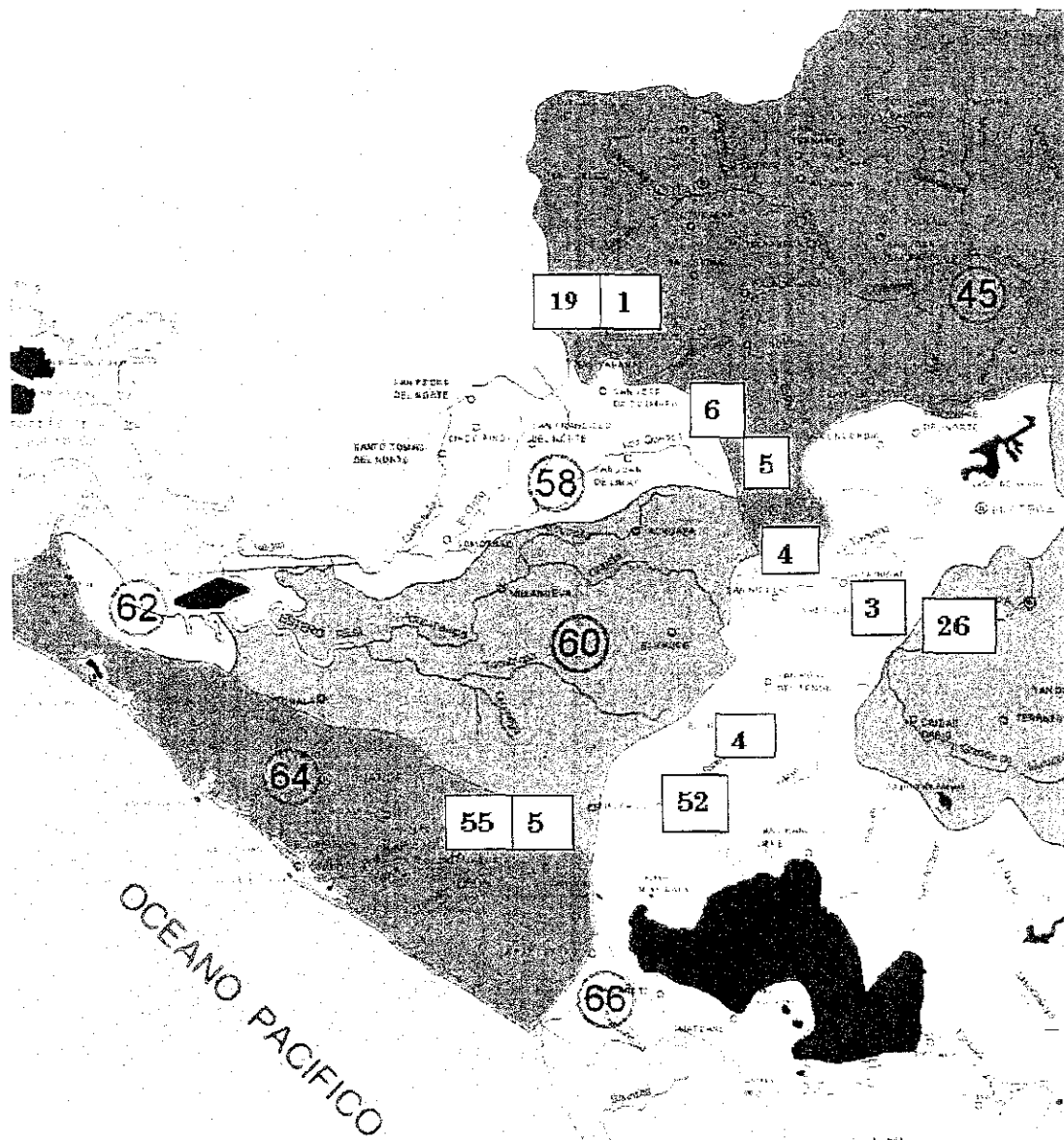


Appendix 3
Hydrology Data

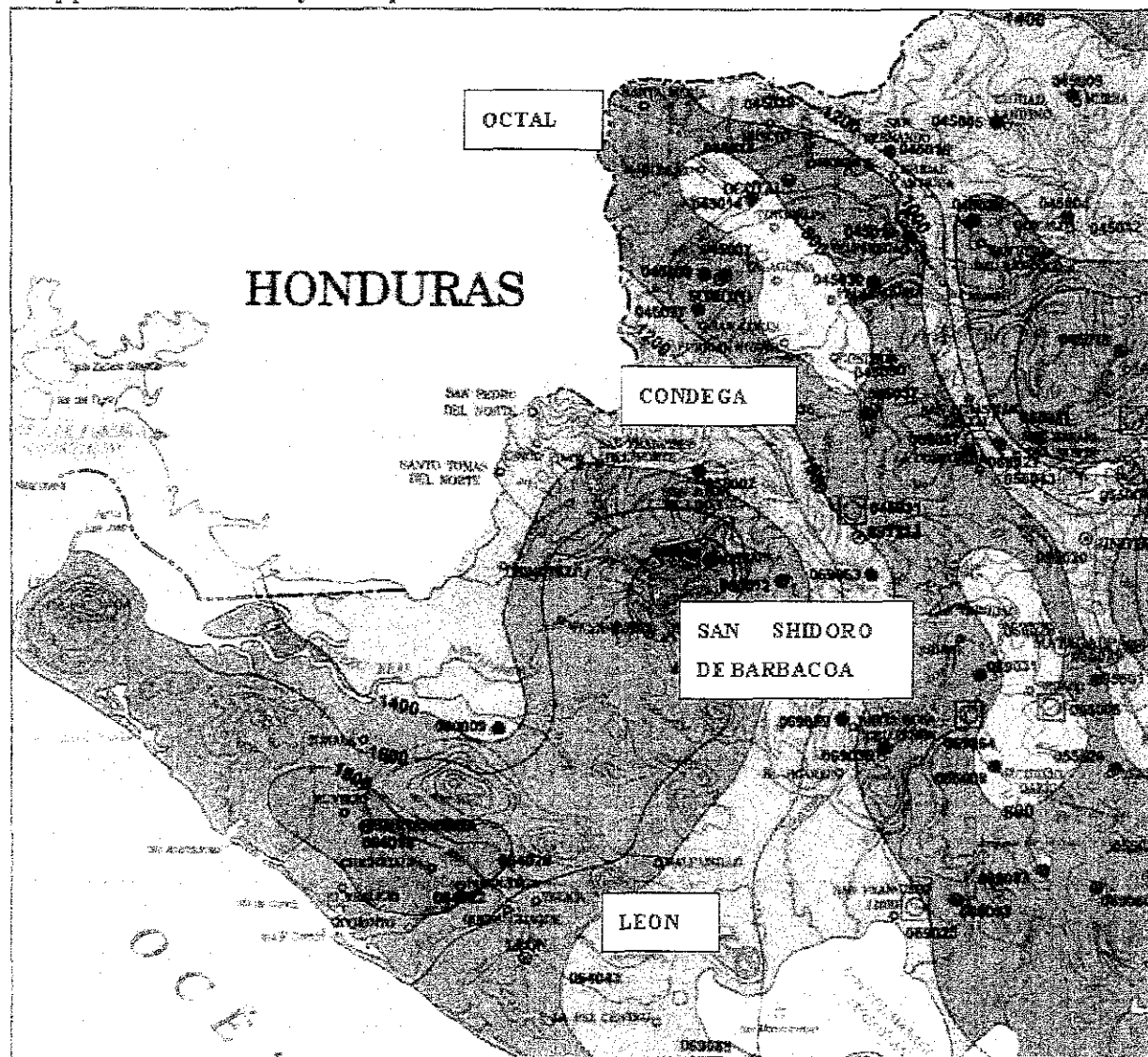
Appendix A3.1 Basin Map and Location of the Study Site



Route	Serial No.	Point from Managua	Bridge name	Remark
NIC.1	3	113.19 km	El Junquillal	Via Sebaco
-Ditto-	4	135.64	San Nicolas	-Ditto-
-Ditto-	5	150.33	Las Chanillas	-Ditto-
-Ditto-	6	151.85	San Ramón	-Ditto-
-Ditto-	18	226.89	Río Inalí	-Ditto-
-Ditto-	19	223.25	Río Tapacalí	-Ditto-
NIC.3	26	119.05	El Guayacan	Via Sebaco
NIC.26	45	170.952	La Banderita	Via Leon
-Ditto-	52	156.785	San Juan de Dios	-Ditto-
-Ditto-	54	108.154	Papalón	-Ditto-
-Ditto-	55	107.533	Solís	-Ditto-

Figure Basin Map and Location of the Study Site

Appendix A3.2 Isohyet Map and Location of Stations



Station Name	ID Code	Record Length	Basin Number
Condega	45003	1958-2001	45
Ocotal	45017	1985-2000	45
Leon	64043	1974-2002	64
San Isidro de Barbacoa	69029	1958-2000	69

Figure Isohyet Map and Location of Stations

Appendix A3.3 Precipitation Data

Table Precipitation Data Ocotal

RAINFALL RECORDS FROM OCOTAL

Metorological Station : OCOTAL
Code No.: 45017
Parameter : PRECIPITATION
Period : 1980-2000

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	TOTAL
1980	0	1	1.2	3.3	273.8	190.5	96.8	61.1	190.3	337.1	51.6	1.6	1208.3
1981	1.6	2.6	6.4	3.9	254.7	281	46.5	250	153.5	61.6	4.5	12.7	1079.0
1982	5.9	0.8	0.9	41.4	248.4	204.7	49	46.6	117.6	91.5	11	2.4	820.2
1983	0.1	2.3	0.1	33.6	181.3	228.5	47.6	79.1	99.6	139.3	73.6	9.4	894.5
1984	7.2	4.5	79.5	55	48.3	125.2	106.9	145.8	316.4	66	4.5	3.2	962.5
1985	1.8	2.7	2.6	49.5	188.2	84.2	92.6	62.5	98.4	96.6	29.8	10.5	719.4
1986	0.8	0	0	0.5	231.3	177.7	49.5	41.6	67.2	92.1	16.4	4.5	681.6
1987	3.9	0.8	11.8	18.4	108.4	154.8	116.7	50.7	84.8	12.4	3.8	3	569.5
1988	0.6	6	17.3	163	196.1	131.2	88.5	258	307.2	168.6	24.40	5.91	1366.8
1989	2.43	2.30	0.4	0	17.2	73.3	39.9	112.2	216.4	33.9	25.7	10.3	534.0
1990	1.2	1.5	0.4	86	100.2	61	44.4	100.8	92.5	95.4	156.7	30.1	770.2
1991	1.3	0	1.2	1.4	188	99.8	39.1	59.4	33.8	191.5	33.3	4.52	653.3
1992	4.6	23	0.9	0.5	130.4	122.1	61.8	56.4	62.2	86.6	2.1	6.1	556.7
1993	2.3	0	11.3	70.8	256.5	120.8	43.7	84.6	269.5	53.8	2.9	1.8	918.0
1994	5.4	1.1	2.2	47.3	112.7	44.5	30.5	60.9	106.8	98.9	37.1	5.3	552.7
1995	0.8	1.8	44.2	161.3	67	148.4	45.7	288.9	169.7	153.4	14.3	14.2	1109.7
1996	2.8	0.7	1	30.7	163.7	26.4	161.3	230.7	89.6	311.3	82.8	0.2	1101.2
1997	3.6	2.6	3.7	24.6	25.6	229.2	58.4	30	157.3	140.5	21.3	0	696.8
1998	0	0	24.9	2	107.1	109.4	169.4	252.3	208.2	776.2	66.3	1.3	1717.1
1999	5.7	38.6	11.1	10.7	68.5	68.6	132.7	82.7	310.3	150.3	41.7	1.6	922.5
2000	6.4	4	0	0	61	12.1	42.3	46.6	179.6	75.1	2.2	10.2	439.5
Average	2.8	4.6	10.5	38.3	144.2	128.3	74.4	114.3	158.6	153.9	33.6	6.6	870.2
MAX	7.2	38.6	79.5	163.0	273.8	281.0	169.4	288.9	316.4	776.2	156.7	30.1	1717.1
MIN	0.0	0.0	0.0	0.0	17.2	12.1	30.5	30.0	33.8	12.4	2.1	0.0	439.5

Table Precipitation Data Condega

RAINFALL RECORDS FROM CONDEGA

Metorological Station : CONDEGA
Code : 45003
Parameter : PRECIPITATION
Period : 1980-2000

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	TOTAL
1980	1.5	1.5	0	4.5	207.8	119.8	108.4	101.6	140.9	294.2	42.3	7	1029.5
1981	0	4.5	36.6	16.4	185.5	310.5	43.7	166	53.4	118	9.6	32.7	976.9
1982	2.5	7.8	0.5	67.8	307.4	170.8	52.8	39.8	89.3	62.3	18.3	10.3	829.6
1983	0.3	2.7	7.7	69.2	72.2	191.5	45.5	138	90.1	52.7	51.1	14.7	735.7
1984	1.2	6	54.5	14.9	58	82.2	161.9	164.7	214.2	72.8	3.5	4.5	838.4
1985	2.6	0.5	2.4	19.4	79.5	37.4	82.7	24.5	47.1	143	43.9	7.5	490.5
1986	3	1	0	0	291.9	107.3	71.4	65.7	79.9	78.1	10.2	2.7	711.2
1987	22.5	2.2	63.6	18.4	119	63.4	75.4	143	75.1	115.1	27.1	15.9	740.7
1988	17.2	2.4	15.2	104.1	103.7	186.2	53.4	209	355.1	105.3	16.5	8.7	1176.8
1989	11.2	13.1	1.5	0	39.4	100.2	58.4	198.9	289.9	22.5	39.9	7.6	722.6
1990	8.4	6.3	3	15.7	97.4	31.1	40.2	115.8	85.4	194.3	104.2	26.1	727.9
1991	9	2.4	0.2	0.2	126	86.7	115.3	48.6	0	140	54.4	14.4	597.2
1992	5.1	8.8	2.5	2.7	95.6	68.2	59.5	25.6	141.7	61.7	3.8	17.1	492.3
1993	10.6	4.3	2	93.6	213.8	234.7	49.6	104.7	200.9	80.1	11.4	14.9	1020.6
1994	12.7	9.8	1.7	34.8	66.1	65.8	19.3	82.8	138.8	107.2	57.5	3.6	600.1
1995	2.8	2.2	59.6	85.9	38.9	184.5	118.6	215.8	203.9	197.9	32.7	16.6	1159.4
1996	8.1	2	2.8	0.7	192.2	52.1	136.3	170.7	108.2	226.3	189.4	9.3	1098.1
1997	60	3.6	13.2	2.7	10.7	179.3	58.9	54.5	76.1	226.3	51.8	2.3	739.4
1998	3.8	0	80.1	0.2	61.6	98.2	70.2	214.7	197.7	615.1	1.6	17.6	1360.8
1999	12.1	74.2	14.7	24.1	97.1	97	62.2	47.1	262.2	221.5	23.3	3.9	939.4
2000	11	4.2	0	0.1	110.3	96.4	39.9	64.1	218.6	84.4	28	10.3	667.3
Average	9.8	7.6	17.2	27.4	122.6	122.1	72.6	111.2	146.1	153.3	39.1	11.8	840.7
MAX	60.0	74.2	80.1	104.1	307.4	310.5	161.9	215.8	355.1	615.1	189.4	32.7	1360.8
MIN	0.0	0.0	0.0	0.0	10.7	31.1	19.3	24.5	0.0	22.5	1.6	2.3	490.5

Table Precipitation Data San Isidoro de Barbacoa

RAINFALL RECORDS FROM SAN ISIDRO BARBARCOA

Metorological Station : San Isidro de Barbacoa/Raúl González

Code : 69029

Parameter : PRECIPITATION

Period : 1980-2000

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	TOTAL
1980	0.8	0	0	0	344.7	162.2	145.3	151.3	133.7	283.3	164.6	0.5	1386.4
1981	0	0	31.4	21.7	183.3	300.5	40.3	291.3	58.2	98.9	31.5	7.5	1064.6
1982	0.7	1.1	1	12.8	438.6	167.6	47.9	15.9	83.9	85.1	20.9	16	891.5
1983	0	0.9	9.5	26.5	84.2	100.9	54.1	148.7	108.4	37.3	44.2	4.5	619.2
1984	0	0	12.5	13.6	10.4	113.3	112.6	192	301.7	48.5	5.2	3	812.8
1985	0	0	0	55	82.8	88.4	64.1	89.1	117.7	245.9	80.9	0.2	824.1
1986	0	5.3	0.5	0	161.2	46	69.5	75.1	96.6	50.1	15.9	1	521.2
1987	9.5	0	11	0	36.3	95.6	138.4	109.3	198.6	47.5	1.7	220.8	868.7
1988	0.4	1.3	22.3	103.7	115.7	166.2	55.8	120.3	193.4	217.1	58.1	4.6	1059.0
1989	3.1	1.0	0	0	33.8	131.5	150	184.9	166.5	57	20	15.6	763.4
1990	0	0.5	0	20.9	117.1	78	75.8	67.8	111.2	143.6	107.6	7.3	729.8
1991	1.6	1	0	1.6	182.1	96	17.9	14.2	121.4	96.3	40.2	0.3	572.6
1992	0.3	5.7	0	0	73	130.9	70.3	43.5	188	57.6	29.7	8.1	607.1
1993	7.6	0	0.9	0.9	275.3	208.4	61.6	69.6	335.2	129.4	13.9	1.6	1104.4
1994	1.5	1.8	2	84.6	91.6	154.9	21.8	70.8	198.7	112.4	88.9	2	831.0
1995	0.4	0	67.5	57.7	129	184.6	32.4	439.3	297	324.9	18.7	15.9	1567.4
1996	9.9	0.3	38.4	2.6	149.5	43.2	204.4	215.3	101.1	340.4	221.8	0.6	1327.5
1997	2.5	0	18.8	5.9	10.1	252	97.6	11.4	102.1	157.7	67.6	0	725.7
1998	0	0	3.5	0	125.8	92.6	44.8	154.9	139.7	888.4	65	3.2	1517.9
1999	10.1	1.8	1.7	8.8	56.3	144.3	95.4	101.7	265.5	215	11.9	0	912.5
2000	0	0.1	0.9	0	71	70.7	87	69.7	294.9	82.6	12.3	0.7	689.9
Average	2.3	1.0	10.6	19.8	132.0	134.7	80.3	125.5	172.1	177.1	53.4	14.9	923.7
MAX	10.1	5.7	67.5	103.7	438.6	300.5	204.4	439.3	335.2	888.4	221.8	220.8	1567.4
MIN	0.0	0.0	0.0	0.0	10.1	43.2	17.9	11.4	58.2	37.3	1.7	0.0	521.2

Table Precipitation Data Leon

RAINFALL RECORDS FROM LEON

Metorological Station : LEON-Aeropuerto Godoy

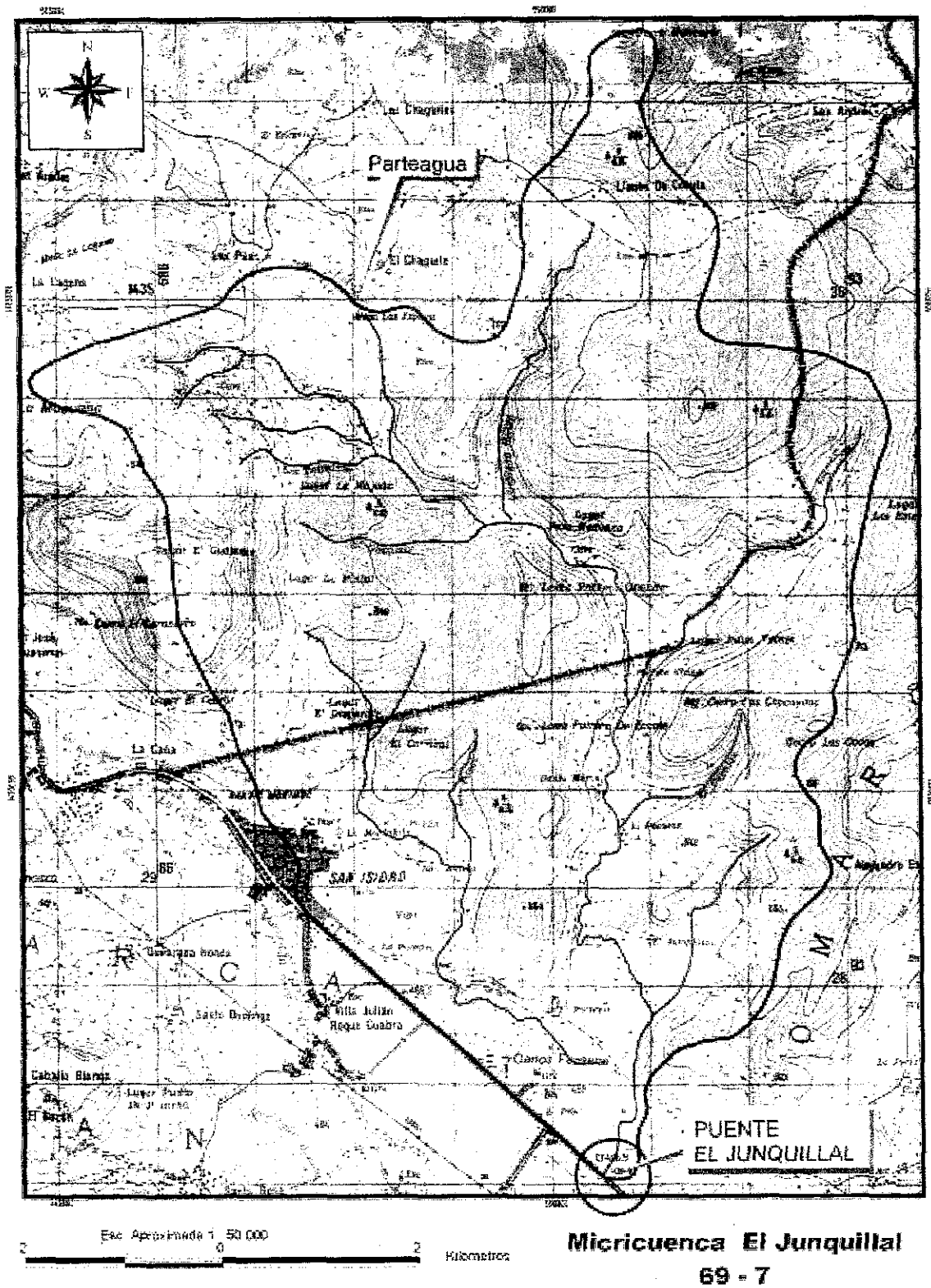
Code : 64043

Parameter : PRECIPITATION

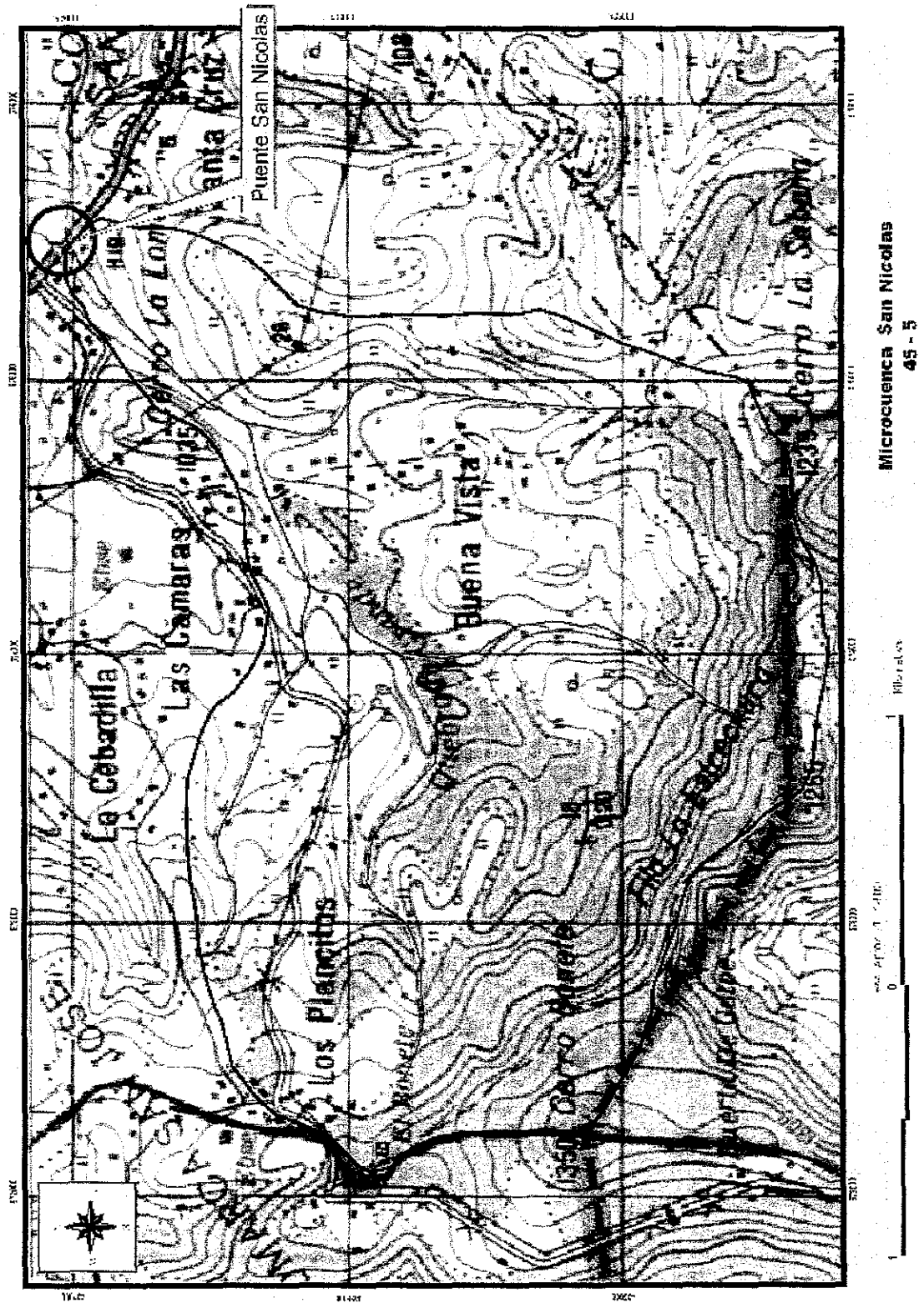
Period : 1980-2000

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	TOTAL
1980	0	0	0	0	169.1	218.3	121.6	61.5	283.3	183.9	125.7	22.9	1186.3
1981	0	0	54.8	0	444.9	550.2	142.7	276.5	263	446.7	2.6	7.2	2188.6
1982	39.6	0	0	0	1214.9	126.1	8.1	7.5	383.3	110	1	13.5	1904
1983	0.4	0	1.4	2.8	91.8	158.2	59.8	94	308	251.8	176.2	9.8	1154.2
1984	0	0.1	1	11.3	150	184.8	121.2	94	507.8	151	27.1	0	1248.3
1985	0	0	0	75.2	66.4	146.9	229.5	230.9	179.2	595.7	91.2	1.9	1616.9
1986	0	5.7	1	0	470.9	251.9	15.5	84.4	170	238.1	9.7	0	1247.2
1987	1.8	0	2.4	0	157.4	266	155.9	143.8	301.1	168.6	0.2	0.5	1197.7
1988	0	0	0.6	1.8	264.9	282.9	231.8	732.7	386.2	483.5	17.5	0.8	2402.7
1989	0	0	0	0	60.8	270.7	190	291	472.6	117.5	126.7	46.7	1576
1990	0	0	0	100	139.8	57.8	81.6	97.8	326.5	282.9	92.8	1.1	1180.3
1991	1.4	0	0	61	274.8	188.6	24.3	92.9	209.1	203.3	33.3	1.2	1089.9
1992	0	3.3	0	0	59.1	173.9	19.6	129.8	376.7	39.3	49.2	13	863.9
1993	2.3	0	0.3	4.9	474.8	322.5	16.9	128.9	681.4	89.2	38.4	0	1759.6
1994	0.5	0	1.7	81.8	131.7	106.1	1.8	218	295.8	239	282.8	0	1359.2
1995	0	0	5.5	13.9	150.4	275.7	193	390.7	441.1	645.9	12.3	21.2	2149.7
1996	8.4	0	0	1.6	255.9	202.7	336.3	203	319.2	495.3	430.6	0	2253
1997	0.6	0	0	13.1	42.3	543.1	32.5	36.8	145.2	227.2	58.2	0	1099
1998	0	0	0.6	15	76.1	114.3	132.7	245.7	495	1338.6	129.3	0.2	2547.5
1999	0	0	0.9	12.1	98.1	257.8	83.8	211.3	1107.9	336.3	116.4	0.5	2225.1
2000	0.3	0	0	0	93.4	112	64.2	116.9	703.6	279.2	109.4	0.1	1479.1
Average	2.6	0.4	3.3	18.8	232.7	229.1	107.8	185.1	397.9	329.7	91.9	6.7	1606.1
MAX	39.6	5.7	54.8	100	1214.9	550.2	336.3	732.7	1107.9	1338.6	430.6	46.7	2547.5
MIN	0	0	0	0	42.3	57.8	1.8	7.5	145.2	39.3	0.2	0	863.9

Appendix A3.4 Watershed Map

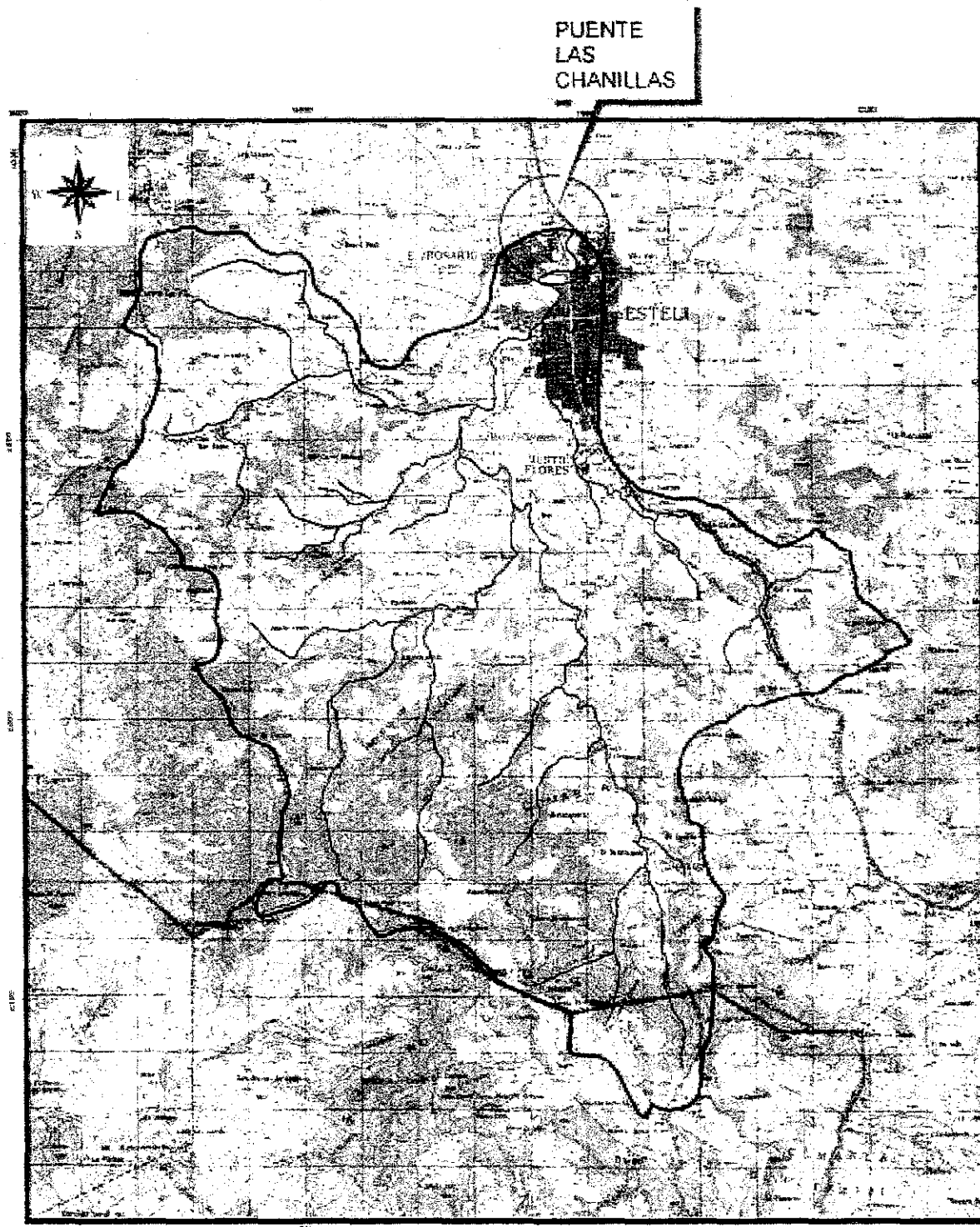


Watershed El Junquollal



Microcuencas San Nicolas
45 - 5

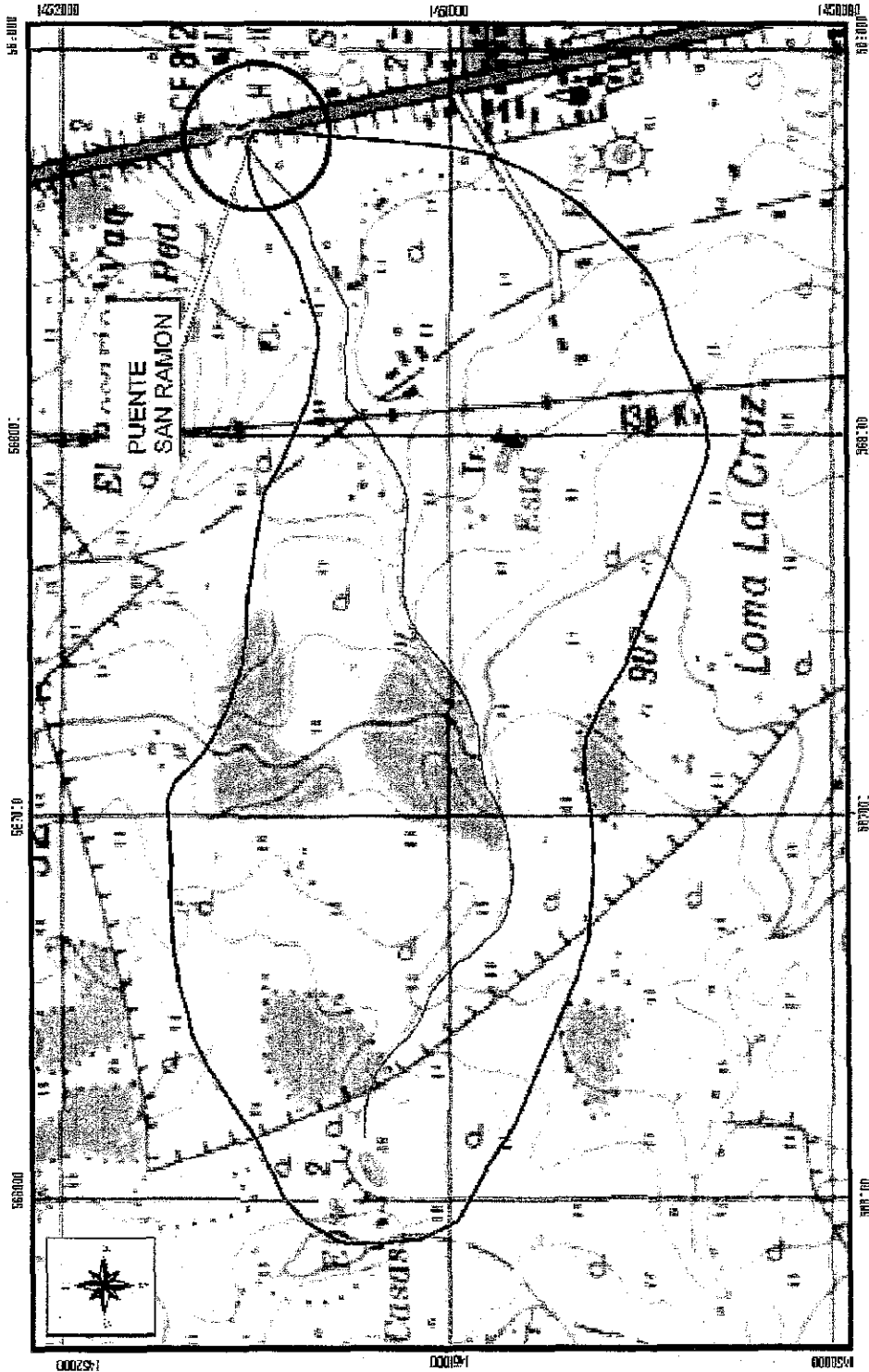
Watershed San Nicolas



Escala Aprox. 1:80 000
0 2.5 Kilómetros

Microcuenca Las Chanillas
45 - 4

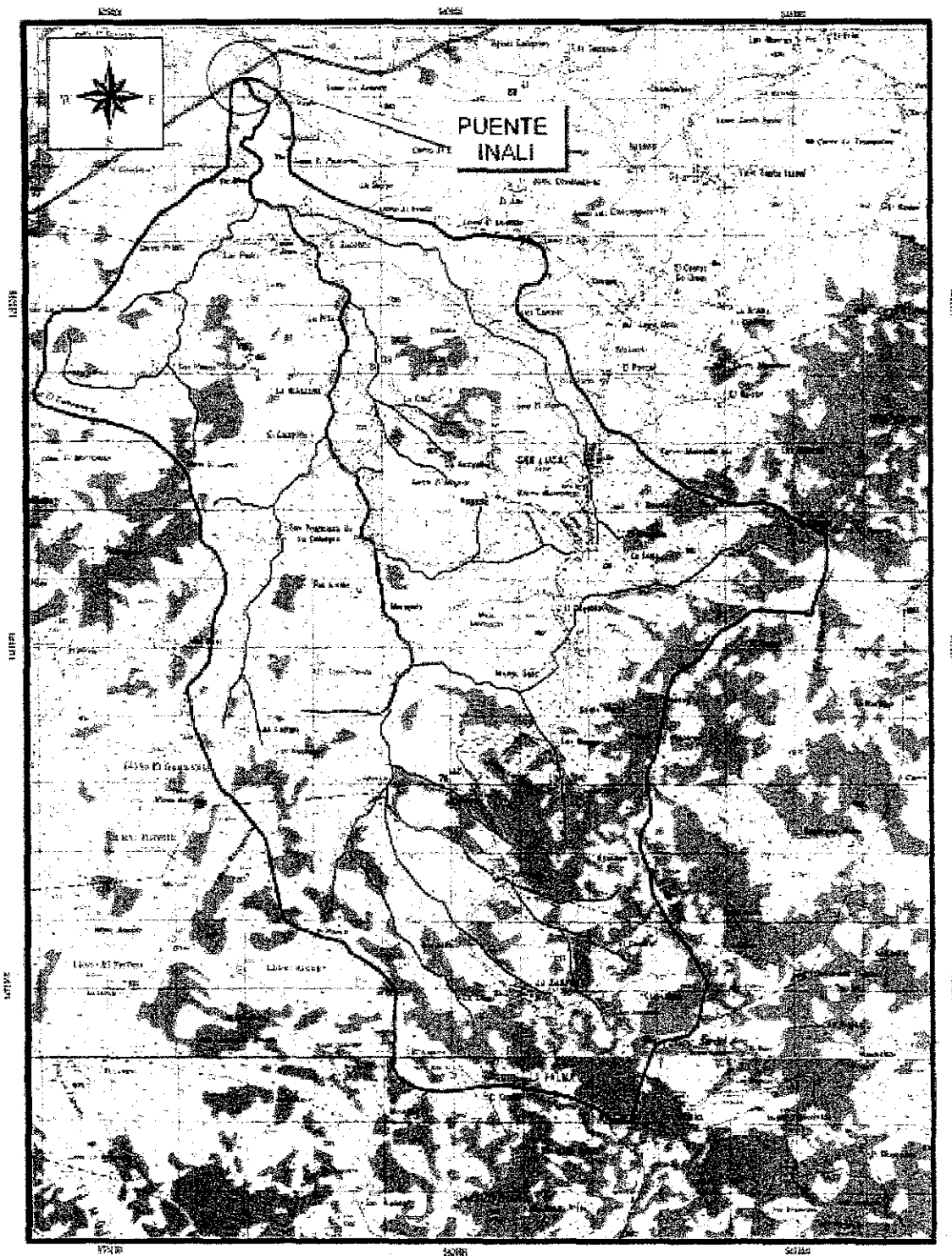
Watershed Las Chanillas



Microcuencas San Ramon
45 - 3

Elev. Approx. 1 : 16.03C
250 0 250 Meters

Watershed San Ramon



Escala Aproximada 1 : 75 000
1 0 1 2
Kilómetros

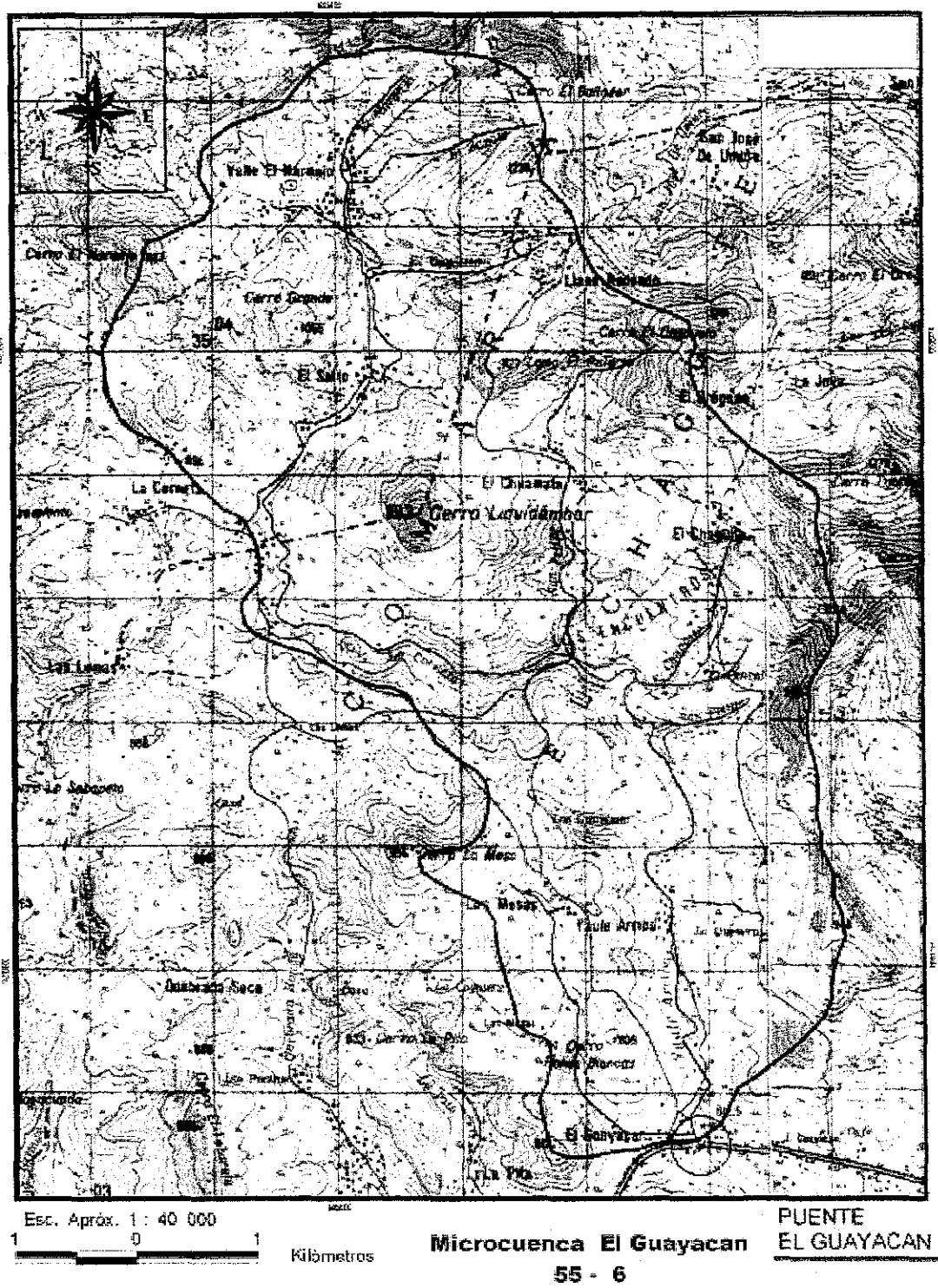
Microcuenca Inali

45 - 2

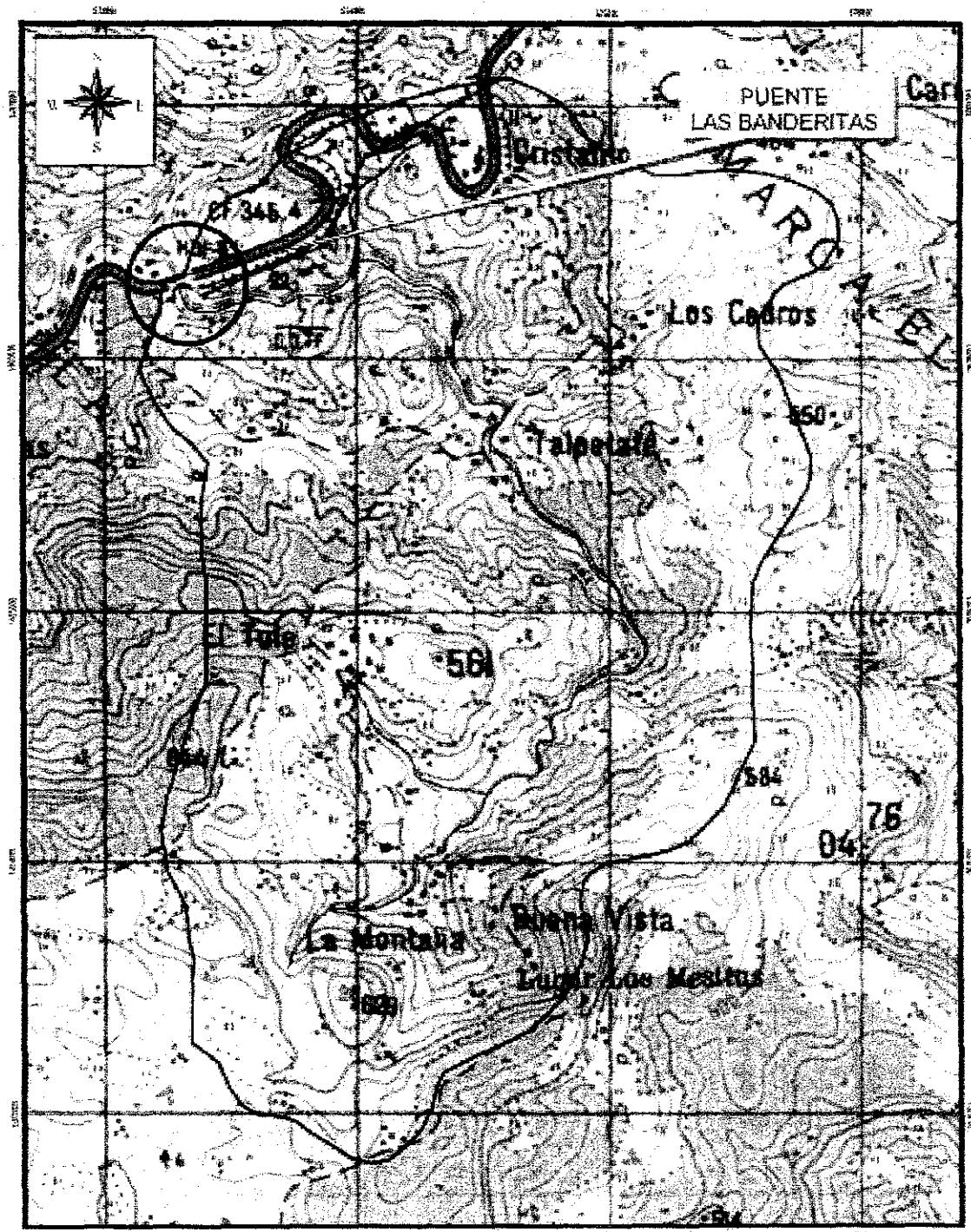
Watershed Rio Inali



Watershed Rio Tapacali



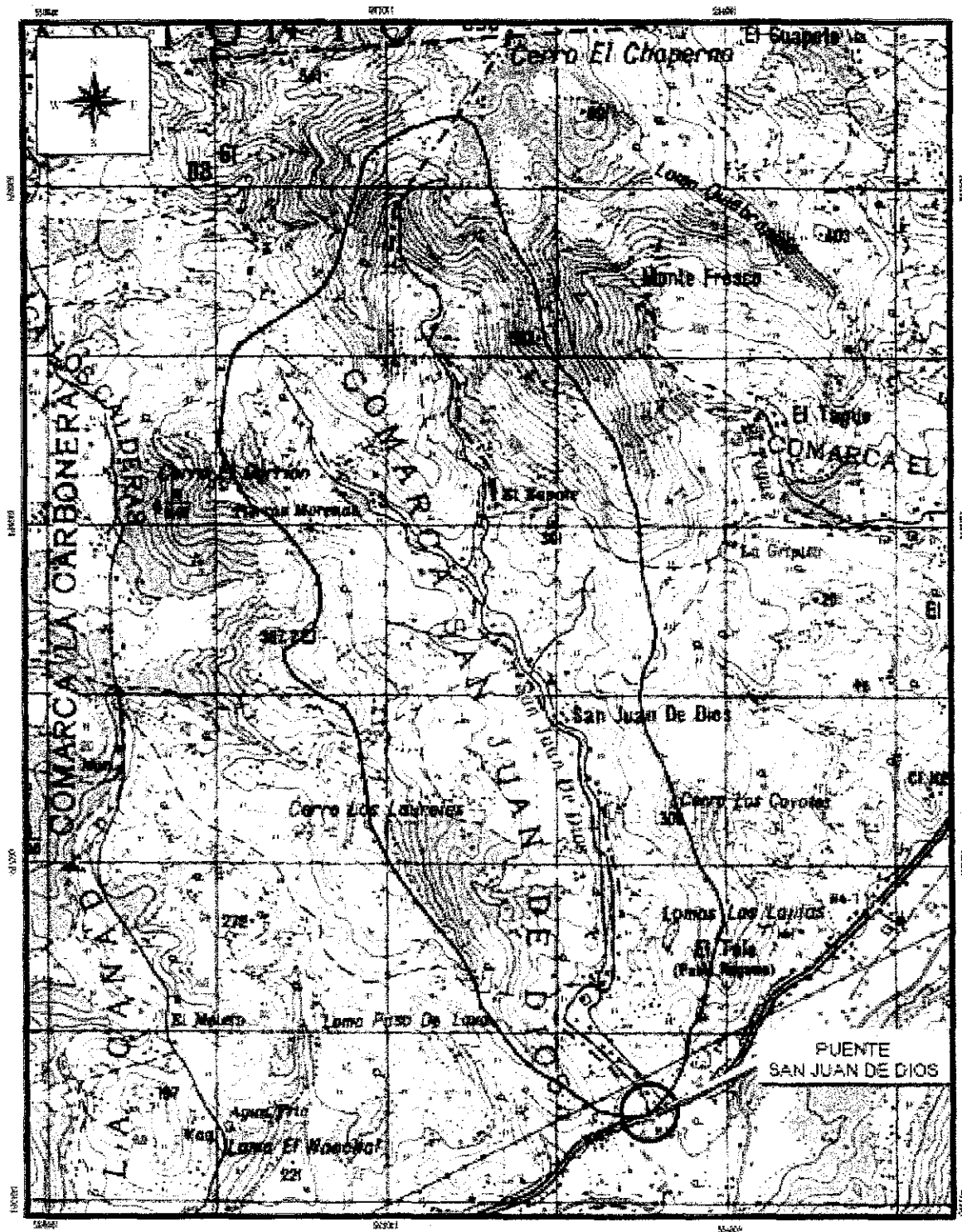
Watershed El Guayacan



Esc. Apróx 1 20 000
0.5 0 0.5 Kilómetros

Microcuenca Las Banderitas
69 - 8

Watershed Las Banderita

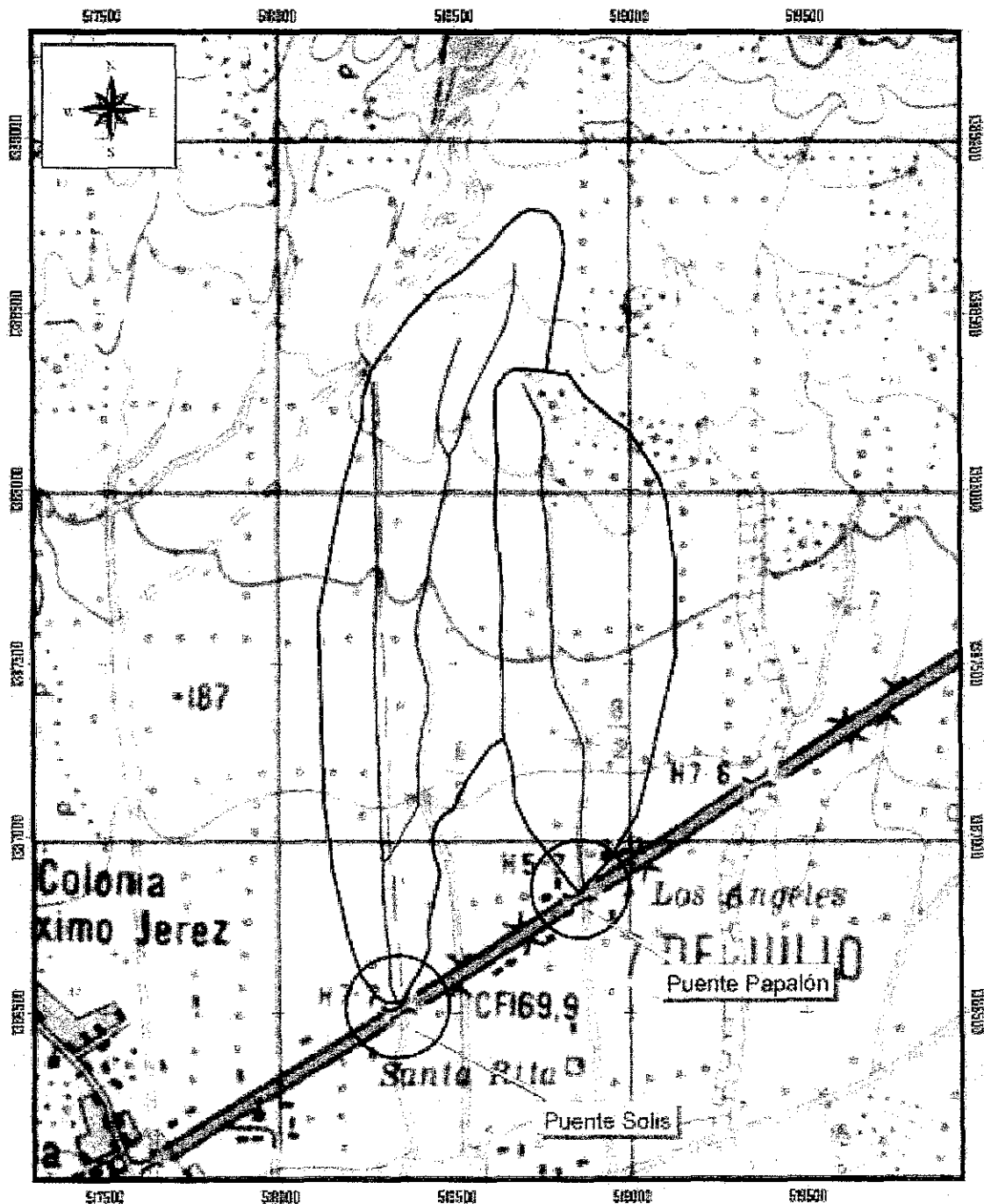


Esc. Apróx 1 : 30 000



Microcuenca San Juan de Dios
69 - 9

Watershed San Juan de Dios



Esc. Aprox. 1 : 8 000
0.2 0 0.2 Kilómetros

**Microcuencas Solis y papalón
64-10,11**

Watershed Rio Inali

Appendix 4

Traffic Survey Data

Appendix A4 Traffic Survey Sheets

A4.1 Traffic Count

TRAFFIC STUDY FOR VULNERABILITY REDUCTION ON MAJOR ROADS IN NICARAGUA
JICA STUDY TEAM

ORIENTAL CONSULTANTS CO., LTD
JAPAN ENGINEERING CONSULTANTS CO., LTD

CONTEO DE TRÁFICO - RECORDING SHEET

Número de Estación	4	Nombre de la Estación	San Isidoro, MC 26	Numero de Hoja
Dirección de Tráfico		Nombre de Contador		
Fecha		Clima		

Periodo de Tiempo		Vehículo de Pasajeros	Minibus	Autobus	Camión Pequeño	Camión Pasado	Camión Articulado	Motocicleta	Bicicleta	Tractor	Camióneta	Otros
Empezar	Fin											
		Nota 1	< 25 asientos	>25 asientos	2 ejes	3 ejes	5 y 6 ejes			(y remolque)	Nota 2	
7:00	7:15											
7:15	7:30											
7:30	7:45											
7:45	8:00											
8:00	8:15											
8:15	8:30											
8:30	8:45											
8:45	9:00											
9:00	9:15											
9:15	9:30											
9:30	9:45											
9:45	10:00											
10:00	10:15											
10:15	10:30											
10:30	10:45											
10:45	11:00											
11:00	11:15											
11:15	11:30											
11:30	11:45											
11:45	12:00											
12:00	12:15											
12:15	12:30											
12:30	12:45											
12:45	13:00											
13:00	13:15											
13:15	13:30											
13:30	13:45											
13:45	14:00											
14:00	14:15											
14:15	14:30											
14:30	14:45											
14:45	15:00											
15:00	15:15											
15:15	15:30											
15:30	15:45											
15:45	16:00											
16:00	16:15											
16:15	16:30											
16:30	16:45											
16:45	17:00											
17:00	17:15											
17:15	17:30											
17:30	17:45											
17:45	18:00											
18:00	18:15											
18:15	18:30											
18:30	18:45											
18:45	19:00											

Por ejemplo Nota 1 Vehículo de Pasajeros(Sedan): Toyota Corolla; Mitsubishi Lancer; Nissan Sentra
Nota 2 Camióneta (Utilitario): Toyota Hilux, Land Cruiser; Mitsubishi Montero; Nissan Samurai

