18	Lenguazaque	2401033	El Espino	Lenguazaque	1961.10	not suspend	2,550	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
19	Lenguazaque	2401038	El Puente	Guacheta	1962.12	not suspend	2,810	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
20	Lenguazaque	2401039	El Triangulo	Lenguazaque	1963.01	not suspend	2,800	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
21	Fuquene	2401036	Monserrate	Fuquene	1962.12	not suspend	2,865	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
22	Fuquene	2401051	El Zarzal	Guacheta	1966.08	not suspend	2,900	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
23	Fuquene	2401110	Isia del Santuario	Fuquene	1960.04	not suspend	2,580	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
24	Susa	2401044	Tres Esquinas	Susa	1965.12	not suspend	3,130	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
25	Simijaca	2401037	Socota	Carupa	1962.12	not suspend	3,080	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
26	Simijaca	2401513	Simijaca	Simijaca	1984.11	not suspend	2,572																																
27	Chiquinquirá	2401042	Caldas	Chiquinquirá	1964.11	not suspend	2,655	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
28	Chiquinquirá	2401524	Boqeron	Chiquinquirá	1967.11	not suspend	2,840																																
29	Suarez	2401031	Los Arrayanes	San Miguel	1960.12	not suspend	2,575	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
30	Suarez	2401043	Esclusa Merchan	Saboya	1965.10	not suspend	2,550	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
31	Suarez	2401068	Central No.2	Carupa	1960.03	not suspend	2,145	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
32	Suarez	2401518	Esclusa Tolon	Chiquinquirá	1963.05	not suspend	2,545	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
33	Suarez	2401520	Alto Saboya	Saboya	1965.02	not suspend	3,360	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

O---Existing

Table B.1.4 (2/2) Observation Period of Meteorological Data (Evaporation, Temperature, Humidity, Solar Radiation, Solar Bright, Wind)

		Year																																
		66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98
(Evaporation)																																		
River/Lake	Himat Code	Station Name	Municipal																															
fuquene	2401110	Isla del Santuario	Fuquene																															
fuquene	2401531	San Miguel de Sema	San Miguel																															
simijaca	2401513	Simijaca	Simijaca																															
suarez	2401518	Esclusa Tolon	Chiquinquira																															
ubate-suta	2401035	El Hato	Carupa																															
ubate-suta	2401511	La Boyera	Ubate																															
ubate-suta	2401519	Novilleros	Ubate																															
ubate-suta	2401521	Sutatausa	Sutatausa																															
(Temperature)																																		
River/Lake	Himat Code	Station Name	Municipal																															
fuquene	2401531	San Miguel de Sema	San Miguel																															
simijaca	2401513	Simijaca	Simijaca																															
suarez	2401518	Esclusa Tolon	Chiquinquira																															
ubate-suta	2401519	Novilleros	Ubate																															
ubate-suta	2401521	Sutatausa	Sutatausa																															
(Humidity)																																		
River/Lake	Himat Code	Station Name	Municipal																															
fuquene	2401531	San Miguel de Sema	San Miguel																															
simijaca	2401513	Simijaca	Simijaca																															
suarez	2401518	Esclusa Tolon	Chiquinquira																															
ubate-suta	2401519	Novilleros	Ubate																															
ubate-suta	2401521	Sutatausa	Sutatausa																															
(Solar Radiation)																																		
River/Lake	Himat Code	Station Name	Municipal																															
fuquene	2401531	San Miguel de Sema	San Miguel																															
simijaca	2401513	Simijaca	Simijaca																															
suarez	2401518	Esclusa Tolon	Chiquinquira																															
ubate-suta	2401519	Novilleros	Ubate																															
(Solar Bright)																																		
River/Lake	Himat Code	Station Name	Municipal																															
fuquene	2401531	San Miguel de Sema	San Miguel																															
simijaca	2401513	Simijaca	Simijaca																															
suarez	2401518	Esclusa Tolon	Chiquinquira																															
ubate-suta	2401519	Novilleros	Ubate																															
(Wind)																																		
River/Lake	Himat Code	Station Name	Municipal																															
chiquinquira	2401524	Boqueron	Caldas																															
fuquene	2401531	San Miguel de Sema	San Miguel																															
simijaca	2401513	Simijaca	Simijaca																															
suarez	2401518	Esclusa Tolon	Chiquinquira																															
ubate-suta	2401520	Alto Saboya	Saboya																															
ubate-suta	2401519	Novilleros	Ubate																															

O---Existing

Table B.1.5 (1/3) Meteorological Features of Representative Stations

Station: LA BOYERA

LATITUDE: 0518 N		LONGITUDE: 7351 W		ELEVATION: 2610 m.s.n.m		BASIN: R. UBATE			STATION No. 2401511			
Month	Temperature(°C)				Monthly Humidity (%)	Rainfall		Solar		Monthly Mean Evaporation (mm)	Wind	
	Monthly Mean	Daily Mean Range	extreme			Monthly Mean (mm)	Max. in 24h (mm)	Monthly Mean Radiation (cal/cm ²)	Monthly Mean Brightness (Hr)		Monthly Mean Velocity (m/sec)	prevail direct
			max.	min.								
Jan.	-	-	-	-	-	30.2	44.3	-	-	120.9	-	-
Feb.	-	-	-	-	-	44.8	40.7	-	-	109.3	-	-
Mar.	-	-	-	-	-	73.5	43.5	-	-	116.3	-	-
Apr.	-	-	-	-	-	100.1	73.3	-	-	101.1	-	-
May	-	-	-	-	-	78.1	49.6	-	-	100.0	-	-
Jun.	-	-	-	-	-	47.0	52.0	-	-	91.9	-	-
Jul.	-	-	-	-	-	34.6	36.9	-	-	101.8	-	-
Aug.	-	-	-	-	-	36.3	31.5	-	-	111.2	-	-
Sep.	-	-	-	-	-	52.7	61.8	-	-	111.9	-	-
Oct.	-	-	-	-	-	104.1	50.0	-	-	103.0	-	-
Nov.	-	-	-	-	-	90.4	35.0	-	-	94.1	-	-
Dec.	-	-	-	-	-	42.7	25.5	-	-	105.4	-	-
Annual	-	-	-	-	-	734.5	73.3	-	-	1266.9	-	-
Record	-	-	-	-	-	'66-'97	'66-'97	-	-	'66-'97	-	-

Station: NOVILLEROS

LATITUDE: 520 N		LONGITUDE: 7347 W		ELEVATION: 2550 m.s.n.m		BASIN: R. UBATE			STATION No. 2401519			
Month	Temperature(°C)				Monthly Humidity (%)	Rainfall		Solar		Monthly Mean Evaporation (mm)	Wind	
	Monthly Mean	Daily Mean Range	extreme			Monthly Mean (mm)	Max. in 24h (mm)	Monthly Mean Radiation (cal/cm ²)	Monthly Mean Brightness (Hr)		Monthly Mean Velocity (m/sec)	prevail direct
			max.	min.								
Jan.	12.0	23.3	26.5	-4.0	70.4	25.0	40.0	348	199	92.4	1.4	S
Feb.	12.6	23.6	26.9	-5.2	70.2	41.7	31.8	377	173	91.8	1.3	S
Mar.	13.0	23.2	27.5	-3.0	71.5	66.8	44.0	371	175	98.6	1.3	S
Apr.	13.1	20.3	25.9	0.0	74.6	97.0	41.4	347	138	84.4	1.3	S
May	13.2	19.3	25.1	-0.5	75.8	81.4	59.6	327	140	75.4	1.2	SE
Jun.	12.6	18.9	24.0	0.0	75.4	52.5	42.8	310	142	66.7	1.3	SE
Jul.	12.2	18.3	25.0	-0.3	74.1	36.8	29.8	321	166	72.9	1.5	S
Aug.	12.1	19.9	26.0	-0.5	73.5	35.6	32.3	333	158	78.2	1.5	S
Sep.	12.2	20.9	28.9	-2.0	72.9	52.6	40.4	347	148	77.7	1.4	S
Oct.	12.5	21.1	25.0	-1.5	74.5	101.2	42.8	344	152	77.9	1.2	S
Nov.	12.7	20.9	25.0	-3.0	76.4	80.2	45.4	329	149	75.1	1.1	S
Dec.	12.2	21.6	26.0	-4.8	74.2	41.2	44.7	320	187	82.7	1.2	S
Annual	12.5	21.0	28.9	-5.2	73.6	712.0	59.6	4074	1926	973.8	1.3	S
Record	'66-'97	'66-'97	'66-'97	'66-'97	'66-'97	'66-'98	'66-'98	'66-'98	'66-'98	'66-'98	'68-'97	'68-'97

Station: EL HATO

LATITUDE: 0517 N		LONGITUDE: 7354 W		ELEVATION: 2900 m.s.n.m		BASIN: UBATE			STATION No. 2401035			
Month	Temperature(°C)				Monthly Humidity (%)	Rainfall		Solar		Monthly Mean Evaporation (mm)	Wind	
	Monthly Mean	Daily Mean Range	extreme			Monthly Mean (mm)	Max. in 24h (mm)	Monthly Mean Radiation (cal/cm ²)	Monthly Mean Brightness (Hr)		Monthly Mean Velocity (m/sec)	prevail direct
			max.	min.								
Jan.	-	-	-	-	-	29.1	30.9	-	-	92.3	-	-
Feb.	-	-	-	-	-	37.1	38.0	-	-	84.7	-	-
Mar.	-	-	-	-	-	73.8	50.0	-	-	87.8	-	-
Apr.	-	-	-	-	-	98.1	55.0	-	-	71.5	-	-
May	-	-	-	-	-	76.1	46.0	-	-	69.5	-	-
Jun.	-	-	-	-	-	45.4	45.0	-	-	71.1	-	-
Jul.	-	-	-	-	-	39.9	37.0	-	-	70.7	-	-
Aug.	-	-	-	-	-	41.8	29.0	-	-	82.4	-	-
Sep.	-	-	-	-	-	57.2	50.0	-	-	82.8	-	-
Oct.	-	-	-	-	-	98.3	45.0	-	-	81.3	-	-
Nov.	-	-	-	-	-	89.9	50.0	-	-	74.7	-	-
Dec.	-	-	-	-	-	47.2	38.0	-	-	79.4	-	-
Annual	-	-	-	-	-	733.9	55.0	-	-	948.2	-	-
Record	-	-	-	-	-	'66-'97	'66-'97	-	-	'93-'97	-	-

Table B.1.5 (2/3) Meteorological Features of Representative Stations

Station: SUTATAUSA

LATITUDE: 515 N		LONGITUDE: 7351 W		ELEVATION: 2700 m.s.n.m		BASIN: R. SUTA		STATION No. 2401521				
Month	Temperature(°C)				Monthly Humidity (%)	Rainfall		Solar		Monthly Evaporation (mm)	Wind	
	Monthly Mean	Daily Mean Range	extreme			Monthly Mean	Max. in 24h (mm)	Monthly Mean Radiation (cal/cm ²)	Monthly Mean Brightnes (Hr)		Monthly Mean Velocity (m/sec)	prevail direct
			max.	min.								
Jan.	13.2	19.2	26.1	-1.0	66.1	30.5	38.0	-	-	101.2	-	-
Feb.	13.4	19.3	26.1	-2.0	67.0	47.2	35.8	-	-	89.8	-	-
Mar.	13.5	18.6	26.8	0.0	68.6	70.7	45.3	-	-	90.9	-	-
Apr.	13.5	16.7	25.7	2.0	71.9	103.9	57.0	-	-	83.6	-	-
May	13.4	15.2	24.5	0.7	70.8	80.7	51.5	-	-	86.8	-	-
Jun.	12.9	15.4	24.2	1.0	69.4	48.0	61.0	-	-	77.2	-	-
Jul.	12.6	14.6	25.0	2.0	68.8	30.3	25.2	-	-	83.3	-	-
Aug.	12.6	16.1	24.0	0.0	68.6	34.1	32.0	-	-	84.6	-	-
Sep.	13.0	17.8	26.0	0.8	67.0	41.8	38.0	-	-	90.3	-	-
Oct.	13.2	18.2	26.0	1.1	70.5	96.6	56.8	-	-	86.2	-	-
Nov.	13.2	18.0	26.0	0.1	71.5	89.0	54.2	-	-	78.3	-	-
Dec.	13.1	20.2	26.0	-4.0	66.1	46.7	39.0	-	-	89.5	-	-
Annual	13.1	17.5	26.8	-4.0	68.9	719.5	61.0	-	-	1041.6	-	-
Record	'66-'97	'66-'96	'66-'97	'66-'97	'66-'97	'66-'98	'66-'98	-	-	'66-'98	-	-

Station: ISLA DEL SANTUARIO

LATITUDE: 0528 N		LONGITUDE: 7344 W		ELEVATION: 2580 m.s.n.m		BASIN: LAKE FUQUENE		STATION No. 2401110				
Month	Temperature(°C)				Monthly Humidity (%)	Rainfall		Solar		Monthly Evaporation (mm)	Wind	
	Monthly Mean	Daily Mean Range	extreme			Monthly Mean	Max. in 24h (mm)	Monthly Mean Radiation (cal/cm ²)	Monthly Mean Brightnes (Hr)		Monthly Mean Velocity (m/sec)	prevail direct
			max.	min.								
Jan.	-	-	-	-	-	51.2	54.8	-	-	110.3	-	-
Feb.	-	-	-	-	-	57.6	37.9	-	-	105.7	-	-
Mar.	-	-	-	-	-	114.4	61.5	-	-	107.2	-	-
Apr.	-	-	-	-	-	144.0	52.1	-	-	88.2	-	-
May	-	-	-	-	-	108.2	50.6	-	-	88.3	-	-
Jun.	-	-	-	-	-	57.8	44.9	-	-	86.8	-	-
Jul.	-	-	-	-	-	37.5	36.2	-	-	101.6	-	-
Aug.	-	-	-	-	-	40.9	37.5	-	-	98.9	-	-
Sep.	-	-	-	-	-	79.4	46.1	-	-	97.5	-	-
Oct.	-	-	-	-	-	156.4	63.1	-	-	89.5	-	-
Nov.	-	-	-	-	-	138.7	70.6	-	-	85.7	-	-
Dec.	-	-	-	-	-	73.2	78.4	-	-	98.1	-	-
Annual	-	-	-	-	-	1059.3	78.4	-	-	1157.8	-	-
Record	-	-	-	-	-	'66-'97	'66-'97	-	-	'66-'98	-	-

Station: SIMIJACA

LATITUDE: 530 N		LONGITUDE: 7351 W		ELEVATION: 2572 m.s.n.m		BASIN: R. SIMIJACA		STATION No. 2401513				
Month	Temperature(°C)				Monthly Humidity (%)	Rainfall		Solar		Monthly Evaporation (mm)	Wind	
	Monthly Mean	Daily Mean Range	extreme			Monthly Mean	Max. in 24h (mm)	Monthly Mean Radiation (cal/cm ²)	Monthly Mean Brightnes (Hr)		Monthly Mean Velocity (m/sec)	prevail direct
			max.	min.								
Jan.	13.3	18.9	23.9	0.0	73.2	28.1	39.0	390	217	84.1	2.1	NW
Feb.	13.6	17.1	23.4	0.7	70.4	40.0	49.2	430	179	75.9	2.2	NW
Mar.	13.7	17.3	24.1	1.0	73.5	72.9	39.7	416	168	70.6	2.1	NW
Apr.	13.8	16.0	24.0	2.0	73.8	111.2	59.3	384	152	65.1	2.0	SE
May	13.9	15.5	23.2	2.0	72.1	89.0	36.5	388	154	73.1	2.0	SE
Jun.	13.6	15.9	24.0	0.2	69.1	40.8	40.0	375	160	73.2	2.6	SE
Jul.	13.5	16.8	24.0	1.0	67.2	30.7	40.0	398	167	84.7	2.6	SE
Aug.	13.4	16.5	23.0	1.0	67.3	38.2	34.0	414	172	84.2	2.5	SE
Sep.	13.5	17.5	25.2	1.2	66.3	53.0	42.0	394	167	77.0	2.3	SE
Oct.	13.1	18.2	29.0	0.3	74.1	131.7	46.3	378	161	70.5	2.0	SE
Nov.	13.4	16.2	23.0	0.7	78.4	89.3	38.0	369	168	72.8	1.9	NW
Dec.	13.1	18.9	25.0	-2.3	71.7	47.3	32.0	388	189	77.0	2.0	SE
Annual	13.5	17.1	29.0	-2.3	71.4	772.2	59.3	4723	2054	908.4	2.2	SE
Record	'85-'97	'85-'96	'85-'97	'85-'97	'85-'97	'80-'98	'80-'98	'86-'97	'85-'98	'87-'98	'85-'98	'85-'98

Table B.1.5 (3/3) Meteorological Features of Representative Stations

Station: BOQUERON

LATITUDE: 530 N		LONGITUDE: 7351 W		ELEVATION: 2572 m.s.n.m		BASIN: R. CHIOUINOIR/		STATION No. 2401524				
Month	Temperature(°C)				Daily Mean Humidity (%)	Rainfall		Solar		Monthly Mean Evaporation (mm)	Wind	
	Daily Mean	Daily Mean Range	extreme			Monthly Mean (mm)	Max. in 24h (mm)	Daily Mean Radiation (cal/cm ²)	Monthly Mean Brightness (Hr)		Monthly Mean Velocity (m/sec)	prevail direct
			max.	min.								
Jan.	-	-	-	-	-	-	-	-	-	-	2.8	SE
Feb.	-	-	-	-	-	-	-	-	-	-	2.8	S
Mar.	-	-	-	-	-	-	-	-	-	-	2.8	S
Apr.	-	-	-	-	-	-	-	-	-	-	2.9	EN
May	-	-	-	-	-	-	-	-	-	-	3.4	SE
Jun.	-	-	-	-	-	-	-	-	-	-	4.4	SE
Jul.	-	-	-	-	-	-	-	-	-	-	5.1	SE
Aug.	-	-	-	-	-	-	-	-	-	-	4.7	SE
Sep.	-	-	-	-	-	-	-	-	-	-	3.9	SE
Oct.	-	-	-	-	-	-	-	-	-	-	2.9	SE
Nov.	-	-	-	-	-	-	-	-	-	-	2.4	NW
Dec.	-	-	-	-	-	-	-	-	-	-	2.8	SE
Annual	-	-	-	-	-	-	-	-	-	-	3.4	SE
Record	-	-	-	-	-	-	-	-	-	-	'68-'97	'68-'97

Station: ESCLUSA TOLON

LATITUDE: 0537 N		LONGITUDE: 7347 W		ELEVATION: 2545 m.s.n.m		BASIN: R. SUAREZ		STATION No. 2401518				
Month	Temperature(°C)				Daily Mean Humidity (%)	Rainfall		Solar		Monthly Mean Evaporation (mm)	Wind	
	Daily Mean	Daily Mean Range	extreme			Monthly Mean (mm)	Max. in 24h (mm)	Daily Mean Radiation (cal/cm ²)	Monthly Mean Brightness (Hr)		Monthly Mean Velocity (m/sec)	prevail direct
			max.	min.								
Jan.	12.4	21.1	27.0	-3.9	75.0	37.5	33.8	424	199	95.0	1.3	S
Feb.	12.9	21.0	26.0	-2.0	75.2	48.1	29.7	445	173	90.6	1.3	S
Mar.	13.3	20.4	26.0	-0.9	76.5	87.8	40.2	426	175	94.6	1.2	S
Apr.	13.5	18.3	26.0	0.0	78.0	124.3	51.5	392	138	79.4	1.3	S
May	13.5	18.0	29.9	0.0	77.1	103.5	64.5	376	140	78.5	1.5	E
Jun.	13.0	18.3	24.0	-0.8	74.9	65.9	40.1	393	142	79.0	1.7	E
Jul.	12.5	18.8	25.0	-0.1	73.2	51.9	40.0	394	166	86.1	1.6	E
Aug.	12.5	20.1	25.0	-2.1	73.0	50.2	42.0	395	158	86.6	1.4	E
Sep.	12.7	20.4	26.0	-3.0	74.1	82.1	44.9	407	148	85.6	1.1	S
Oct.	13.1	19.6	25.0	-2.9	77.4	135.6	42.0	402	152	79.8	1.1	S
Nov.	13.3	18.4	26.0	0.2	78.7	121.2	70.3	387	149	80.3	1.2	S
Dec.	12.8	20.5	30.0	-2.9	77.1	61.0	36.5	402	187	91.0	1.3	S
Annual	13.0	19.6	30.0	-3.9	75.9	969.1	70.3	4841	1926	1026.5	1.3	
Record	'68-'98	'68-'97	'68-'98	'68-'98	'66-'97	'66-'98	'66-'98	'66-'98	'66-'98	'66-'98	'66-'98	'66-'98

Table B.1.6 Annual Rainfall Record

Station	Upper Ubatuba River Basin				Suas River Basin				Lenguazapate				Fuquene Lake Basin				Suas River Basin				Simijon River Basin				Chiquinquira River Basin				Suarez River Basin			
	2401002	2401053	2401052	2401053	2401051	2401511	2401519	2401027	2401049	2401321	2401028	2401033	2401038	2401039	2401036	2401051	2401110	2401044	2401037	2401513	2401042	2401031	2401043	2401068	2401518	2401520						
Year	CARUPA EL HATO No. 1	EL HATO No. 2	EL HATO No. 3	EL HATO No. 4	LA BOTERA	NOVILLEROS	EL ENCANT	EL PINO	EL PEDREGAL	SUITATAUSA	TARAS	EL ESPINO	EL PUENTE	EL TRIANGULO	MONSERRATTE	EL ZARZAL	ISLA DEL SAQUIARIO	TRES ESCUINAS	SOCOTA	RIMILACA	LOS ARRAYANES	ESCLUSA MERCHANT No. 2	ESCLUSA CENTRAL	ESCLUSA TOLON	AUTO SABOYA							
1966	690.6	956.4	-	-	705.3	674.8	-	454.5	*	575.0	638.0	697.6	*	836.0	939.0	*	1006.5	900.1	913.5	-	1049.3	1166.3	1108.0	2487.0	1059.5	*						
1967	708.4	927.1	-	-	675.3	709.3	-	489.2	1018.1	701.2	634.5	545.7	773.3	851.5	1044.6	1217.7	856.4	711.3	1119.7	-	949.9	1221.5	*	2283.3	853.0	*						
1968	843.5	722.6	-	-	770.2	740.4	-	712.0	1282.0	775.7	707.8	783.2	742.4	852.5	1014.5	1064.8	857.8	826.0	1150.0	-	1059.2	1188.5	1188.5	2762.5	1094.2	*						
1969	753.7	683.6	-	-	790.3	806.7	-	666.9	938.0	729.5	847.6	720.9	660.9	814.9	868.0	1048.7	997.8	916.0	1083.0	-	949.0	1196.9	1103.4	*	1202.8	1298.6						
1970	640.6	682.2	-	-	679.4	686.9	-	571.6	715.0	589.4	835.2	846.8	745.3	783.1	773.5	1125.8	895.7	547.0	911.5	-	787.9	1246.0	1083.6	2533.3	988.0	*						
1971	1053.6	657.2	-	-	646.2	889.6	*	*	1024.5	937.8	1028.9	924.4	816.0	798.6	1314.6	1299.5	1411.4	1032.4	1129.5	-	1186.7	1751.0	1628.7	3420.0	1297.6	2061.0						
1972	884.0	822.3	-	-	791.7	798.5	-	756.3	800.5	796.8	807.5	819.6	758.5	724.1	1194.5	1040.4	1014.2	476.5	1299.0	-	1184.4	1495.0	1180.1	2785.7	1145.5	1710.3						
1973	766.9	697.9	945.0	801.0	1248.0	1227.0	767.8	554.7	1325.5	832.5	866.3	910.1	757.6	854.4	1273.0	1287.4	1287.5	1509.4	1288.5	-	1239.7	1615.3	1443.7	3089.3	1354.7	2207.9						
1974	882.7	594.1	1063.0	*	1426.0	1214.0	636.6	720.2	693.8	720.2	746.8	767.0	639.3	734.6	1001.0	1172.9	1241.2	1267.0	1109.0	-	1221.1	1926.5	1456.5	*	1233.2	1837.8						
1975	905.1	686.4	1163.0	856.0	1197.0	1289.0	808.5	774.8	1345.0	812.5	836.7	727.8	750.1	833.7	1123.5	1276.0	1174.4	1112.1	1195.9	-	1327.0	1460.5	1340.4	3532.2	1085.6	1657.1						
1976	820.3	758.8	1269.0	1094.0	1446.0	1594.0	898.5	786.0	810.0	707.2	800.3	761.2	897.8	800.6	1166.0	1249.1	1009.4	1084.0	1118.5	-	977.4	1314.5	1086.8	2044.9	976.9	1441.7						
1977	634.3	776.6	901.0	776.0	1255.0	1139.0	583.2	638.2	594	567.5	616.0	668.0	821.6	*	874.0	1045.9	838.5	1115.0	735.0	-	729.3	1175.0	975.7	2227.2	959.1	1484.2						
1978	762.4	629.7	745.0	752.0	1061.0	1009.0	730.4	707.7	761.0	650.0	650.9	*	638.9	*	1432.0	1037.9	1056.0	921.0	975.0	-	974.8	1185.1	1156.2	2323.9	971.3	1194.2						
1979	1032.2	531.5	1138.0	1132.0	*	1226.0	1122.2	904.2	1166.0	916.2	869.0	*	779.3	1125.9	1286.0	1489.6	1289.8	1315.0	1597.0	-	1087.3	1726.5	1569.6	2766.2	1187.2	1517.0						
1980	619.0	963.2	559.0	522.0	1048.0	908.8	675.3	565	520.7	635.0	844.8	740.9	663.9	671.5	969.9	984.0	1020.2	597.0	838.5	*	763.1	828.3	962.1	639.5	711.5	836.0						
1981	819.5	595.1	740.5	870.0	1103.0	1643.0	853.4	710.3	963	650.5	694.0	847.3	799.7	812.3	825.0	1127.6	1111.3	679.0	1084.5	*	1034.9	1347.0	1284.5	*	1038.0	1748.0						
1982	781.4	890.1	*	858.0	1214.0	2161.0	823.8	668.2	*	697.1	902.0	884.4	*	821.1	784.7	858.9	623.0	*	979.2	688.0	1186.0	901.5	1174.5	2741.8	356.8	1666.0						
1983	661.1	849.3	932.0	488.0	823.0	1608.3	612.8	417.2	*	517.2	*	495.8	535.4	688.9	*	749.2	1027.0	*	831.5	568.3	928.2	997.5	1101.0	*	602.3	*						
1984	686.6	618.1	994.0	706.0	*	702.9	565.3	737	348.1	733.0	704.4	716.0	677.0	*	753.3	*	1236.1	1263.1	718.0	1157.0	790.2	1220.1	1416.0	1262.2	3132.0	635.5	1261.6					
1985	642.9	691.9	984.0	702.2	1053.0	*	737.2	724.1	645	498.3	857.0	676.2	892.1	544.4	1009.3	839.9	*	399.0	1285.0	675.2	924.8	1063.5	782.7	1963.7	465.5	833.0						
1986	743.6	838.4	888.0	753.0	1405.0	1700.0	801.1	721.2	662	629.0	880.3	774.3	842.4	*	925.0	1226.6	*	461.0	1027.5	638.9	940.0	1452.5	1197.2	2836.1	920.6	*						
1987	*	692.0	909.0	*	1165.0	1307.6	865.4	831.3	*	592.0	569.4	715.5	*	947.5	942.1	1052.6	*	1059.0	668.3	958.5	1208.0	1141.7	2312.4	757.2	1741.4	*						
1988	*	804.5	956.0	785.0	1002.0	1336.0	787.9	727.1	675.8	838.5	823.0	783.2	760.6	*	966.5	1122.9	1205.9	582.0	1086.0	907.2	1140.4	1328.0	1069.0	2977.0	1051.2	1427.8						
1989	*	796.7	789.0	*	867.3	662.3	588.1	806.1	806.1	525.9	881.8	688.9	722.0	*	740.0	967.7	896.8	576.0	846.0	746.1	724.6	1209.5	954.5	*	946.0	1201.6						
1990	753.9	624.0	995.0	561.0	796.0	1089.0	775.5	674.8	576.3	722.6	708.3	591.3	285.5	696.1	1059.0	860.3	*	666.0	670.0	895.5	804.2	830.9	1152.0	1115.1	2527.6	759.5	1147.2					
1991	*	831.6	814.0	402.0	1216.0	1229.0	562.2	632.7	674.8	708.3	591.3	285.5	696.1	933.8	783.0	1054.1	806.3	670.0	895.5	804.2	830.9	1152.0	1115.1	2527.6	759.5	1147.2						
1992	498.4	660.7	588.0	244.0	*	*	438.8	562.7	*	501.8	718.7	589.7	765.4	*	626.5	826.4	771.1	345.5	651.0	539.5	580.2	905.1	734.4	2066.5	704.8	635.5						
1993	734.5	524.4	756.0	868.0	1193.0	*	630.0	836.7	978.9	628.9	669.3	765.4	*	607.2	973.9	1085.8	926.8	704.0	1068.5	689.1	823.2	866.6	1156.4	2805.9	1053.7	1389.5						
1994	*	691.4	904.0	769.0	1164.0	1728.0	719.5	675.3	879	701.8	565.3	770.5	985.6	816.8	882.5	1350.8	969.4	891.0	1170.0	1035.8	1042.3	1239.2	1207.2	2808.8	1195.9	2329.0						
1995	714.7	839.8	905.0	612.0	969.0	1722.0	703.1	765.9	815.7	625.5	820.0	688.7	*	941.7	1046.5	1274.6	1371.4	943.0	1066.5	1069.0	1040.1	1185.6	1188.7	2854.8	1195.9	2329.0						
1996	723.0	836.2	*	813.5	1292.0	1979.0	789.5	843.1	1067.5	728.0	654.1	826.3	785.9	*	1298.5	1366.5	1208.3	1017.5	1261.5	1063.0	1176.7	917.4	833.7	1169.9	2865.8	1020.7	2082.0					
1997	*	*	551.0	452.1	1083.0	1837.0	455.5	502.2	*	512.3	411.4	434.7	526.0	*	986.0	1037.9	651.2	*	772.9	587.9	723.0	615.5	734.0	*	2036.0	836.8	980.0					
1998	*	*	*	778.3	*	1021.0	*	*	*	*	*	599.7	*	*	*	*	*	*	*	*	*	*	*	*	*	*	923.2	*				
Average	759.9	733.9	881.3	721.5	1150.4	1401.6	734.4	712.0	838.1	719.5	763.1	701.2	780.1	873.3	986.0	1096.9	1059.3	810.1	1041.1	772.2	971.4	1250.5	1160.8	2567.8	969.1	1475.1						

* ... not available
 ... out of observation period

Table B.2.1 Inventory of Gauging Stations

Basin	No	River	Himat Code	Station Name	Installation		Area(km ²)	Elevation (m.s.n.m)	Water Level	Gauging Type		
					Start	End				Staff ^{*1}	Graph ^{*2}	Aforos ^{*3}
Upper Ubate River	1	Q. El Molino	2401780	Corralejas	1994.01	not suspend	not clear	not clear		○		○
	2	Q. La Playa	2401755	La Malillia	1967.03	not suspend	64	2,596		○	○	○
	3	R. El Hato	2120913	El Hato	1992.06	not suspend	not clear	2,840		○	○	○
	4	R. El Hato	2401710	Corralejas	1955.08	not suspend	49	2,830		○	○	○
	5	R. Ubate	2401715	La Boyera	1960.01	not suspend	180	2,598		○		○
	6	R. Ubate	2401731	Pte. Barcelona	1964.04	not suspend	220	2,548		○	○	○
	7	R. Ubate	-	La Soledad	1964.04	1968.01	not clear	not clear		○		
	8	R. Ubate	-	Pte. Narino	1964.04	1966.07	not clear	not clear		○		
Suta River	9	R. Suta	2401716	EL Pino	1960.01	not suspend	81	2,600		○	○	○
	10	R. Suta	-	Pte. Cartagena	1964.04	1967.01	not clear	not clear		○		
	11	R. Suta	-	Pte. San Lgnacio	1964.04	1967.04	not clear	not clear		○		
Cucunuba Lake	12	L. De Cucunuba	2401708	Esclusa Cartagena Arriba	1996.01	not suspend	not clear	not clear	○			
	13	L. De Cucunuba	2401709	Esclusa Cartagena Abajo	1996.01	not suspend	not clear	not clear	○			
	14	L. De Cucunuba	2401726	Penas de Palacio	1962.01	not suspend	not clear	2,542	○			
Lenguazaque River	15	R. Lenguazaque	2401714	Tapias	1960.01	not suspend	163	2,572		○		○
	16	R. Lenguazaque	2401723	El Boqueron	1960.11	not suspend	250	2,558		○		○
	17	R. Lenguazaque	2401733	Pte. La Balsa	1964.04	not suspend	284	2,544		○	○	○
	18	R. Lenguazaque	-	Las Juntas	1964.04	1967.01	not clear	not clear		○		
	19	R. Lenguazaque	-	Pte. Piedragorda	1964.04	1967.01	not clear	not clear		○		
	20	R. Lenguazaque	-	Pte. La Jabonera	1964.04	1966.06	not clear	not clear		○		
	21	R. Lenguazaque	-	La Ramada	1964.04	1967.01	not clear	not clear		○		
	22	R. Lenguazaque	-	Pte. Florez	1964.04	1967.01	not clear	not clear		○		
23	R. Lenguazaque	-	La Resaca	1967.03	1968.03	not clear	not clear		○			
Fuquene Lake	24	Fuquene Lake	-	Santuario Antigua	1934.01	1963.02	not clear	not clear		○		
	25	L. De Fuquene	2401717	Isla Del Santuario	1960.11	not suspend	not clear	2,538	○			
	26	Q. Honda	2401793	Fuquene	1997.12	not suspend	not clear	not clear				○
	27	Q. Mina	2401795	Ticha Munoz	1997.12	not suspend	not clear	not clear				○
	28	R. Fuquene	2401781	Chinzaque	1997.12	not suspend	not clear	not clear				○
	29	R. Ubate	2401725	Esclusa El Cubio	1961.11	not suspend	not clear	not clear	○			
Susa River	30	R. Ubate	2401729	Pte. Colorado	1965.01	not suspend	808	not clear		○	○	○
	31	R. Susa	2401738	Pte. Peralonso	1964.04	not suspend	49	2,600		○	○	○
Simijaca River	32	R. Susa	-	Pte. Calicanto	1964.04	1966.12	not clear	not clear		○		
	33	R. Nutrias	2401722	San Agustin	1960.09	not suspend	59	2,919		○		○
	34	R. Simijaca	2401730	Pte. Guzman	1964.04	not suspend	108	2,545		○	○	○
Chiquinqura	35	R. Simijaca	-	Pte. Cuatro Esquinas	1964.04	1966.12	not clear	not clear		○		
	36	R. Chiquinqura	2401751	Narino	1964.11	not suspend	79	2,593		○		○
	37	R. Chiquinqura	2401745	Pte. Pinilla	1964.04	not suspend	103	2,549				○
	38	R. Chiquinqura	-	Aguablanca	1962.08	1968.12	not clear	not clear		○		
Suarez River	39	R. Chiquinqura	-	El Palmar	1967.03	1967.08	not clear	not clear		○		
	40	R. Madron	-	Pte. Centenario	1964.04	1968.07	not clear	not clear		○		
	41	R. Suarez	2401711	Pte. San Miguel	1959.04	not suspend	not clear	not clear				○
	42	R. Suarez	2401719	Tolon Abajo	1960.06	not suspend	not clear	not clear	○			
	43	R. Suarez	2401749	Esclusa Merchan Abajo	1961.10	not suspend	1,615	2,700	○			
	44	R. Suarez	2401750	Esclusa Merchan Arriba	1961.11	not suspend	not clear	not clear	○			
	45	R. Suarez	2401789	Tolon Arriba	1960.06	not suspend	not clear	not clear	○			
	46	R. Suarez	2401713	Garavito	1960.01	not suspend	1,729	2,526		○		○
	47	R. Suarez	2401704	La Balsa	1934.03	not suspend	1,445	2,537		○	○	○
	48	R. Suarez	-	La Copetona	1934.03	1968.07	not clear	not clear		○		
	49	R. Suarez	-	Pte. El Bujio	1962.08	1966.11	not clear	not clear		○		
	50	R. Suarez	-	Pte. Quebraditas	1934.03	1968.03	not clear	not clear		○		
	51	R. Suarez	-	El Carrizal	1964.05	1967.01	not clear	not clear		○		

*1 Staff : Staff Gauging Station

*2 Graph : Automatic Water Level Gauging Station

*3 Aforos : Stream Flow Gauging Station

Table B.2.3 Annual Average Discharge

Basin	Upper Ubate River			Suta River			Lenguazaque River			Fruque Lake		Susa River		Simijaca River		Chiquiquira River		Suarez River	
	Sta.	2401710	2401715	2401731	2401716	2401714	2401723	2401733	2401729	2401738	2401722	2401730	2401751	2401745	2401704	2401713			
Year	La Matillia	Corralejas	La Boyera	Pte Barceloneta	EL Pino	Tapias	El Boqueron	Pte La Balsa	Pte Colorado	Pte Peralonso	San Agustín	Pte Guzman	Narino	Pte Pinilla	La Balsa	Garavito			
1966	-	0.47	0.95	-	0.40	0.63	-	-	-	0.13	0.22	0.46	-	3.70	7.18				
1967	-	-	1.07	-	0.42	1.13	1.96	-	2.67	0.25	0.43	-	-	5.92	8.99				
1968	-	-	8.24	-	0.53	1.23	1.57	-	4.90	0.26	0.59	1.00	0.63	-	12.75				
1969	0.42	0.54	7.67	-	0.66	1.15	1.51	-	3.57	0.35	0.54	0.91	0.51	-	10.37				
1970	0.25	0.42	3.00	-	0.45	0.93	-	-	6.02	0.09	0.27	0.43	0.20	6.69	8.00				
1971	0.45	0.69	4.32	2.48	0.67	1.13	2.52	-	7.23	0.37	0.75	1.19	0.85	11.02	19.92				
1972	0.55	1.24	1.77	2.11	0.71	1.40	1.88	1.97	4.99	0.40	0.75	1.09	1.16	9.62	18.25				
1973	0.37	0.66	1.34	1.45	0.63	1.17	1.54	1.48	4.62	1.15	-	1.15	1.11	-	14.46				
1974	0.39	0.71	1.56	1.90	0.49	0.98	-	1.49	5.94	0.64	0.68	-	-	12.94	19.86				
1975	0.45	0.64	1.43	2.57	0.54	0.93	1.42	1.53	3.94	0.32	0.75	1.38	-	8.47	15.50				
1976	0.47	0.94	1.90	2.96	0.72	1.62	3.29	2.70	6.28	0.35	0.81	0.99	1.00	10.78	15.75				
1977	0.39	0.44	1.04	1.40	0.47	0.86	-	1.53	3.08	0.29	0.37	0.54	-	3.25	6.30				
1978	0.42	0.47	1.23	1.30	0.59	0.98	-	1.54	1.23	0.22	0.44	0.67	-	4.34	7.17				
1979	0.74	1.03	2.02	2.33	1.56	2.42	3.70	3.84	3.06	0.71	-	1.49	0.87	14.02	21.13				
1980	-	0.36	0.89	1.09	0.41	0.69	1.34	1.44	2.26	0.17	0.30	0.39	0.20	4.88	5.22				
1981	0.25	0.80	1.54	2.09	1.26	2.08	1.96	-	5.52	0.35	0.50	0.92	0.53	6.08	13.75				
1982	0.32	-	2.62	2.13	0.96	1.09	-	-	5.18	0.37	0.61	-	0.63	-	15.58				
1983	-	0.38	-	1.31	0.22	-	1.08	-	2.63	0.23	0.30	-	0.37	-	7.55				
1984	0.34	-	0.47	1.10	-	-	1.10	-	2.55	0.15	0.39	0.78	0.62	6.77	12.19				
1985	0.50	0.78	0.57	1.10	0.08	0.77	1.44	0.51	2.95	0.33	0.59	0.82	0.54	5.59	8.72				
1986	0.83	0.69	0.68	1.51	0.32	1.00	1.47	-	3.15	-	0.43	0.73	-	6.89	10.76				
1987	0.62	0.50	0.65	1.22	0.21	0.99	1.17	-	3.49	-	0.54	-	-	6.25	8.40				
1988	0.94	0.43	0.60	1.02	0.30	-	1.40	-	3.36	-	0.44	0.51	-	7.05	-				
1989	1.27	0.30	-	-	0.38	-	1.38	-	-	-	0.38	-	-	3.70	7.27				
1990	0.38	0.60	1.00	-	0.40	0.94	1.01	-	-	-	0.54	0.49	0.37	-	8.29				
1991	0.20	-	0.85	0.90	0.28	0.47	0.90	-	-	0.16	0.38	0.31	-	-	4.48				
1992	-	-	0.27	0.15	0.10	0.32	0.72	-	-	0.12	0.10	-	0.02	0.17	0.92				
1993	1.06	-	0.67	0.47	0.19	-	0.99	-	-	-	0.24	-	-	2.49	5.80				
1994	1.51	0.16	1.17	-	0.22	-	1.48	-	-	0.21	0.46	0.39	0.30	6.57	15.54				
1995	1.06	0.12	0.82	-	0.13	-	0.51	-	-	-	0.35	0.74	0.52	4.12	7.31				
1996	1.35	0.10	1.00	-	0.38	-	1.14	-	-	-	-	-	0.52	4.52	7.53				
1997	-	0.07	0.63	0.53	0.11	0.75	1.15	-	-	0.21	0.32	-	0.12	0.97	1.40				
1998	-	-	1.45	-	0.26	0.99	1.41	-	-	-	0.42	-	0.73	-	-				
Ave.	0.62	0.54	1.72	1.50	0.47	1.07	1.52	1.80	4.25	0.33	0.46	0.79	0.55	6.27	10.53				

- : Not Available (missing data > 10)

Table B.2.4 Runoff Ratio at Principal Stations

Basin	River	Station		Catchment Area(Km ²)	Data Period	Runoff Ratio
		Name	No			
Upper Ubate	R. Ubate	Balcerona	2401731	219.5	1977-1997	0.41
Suta	R. Suta	El Pino	2401716	81.0	1977-1997	0.21
Lenguazaque	R. Lenguazaque	Tapias	2401714	163.3	1977-1997	0.21

Table B.2.5 Flow Regime at Principal Discharge Observed Stations

Basin	River	Station Name	IDEAM Code	Area (Km ²)	Day					Average	
					95(26%)	185(50%)	275(75%)	355(97%)	Wet Season	Dry Season	Annual
Upper Ubate	Ubate	La Malilla	2401755	64	0.66	0.48	0.38	0.15	0.79	0.45	0.62
		Corralejas	2401710	49	0.52	0.34	0.24	0.13	0.72	0.36	0.54
		La Boyela	2401715	180	1.89	1.28	0.98	0.69	2.25	1.19	1.72
Suta	Suta	Barcelona	2401731	220	1.40	0.78	0.49	0.14	2.18	0.83	1.50
		El Pino	2401716	81	0.36	0.19	0.11	0.03	0.72	0.22	0.47
Lenguazaque	Lenguazaque	Tapias	2401714	163	1.08	0.62	0.37	0.16	1.44	0.69	1.07
		El Boqueron	2401723	250	1.61	0.98	0.62	0.26	1.90	1.13	1.52
		Pte La Balsa	2401733	284	1.72	0.98	0.27	0.01	2.65	0.94	1.80
Fuquene	Ubate	Pte Colorado	2401729	808	4.49	2.05	1.14	0.23	6.21	2.27	4.25
		Pte Peralonso	2401738	49	0.29	0.12	0.07	0.03	0.50	0.15	0.33
Simijaca	Simijaca	San Agustin	2401722	59	0.44	0.25	0.18	0.10	0.69	0.23	0.46
		Pte Guzman	2401730	108	0.73	0.32	0.18	0.06	1.28	0.29	0.79
Chiquinquira	Chiquinquira	Narino	2401751	79	0.96	0.48	0.35	0.22	1.67	0.47	1.07
		Pte Pimilla	2401745	103	0.55	0.25	0.14	0.06	0.87	0.22	0.55
		La Balsa	2401704	1445	8.53	3.62	1.50	0.20	9.29	3.24	6.27
Suarea	Suarez	Garavito	2401713	1729	14.14	5.95	3.00	0.70	16.12	4.90	10.53

Table B.2.6 Inventory of Groundwater Stations

No.	Basin	River	Station Name	Municipal	Installation		Use of not for Survey	Year																																		
					Start	End		'66	'67	'68	'69	'70	'71	'72	'73	'74	'75	'76	'77	'78	'79	'80	'81	'82	'83	'84	'85	'86	'87	'88	'89	'90	'91	'92	'93	'94	'95	'96	'97	'98		
3-401	SZ Simijaca	R. Simijaca	San Cayetano	Simijaca	1962.08	Not Suspend	use	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○		
3-402	SZ Suarez	R. Suarez	Paicahuira	San Miguel	1962.08	Not Suspend	use	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	
3-403	SZ Fuquene Lake L.	R. Fuquene	Sirigay	San Miguel	1962.08	Not Suspend	use	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	
3-404	SZ Suarez	R. Madron	La Aurora	Tinjaca	1964.11	Not Suspend	use	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	
3-405	SZ Suarez	R. Madron	Sasa	Tinjaca	1964.11	Not Suspend	use	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
3-406	SZ Suarez	R. Madron	El Plan	Tinjaca	1964.11	Not Suspend	use	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
3-407	SZ not clear	not clear	San Martín	not clear	1964.1	1968.01	not use	○																																		
3-408	SZ Suarez	R. Suarez	Esmeralda-I	Tinjaca	1964.12	Not Suspend	use	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	
3-409	SZ Suarez	R. Suarez	Esmeralda-II	Tinjaca	1964.12	Not Suspend	use	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
3-410	SZ Suarez	R. Suarez	Esmeralda-III	Tinjaca	1965.01	Not Suspend	use	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
3-411	SZ Suarez	R. Suarez	Isla Grande	Simijaca	1965.01	Not Suspend	use	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
3-412	SZ Suarez	R. Suarez	Churvesi	Susa	1992.01	Not Suspend	not use																																			
3-413	SZ Suta	R. Suta	Punta de Cruz	Susa	1992.01	Not Suspend	not use																																			
3-401	UB Fuquene Lake R.	R. Ubate	La Maria	Fuquene	1962.08	Not Suspend	use	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	
3-402	UB Suta	R. Suta	San Ignacio	Ubate	1962.08	Not Suspend	use	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	
3-403	UB Lenguazaque	R. Lenguazaque	El Espino	Lenguazaque	1962.08	Not Suspend	use	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
3-404	UB Fuquene Lake L.	R. Fuquene	Tichauribe	Guacheta	1962.08	Not Suspend	use	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
3-405	UB Lenguazaque	R. Lenguazaque	Rabanal-I	Lenguazaque	1965.02	Not Suspend	use	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
3-406	UB Lenguazaque	R. Lenguazaque	Rabanal-II	Lenguazaque	1965.02	Not Suspend	use	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
3-407	UB Lenguazaque	R. Lenguazaque	Las Penitas	Lenguazaque	1965.02	Not Suspend	use	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
3-408	UB Upper ubate	R. Ubate	La Albalda	Ubate	1965.03	Not Suspend	use	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
3-409	UB Fuquene Lake R.	R. Ubate	Venezia	Fuquene	1965.05	Not Suspend	use	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
3-410	UB Fuquene Lake L.	R. Fuquene	El Tesoro	Fuquene	1965.05	Not Suspend	use	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
3-411	UB Fuquene Lake R.	R. Ubate	Betania	Lenguazaque	1965.05	Not Suspend	use	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
3-412	UB Upper ubate	R. Ubate	El Triunfo	Ubate	1965.05	Not Suspend	use	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○

○ ... Existing