TABLES

Table 2.1.1 MAJOR DIMENSIONS OF DAMS IN APURE RIVER BASIN (1/4)

DAMS	LA HONDA	LAS CUEVAS	BORDE SECO	LA VUELTOSA	STO.DOMINGO	MASPARRO
OWNER	CADAFE	CADAFE	CADAFE	CADAFE	CADAFE	MARNR
LOCATION RIVER SYSTEM	URIBANTE -APURE	DORADAS -URIBANTE -APURE	CAMBURITO -CAPARO -APURE	CAPARO -APURE	STO. DOMINGO -PAGUEY -APURE	MASPARRO -APURE
PURPOSE	ELECTRICITY	ELECTRICITY	-	ELECTRICITY	ELECTRICITY	IRRIGATION ELECTRICITY FLOOD CONTROL LAND IMPROV.
BASIN AREA (Km2)	1340	150	390	2700	420	500
RESERVOIR: AREA AT N.W.L.(Has)	2040	2740	11800		12	3680
EFFECT.CAP.(mill.m3)	450	345	2097		2.6	837
MAXIMUM CAPACITY (mill.m3)					5.4	965
NORMAL CAPACITY (mill. m3)	775	1185	5693		3.0	870
MINIMUM CAPACITY (mill. m3)	325	840	3596		0.4	33
MAXIMUM WATER LEVEL (m,sam)	1109.7	737.5	317.0		1597	244.5
NORMAL WATER LEVEL (m,sam)	1098	706	310		1585.5	241.7
MINIMUM WATER LEEVE (m,sam)	1066	693	290			201.34
INTAKE DISCHARGE (m3/s)	39.3	66.7	200		35	35
DAM: TYPE	EARTH DAM	EARTH DAM	EARTH DAM	EARTH DAM	CONC.ARCH DAM	EARTH DAM
MAXIMUM HEIGHT (m)	140	115	120	130	70	63
CREST WIDTH (m)	10	20	10	10	4.3	10
MAXIMUM BASE WIDTH (m)					13.3	
CREST LENGTH (m)	630	386	400	600	220	(No.2) 610
CREST ELEVATION (m,sam)	1111	715	320	320	1598	246
TOTAL VOLUME (mill. m3)	10	5.4	7	17.5	(conc.) 0.115	(No.1,2,3) 545
SPILLWAY: SPILLWAY TYPE	RADIAL GATE	FREE DISCHARGE	FREE DISCHARGE	NO SPILLWAY	FREE DISCHARGE	FREE DISCHARGE
SPILLWAY CAPACITY (m3/s)	940	325	775	-	3200	300
OVERFLOW DEPTH (m)					10.5	
SPILLWAY ELEVATION (m,sam)	1066	706	310		1585.5	241.7
RIVER BED ELEVATION (m,sam)						185
STATUS	CONSTRUCTED	SCHEDULED	UNDER CONST.	UNDER CONST.	CONSTRUCTED	CONSTRUCTED
CONSTRUCTION YEAR	1987				1970-1973	1988
REMARKS	01	02	03	04	05	06

Table 2.1.1 MAJOR DIMENSIONS OF DAMS IN APURE RIVER BASIN (2/4)

DAMS	BOCONO	TUCUPIDO	MESA DE CAVACA	VEGA HONDA	MORADOR	YACAMBU
OWNER	MARNR	MARNR	MARNR	MARNR	MARNR	MARNR
LOCATION RIVER SYSTEM	BOCONO -GUANARE -PORTUGUESA	TUCUPIDO -GUANARE -PORTUGUESA	GUANARE -PORTUGUESA	PORTUGUESA	MORADOR -PORTUGUESA	YACAMBU -ACARIGUA -PORTUGUESA
PURPOSE	IRRIGATION ELECTRICITY FLOOD CONTROL	IRRIGATION FLOOD CONTROL	FLOOD CONTROL IRRIGATION	IRRIGATION WATER SUPPLY ELECTRICITY FLOOD CONTROL	IRRIGATION ELECTRICITY FLOOD CONTROL	IRRIGATION WATER SUPPLY FLOOD CONTROL
BASIN AREA (Km2)	440	1580	1319	730	602	335
RESERVOIR:						
AREA AT N.W.L.(Has)	12550			3120	3403	852
EFFECT.CAP.(mill.m3)	2595			312	698	287
MAXIMUM CAPACITY (mill.m3)	3734					451
NORMAL CAPACITY (mill. m3)	3485			313.2	921.6	435.4
MINIMUM CAPACITY (mill. m3)	890		19.6		739	148.4
MAXIMUM WATER LEVEL (m,smm)	269					754.47
NORMAL WATER LEVEL (m,smm)	267		200	196.5	230	751
MINIMUM WATER LLEVE (m,smm)	237		200	175		
INTAKE DISCHARGE (m3/s)	30			30		9.1
DAM:						
TYPE	EARTH DAM	EARTH DAM	EARTH DAM	EARTH DAM	EARTH DAM	GRAVEL/CONC.DAM
MAXIMUM HEIGHT (m)	80	87		48.1	65	158
CREST WIDTH (m)	10	12	8	10	10	8
MAXIMUM BASE WIDTH (m)		400			295	408
CREST LENGTH (m)	395	290	1400	1830	680	115
CREST ELEVATION (m,smm)		272		202		758
TOTAL VOLUME (mill. m3)		2850		13	45850	3.6
SPILLWAY:						
SPILLWAY TYPE	RADIAL GATE W/TUNNEL	NO SPILWAY	FREE DISCHARGE	FREE DISCHARGE	MORNING GLORY	SKY JUMP W/GATE
SPILLWAY CAPACITY (m3/s)	687	180	550	460		480
OVERFLOW DEPTH (m)				5.1		
SPILLWAY ELEVATION (m,smm)	256			196.5	230	
RIVER BED ELEVATION (m,smm)			188	154		596
STATUS	CONSTRUCTED	CONSTRUCTED	SCHEDULED	SCHEDULED	SCHEDULED	UNDER CONST.
CONSTRUCTION YEAR	1975-1978	1975-1978				
REMARKS	D7	D7	D8	D9	D10	D11

Table 2.1.1 MAJOR DIMENSIONS OF DAMS IN APURE RIVER BASIN (3/4)

DAMS	DOS BOCAS	LAS MAJAGUAS	RIITO	LAS PALMAS	CABUY	A PALMERA
OWNER	MARNR	MARNR	MARNR	MARNR	MARNR	MARNR
LOCATION RIVER SYSTEM	ACARIGUA -PORTUGUESA	SARARE -COJEDES -PORTUGUESA	NIRGUA -COJEDES -PORTUGUESA	COJEDES -PORTUGUESA	CABUY -SAN CARLOS -COJEDES -PORTUGUESA	SAN CARLOS -COJEDES -PORTUGUESA
PURPOSE	WATER SUPPLY IRRIGATION ELECTRICITY FLOOD CONTROL	IRRIGATION FLOOD CONTROL	WATER SUPPLY	IRRIGATION FLOOD CONTROL ELECTRICITY WATER SUPPLY	IRRIGATION	WATER SUPPLY IRRIGATION
BASIN AREA (Km2)			30.9	4325	44	1563
RESERVOIR: AREA AT N.W.L.(Has)	700	4250	16.83	2400	178	1426
EFFECT.CAP.(mill.m3)	126.5	303.5	1.9728	1750	10.6	378
MAXIMUM CAPACITY (mill.m3)		345		2045	15.5	488
NORMAL CAPACITY (mill. m3)		304		1920	11.3	424
MINIMUM CAPACITY (mill. m3)		0.5	2.0128	170	0.7	46
MAXIMUM WATER LEVEL (m,snm)		253.85		342.66	617.18	250.24
NORMAL WATER LEVEL (m,snm)	467	252.75	757	341	615.2	246
MINIMUM WATER LLEVE (m,snm)		239.5	735	285	599	200
INTAKE DISCHARGE (m3/s)	10	100	160	18	2.78	14
DAM: TYPE	EARTH DAM	EARTH DAM	ROCK FILL DAM	EARTH DAM	EARTH DAM	EARTH DAM
MAXIMUM HEIGHT (m)	102.5	(ave.) 19	35.51	95	23	93
CREST WIDTH (m)	27	5	8	10	7.5	12
MAXIMUM BASE WIDTH (m)		60	200		145	
CREST LENGTH (m)	630	(No.1-9) 8900	165	881.5	135	530
CREST ELEVATION (m,snm)	482.5	255.35	760	345	618.2	260
TOTAL VOLUME (mill. m3)	9000	3500	727.27	14	0.25	6.67
SPILLWAY: SPILLWAY TYPE	FREE DISCHARGE	CONTROLLED	FREE DISCHARGE	RADIAL GATE	WELL TYPE	FREE DISCHARGE
SPILLWAY CAPACITY (m3/s)	1200	60	256.25	170	79.5	416
OVERFLOW DEPTH (m)		1.1	4.5	9	1.98	
SPILLWAY ELEVATION (m,snm)	482	252.75	754	336	615.2	246
RIVER BED ELEVATION (m,snm)	380		723	250	595	170
STATUS	SCHEDULED	CONSTRUCTED	SCHEDULED	UNDER CONST.	CONSTRUTED	SCHEDULED
CONSTRUCTION YEAR		1960-1963			1971-1974	
REMARKS	D12	D13	D14	D15	D16	D17

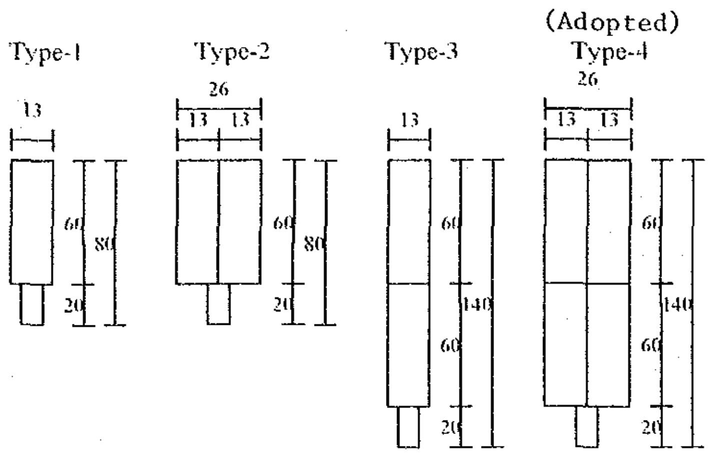
Table 2.1.1 MAJOR DIMENSIONS OF DAMS IN APURE RIVER BASIN (4/4)

DAMS	TINACO	PAO CACHINCHE	PAO LA BALSA	TIZNADOS
OWNER	MARNR	INOS	INOS	MARNR
LOCATION RIVER SYSTEM	TINACO -SAN CARLOS -COJEDES -PORTUGUESA	PAITO -PAO -PORTUGUESA	PAO -PORTUGUESA	TIZNADOS -PORTUGUESA
PURPOSE	IRRIGATION	WATER SUPPLY IRRIGATION	WATER SUPPLY IRRIGATION	IRRIGATION FLOOD CONTROL
BASIN AREA (Km2)	1635	940	2700	1490
RESERVOIR: AREA AT N.W.L.(Has)	14600	1650	5100	7500
EFFECT.CAP.(mill.m3)	891	165	369	820.78
MAXIMUM CAPACITY (mill.m3)			450	1100.03
NORMAL CAPACITY (mill. m3)		170	394	870.59
MINIMUM CAPACITY (mill. m3)	381	5	25	49.81
MAXIMUM WATER LEVEL (m,snm)		357.5	132.5	185.27
NORMAL WATER LEVEL (m,snm)	115	353	131	183
MINIMUM WATER LLEVE (m,snm)		325		161
INTAKE DISCHARGE (m3/s)		7	60	90
DAM: TYPE	EARTH DAM	EARTH DAM	EARTH DAM	EARTH DAM
MAXIMUM HEIGHT (m)	22	52	27	39
CREST WIDTH (m)	6	11	10	10
MAXIMUM BASE WIDTH (m)		220	180	215
CREST LENGTH (m)	465	260	250	590
CREST ELEVATION (m,snm)	117.8	360	135	187
TOTAL VOLUME (mill. m3)		0.677		550.64
SPILLWAY: SPILLWAY TYPE	SUPERFICIAL FRONTAL CHANNEL	FREE DISCHARGE (FAN SHAPE)	FREE DISCHARGE	1:RADIAL GATE 2:W/O GATE
SPILLWAY CAPACITY (m3/s)	50	760	60	486
OVERFLOW DEPTH (m)	1.3	4.5	1.5	2.27
SPILLWAY ELEVATION (m,snm)	113	353	131	180+183
RIVER BED ELEVATION (m,snm)				161
STATUS	SCHEDULED	CONSTRUCTED	CONSTRUCTED	CONSTRUCTED
CONSTRUCTION YEAR		1971-1974	1976-1979	1976-1980
REMARKS	018	019	020	021

Table 2.2.1 SIZE CRITERIA OF NAVIGATION CHANNEL

Apure River

1) Barge : 60 m (Ls) x 13 m (Ws)
2) Tugboat : 20 m long
3) Composition of barge and boat (Unit: m)



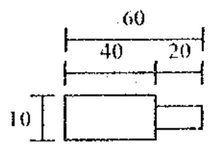
4) Channel depth : 2.00 m
5) Channel width for no navigation aid : 3 x Ws

-Type 1 and 3 : 40 m

-Type 2 and 4 : 80 m

Portuguesa River

1) Barge : 40 m (Ls) x 10 m (Ws)
2) Tugboat : 20 m long
3) Composition of barge and boat (Unit: m)



4) Channel depth : 1.70 m
5) Channel width for no navigation aid : 30 m

Table 2.3.1 PREVIOUS STUDIES AND WORKS (1/2)

(1) Dike Projects of Apure River

1) San Fernando - Biruaca - Achaguas - Apurito road dike
   a) Outline: To protect right bank area from the Apure floods and to serve as road to connect major towns along the river
   b) Status: Constructed in 1969 to 1970

2) Apurito -San Fernando dike
   a) Outline: To protect agricultural lands on the right side bank from the floods by continuous dike and closing of the Apure Viejo (Cano Las Mercedes) near Apurito, constructed by the Provincial government of Apure.
   b) Status: Constructed in 1980; The dike has problems of erosion since it is too close to the river.

3) San Vicente - Palmarito dike
   a) Outline: To protect the areas of Modulos de Apure from the Apure floods
   b) Status: Constructed in 1981 to 1982

4) Old channel closing dike at Pto. Nutrias/Bruzual
   a) Outline: To close the Boral river and protect town of Puerto de Nutrias and its surrounding area from the Apure floods
   b) Status: Constructed in 1983 to 1984

(2) Bank Protection Works of Apure River

1) Guasdualito
   a) Outline: To protect the town of Guasdualito from erosion by cut-off channel, dike and riprap works
   b) Status: Existing

2) Totumito
   a) Outline: To protect town of Totumito from erosion by steel pile groynes
   b) Status: Existing

3) Palmarito
   a) Outline: To protect town of Palmarito from erosion by sand cement bag groynes
   b) Status: Existing

4) Quintero
   a) Outline: To protect town of Quntero from erosion by sand cement bag groynes
   b) Status: Existing

5) San Vicente
   a) Outline: To protect town of San Vicente from erosion by sand cement bag groynes and sand cement bag revetment
   b) Status: Existing; Some revetment works were implemented in 1992.

6) Bruzual bridge
   a) Outline: To protect bridge abutment and river bank from erosion by sheet piling, spur dike and riprap works
   b) Status: Existing; Sheet piling constructed in 1972 but not successful; Spur dike constructed in 1991

7) El Saman
   a) Outline: To protect town of El Saman from erosion by sand cement bag groynes
   b) Status: Exising

8) Apurito
   a) Outline: To protect town of Apurito from erosion by sand cement bag groynes
   b) Status: Existing

9) Confluence of Portuguesa river
   a) Outline: Channel improvement at the confluence of Portuguesa river junction and bank protection on the opposite bank (near Las Culatas and Las Guanotas) by sand cement bag groynes and riprap works
   b) Status: Existing

10) San Fernando town, bridge and airport
   a) Outline: To protect town of San Fernando, bridge and airport from erosion by cut-off channel, sand cement bag groynes, and sand cement bag revetment works
   b) Status: Existing

11) El Negro
   a) Outline: To protect public road from erosion by sand cement bag groynes
   b) Status: Existing; The erosion is extending further toward downstream reaches

12) Arichuna
   a) Outline: To protect town of Arichuna from bank erosion by sand cement bag groynes
   b) Status: Existing

Table 2.3.1 PREVIOUS STUDIES AND WORKS (2/2)

(3) Apurito Guide Dike Project

a) Outline: To divert inundated water of the Portuguesa and Apure rivers in the upstream of the route No. 1 highway directly into the Apurito river by a viaduct under the highway and parallel guide dikes from the highway to the Apurito river without channel excavation. This project was promoted after the experience of 1981-food.
   - No design discharge was determined because of guide dikes
   - Viaduct width: 100 m
   - Channel width between dikes: 500 m

b) Status: Existing

(4) Submerged Dike on Chirel River

a) Outline: Diversion discharge into the Chirel is increasing year by year, and at present 60 % of dry season discharge of the Apure is reported to flow into the Chirel river. A submerged dike made of sand cement bags was designed on the Chirel river to maintain the main Apure river as navigation canal. It is expected that the navigation period will be extended by two (2) months, when the project is realized.

b) Status: Construction on-going

(5) Cut-off Channel of Portuguesa River

1) Cut-off Channel at Camaguan
   a) Outline: To avail smooth passage of boats/barges in the meandering channel and to protect town of Camaguan by erosion by constructing pilot cut-off channel
   b) Status: Design on-going
2) Cut-off Channel at La Muerta
   a) Outline: To avail smooth passage of boats/barges in the meandering channel at La Muerta by constructing pilot cut-off channel. The existing channel length of about 8 km will be shortened to 1.1 km by the cut-off channel.
   b) Status: Design on-going

(6) Caparo-Uribante Viejo Diversion Channel

a) Outline: To construct Caparo-Uribante Viejo diversion channel (about 7.1 km long) at El Canton in order to increase the Apure discharge and improve the navigation conditions of about 100 km (from La Tigra jct. to Uribante Viejo jct.). According to a study, it is expected to increase discharge by about 200 m3 incorporating released water for hydro-power generation of the Uribante-Caparo.

b) Status: Design completed in 1992

(7) Channel Improvement of Upper Portuguesa River

1) Stabilization of Acarigua River - Turen Pilot Channel System
   a) Outline: To make study and design for the stabilization of the Acarigua river and Turen pilot channel (constructed in 1960s) system by constructing drop structures to make the bed slope milder. This project will contribute to the improvement of the sedimentation problems of the Portuguesa river in Vuelta La Mamantona.
   b) Status: Study and design on-going; Cleaning works of secondary channel of the Portuguesa is on-going (since 1991).
2) Margenal Dike of Portuguesa and Rico River
   a) Outline: To prevent discharge loss due to overflow and flooding in Vuelta La Mamantona owing to the sedimentation of the Portuguesa river, by constructing dikes between the Portuguesa and Rico rivers (right bank of the Portuguesa). The dike also has a possibility to be used as a causeway of the proposed railway
   b) Status: Study on-going

(8) Cojedes-Frasco Diversion Channel

a) Outline: To examine the possibility and to justify the diversion channel scheme (about 13 km long) of the Cojedes river, so as to increase dry season discharge of the Portuguesa for navigation. The Frasco drainage canal which exists since 1978 is to be used as a part of the diversion channel.

b) Status: Study to be completed in 1992.

Table 3.3.1 AVAILABILITY OF CROSS-SECTIONAL SURVEY OF PROA

NO.	STATION	1988	1989	1990	1991	1992
1	REMOLINO	-2--5--8----	-------8----	----5-----1-	----5--8----	--3---------
2	SANTOS LUZARDO	-2--5--8----	---4---8----	----5-----1-	----5--8----	--3---------
3	LA ORURITA	-2--5--8----	---4---8----	----5-----1-	----5--8----	--3---------
4	HATO LA MIEL	------------	------------	----5-----1-	----5--8----	--3---------
5	TOTUMITO	-2--5--8----	---4---8----	----5-----1-	----5--8----	--3---------
6	SAMANAL	------------	------------	----5-----1-	----5--8----	--3---------
7	PALMARITO	-2--5--8----	1--4--78-0-2	-23-5-----1-	----5--8----	--3---------
B1	PERRO DE AGUA/CAPARO	------------	------------	----5-----1-	----5--8----	------------
B2	LOS CARACAROS/TIGRA	------------	-------8----	----5-----1-	----5--8----	--3---------
8	ARECOSTON DE LA TIGRA	------------	------------	----------1-	----5--8----	--3---------
B3	LOS TEQUEDAMAS/SURIPA	------------	-------8----	----5-----1-	------------	------------
9	BOCA DEL SURIPA	-2--5--8----	---4---8----	----5-----1-	----5--8----	--3---------
10	QUINTERO	------------	---4--78-0-2	-23-5-----1-	----5--8----	--3---------
B4	PAGUEY/PAGUEY	------------	------------	----5-----1-	------------	------------
11	SAN VICENTE	-2--5--8----	---4---8----	----5-----1-	----5--8----	--3---------
B5	SARARIT/MASPARRO	------------	-------8----	----5-----1-	----5--8----	--3---------
12	BOCA DEL MASPARRO	-2--5--8----	---4---8----	----5-----1-	----5--8----	--3---------
13	BRUZUAL	-2--5--8----	1--4--78-0-2	-23-5-----1-	----5--8----	--3---------
14	EL CHINAL	------------	------------	----5-----1-	----5--8----	--3---------
15	EL SAMAN	-2--5--8----	1--4--78-0-2	-23-5-----1-	----5--8----	--3---------
16	APURITO	----5--8----	---4--78-0-2	-23-5-----1-	----5--8----	--3---------
17	BOCA DE LA ROMPIDA	------------	-------8----	----5-----1-	------------	------------
18	EL FOMENTO/BRABO	-2--5--8----	---4---8----	----5-----1-	----5--8----	--3---------
19	MIS DESEOS/GARZAS	-2--5--8----	1--4--78-0-2	-23-5-----1-	----5--8----	--3---------
20	CHAMIZAL/RUENDE	-2--5--8----	1--4--78-0-2	-23-5-----1-	----5--8----	--3---------
21	LAS YEGUAS/YEGUAS	-------8----	-------8-0-2	----5-----1-	------------	------------
22	LAS CULATAS	-2--5--8----	---4---8----	----5-----1-	----5--8----	--3---------
23	LAS GUANOTAS	-2--5--8----	---4---8----	----5-----1-	----5--8----	--3---------
24	SAN FERNANDO	-2--5--8----	1--4--78-0-2	-23-5-----1-	----5-------	--3---------
25	EL NEGRO	------------	------------	------------	------------	--3---------
26	EL JOBAL	-2--5--8----	---4---8----	----5-------	----5--8----	--3---------
B6	BOQUERONES/BOQUERONES	-2--5--8----	1--4--78-0-2	-23-5-----1-	----5--8----	--3---------
27	CHIREL I	------------	------------	----5-------	----5--8----	--3---------
28	CHIREL II/CHIREL	------------	------------	----5-----1-	----5--8----	--3---------
29	CHIREL III/CHIREL	------------	------------	----5-----1-	----5--8----	------------
30	CHIREL/APURITO	-2--5--8----	---4---8----	----5-----1-	------------	--3---------
31	ARICHUNA	----5--8----	1-----78-0-2	-23-5-------	----5--8----	--3---------
32	MANGAS COVERAS/APURITO	-2--5--8----	1--4--78-0-2	-23-5-----1-	----5--8----	--3---------
33	LAS PLAYAS/CAUJARITO	-2--5--8----	---4---8----	----5-------	----5--8----	------------
34	EL SAUSAL	-2--5--8----	1--4--78-0-2	-23-5-----1-	----5-------	--3---------
35	MANUELERO/CHIRERE	-------8----	---4---8----	----5-----1-	----5-------	--3---------
36	PALO SECO/APURITO	------------	---4--78-0-2	-23-5-----1-	----5--8----	------------
37	LA MACIERA	-2--5-------	---4---8----	----5-------	----5-------	--3---------
38	EL MAMON	------------	------------	----5-------	----5-------	--3---------
39	EL PERRO	-2--5--8----	---4--78-0-2	-23-5-----1-	----5-------	--3---------
	GUAYABO	-2--5-------	---4--------	------------	------------	------------
B7	STA.ROSALIA/PORTUGUESA	------------	------------	------------	----5--8----	--3---------
B8	CAMAGUAN/PORTUGUESA	------------	---4---8----	----5-----1-	----5--8----	--3---------
B9	SOMBRERITO/PORTUGUESA	-2--5--8----	---4---8----	----5-------	----5--8----	------------
		------------	------------	------------	------------	------------

Table 3.3.2 CHANGES OF CHANNEL DEPTH (1/3)

CAHNNEL DEPTH OF APURE AND PORTUGUESA RIVERS

SER. NO.	SECTION	DISTANCE (KM)	GR.EL. (M,MCL)		DEPTH (M) 8802	8805	8808	8904	8908	8912	9003	9005	9011	9105	9108	9203	RANGE
	APURE RIVER																
1	PUENTE REMOLINO	681.02	130.89	Hm	-	2.8	3.3	-	3.8	-	-	4.0	3.8	3.4	3.4	4.5	2.8 - 4.5
				Hmax	-	4.4	7.6	-	6.6	-	-	6.7	6.2	6.2	5.7	6.1	
				Max/m		1.6	2.3		1.7			1.7	1.6	1.8	1.7	1.4	
2	PUERTO SANTOS LUZARDO	663.38	125.79	Hm	3.5	3.2	3.8	4.3	5.6	-	-	4.6	5.1	4.3	5.2	3.7	3.2 - 5.6
				Hmax	4.7	5.2	6.1	5.3	7.3	-	-	5.6	6.2	5.5	8.0	5.3	
				Max/m	1.3	1.6	1.6	1.2	1.3			1.2	1.2	1.3	1.5	1.4	
3	ORURITA	652.99	123.06	Hm	3.6	3.7	4.1	4.2	4.9	-	-	4.6	4.8	4.2	4.2	4.2	3.6 - 4.9
				Hmax	4.7	4.9	5.9	5.3	6.4	-	-	6.2	6.5	5.4	5.2	5.7	
				Max/m	1.3	1.3	1.4	1.3	1.3			1.4	1.4	1.3	1.2	1.4	
4	HATO LA MIEL	645.79	121.00	Hm	-	-	-	-	-	-	-	4.8	4.7	4.3	4.5	3.8	3.8 - 4.8
				Hmax	-	-	-	-	-	-	-	6.8	6.9	6.5	7.8	5.6	
				Max/m								1.4	1.5	1.5	1.7	1.5	
5	TOTUMITO	633.36	118.53	Hm	3.1	-	3.5	3.5	5.3	-	-	3.8	4.5	3.4	3.4	3.5	3.1 - 5.3
				Hmax	4.1	-	6.5	5.5	7.0	-	-	5.6	6.0	6.0	6.7	6.5	
				Max/m	1.3		1.8	1.6	1.3			1.5	1.3	1.8	2.0	1.8	
6	SAMANAL	593.45	109.00	Hm	-	-	-	-	-	-	-	3.9	4.3	3.7	-	3.9	3.7 - 4.3
				Hmax	-	-	-	-	-	-	-	6.5	5.4	5.0	-	4.9	
				Max/m								1.7	1.3	1.4		1.3	
7	PALMARITO	570.99	104.04	Hm	3.4	3.2	4.1	-	4.3	4.4	4.7	4.2	4.6	4.4	-	4.0	3.2 - 4.7
				Hmax	6.0	6.2	9.1	-	8.2	6.6	6.5	7.2	7.1	6.4	-	6.0	
				Max/m	1.8	1.9	2.2		1.9	1.5	1.4	1.7	1.5	1.5		1.5	
8	ARECOSTON DE LA TIGRA	543.82	96.70	Hm	-	-	-	-	-	-	-	-	7.0	6.0	-	5.0	5.0 - 7.0
				Hmax	-	-	-	-	-	-	-	-	9.1	7.7	-	6.3	
				Max/m									1.3	1.3		1.3	
9	BOCA DEL SURIPA	525.68	93.93	Hm	4.1	4.7	4.4	5.1	5.8	-	-	5.1	5.5	5.2	4.4	3.9	4.1 - 5.8
				Hmax	6.7	6.0	7.3	6.9	10.3	-	-	9.4	8.7	8.5	6.9	7.5	
				Max/m	1.6	1.3	1.7	1.4	1.8			1.8	1.6	1.6	1.6	1.9	
10	QUINTERO	514.01	92.90	Hm	-	-	-	5.8	6.1	6.0	5.9	5.8	6.7	5.1	6.1	5.2	5.1 - 6.7
				Hmax	-	-	-	8.1	8.9	7.6	7.5	7.2	9.2	7.7	8.7	7.6	
				Max/m				1.4	1.5	1.3	1.3	1.2	1.4	1.5	1.4	1.5	
11	SAN VICENTE	465.41	83.76	Hm	5.3	7.1	7.1	7.0	8.1	-	-	6.3	6.9	7.1	8.9	6.6	5.3 - 8.9
				Hmax	11.0	11.2	12.9	9.9	18.0	-	-	12.1	14.3	15.7	17.0	15.6	
				Max/m	2.1	1.6	1.8	1.4	2.2			1.9	2.1	2.2	1.9	2.4	
12	BOCA DEL MASPARRO	453.59	80.94	Hm	3.6	6.1	5.2	5.0	6.0	-	-	5.2	6.4	5.8	5.7	5.6	3.6 - 6.4
				Hmax	10.9	9.7	10.9	6.2	13.9	-	-	7.7	8.4	8.3	10.2	8.3	
				Max/m	3.0	1.6	2.1	1.2	2.3			1.5	1.3	1.4	1.8	1.5	
13	BRUZUAL	442.14	81.03	Hm	7.2	7.4	9.0	8.1	9.9	8.3	9.0	-	-	-	9.8	8.7	7.2 - 9.9
				Hmax	9.9	10.8	15.3	12.5	22.8	17.8	15.5	-	-	-	19.8	18.6	
				Max/m	1.4	1.5	1.7	1.5	2.3	2.1	1.7				2.0	2.1	

Table 3.3.2 CHANGES OF CHANNEL DEPTH (2/3)

CAHNNEL DEPTH OF APURE AND PORTUGUESA RIVERS

SER. NO. SECTION	DISTANCE (KM)	GR.EL. (M,MCL)		DEPTH (M) 8802	8805	8808	8904	8908	8912	9003	9005	9011	9105	9108	9203	RANGE
14 EL CHINAL	397.07	74.00	Hm	-	-	-	-	-	-	-	6.4	7.3	6.7	6.1	6.1	6.1 - 7.3
			Hmax	-	-	-	-	-	-	-	9.5	11.0	8.1	9.7	8.3	
			Max/m								1.5	1.5	1.2	1.6	1.4	
15 EL SAMAN	348.12	64.92	Hm	-	-	6.5	-	6.4	6.2	6.5	5.5	6.3	6.1	6.8	5.8	5.5 - 6.8
			Hmax	-	-	9.8	-	8.8	8.8	8.8	7.8	8.8	8.3	8.9	8.5	
			Max/m			1.5		1.4	1.4	1.4	1.4	1.4	1.4	1.3	1.5	
16 APURITO	319.79	61.05	Hm	-	-	-	5.9	6.3	5.0	6.3	5.5	4.0	5.3	5.8	5.4	4.0 - 6.3
			Hmax	-	-	-	9.8	9.8	11.2	10.3	10.5	7.8	9.0	13.3	9.3	
			Max/m				1.7	1.6	2.2	1.7	1.9	1.9	1.7	2.3	1.7	
17 CHAMIZAL	230.36	49.39	Hm	5.7	6.1	5.2	6.6	7.1	6.9	7.1	6.9	6.5	-	6.1	6.9	5.2 - 7.1
			Hmax	7.8	9.3	8.5	9.5	9.2	9.6	8.8	8.9	9.1	-	8.3	8.9	
			Max/m	1.4	1.5	1.6	1.4	1.3	1.4	1.2	1.3	1.4		1.4	1.3	
18 LAS CULATAS	195.72	45.52	Hm	8.0	6.8	7.9	8.8	8.1	-	-	8.2	7.6	8.4	8.1	8.5	6.8 - 8.8
			Hmax	10.3	8.7	11.0	10.9	12.1	-	-	9.5	10.8	10.0	11.3	11.3	
			Max/m	1.3	1.3	1.4	1.2	1.5			1.2	1.4	1.2	1.4	1.3	
19 LAS GUANOTAS	191.23	45.33	Hm	7.3	9.8	7.7	7.7	7.3	-	-	7.2	8.8	-	8.1	9.1	7.2 - 9.8
			Hmax	18.9	18.2	19.5	18.6	17.6	-	-	16.0	18.7	-	19.0	15.0	
			Max/m	2.6	1.9	2.5	2.4	2.4			2.2	2.1		2.3	1.6	
20 SAN FERNANDO	180.47	45.19	Hm	8.1	7.8	7.2	7.5	8.0	-	-	-	7.8	-	-	7.4	7.2 - 8.1
			Hmax	14.9	14.6	15.5	13.9	14.7	-	-	-	14.2	-	-	12.5	
			Max/m	1.8	1.9	2.2	1.9	1.8				1.8			1.7	
21 EL NEGRO	170.59	43.00	Hm	-	-	-	-	-	-	-	-	-	-	-	11.9	11.9
			Hmax	-	-	-	-	-	-	-	-	-	-	-	22.2	
			Max/m												1.9	
22 EL JOBAL	152.48	43.47	Hm	9.5	9.3	8.2	7.9	7.9	-	-	5.6	-	-	9.2	6.2	5.6 - 9.5
			Hmax	15.5	14.7	15.7	16.3	16.0	-	-	15.3	-	-	15.7	13.5	
			Max/m	1.6	1.6	1.9	2.1	2.0			2.7			1.7	2.2	
23 CHIREL I	143.34	43.47	Hm	-	-	-	-	-	-	-	9.0	-	9.1	9.2	7.1	7.1 - 9.2
			Hmax	-	-	-	-	-	-	-	15.3	-	17.4	17.2	13.7	
			Max/m								1.7		1.9	1.9	1.9	
24 ARICHUNA	122.90	41.21	Hm	-	5.3	4.9	-	5.2	5.7	5.4	4.6	-	5.9	4.6	6.3	4.6 - 6.3
			Hmax	-	6.9	7.2	-	6.9	7.5	7.7	6.5	-	7.1	6.1	6.9	
			Max/m		1.3	1.5		1.3	1.3	1.4	1.4		1.2	1.3	1.1	
25 EL SAUSAL	83.46	36.85	Hm	6.4	5.5	6.3	6.5	6.5	7.0	6.9	6.1	6.1	6.9	-	7.5	5.5 - 7.5
			Hmax	8.6	8.0	8.5	8.5	8.6	9.2	9.8	8.2	8.2	8.7	-	9.9	
			Max/m	1.3	1.5	1.4	1.3	1.3	1.3	1.4	1.3	1.3	1.3		1.3	
26 LA MACIERA	49.27	36.79	Hm	8.3	8.5	-	7.8	10.1	-	-	8.0	-	8.8	-	9.9	7.8 -10.1
			Hmax	14.1	13.9	-	14.3	18.4	-	-	12.4	-	12.3	-	13.9	
			Max/m	1.7	1.6		1.8	1.8			1.6		1.4		1.4	

Table 3.3.2 CHANGES OF CHANNEL DEPTH (3/3)

CAHNNEL DEPTH OF APURE AND PORTUGUESA RIVERS

SER. SECTION NO.	DISTANCE (KM)	GR.EL. (M,MCL)		DEPTH (M) 8802	8805	8808	8904	8908	8912	9003	9005	9011	9105	9108	9203	RANGE
27 EL MAMON	41.20	38.00	Hm	-	-	-	-	-	-	-	8.5	-	9.1	-	9.3	8.5 - 9.3
			Hmax	-	-	-	-	-	-	-	12.1	-	12.6	-	12.5	
			Max/m								1.4		1.4		1.3	
28 EL PERRO	10.47	35.92	Hm	8.3	10.1	8.7	11.4	10.4	6.7	10.0	9.1	8.3	9.8	-	10.4	6.7 -11.4
			Hmax	12.3	15.1	13.4	19.7	15.5	14.3	15.2	13.6	19.3	18.9	-	15.0	
			Max/m	1.5	1.5	1.5	1.7	1.5	2.1	1.5	1.5	2.3	1.9		1.4	
PORTUGUESA RIVER																
29 ST.ROSALIA	121.01	52.23	Hm	-	-	-	-	-	-	-	-	-	8.6	7.2	8.8	7.2 - 8.8
			Hmax	-	-	-	-	-	-	-	-	-	12.6	13.7	12.6	
			Max/m										1.5	1.9	1.4	
30 CAMAGUAN	44.25	47.80	Hm	-	-	-	8.8	6.2	-	-	6.3	7.6	7.8	7.3	-	6.2 - 8.8
			Hmax	-	-	-	12.7	9.3	-	-	8.4	10.9	11.7	14.1	-	
			Max/m				1.4	1.5			1.3	1.4	1.5	1.9		
31 SOMBRERITO	6.00	45.88	Hm	8.8	7.5	-	8.0	7.5	-	-	6.8	-	8.4	7.9	-	6.8 - 8.8
			Hmax	14.7	12.6	-	12.5	12.7	-	-	11.2	-	11.8	12.5	-	
			Max/m	1.7	1.7		1.6	1.7			1.6		1.4	1.6		

Table 3.4.1 CHARACTERISTICS OF CROSS SECTIONS : GUASDUALITO

1992 (July/1992) — Site : Guasdualito

Sec No.	Distance (km)	River Bank Elev (m,MSL) <Hb>	River Width (m) <B>	Channel Depth (Max) (m) <hmax>	(Mean) (m) <hm>	River Bed Elevation (Lowest) (m,MSL) <Hmax>	(Mean) (m,MSL) <Hm>	Dist to hmax fr L-Bank (m) <E>	Area (B*hm) (m2)	|E-B/2|/B	hmax/hm
G-48	0.00	124.63	354	7.62	3.26	117.01	121.37	325	1153	0.42	2.34
G-47	0.43	124.77	185	7.83	4.89	115.94	119.88	38	905	0.29	1.60
G-46	1.05	124.77	293	6.42	3.96	118.35	120.81	282	1159	0.46	1.62
G-45	1.55	124.89	307	5.81	3.67	119.08	121.22	231	1127	0.25	1.58
G-44	2.05	124.74	247	5.75	3.66	118.99	121.08	238	903	0.46	1.57
G-43	2.56	125.33	211	5.60	3.98	119.73	121.35	184	839	0.37	1.41
G-42	3.08	124.82	165	5.05	4.12	119.77	120.70	148	680	0.40	1.23
G-41	3.72	125.68	279	4.55	3.29	121.13	122.39	268	917	0.46	1.38
G-40	4.16	127.23	204	6.76	4.90	120.47	122.33	42	1000	0.29	1.38
G-39	4.73	125.87	170	8.29	4.87	117.58	121.00	21	829	0.38	1.70
G-38	5.06	125.75	354	4.79	2.47	120.96	123.28	12	876	0.47	1.94
G-37	5.59	126.17	286	5.87	3.37	120.30	122.80	17	965	0.44	1.74
G-36	6.10	126.33	266	5.09	3.65	121.24	122.68	21	972	0.42	1.39
G-35	6.54	126.10	326	3.75	2.73	122.35	123.35	47	895	0.36	1.37
G-34	7.00	126.25	254	5.50	3.06	120.75	123.19	94	778	0.13	1.80
G-33	7.78	126.95	342	5.95	3.20	121.00	123.75	16	1096	0.45	1.86
G-32	8.31	126.76	173	6.70	4.31	120.06	122.45	164	746	0.45	1.55
G-31	8.76	126.85	287	4.77	3.14	122.08	123.71	268	900	0.43	1.52
G-30	9.26	128.25	346	6.32	3.87	121.93	124.38	296	1300	0.38	1.63
G-29	9.73	127.27	297	5.24	3.24	122.03	124.03	239	961	0.30	1.62
G-28	10.25	127.53	260	5.36	3.27	122.17	124.26	140	851	0.04	1.64
G-27	10.72	127.49	526	6.24	1.88	121.25	125.61	13	987	0.48	3.32
G-26	11.15	127.73	453	6.13	2.47	121.60	125.26	11	1121	0.48	2.48
G-25	11.65	128.44	180	6.79	4.57	121.65	123.87	100	822	0.06	1.49
G-24	12.16	129.01	192	6.10	4.72	122.91	124.29	159	906	0.33	1.29
G-23	12.68	127.95	149	7.59	3.79	120.36	124.16	42	565	0.22	2.00
G-22	13.16	128.38	179	10.39	4.80	117.99	123.58	14	858	0.42	2.17
G-21	13.61	128.32	298	9.18	2.81	119.14	125.51	259	837	0.37	3.27
G-20	13.96	128.46	283	8.23	3.31	120.23	125.15	249	937	0.38	2.49
G-19	14.36	128.44	140	7.48	4.16	120.96	124.28	15	583	0.39	1.80
G-18	14.78	128.67	242	8.69	3.32	119.98	125.35	48	805	0.30	2.61
G-17	15.17	128.65	231	3.73	2.65	124.92	126.00	108	613	0.03	1.41
G-16	15.59	129.07	287	8.49	2.68	120.58	126.39	259	770	0.40	3.17
G-15	16.15	129.02	193	6.29	3.81	122.73	125.18	9	742	0.45	1.64
G-14	16.60	129.20	277	7.00	3.35	122.20	125.85	21	929	0.42	2.09
G-13	17.05	129.48	215	5.56	3.88	123.92	125.60	159	834	0.24	1.43
G-12	17.60	129.51	214	5.71	4.16	123.80	125.35	58	890	0.23	1.37
G-11	18.23	129.76	362	5.88	2.73	123.88	127.03	17	989	0.45	2.15
G-10	18.71	129.82	339	3.94	2.98	125.88	126.84	88	1070	0.25	1.32
G-9	19.20	130.41	253	6.79	3.62	123.62	126.79	223	916	0.38	1.87
G-8	19.70	130.07	327	4.11	3.12	125.96	126.95	305	1020	0.43	1.32
G-7	20.28	131.03	339	6.07	4.01	124.96	126.99	32	1369	0.41	1.50
G-6	20.89	130.33	200	5.74	3.90	124.59	126.43	17	781	0.42	1.47
G-5	21.39	131.58	268	6.70	4.54	124.88	127.05	250	1214	0.43	1.48
G-4	21.81	130.74	197	5.28	4.15	125.46	126.59	51	817	0.24	1.27
G-3	21.91	130.69	180	6.27	4.32	121.42	126.37	31	778	0.33	1.45
G-2	22.09	132.11	184	9.38	5.25	122.73	126.86	28	966	0.35	1.79
G-1	22.32	130.64	283	4.65	3.28	125.99	127.36	11	928	0.46	1.42

1993 (February/1993)

Sec No.	River Width (m) <B>	Channel Depth (Max) (m) <hmax>	(Mean) (m) <hm>	River Bed Elevation (Lowest) (m,MSL) <Hmax>	(Mean) (m,MSL) <Hm>	Dist. to hmax fr. L-Bank (m) <E>	Area (B*hm) (m2)	|E-B/2|/B	hmax/hm
G-48	354	6.63	3.07	118.00	121.56	345	1087	0.47	2.16
G-47	183	5.63	4.34	119.14	120.43	31	796	0.33	1.30
G-46	293	7.19	3.45	117.58	121.32	25	1011	0.41	2.08
G-45	307	6.49	3.38	118.40	121.51	280	1036	0.41	1.92
G-44	249	4.46	3.69	120.28	121.05	165	918	0.16	1.21
G-43	227	5.15	3.52	120.18	121.81	216	798	0.45	1.46
G-42	231	5.31	2.97	119.51	121.85	137	685	0.09	1.79
G-41	183	6.66	3.92	119.02	121.76	32	718	0.33	1.70
G-40	204	7.22	5.16	120.01	122.07	15	1053	0.43	1.40
G-39	175	7.03	4.55	118.84	121.32	65	796	0.13	1.55
G-38	177	5.24	3.86	120.51	121.89	50	682	0.22	1.36
G-37	286	5.27	3.67	120.90	122.50	280	1050	0.48	1.44
G-36	268	6.10	2.90	120.23	123.43	60	778	0.28	2.10
G-35	330	6.04	2.91	120.06	123.19	313	959	0.45	2.08
G-34	185	4.55	3.71	121.70	122.54	93	687	0.00	1.23
G-33	348	5.80	3.31	121.15	123.64	9	1152	0.47	1.75
G-32	175	5.31	3.79	121.45	122.97	165	664	0.44	1.40
G-31	289	5.63	2.72	121.22	124.13	276	785	0.46	2.07
G-30	336	7.21	3.58	121.04	124.67	312	1202	0.43	2.02
G-29	297	4.09	3.48	123.18	123.79	184	1035	0.12	1.17
G-28	269	4.99	2.80	122.54	124.73	95	753	0.15	1.78
G-27	526	4.99	1.44	122.50	126.05	500	756	0.45	3.47
G-26	444	5.41	1.94	122.32	125.79	18	863	0.46	2.78
G-25	178	5.52	4.65	122.92	123.79	20	827	0.39	1.19
G-24	192	8.06	5.16	120.95	123.85	168	990	0.38	1.56
G-23	127	6.43	3.93	121.52	124.02	17	499	0.37	1.64
G-22	189	9.35	3.34	119.03	125.04	19	632	0.40	2.80
G-21	167	8.29	4.27	120.03	124.05	152	713	0.41	1.94
G-20	275	8.51	3.59	119.95	124.87	220	987	0.30	2.37
G-19	130	6.97	4.07	121.47	124.37	14	529	0.39	1.71
G-18	162	9.12	3.04	119.55	125.63	13	492	0.42	3.00
G-17	288	5.83	2.36	122.82	126.29	275	679	0.45	2.47
G-16	219	6.22	2.87	122.85	126.20	211	629	0.46	2.17
G-15	214	5.09	3.34	123.93	125.68	13	715	0.44	1.52
G-14	242	5.22	3.34	123.98	125.86	8	809	0.47	1.56
G-13	223	6.48	3.68	123.00	125.80	12	823	0.45	1.76
G-12	225	5.53	3.59	123.98	125.92	178	806	0.29	1.54
G-11	368	6.50	2.04	123.26	127.72	360	750	0.48	3.19
G-10	359	5.12	3.03	124.70	126.79	350	1086	0.47	1.69
G-9	262	7.40	4.37	123.01	126.04	14	1145	0.45	1.69
G-8	328	5.50	2.72	124.57	127.35	313	891	0.45	2.02
G-7	339	5.97	3.14	125.06	127.89	327	1064	0.46	1.90
G-6	206	5.09	3.63	125.24	126.70	54	749	0.24	1.40
G-5	268	8.72	4.10	122.86	127.48	13	1099	0.45	2.13
G-4	198	4.78	3.97	125.96	126.77	133	786	0.17	1.20
G-3	180	5.88	4.02	124.81	126.67	20	723	0.39	1.46
G-2	184	8.89	4.84	123.22	127.27	38	890	0.29	1.84
G-1	287	5.87	3.49	124.77	127.15	269	1001	0.44	1.68

Variation of Characteristics (V93-V92)

Sec No.	River Width (m) <B>	Channel Depth (Max) (m) <hmax>	(Mean) (m) <hm>	Area (B*hm) (m2)	Variation of River Bank Left (m)	Right (m)
G-48	0	-0.99	-0.19	-67	0	0
G-47	-2	-2.20	-0.55	-109	1	1
G-46	0	0.77	-0.51	-148	0	0
G-45	0	0.68	-0.29	-91	0	0
G-44	2	-1.29	0.03	15	-2	0
G-43	16	-0.45	-0.46	-41	-16	0
G-42	66	0.26	-1.15	6	-8	-58
G-41	-96	2.11	0.63	-200	96	0
G-40	0	0.46	0.26	52	0	0
G-39	5	-1.26	-0.33	-33	-19	14
G-38	-177	0.45	1.38	-193	2	175
G-37	0	-0.60	0.30	85	0	0
G-36	2	1.01	-0.75	-193	0	-2
G-35	4	2.29	0.16	64	0	-4
G-34	-69	-0.95	0.64	-91	0	69
G-33	6	-0.15	0.11	56	0	-6
G-32	2	-1.39	-0.52	-82	-2	0
G-31	2	0.86	-0.42	-115	-1	-1
G-30	0	0.89	-0.29	-98	0	0
G-29	0	-1.15	0.25	74	0	0
G-28	9	-0.37	-0.47	-98	-4	-5
G-27	0	-1.25	-0.44	-231	-70	70
G-26	-9	-0.72	-0.53	-258	-1	10
G-25	-2	-1.27	0.08	5	0	2
G-24	0	1.96	0.44	84	0	0
G-23	-22	-1.16	0.14	-66	10	12
G-22	10	-1.04	-1.45	-227	-10	0
G-21	-131	-0.89	1.46	-125	180	-49
G-20	-8	0.28	0.28	51	50	-42
G-19	-10	-0.51	-0.10	-54	-45	55
G-18	-80	0.43	-0.28	-312	0	80
G-17	57	2.10	-0.29	67	0	-57
G-16	-68	-2.27	0.19	-141	130	-62
G-15	21	-1.20	-0.50	-26	-63	42
G-14	-35	-1.78	-0.01	-120	-2	37
G-13	8	0.92	-0.19	-11	-3	-5
G-12	11	-0.18	-0.57	-84	-11	0
G-11	6	0.62	-0.69	-239	-2	-4
G-10	0	1.18	0.04	16	0	0
G-9	9	0.61	0.75	229	-9	0
G-8	1	1.39	-0.40	-129	0	-1
G-7	0	-0.10	-0.90	-305	0	0
G-6	6	-0.65	-0.27	-32	-6	0
G-5	0	2.02	-0.43	-116	0	0
G-4	1	-0.50	-0.18	-31	-1	0
G-3	0	-0.39	-0.30	-55	0	0
G-2	0	-0.49	-0.41	-76	0	0
G-1	4	1.22	0.21	73	-3	-1

Table 3.4.2 CHARACTERISTICS OF CROSS SECTIONS : BRUZUAL

Site : Bruzual

Sec. No.	Distance (km)	River Bank Elev. (m,MSL) <Hb>	1992 River Width (m) <B>	1992 Channel Depth (Max) (m) <hmax>	1992 Channel Depth (Mean) (m) <hm>	1992 River Bed Elevation (Lowest) (m,MSL) <Hmax>	1992 River Bed Elevation (Mean) (m,MSL) <Hm>	1992 Dist. to hmax fr. L-Bank (m) <E>	1992 Area (B*hm) (m2)	1992 |E-B/2|/B	1992 hmax/hm
			June/1992								
B-00	0.00	78.62	407	6.23	4.81	72.39	73.81	435	1956	0.57	1.30
B-01	0.46	78.52	368	7.96	5.11	70.56	73.41	149	1882	0.10	1.56
B-02	0.94	78.73	675	8.15	4.14	70.58	74.59	33	2793	0.45	1.97
B-03	1.48	79.04	501	5.90	5.21	73.14	73.83	14	2608	0.47	1.13
B-04	2.01	80.45	310	9.21	6.61	71.24	73.84	120	2048	0.11	1.39
B-05	2.11	80.19	303	9.75	6.39	70.44	73.80	44	1937	0.35	1.52
B-06	2.25	81.03	383	19.67	7.63	61.36	73.40	127	2922	0.17	2.58
B-07	2.77	78.91	481	8.27	4.74	70.64	74.17	399	2280	0.33	1.74
B-08	3.22	78.71	560	8.16	4.32	70.55	74.39	525	2417	0.44	1.89
B-09	3.71	79.05	395	6.93	4.99	72.12	74.06	260	1969	0.16	1.39
B-10	4.26	79.16	367	6.34	5.02	72.82	74.14	23	1843	0.44	1.26
B-11	4.82	79.34	392	7.57	4.60	71.77	74.74	292	1802	0.24	1.65
B-12	5.22	79.43	660	7.09	4.50	72.34	74.93	545	2970	0.33	1.58
B-13	5.62	79.85	590	7.55	4.72	72.30	75.13	39	2786	0.43	1.60
B-14	6.36	79.34	435	5.63	4.69	73.71	74.65	212	2041	0.01	1.20
B-15	6.86	79.81	482	8.02	4.48	71.79	75.33	445	2158	0.42	1.79
B-16	7.31	79.97	502	7.76	4.22	72.21	75.75	485	2116	0.47	1.84
B-17	8.03	80.27	349	7.25	5.75	73.02	74.52	197	2006	0.06	1.26
B-18	8.61	80.60	226	9.23	8.38	71.37	72.22	138	1895	0.11	1.10
B-19	9.10	80.67	319	7.96	5.95	72.71	74.74	20	1890	0.44	1.34
B-20	9.86	80.58	408	7.33	5.30	73.25	75.28	164	2161	0.10	1.38
B-21	10.34	80.89	271	9.90	5.55	70.99	75.34	31	1504	0.39	1.78
B-22	10.73	80.47	272	9.89	7.20	70.58	73.27	251	1957	0.42	1.37
B-23	11.34	80.60	539	7.55	4.78	73.05	75.82	497	2579	0.42	1.58
B-24	12.14	81.10	613	8.19	4.84	72.91	76.26	436	2968	0.21	1.69
B-25	12.82	81.17	297	8.83	6.12	72.34	75.05	263	1816	0.39	1.44
B-26	13.32	81.13	293	8.90	5.75	72.23	75.38	44	1684	0.35	1.55
B-27	14.05	81.21	308	7.67	5.54	73.54	75.67	23	1707	0.43	1.38
B-29	14.48	81.16	321	6.41	5.29	74.75	75.87	227	1698	0.21	1.21
B-30	15.00	81.08	265	9.16	6.30	71.92	74.78	16	1669	0.44	1.45
B-31	15.45	81.50	468	9.60	5.39	71.90	76.11	39	2522	0.42	1.78
B-32	16.05	81.51	442	5.77	4.47	75.74	77.04	17	1975	0.46	1.29
B-33	16.67	81.66	374	5.67	4.39	75.99	77.27	36	1641	0.40	1.29
B-35	17.58	82.01	679	7.67	4.69	74.34	77.32	642	3187	0.45	1.63
B-36	18.37	82.06	354	6.61	4.77	75.45	77.29	258	1689	0.23	1.39
B-37	19.29	82.11	482	6.49	4.13	75.62	77.98	332	1991	0.19	1.57
B-38	19.94	82.10	432	8.73	4.38	73.37	77.72	36	1892	0.42	1.99
B-42	20.35	82.46	427	7.03	4.75	75.43	77.71	5	2028	0.49	1.48
B-43	20.73	82.48	388	5.63	4.54	76.85	77.94	376	1761	0.47	1.24
B-44	21.38	82.59	183	8.34	6.38	74.25	76.21	130	1168	0.21	1.31
B-45	22.00	82.74	285	7.25	5.04	75.49	77.70	263	1436	0.42	1.44

Sec. No.	1993 River Width (m) <B>	1993 Channel Depth (Max) (m) <hmax>	1993 Channel Depth (Mean) (m) <hm>	1993 River Bed Elevation (Lowest) (m,MSL) <Hmax>	1993 River Bed Elevation (Mean) (m,MSL) <Hm>	1993 Dist. to hmax fr. L-Bank (m) <E>	1993 Area (B*hm) (m2)	1993 |E-B/2|/B	1993 hmax/hm
	Feb.-Mar./1993								
B-00	407	6.21	5.29	72.41	73.33	314	2152	0.27	1.17
B-01	368	8.72	4.02	69.80	74.50	122	1480	0.17	2.17
B-02	669	10.35	3.66	68.38	75.07	24	2451	0.46	2.82
B-03	505	6.96	5.40	72.08	73.64	13	2727	0.47	1.29
B-04	310	10.53	7.13	69.92	73.32	38	2209	0.38	1.48
B-05	303	11.79	6.70	68.40	73.49	92	2030	0.20	1.76
B-06	383	17.01	5.58	64.02	75.45	33	2136	0.41	3.05
B-07	517	7.69	5.07	71.22	73.84	483	2623	0.43	1.52
B-08	566	6.50	4.11	72.21	74.60	486	2325	0.36	1.58
B-09	398	6.42	4.77	72.63	74.28	178	1901	0.05	1.34
B-10	387	9.65	4.66	69.51	74.50	20	1803	0.45	2.07
B-11	404	7.33	4.20	72.01	75.14	14	1698	0.47	1.74
B-12	655	7.34	2.61	72.09	76.82	580	1711	0.39	2.81
B-13	600	8.26	2.76	71.59	77.09	97	1659	0.34	2.99
B-14	431	7.43	5.13	71.91	74.21	278	2213	0.15	1.45
B-15	549	7.61	4.03	72.20	75.78	488	2213	0.39	1.89
B-16	556	8.01	3.99	71.96	75.98	534	2218	0.46	2.01
B-17	358	8.63	5.76	71.64	74.51	312	2062	0.37	1.50
B-18	238	8.39	7.03	72.21	73.57	201	1676	0.34	1.19
B-19	320	8.88	5.70	71.79	74.97	55	1824	0.33	1.56
B-20	390	9.56	5.03	71.02	75.55	52	1959	0.37	1.90
B-21	225	9.90	7.09	70.99	73.80	41	1596	0.32	1.40
B-22	497	7.64	4.44	72.83	76.03	355	2208	0.21	1.72
B-23	584	8.16	4.80	72.44	75.80	566	2803	0.47	1.70
B-24	571	7.16	4.73	73.94	76.37	397	2700	0.20	1.51
B-25	297	7.18	6.00	73.99	75.17	253	1781	0.35	1.20
B-26	293	8.48	6.02	72.65	75.11	270	1763	0.42	1.41
B-27	310	7.87	5.36	73.34	75.85	28	1662	0.41	1.47
B-29	329	7.11	4.98	74.05	76.18	8	1638	0.48	1.43
B-30	270	11.39	6.23	69.69	74.85	68	1683	0.25	1.83
B-31	483	7.58	4.82	73.92	76.68	470	2329	0.47	1.57
B-32	450	7.74	4.06	73.77	77.45	289	1828	0.14	1.91
B-33	156	6.81	5.14	74.85	76.52	78	802	0.00	1.32
B-35	684	7.87	3.25	74.14	78.76	651	2221	0.45	2.42
B-36	363	6.31	5.12	75.75	76.94	167	1860	0.04	1.23
B-37	487	7.42	3.20	74.69	78.91	140	1558	0.21	2.32
B-38	500	8.53	4.22	73.57	77.88	57	2112	0.39	2.02
B-42	432	6.58	4.92	75.58	77.54	220	2126	0.01	1.34
B-43	395	8.34	3.50	74.14	78.98	378	1383	0.46	2.38
B-44	256	8.96	4.57	73.63	78.02	223	1172	0.37	1.96
B-45	285	6.02	5.06	76.72	77.68	38	1443	0.37	1.19

Sec. No.	Variation of Characteristics (V93-V92): River Width (m) <B>	Channel Depth (Max) (m) <hmax>	Channel Depth (Mean) (m) <hm>	Area (B*hm) (m2)	Variation of River Bank Left (m)	Variation of River Bank Right (m)
B-00	0	-0.02	0.48	196	0	0
B-01	0	0.76	-1.09	-402	0	0
B-02	-6	2.20	-0.47	-342	6	0
B-03	4	1.06	0.19	119	-4	0
B-04	0	1.32	0.52	161	0	0
B-05	0	2.04	0.31	93	0	0
B-06	0	-2.66	-2.05	-786	0	0
B-07	36	-0.58	0.33	343	0	-36
B-08	6	-1.66	-0.21	-92	0	-6
B-09	3	-0.51	-0.21	-68	0	-3
B-10	20	3.31	-0.36	-39	-10	-10
B-11	12	-0.24	-0.40	-105	-12	0
B-12	-5	0.25	-1.89	-1259	5	0
B-13	10	0.71	-1.96	-1128	0	-10
B-14	-4	1.80	0.44	172	0	4
B-15	67	-0.41	-0.45	55	0	-67
B-16	54	0.25	-0.23	102	0	-54
B-17	9	1.38	0.01	56	3	-12
B-18	12	-0.84	-1.35	-219	0	-12
B-19	1	0.92	-0.22	-66	0	-1
B-20	-18	2.23	-0.27	-202	0	18
B-21	-46	0.00	1.54	92	0	46
B-22	225	-2.25	-2.75	250	0	-225
B-23	45	0.61	0.01	224	0	-45
B-24	-42	-1.03	-0.11	-269	45	-3
B-25	0	-1.65	-0.12	-35	0	0
B-26	0	-0.42	0.27	79	0	0
B-27	2	0.20	-0.18	-45	0	-2
B-29	8	0.70	-0.31	-61	-8	0
B-30	5	2.23	-0.06	14	-2	-3
B-31	15	-2.02	-0.57	-194	0	-15
B-32	8	1.97	-0.41	-147	0	-8
B-33	-218	1.14	0.75	-839	232	-14
B-35	5	0.20	-1.45	-966	-5	0
B-36	9	-0.30	0.35	171	0	-9
B-37	5	0.93	-0.93	-433	-4	-1
B-38	68	-0.20	-0.15	220	-68	0
B-42	5	-0.45	0.17	98	0	-5
B-43	7	2.71	-1.04	-378	0	-7
B-44	73	0.62	-1.81	4	-49	-24
B-45	0	-1.23	0.03	8	5	-5

Table 3.4.3 CHARACTERISTICS OF CROSS SECTIONS : CAMAGUAN

Sec. No.	Distance (km)	River Bank Elev. (m,MSL) <Hb>	1992 River Width (m) <B>	Channel Depth (Max) (m) <hmax>	(Mean) (m) <hm>	River Bed Elevation (Lowest) (m,MSL) <Hmax>	(Mean) (m,MSL) <Hm>	Dist. to hmax fr. L-Bank (m) <E>	Area (B*hm) (m2)	|E-B/2|/B	hmax/hm
- Site : Camaguan -			July/1992								
C-1	0.00	47.43	140	9.87	6.64	37.56	40.79	8	930	0.44	1.49
C-2	0.20	47.48	151	10.42	6.47	37.06	41.01	32	976	0.29	1.61
C-3	0.38	47.45	126	10.90	7.54	36.55	39.91	24	950	0.31	1.45
C-4	0.43	47.50	130	11.12	6.83	36.38	40.67	32	888	0.25	1.63
C-5	0.59	48.27	113	11.94	9.01	36.33	39.26	27	1018	0.26	1.33
C-6	0.76	47.89	123	13.50	8.47	34.39	39.42	56	1042	0.04	1.59
C-7	0.87	48.56	196	12.24	9.01	36.32	39.55	63	1765	0.18	1.36
C-8	1.30	47.42	153	9.33	6.36	38.09	41.06	110	973	0.22	1.47
C-9	1.49	47.85	142	9.23	7.41	38.62	40.44	123	1052	0.37	1.25
C-10	1.78	47.80	136	10.04	7.46	37.76	40.34	105	1015	0.27	1.35
C-11	2.09	47.60	99	12.06	10.07	35.54	37.53	59	997	0.10	1.20
C-12	2.31	47.99	103	15.29	8.35	32.70	39.64	51	860	0.00	1.83
C-13	2.45	47.84	113	12.66	7.69	35.18	40.15	81	869	0.22	1.65
C-14	2.65	47.89	159	9.27	6.97	38.62	40.92	135	1109	0.35	1.33
C-15	2.90	47.72	145	8.79	6.97	38.93	40.75	100	1010	0.19	1.26
C-16	3.18	47.81	155	8.62	7.28	39.19	40.53	54	1129	0.15	1.18
C-17	3.60	47.66	166	8.89	7.07	38.77	40.59	32	1174	0.31	1.26
C-18	3.96	48.07	129	10.71	8.27	37.36	39.80	99	1066	0.27	1.30
C-19	4.24	47.98	126	15.08	7.75	32.90	40.23	91	977	0.22	1.95
C-20	4.56	47.92	118	19.94	10.71	27.98	37.21	83	1264	0.20	1.86
C-21	4.87	47.98	142	10.77	7.31	37.21	40.67	119	1038	0.34	1.47
C-22	5.20	47.69	197	8.99	5.39	38.70	42.30	44	1062	0.28	1.67
C-23	5.52	47.60	180	9.61	6.16	37.99	41.44	28	1109	0.34	1.56
C-24	5.79	47.85	148	10.95	7.23	36.90	40.62	31	1070	0.29	1.51
C-25	6.12	48.03	124	11.12	7.89	36.91	40.14	37	979	0.24	1.41
C-26	6.38	47.77	148	10.75	6.97	37.02	40.80	33	1032	0.28	1.54
C-27	6.61	47.90	150	12.18	7.17	35.72	40.73	38	1075	0.25	1.70
C-28	6.79	47.98	169	12.65	6.68	35.33	41.30	34	1129	0.30	1.89
C-29	6.99	48.27	122	10.43	8.04	37.84	40.25	99	981	0.31	1.30
C-30	7.25	48.00	154	10.59	6.62	37.41	41.38	130	1020	0.34	1.60
C-31	7.49	48.21	141	10.75	6.87	37.46	41.34	127	969	0.40	1.56
C-32	7.72	48.28	139	11.06	7.70	37.22	40.58	118	1070	0.35	1.44
C-33	7.95	48.19	154	9.76	7.05	38.43	41.14	126	1086	0.32	1.38
C-34	8.15	48.36	133	12.75	7.54	35.61	40.82	103	1003	0.27	1.69
C-35	8.34	48.21	121	10.89	8.28	37.32	39.93	23	1002	0.31	1.31
C-36	8.56	48.33	120	11.95	8.00	36.38	40.34	22	959	0.32	1.49
C-37	8.80	48.52	114	11.95	8.66	36.57	39.86	32	988	0.22	1.38
C-38	9.03	47.98	121	11.92	7.99	36.06	39.99	34	967	0.22	1.49
C-39	9.22	48.07	125	12.46	7.27	35.61	40.80	33	909	0.24	1.71
C-40	9.43	48.09	145	12.24	6.73	35.85	41.36	51	976	0.15	1.82
C-41	9.60	48.16	107	11.68	8.52	36.48	39.64	65	912	0.11	1.37
C-42	9.78	47.91	113	11.58	8.05	36.33	39.86	39	910	0.15	1.44
C-43	9.96	48.42	145	9.59	7.63	38.83	40.79	55	1107	0.12	1.26
C-44	10.16	47.87	170	8.34	6.11	39.53	41.76	45	1038	0.24	1.37
C-45	10.39	47.58	149	7.62	6.37	39.96	41.21	73	949	0.01	1.20
C-46	10.54	47.53	173	8.68	6.01	38.85	41.52	30	1040	0.33	1.44
C-47	10.76	48.17	143	8.30	6.90	39.87	41.27	100	987	0.20	1.20
C-48	10.99	48.01	147	8.21	6.94	39.80	41.07	23	1020	0.34	1.18
C-49	11.22	48.35	130	9.13	7.73	39.22	40.62	20	1005	0.35	1.18
C-50	11.48	48.20	134	9.47	7.11	38.73	41.06	99	957	0.21	1.33
C-51	11.75	48.36	148	8.87	7.07	39.49	41.29	118	1046	0.30	1.26
C-52	11.94	48.11	131	8.67	7.36	39.14	40.75	23	965	0.32	1.18

Sec. No.	1993 River Width (m) <B>	Channel Depth (Max) (m) <hmax>	(Mean) (m) <hm>	River Bed Elevation (Lowest) (m,MSL) <Hmax>	(Mean) (m,MSL) <Hm>	Dist. to hmax fr. L-Bank (m) <E>	Area (B*hm) (m2)	|E-B/2|/B	hmax/hm
	March/1993								
C-1	160	10.14	6.23	37.29	41.20	28	997	0.33	1.63
C-2	145	10.55	6.45	36.93	41.03	27	935	0.31	1.63
C-3	134	10.42	7.04	37.03	40.41	22	943	0.34	1.48
C-4	145	10.93	6.01	36.57	41.49	20	872	0.36	1.82
C-5	113	11.33	8.12	36.94	40.15	34	917	0.20	1.40
C-6	123	14.11	8.69	33.78	39.20	62	1069	0.00	1.62
C-7	200	13.52	9.01	35.04	39.55	113	1801	0.07	1.50
C-8	153	9.61	6.03	37.81	41.39	115	922	0.25	1.59
C-9	142	9.23	7.39	38.62	40.46	115	1050	0.31	1.25
C-10	136	9.79	7.24	38.01	40.56	98	984	0.22	1.35
C-11	99	11.50	8.29	36.10	39.31	80	821	0.31	1.39
C-12	103	14.53	9.08	33.46	38.91	58	935	0.06	1.60
C-13	113	13.35	7.87	34.49	39.97	66	889	0.08	1.70
C-14	159	9.11	6.58	38.78	41.31	141	1046	0.39	1.39
C-15	145	8.79	7.06	38.93	40.66	126	1024	0.37	1.24
C-16	155	8.43	6.95	39.38	40.86	18	1078	0.38	1.21
C-17	166	7.91	6.72	39.75	40.94	92	1117	0.05	1.18
C-18	127	10.76	8.51	37.31	39.56	97	1084	0.26	1.26
C-19	126	15.62	7.32	32.36	40.66	73	922	0.08	2.13
C-20	117	20.28	11.98	27.64	35.94	77	1402	0.16	1.69
C-21	142	10.75	7.16	37.23	40.82	118	1017	0.33	1.50
C-22	187	8.47	5.48	39.22	42.21	59	1026	0.18	1.54
C-23	181	9.26	5.53	38.34	42.07	23	1000	0.37	1.67
C-24	143	10.80	6.40	37.05	41.45	25	915	0.33	1.69
C-25	124	11.53	8.13	36.50	39.90	38	1008	0.19	1.42
C-26	148	10.51	6.41	37.26	41.36	29	949	0.30	1.64
C-27	142	12.82	6.83	35.08	41.07	24	970	0.33	1.88
C-28	145	12.57	7.10	35.41	40.88	24	1030	0.33	1.77
C-29	132	10.49	7.66	37.78	40.61	104	1012	0.29	1.37
C-30	157	10.24	6.68	37.76	41.32	139	1049	0.38	1.53
C-31	141	10.96	7.73	37.25	40.48	125	1094	0.38	1.42
C-32	159	10.87	6.96	37.41	41.32	140	1106	0.38	1.56
C-33	156	9.74	7.06	38.45	41.13	129	1101	0.33	1.38
C-34	122	12.71	8.24	35.65	40.12	87	1006	0.21	1.54
C-35	127	10.95	7.82	37.26	40.39	18	993	0.36	1.40
C-36	120	11.95	8.45	36.38	39.88	28	1014	0.27	1.41
C-37	116	12.62	9.06	35.90	39.46	31	1051	0.23	1.39
C-38	121	11.67	7.93	36.31	40.05	35	963	0.21	1.47
C-39	105	12.35	8.71	35.72	39.36	28	914	0.23	1.42
C-40	122	12.16	7.94	35.93	40.15	33	969	0.23	1.53
C-41	101	11.85	9.09	36.31	39.07	63	918	0.12	1.30
C-42	111	12.35	8.98	35.56	38.93	28	993	0.25	1.38
C-43	143	11.02	8.42	37.40	40.00	63	1205	0.06	1.31
C-44	148	8.38	7.01	39.49	40.86	18	1036	0.38	1.20
C-45	145	7.70	6.64	39.88	40.94	44	963	0.20	1.16
C-46	124	7.88	6.59	39.65	40.94	21	817	0.33	1.20
C-47	137	9.04	7.48	39.13	40.69	78	1025	0.07	1.21
C-48	148	8.67	7.25	39.34	40.76	49	1073	0.17	1.20
C-49	130	9.60	7.82	38.75	40.53	18	1017	0.36	1.23
C-50	132	9.43	7.41	38.77	40.79	27	978	0.30	1.27
C-51	140	8.94	7.32	39.42	41.04	94	1025	0.17	1.22
C-52	130	8.68	7.40	39.43	40.71	93	962	0.22	1.17

Sec. No.	Variation of Characteristics (V93-V92) River Width (m) <B>	Channel Depth (Max) (m) <hmax>	(Mean) (m) <hm>	Area (B*hm) (m2)	Variation of River Bank Left (m)	Right (m)
C-1	20	0.27	-0.41	67	0	-20
C-2	-6	0.13	-0.01	-42	3	3
C-3	8	-0.48	-0.50	-6	0	-8
C-4	15	-0.19	-0.82	-16	0	-15
C-5	0	-0.61	-0.89	-100	0	0
C-6	0	0.61	0.22	27	0	0
C-7	4	1.28	0.00	36	0	-4
C-8	0	0.28	-0.33	-51	0	0
C-9	0	0.00	-0.01	-2	0	0
C-10	0	-0.25	-0.22	-30	0	0
C-11	0	-0.56	-1.78	-176	0	0
C-12	0	-0.76	0.73	75	0	0
C-13	0	0.69	0.18	21	0	0
C-14	0	-0.16	-0.39	-63	0	0
C-15	0	0.00	0.10	14	0	0
C-16	0	-0.19	-0.33	-51	0	0
C-17	0	-0.98	-0.35	-58	0	0
C-18	-2	0.05	0.24	17	2	0
C-19	0	0.54	-0.43	-55	0	0
C-20	-1	0.34	1.26	138	0	1
C-21	0	-0.02	-0.15	-21	0	0
C-22	-10	-0.52	0.09	-37	10	0
C-23	1	-0.35	-0.63	-109	-6	5
C-24	-5	-0.15	-0.83	-155	-3	8
C-25	0	0.41	0.23	29	0	0
C-26	0	-0.24	-0.56	-83	-10	10
C-27	-8	0.64	-0.34	-105	0	8
C-28	-24	-0.08	0.42	-99	4	20
C-29	10	0.06	-0.38	30	0	-10
C-30	3	-0.35	0.06	30	0	-3
C-31	0	0.21	0.86	125	0	0
C-32	20	-0.19	-0.74	36	-14	-6
C-33	2	-0.02	0.00	16	0	-2
C-34	-11	-0.04	0.70	3	10	1
C-35	6	0.06	-0.46	-9	-1	-5
C-36	0	0.00	0.46	55	0	0
C-37	2	0.67	0.39	63	-2	0
C-38	0	-0.25	-0.06	-4	0	0
C-39	-20	-0.11	1.44	6	10	10
C-40	-23	-0.08	1.21	-7	13	10
C-41	-6	0.17	0.57	6	3	3
C-42	-2	0.77	0.93	84	2	0
C-43	-2	1.43	0.79	98	1	1
C-44	-22	0.04	0.90	-2	20	2
C-45	-4	0.08	0.27	13	3	1
C-46	-49	-0.80	0.58	-223	23	26
C-47	-6	0.74	0.58	38	0	6
C-48	1	0.46	0.31	53	-1	0
C-49	0	0.47	0.09	12	0	0
C-50	-2	-0.04	0.26	20	1	1
C-51	-8	0.07	0.25	-21	7	1
C-52	-1	0.01	0.03	-3	0	1

Table 4.2.1 N-VALUE ESTIMATED FOR VARIOUS FLOW CONDITIONS : APURE RIVER

Sections	Navigable Period (month)							
	5 (Q210d)	6 (Q180d)	7 (Q150d)	8 (Q120d)	9 (Q 90d)	10 (Q 60d)	11 (Q 30d)	12 (Q 1d)
River Mouth - El Saman	0.015	0.015	0.015	0.015	0.016	0.016	0.017	0.019
El Saman - Bruzual	0.020	0.021	0.024	0.027	0.032	0.035	0.038	0.042
Bruzual - Palmarito	0.025	0.027	0.033	0.039	0.047	0.053	0.060	0.068
Palmarito - Puente Remolino	0.032	0.034	0.037	0.041	0.048	0.054	0.061	0.068

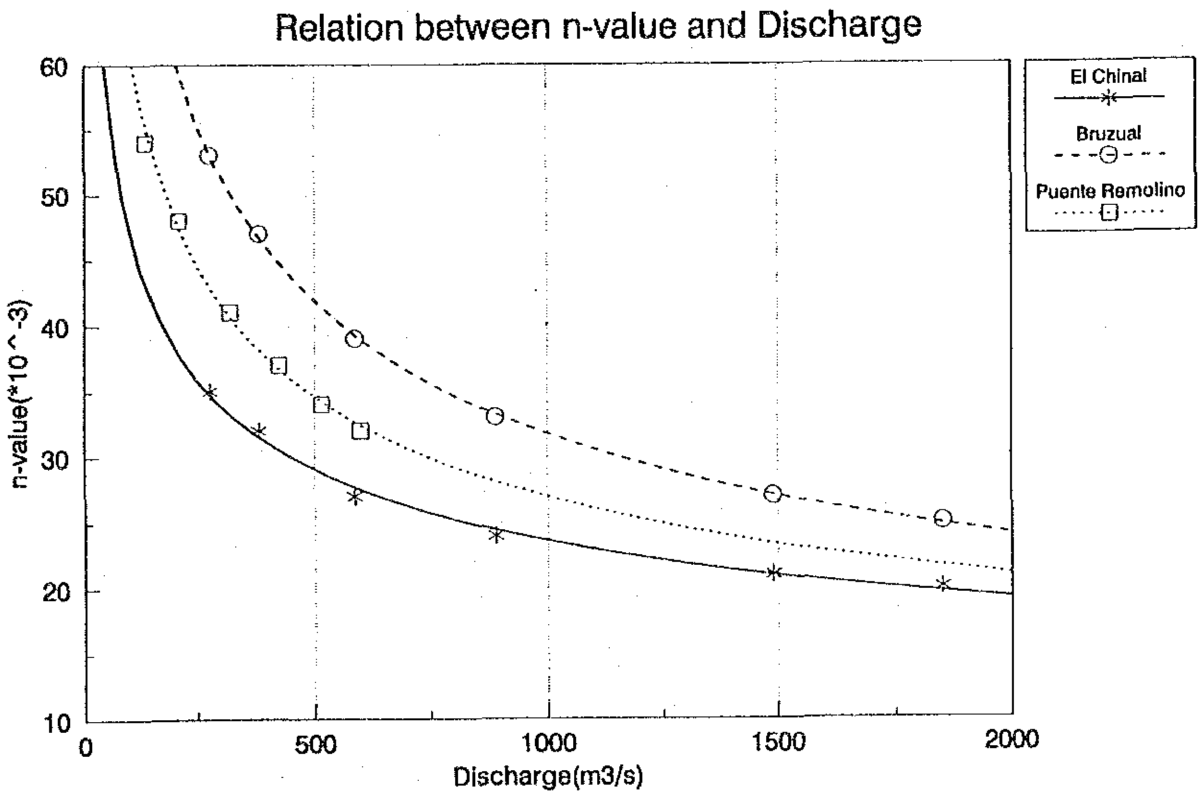


Table 4.2.2 NUMBER OF CRITICAL SECTIONS FOR DEPTH : EXISTING APURE RIVER (1/3)

Case 0 : Existing Apure River

Stretch (km)	Navigation Period (months) 5	6	7	8	9	10	11	12
	Q210d	Q180d	Q150d	Q120d	Q 90d	Q 60d	Q 30d	Q 1d
95.74 - 104	0	0	0	0	1	1	1	1
104 - 108	0	0	1	2	2	3	4	6
108 - 112	0	0	0	0	1	3	3	4
112 - 116	0	0	0	0	0	0	0	0
116 - 120	0	0	0	0	0	4	4	4
120 - 124	0	0	0	0	0	1	1	1
124 - 128	0	0	0	0	1	1	2	3
128 - 132	0	0	0	0	0	0	0	0
132 - 136	0	0	0	0	0	0	0	0
136 - 140	0	0	0	0	0	0	0	0
140 - 144	0	0	0	0	0	0	1	2
144 - 148	0	0	0	0	0	0	1	4
148 - 152	0	0	0	0	0	0	0	0
152 - 156	0	0	0	0	0	0	0	3
156 - 160	0	0	0	0	3	4	4	7
160 - 164	0	0	0	0	0	0	0	0
164 - 168	0	0	0	1	3	4	4	8
Sub-total(St-A1)								
- Sections	0	0	1	3	11	21	25	43
- Length(km)	0.0	0.0	0.2	0.5	1.7	3.2	3.8	6.5
168 - 172	0	0	0	0	0	0	0	0
172 - 176	0	0	0	0	1	1	1	1
176 - 180	0	1	3	5	8	9	10	10
180 - 184	0	0	0	0	0	2	2	4
184 - 188	0	0	0	0	2	2	2	6
188 - 192	0	0	0	1	2	3	3	3
Sub-total(St-A2)								
- Sections	0	1	3	6	13	17	18	24
- Length(km)	-0.0	0.2	0.5	0.9	2.0	2.6	2.7	3.6

Table 4.2.2 NUMBER OF CRITICAL SECTIONS FOR DEPTH : EXISTING APURE RIVER (2/3)

Case 0 : Existing Apure River

Stretch (km)		Navigation Period (months) 5	6	7	8	9	10	11	12
		Q210d	Q180d	Q150d	Q120d	Q 90d	Q 60d	Q 30d	Q 1d
192 -	196	0	0	0	0	0	5	7	8
196 -	200	0	0	0	0	0	2	7	8
200 -	204	0	0	0	5	6	9	9	10
204 -	208	0	0	0	0	2	2	2	3
208 -	212	0	2	4	6	12	15	17	17
212 -	216	0	0	0	0	0	0	1	1
216 -	220	0	0	1	6	7	7	10	10
220 -	224	0	0	1	6	7	11	12	13
224 -	228	0	0	1	7	9	11	12	13
228 -	232	0	0	1	13	16	16	17	17
232 -	236	0	0	0	0	1	1	1	1
236 -	240	0	0	2	3	5	9	9	12
240 -	244	0	0	3	14	16	20	22	22
244 -	248	0	0	0	2	4	4	5	6
248 -	252	0	0	0	4	7	8	11	12
252 -	256	0	0	0	6	9	11	11	11
256 -	260	0	0	0	3	6	6	7	9
260 -	264	0	0	0	0	1	1	1	1
264 -	268	0	0	0	0	0	0	0	0
268 -	272	0	0	0	1	3	6	7	8
272 -	276	0	0	0	5	7	7	8	8
276 -	280	0	0	0	0	3	3	6	6
280 -	284	0	0	0	1	1	3	4	5
284 -	288	0	0	1	5	6	9	10	10
288 -	292	0	0	0	0	0	0	1	1
292 -	296	0	0	0	0	0	0	0	0
296 -	300	0	0	0	0	1	2	2	2
300 -	304	0	0	0	0	1	1	1	1
304 -	308	0	0	0	0	0	0	0	0
308 -	312	0	0	0	0	0	0	0	0
312 -	316	0	0	2	7	7	8	8	8
316 -	320	0	2	5	9	9	11	12	12
320 -	324	0	0	4	8	9	9	10	11
324 -	328	0	0	2	6	6	7	7	7

Case 0 : Existing Apure River

Stretch (km)		Navigation Period (months) 5	6	7	8	9	10	11	12
		Q210d	Q180d	Q150d	Q120d	Q 90d	Q 60d	Q 30d	Q 1d
328 -	332	0	0	1	1	3	3	3	3
332 -	336	0	0	0	5	7	7	7	7
336 -	340	0	0	0	0	0	0	1	4
340 -	344	0	0	0	2	2	2	2	2
344 -	348	0	0	0	2	4	4	4	4
348 -	352	0	0	0	0	0	1	2	3
352 -	356	0	0	0	0	0	0	1	2
356 -	360	0	0	0	0	0	0	0	0
360 -	364	0	0	0	0	0	0	1	2
364 -	368	0	0	0	0	0	3	6	7
366 -	370	0	0	0	0	0	0	0	0
370 -	374	0	0	0	3	6	7	8	8
374 -	378	0	0	0	0	1	1	2	2
378 -	382	0	0	1	2	4	5	6	7
382 -	386	0	0	2	2	2	2	4	5
386 -	390	0	0	0	0	0	4	5	5
390 -	394	0	0	0	0	0	0	0	0
394 -	398	0	0	0	0	0	0	0	0
398 -	402	0	0	0	0	0	0	0	0
402 -	406	0	0	0	0	0	0	1	5
406 -	410	0	0	0	0	0	0	0	0
410 -	414	0	0	0	0	2	2	3	4
414 -	418	0	1	1	1	2	3	3	3
418 -	422	0	0	0	1	2	2	7	9
422 -	426	0	0	1	1	2	2	2	2
426 -	430	0	0	1	2	3	4	7	7
430 -	434	0	0	2	5	5	6	6	8
434 -	438	0	0	0	2	4	4	4	4
438 -	442	0	1	2	2	4	6	9	11
Sub-total(St-A3)									
- Sections		0	6	38	148	214	272	331	367
- Length(km)		0.0	0.9	5.7	22.2	32.1	40.8	49.7	55.1

Table 4.2.2 NUMBER OF CRITICAL SECTIONS FOR DEPTH : EXISTING APURE RIVER (3/3)

Case 0 : Existing Apure River

Stretch (km)	Navigation Period (months) 5	6	7	8	9	10	11	12
	Q210d	Q180d	Q150d	Q120d	Q 90d	Q 60d	Q 30d	Q 1d
442 - 446	0	0	0	3	4	5	5	5
446 - 450	0	0	3	3	6	8	13	14
450 - 454	0	0	0	0	0	1	4	7
454 - 458	0	0	0	1	2	6	7	8
458 - 462	1	2	5	11	17	19	20	21
462 - 466	0	0	0	0	6	13	15	17
466 - 470	0	0	0	1	5	6	10	12
470 - 474	0	0	0	0	2	4	4	5
474 - 478	0	0	0	0	0	2	2	2
478 - 482	0	0	0	0	3	4	4	5
482 - 486	0	0	0	0	0	0	1	1
486 - 490	0	0	0	0	2	2	2	2
490 - 494	0	0	0	0	0	0	0	2
494 - 498	1	1	2	4	4	8	9	13
498 - 502	0	0	1	3	5	6	6	9
502 - 506	2	2	2	4	12	13	13	15
506 - 510	0	0	0	0	1	1	3	7
510 - 514	0	0	0	0	3	4	4	8
514 - 518	0	0	0	2	3	3	3	4
518 - 522	0	0	1	2	3	8	11	12
522 - 526	0	0	0	0	2	3	3	8
526 - 530	1	2	2	4	4	4	7	7
530 - 534	4	5	6	7	8	9	12	14
534 - 538	0	1	1	1	1	1	3	4
538 - 542	1	4	4	6	8	8	9	11
542 - 546	0	1	1	2	4	8	10	12
546 - 550	6	6	6	6	7	8	10	10
550 - 554	0	0	1	2	5	7	7	7
554 - 558	0	0	0	0	0	0	0	0
558 - 562	0	0	0	0	1	4	5	5
562 - 566	0	0	0	2	3	3	3	3
566 - 570	0	0	0	0	2	5	5	5
570 - 574	0	0	1	1	3	8	10	10
574 - 578	0	0	0	0	0	0	1	1

Case 0 : Existing Apure River

Stretch (km)	Navigation Period (months) 5	6	7	8	9	10	11	12
	Q210d	Q180d	Q150d	Q120d	Q 90d	Q 60d	Q 30d	Q 1d
578 - 582	0	0	0	0	2	2	4	5
582 - 586	0	0	0	0	0	0	0	0
586 - 590	0	0	1	2	5	11	11	11
590 - 594	1	1	2	5	7	9	9	9
594 - 598	0	0	0	0	2	3	4	4
598 - 602	0	0	0	0	0	0	0	0
602 - 606	0	0	0	1	2	4	4	5
606 - 610	0	0	1	1	1	2	2	2
610 - 614	0	0	0	0	0	1	3	4
614 - 618	0	0	0	0	1	2	2	3
618 - 622	0	0	0	0	2	2	4	4
622 - 626	0	0	0	0	2	6	7	10
626 - 630	0	0	0	2	5	6	6	6
630 - 634	0	0	1	3	7	12	17	19
634 - 638	0	0	0	0	0	3	5	6
638 - 642	0	0	1	2	5	9	14	16
642 - 646	0	0	1	2	4	5	6	7
646 - 650	0	0	0	0	2	5	6	6
650 - 654	0	0	0	1	3	5	6	10
654 - 658	0	0	0	4	5	5	9	9
658 - 662	1	1	2	4	5	8	11	13
662 - 663.38	0	0	0	3	6	8	8	8
Sub-total(St-A4)								
- Sections	18	26	45	95	192	289	359	423
- Length(km)	2.7	3.9	6.8	14.3	28.8	43.4	53.9	63.5
Total								
- Sections	18	33	87	252	430	599	733	857
- Length(km)	2.7	5.0	13.1	37.8	64.5	89.9	110.0	128.6
- Percentage	0.5	0.9	2.3	6.7	11.4	15.8	19.4	22.6

Table 4.2.3 RIVER WIDTH AT CRITICAL RIVER BED : APURE RIVER

No.	Name	Distance (km)	River Width at Critical River Bed Navigable Period 6month Q180d	 7month Q150d	 - Present Condition - 8month Q120d	 9month Q 90d	 10month Q 60d	 11month Q 30d	 unit ; m 12month Q 1d	Height of Critical River Bed (Water Level - 2 m) Navigable Period 6month Q180d	 7month Q150d	 - Present Condition - 8month Q120d	 9month Q 90d	 10month Q 60d	 unit ; m.MSL 11month Q 30d	 12month Q 1d
1	R.MOUTH	0.00	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2	EL PERRO	10.47	289.0	282.1	277.4	274.8	273.1	256.8	164.7	29.08	27.63	26.63	26.09	25.72	25.48	25.35
3	EL MAMON	41.20	270.8	262.0	174.0	128.3	94.5	76.6	62.7	31.19	29.86	28.82	28.19	27.72	27.38	27.10
4	LA MACIERA	49.27	191.1	184.1	177.6	169.6	160.7	122.4	116.6	31.57	30.22	29.12	28.47	28.00	27.65	27.35
5	66.4K	66.37	181.2	176.4	145.6	135.6	119.5	99.4	73.4	32.24	30.81	29.62	28.90	28.40	28.00	27.67
6	EL SAUSAL	83.46	180.7	175.7	144.1	133.9	113.5	93.5	65.2	32.96	31.60	30.51	29.78	29.28	28.89	28.58
7	570-7(INC)	96.66	196.7	154.3	120.1	99.7	85.0	73.7	63.5	33.73	32.63	31.80	31.24	30.84	30.53	30.25
8	556-1(INC)	109.74	385.1	280.8	103.8	89.9	80.6	76.9	73.6	35.20	34.44	33.80	33.39	33.06	32.84	32.65
9	ARICHUNA	122.90	285.3	190.2	96.7	34.3	0.0	0.0	0.0	36.36	35.57	34.88	34.45	34.13	33.92	33.73
10	534-9(INC)	133.19	230.0	230.0	151.3	133.0	127.3	123.9	121.2	36.80	35.93	35.17	34.70	34.36	34.13	33.94
11	CHIREL I	143.34	176.8	163.0	150.4	137.4	128.0	121.6	116.2	37.35	36.35	35.46	34.91	34.51	34.24	34.02
12	EL JOBAL	152.48	274.3	234.2	174.2	158.4	147.5	140.3	135.0	38.00	36.83	35.77	35.12	34.67	34.35	34.10
13	EL NEGRO	170.59	282.9	274.7	267.5	266.2	259.7	245.6	228.5	38.76	37.36	36.13	35.37	34.85	34.49	34.20
14	SAN FERNANDO	180.47	421.1	180.2	143.9	120.0	110.4	103.6	97.0	39.39	38.14	37.09	36.36	35.84	35.40	34.95
15	LAS GUANOTAS	191.23	197.2	176.0	156.9	139.1	130.7	119.7	108.1	40.53	39.22	37.98	37.01	36.36	35.84	35.33
16	LAS CULATAS	195.72	260.0	251.5	240.2	225.6	126.1	51.5	19.3	40.92	39.53	38.22	37.25	36.60	36.10	35.67
17	454-2(INC)	211.91	195.1	142.6	96.1	60.9	24.4	0.0	0.0	42.66	41.86	41.13	40.74	40.44	40.22	40.16
18	CHAMIZAL	230.36	162.1	153.6	149.2	70.9	50.2	44.6	40.5	44.40	43.56	42.74	42.27	41.90	41.65	41.51
19	418-9(INC)	248.97	69.0	55.0	33.4	23.1	15.9	11.0	8.1	47.22	46.38	45.55	45.11	44.77	44.54	44.40
20	400-7(INC)	266.66	189.1	176.3	162.5	152.7	145.2	139.9	136.6	49.47	48.48	47.50	46.87	46.39	46.05	45.84
21	382-5(INC)	284.36	217.8	151.7	127.0	84.0	63.5	31.2	24.2	51.77	50.93	49.95	49.49	49.08	48.85	48.72
22	364-3(INC)	302.05	370.0	205.0	189.7	111.4	84.3	61.8	59.3	53.73	52.94	52.13	51.46	51.04	50.77	50.61
23	APURITO	319.79	239.5	200.2	165.3	137.4	108.5	98.0	92.1	56.00	55.19	54.37	53.90	53.52	53.26	53.11
24	332-2(INC)	333.89	228.0	196.4	127.6	41.7	10.0	0.0	0.0	58.55	58.04	57.59	57.35	57.16	56.92	56.84
25	EL SAMAN	348.12	295.4	214.7	207.8	199.6	192.9	187.4	184.6	60.33	59.64	58.98	58.60	58.29	58.04	57.91
26	312-4(INC)	364.24	252.1	239.3	156.4	150.8	144.4	138.5	135.6	63.24	62.76	62.27	61.97	61.62	61.30	61.14
27	296-7(INC)	380.74	310.0	249.5	213.5	177.2	147.0	125.0	92.5	65.62	64.77	64.20	63.77	63.36	63.03	62.77
28	EL CHINAL	397.07	199.1	189.1	170.4	129.0	79.6	67.3	57.2	70.00	68.94	68.30	67.83	67.49	67.21	66.98
29	258-8(INC)	412.91	490.0	475.8	324.9	206.3	164.2	140.2	113.7	71.65	70.49	69.81	69.33	68.99	68.72	68.49
30	244-9(INC)	427.07	351.3	339.1	135.0	100.0	75.0	0.0	0.0	72.86	71.85	71.30	70.93	70.66	70.44	70.26
31	BRUZUAL	442.14	258.8	237.8	202.4	182.7	180.0	177.5	174.9	75.50	74.51	73.88	73.33	72.98	72.67	72.34
32	BOCA DEL MASPARRO	453.59	237.3	183.0	144.8	139.0	135.2	133.1	117.5	77.51	76.42	75.70	75.08	74.69	74.31	73.94
33	SAN VICENTE	465.41	141.4	123.7	100.8	83.3	70.3	60.1	53.5	80.06	78.87	77.95	77.19	76.63	76.15	75.69
34	188-5(INC)	482.41	304.5	278.5	253.6	202.7	180.4	154.9	135.2	82.72	82.40	82.00	81.64	81.37	81.06	80.85
35	172-2(INC)	497.89	169.1	164.6	149.8	136.4	125.5	116.2	108.9	84.91	84.77	84.29	83.77	83.35	82.99	82.71
36	QUINTERO	514.01	218.9	218.3	169.5	142.9	124.0	111.6	101.3	88.21	88.06	87.53	87.03	86.67	86.42	86.21
37	BOCA DEL SURIPA	525.68	162.4	154.3	150.7	109.1	96.9	95.9	94.9	90.13	90.01	89.66	89.34	89.10	88.51	88.17
38	ARECOSTON DE LA TIGRA	543.82	187.4	173.2	140.2	48.6	6.4	0.0	0.0	93.37	93.31	93.17	92.94	92.70	92.56	92.48
39	114-12(INC)	557.43	179.7	178.0	140.0	112.7	39.0	24.0	15.0	97.57	97.50	97.33	97.03	96.73	96.58	96.49
40	PALMARITO	570.99	156.3	155.9	152.5	126.3	98.3	75.4	73.8	100.87	100.74	100.46	100.03	99.60	99.38	99.24
41	88-10(INC)	582.64	123.7	99.4	83.2	77.9	72.6	69.8	67.7	103.85	103.61	103.29	103.03	102.77	102.63	102.53
42	SAMANAL	593.45	306.3	277.2	214.5	160.9	113.3	91.8	74.9	105.81	105.56	105.22	104.93	104.62	104.47	104.36
43	64-8(INC)	606.91	180.2	178.0	175.7	100.3	57.5	48.6	37.6	110.27	109.99	109.71	109.34	109.02	108.86	108.74
44	50-3(INC)	620.05	212.0	207.0	125.0	122.1	80.7	64.3	52.0	112.90	112.59	112.24	111.80	111.42	111.23	111.10
45	TOTUMITO	633.36	173.5	160.4	145.5	131.7	114.0	90.8	74.5	115.51	115.17	114.78	114.31	113.89	113.68	113.53
46	HATO LA MIEL	645.79	127.2	113.0	97.4	93.6	91.0	80.7	72.2	118.62	118.26	117.86	117.28	116.90	116.64	116.45
47	ORURITA	652.99	188.8	185.8	167.9	130.6	88.6	51.6	34.2	120.25	119.88	119.48	119.01	118.58	118.37	118.23
48	PUERTO SANTOS LUZARD	663.38	131.7	131.1	127.9	119.4	92.3	79.6	50.8	122.82	122.52	122.15	121.65	121.26	121.07	120.93
49	PUENTE REMOLINO	681.02	151.0	139.9	123.0	103.9	77.7	62.84	53.8	127.82	127.59	127.24	126.79	126.41	126.23	126.11

Remarks : Critical river bed is set at 2.00m below water surface.

Table 4.3.1 RIVER WIDTH AT CRITICAL RIVER BED : PORTUGUESA RIVER

No.	Distance(km)	River Width at Critical River Bed					unit ; m	Height of Critical River Bed (Water Level - 1.7 m)					unit ; m, MSL
		Navigable Period - Present Condition						Navigable Period - Present Condition					
		7month	8month	9month	10month	11month	12month	7month	8month	9month	10month	11month	12month
		Q150d	Q120d	Q90d	Q60d	Q30d	Q1d	Q150d	Q120d	Q90d	Q60d	Q30d	Q1d
1	0.00	110	82	62	33	14	0	39.75	38.50	37.42	36.68	36.22	35.70
2	2.88	69	65	63	61	60	59	39.82	38.58	37.54	36.88	36.56	36.27
3	9.38	105	96	89	6	0	0	39.99	38.73	37.71	37.10	36.82	36.58
4	15.00	62	54	49	47	33	27	40.21	38.98	38.04	37.52	37.28	37.09
5	21.75	86	48	35	30	25	22	40.72	39.60	38.87	38.49	38.27	38.05
6	29.25	71	64	58	55	54	45	41.24	40.21	39.54	39.15	38.91	38.67
7	37.00	103	89	18	11	4	0	41.73	40.74	40.12	39.78	39.59	39.42
8	43.25	70	62	45	43	43	42	42.04	41.04	40.40	40.06	39.86	39.69
9	51.50	70	63	58	52	47	43	42.42	41.36	40.66	40.26	40.03	39.82
10	55.75	93	27	19	10	3	0	42.71	41.68	41.05	40.72	40.54	40.38
11	64.00	60	55	51	49	48	47	43.25	42.27	41.68	41.39	41.25	41.13
12	73.00	69	62	59	56	55	53	43.77	42.69	41.99	41.62	41.42	41.26
13	78.00	71	64	52	44	33	31	44.07	42.97	42.25	41.85	41.63	41.43
14	79.50	47	40	37	36	35	34	44.20	43.10	42.36	41.95	41.71	41.50
15	86.25	50	44	40	37	33	31	44.60	43.45	42.65	42.19	41.92	41.66
16	93.88	50	44	40	37	35	33	45.12	43.98	43.17	42.70	42.42	42.13
17	99.50	43	38	34	31	29	26	45.50	44.39	43.59	43.12	42.83	42.54
18	103.25	42	38	35	33	32	32	45.76	44.62	43.79	43.30	43.00	42.70
19	116.25	49	36	33	31	25	23	46.42	45.23	44.35	43.83	43.51	43.19
20	122.50	43	41	35	31	28	8	46.83	45.67	44.82	44.32	44.04	43.75
21	129.75	55	48	43	40	29	10	47.28	46.15	45.33	44.88	44.63	44.38
22	136.25	79	31	0	0	0	0	47.68	46.67	46.08	45.83	45.71	45.61
23	143.75	46	42	39	38	38	37	48.17	47.27	46.74	46.50	46.37	46.23
24	148.50	48	43	40	38	37	11	48.57	47.65	47.06	46.76	46.58	46.41
25	161.00	52	44	39	37	35	30	49.51	48.57	47.90	47.52	47.29	47.05
26	170.00	50	45	42	11	9	4	49.94	49.03	48.40	48.03	47.83	47.64
27	178.00	36	31	30	26	24	22	50.76	50.04	49.72	49.36	49.18	49.00
28	188.50	44	39	36	33	28	22	51.93	51.23	50.95	50.56	50.38	50.19
29	198.00	33	29	26	24	23	22	52.82	52.08	51.78	51.35	51.15	50.92
30	205.75	40	34	32	28	27	26	53.43	52.64	52.29	51.82	51.60	51.35
31	214.75	57	53	51	10	0	0	53.96	53.17	52.84	52.42	52.22	52.02
32	219.38	33	30	28	16	15	12	54.38	53.60	53.15	52.78	52.63	52.48
33	225.63	30	25	20	18	16	14	55.03	54.28	53.85	53.53	53.41	53.27
34	230.25	32	30	29	28	16	10	55.46	54.72	54.27	53.95	53.82	53.68
35	233.38	38	34	27	13	10	8	55.67	54.93	54.48	54.16	54.03	53.89
36	236.38	46	35	32	29	15	6	55.85	55.12	54.68	54.37	54.24	54.11
37	241.00	32	29	27	25	24	24	56.06	55.32	54.87	54.54	54.41	54.27
38	244.00	33	24	20	18	17	16	56.24	55.50	55.05	54.72	54.59	54.44
39	248.63	29	25	21	18	16	15	56.64	55.90	55.44	55.09	54.95	54.80

Remarks : Critical river bed is set at 1.70m below water surface

Table 5.2.1 DIMENSION OF DAMS FOR CHANNEL STABILIZATION STUDY

Dam		Catchment Area	Effective Reservoir Capacity	Stage	Power Generation				Intake for Irrigation	Effective Discharge for Navigation	Remarks
Name	Purpose	(km2)	(mill.m3)		Installed Capacities (MW)	Released Discharge (m3/s) A	Load Factor B	Average Discharge (m3/s) C (A x B)	(m3/s) D	(m3/s) C - D	
La Honda	HP	1340	126.5	Initial	150 x 2	100	0.364	37	0	37	
CADAFE(C)				Final	150 x 2	100	0.364	37	0	**37	
Las Cuevas	HP	390	345	Initial	-	-	-	-	-	-	
CADAFE(S)				Final	120 x 3	(127)	0.470	60	0	#60	**37+23=#60
Borde Seco/La Vueltosa	HP	3090	2097	Initial	208 x 2	(445)	0.327	145	0	::145	
CADAFE(U)				Final	208 x 3	(627)	0.327	205	0	@205	#60+::145=@205
Masparro	HP,IR	500	837	Initial	25 x 1	50	0.500	25	1	24	Final Stage
MARNR(C)	FC,LI			Final	25 x 1	50	0.500	25	17	8	(AD 2020)
Bocono-Tucupido	HP,IR	2020	2595	Initial	40 x 2	130	0.500	65	4	61	Final Stage
MARNR(C)	FC			Final	40 x 2	130	0.500	65	41	24	(AD 2020)
Las Majaguas	IR,FC	-	303.5	Initial	-	-	-	-	-	-	
MARNR(C)				Final	-	-	-	-	-	-	
Las Palmas	HP,IR	4325	1750	Initial	25 x 1	55	0.290	16	0	16	
MARNR(U)	WS,FC			Final	25 x 1	55	0.290	16	10	6	

Remarks :

1 (C) : Constructed, (U) : Under Const., (S) : Scheduled
2 HP : Hydro-Power, IR : Irrigation, WS : Water Supply, FC : Flood Control
3 Released discharge in ( ) : Estimated from Load Factor
4 Source of intake for navigation at Bocono-Masparro : "Estudio Preliminar del Trasvase Bocono-Masparro para Mejorar las Condiciones de Navegacion del Eje Fluvial Orinoco-Apure" (PROA Jan. '91)
5 Ratio of intake for irrigation at Bocono and Masparro : Estimated by ratio of effective resovoir capacity

Table 5.2.2 HYDRAULIC EFFECT OF FLOW IMPROVEMENT SCHEMES(1/2)

- Navigable Period = 7 month (Q150d) -

Unit : m3/s

Method	Present Condition				Dam (Effective Ratio = 0.9)								Diversion Channel						
Case	Main Channel	Tributaries			Borde Seco/La Vueltosa		Masparro		Bocono Tucupido		All Dams		Uribante - Caparo(+Dam)		Bocono-Masparro(+Dam)		Urb-Cpr+Bcn-Msp(+Dam)		Cojedes-El Frasco
					Initial	Final	Initial	Final	Initial	Final	Initial	Final	Initial	Final	Initial	Final	Initial	Final	
				Qo	145	205	24	8	61	24									
River Mouth	876			Q	921	901	883	875	876	856	929	881	921	901	883	855	929	881	876
				dQ	45	25	7	-1	0	-20	53	5	45	25	7	-21	53	5	0
		Caujarito	-192		-202	-198	-194	-192		-188	-204	-193	-202	-198	-194	-188	-204	-193	
		Boquerones	-401		-422	-413	-405	-400		-392	-425	-403	-422	-413	-405	-391	-425	-403	
San Fernando	1469			Q	1545	1512	1482	1467	1469	1436	1558	1477	1545	1512	1482	1434	1558	1477	1469
				dQ	76	43	13	-2	0	-33	89	8	76	43	13	-35	89	8	0
		Portuguesa	275						275	242	275	242			232	232	232	232	275
		Guanaparo	233																
El Saman	961			Q	1037	1004	974	959	961	961	1050	1002	1037	1004	1017	969	1093	1012	961
				dQ	76	43	13	-2	0	0	89	41	76	43	56	8	132	51	0
		Guaritico	71																
Brazual	890			Q	966	933	903	888	890	890	979	931	966	933	946	898	1022	941	890
				dQ	76	43	13	-2	0	0	89	41	76	43	56	8	132	51	0
		Masparro	37				50	35			50	35			93	45	93	45	
		Paguey	88																
		Canagua	41																
		Suripa	271		347	401					347	401	231	231			231	231	
		Uribante	29										145	199			145	199	
Puente Remolino	424			Q	424	337	424	424	424	424	424	337	424	337	424	424	424	337	424
				dQ	0	-87	0	0	0	0	0	-87	0	-87	0	0	0	-87	0
Camaguan	275			Q	275	275	275	275	275	242	275	242	275	275	232	232	232	232	275
				dQ	0	0	0	0	0	-33	0	-33	0	0	-43	-43	-43	-43	0
		Guanare	63						63	30	63	30			20	20	20	20	
		Tiznados	27																
		Pao	53																
		Ignes	13																
Jobalito	119			Q	119	119	119	119	119	119	119	119	119	119	119	119	119	119	119
				dQ	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		Cojedes	39																21
		Portuguesa	80																98
El Bani	35			Q	35	35	35	35	35	35	35	35	35	35	35	35	35	35	17
				dQ	0	0	0	0	0	0	0	0	0	0	0	0	0	0	-18

Table 5.2.2 HYDRAULIC EFFECT OF FLOW IMPROVEMENT SCHEMES(2/2)

- Navigable Period = 12 month (Q 1d) -

Unit : m3/s

Method	Present Condition				Dam (Effective Ratio = 0.9)								Diversion Channel						
Case	Main Channel	Tributaries			Borde Seco/La Vueltosa		Masparro		Bocono Tucupido		All Dams		Uribante - Caparo(+Dam)		Bocono-Masparro(+Dam)		Urb-Cpr+Bcn-Msp(+Dam)		Cojedes-El Frasco
					Initial	Final	Initial	Final	Initial	Final	Initial	Final	Initial	Final	Initial	Final	Initial	Final	
				Qo	145	205	24	8	61	24									
River	172			Q	246	267	184	175	172	153	257	252	246	267	184	156	258	252	172
Mouth				dQ	74	95	12	3	0	-19	85	80	74	95	12	-16	86	80	0
		Caujarito	-38		-54	-59	-41	-39		-33	-57	-55	-54	-59	-41	-34	-57	-55	
		Boquerones	-79		-112	-123	-84	-81		-70	-118	-115	-112	-123	-85	-72	-118	-115	
San	289			Q	412	449	309	295	289	256	432	422	412	449	310	262	433	422	289
Fernando				dQ	123	160	20	6	0	-33	143	133	123	160	21	-27	144	133	0
		Portuguesa	57						57	24	57	24			14	14	14	14	57
		Guanaparo	15																
El Saman	217			Q	340	377	237	223	217	217	360	383	340	377	281	233	404	393	217
				dQ	123	160	20	6	0	0	143	166	123	160	64	16	187	176	0
		Guaritico	69																
Bruzual	148			Q	271	308	168	154	148	148	291	314	271	308	212	164	335	324	148
				dQ	123	160	20	6	0	0	143	166	123	160	64	16	187	176	0
		Masparro	5				25	11			25	11			69	21	69	21	
		Paguey	12																
		Canagua	6																
		Suripa	38		161	215					161	215	67	67			67	67	
		Uribante	4										98	152			98	152	
Puente	83			Q	83	66	83	83	83	83	83	66	83	66	83	83	83	66	83
Remolino				dQ	0	-17	0	0	0	0	0	-17	0	-17	0	0	0	-17	0
Camaguan	57			Q	57	57	57	57	57	24	57	24	57	57	14	14	14	14	57
				dQ	0	0	0	0	0	-33	0	-33	0	0	-43	-43	-43	-43	0
		Guanare	11						11	-22	11	-22			-32	-32	-32	-32	
		Tiznados	4																
		Pao	9																
		Igues	2																
Jobalito	31			Q	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31
				dQ	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		Cojedes	10																7
		Portuguesa	21																24
El Baul	9			Q	9	9	9	9	9	9	9	9	9	9	9	9	9	9	6
				dQ	0	0	0	0	0	0	0	0	0	0	0	0	0	0	-3

Table 5.2.3 IMPROVEMENT OF DISCHARGE BY DAMS AND DERIVATION CHANNELS

Unit ; m3/s

Navigation Period (months)	5	6	7	8	9	10	11	12
< Initial Stage >								
Dams								
Borde Seco/Vueltosa	52	63	76	99	111	114	119	123
Masparro	-20	-10	13	17	18	19	20	21
Bocono Tucupido	-	-	-	-	-	-	-	-
All Dams	32	53	89	116	129	133	139	143
Diversion Channel + Dams								
Uribante-Caparo								
(Downstream of Suripa R.)	52	63	76	99	111	114	119	123
(Upstream of Suripa R.)	127	122	116	105	100	98	95	94
Bocono-Masparro								
(at San Fernando)	-20	-10	13	17	18	19	20	21
(at El Saman and Bruzual)	23	34	56	60	61	62	63	64
Urb-Cpr + Bcn-Msp								
(at San Fernando)	32	53	89	116	129	133	139	144
(at El Saman and Bruzual)	75	97	132	159	172	176	182	187
< Final Stage >								
Dams								
Navigation Period (months)	5	6	7	8	9	10	11	12
Borde Seco/Vueltosa								
(Downstream of Suripa R.)	-17	11	43	87	122	140	152	160
(Upstream of Suripa R.)	-123	-106	-87	-66	-43	-28	-21	-17
Masparro	-35	-24	-2	2	4	5	5	6
Bocono Tucupido	-33	-33	-33	-33	-33	-33	-33	-33
All Dams	-85	-46	8	56	93	112	124	133
Diversion Channel + Dams								
Uribante-Caparo								
(Downstream of Suripa R.)	-17	11	43	87	122	140	152	160
(Upstream of Suripa R.)	58	70	83	93	111	124	128	131
Bocono-Masparro								
(at San Fernando)	-68	-57	-35	-31	-29	-29	-28	-27
(at El Saman and Bruzual)	-25	-14	8	12	14	14	15	16
Urb-Cpr + Bcn-Msp								
(at San Fernando)	-85	-46	8	56	93	111	124	133
(at El Saman and Bruzual)	-42	-3	51	99	136	154	167	176

Table 5.2.4 IMPROVEMENT OF TOTAL CRITICAL CHANNEL LENGTH

unit ; km

Navigable Period (month)		5	6	7	8	9	10	11	12
< Present Condition >									
		2.7	5.0	13.1	37.8	64.5	89.9	110.0	128.6
< Initial Stage >									
Dams									
- Borde Seco/La Vueltosa		2.2	4.1	10.8	27.6	46.0	61.0	72.4	82.1
	dL	-0.5	-0.9	-2.3	-10.2	-18.5	-28.9	-37.6	-46.5
- Masparro		2.7	5.1	13.0	36.9	63.4	88.0	107.2	125.6
	dL	0.0	0.1	-0.1	-0.9	-1.1	-1.9	-2.8	-3.0
- All Dams		2.2	4.2	10.6	26.6	45.0	59.7	70.4	79.2
	dL	-0.5	-0.8	-2.5	-11.2	-19.5	-30.2	-39.6	-49.4
Diversion Channel + Dams									
- Uribante-Caparo		2.1	3.5	7.7	25.8	45.0	63.2	76.2	85.8
	dL	-0.6	-1.5	-5.4	-12.0	-19.5	-26.7	-33.8	-42.8
- Bocono-Masparro		2.7	4.5	11.4	32.1	60.5	84.5	101.7	118.4
	dL	0.0	-0.5	-1.7	-5.7	-4.0	-5.4	-8.3	-10.2
- Urb-Cpr + Bcn-Msp		2.1	3.5	6.6	22.7	41.0	59.0	71.0	80.0
	dL	-0.6	-1.5	-6.5	-15.1	-23.5	-30.9	-39.0	-48.9
< Final Stage >									
Dams									
- Borde Seco/La Vueltosa		4.0	5.9	13.3	34.7	55.2	73.7	88.9	97.6
	dL	1.3	0.9	0.2	-3.1	-9.3	-16.2	-21.1	-31.0
- Masparro		2.7	5.0	13.2	37.7	64.3	89.4	109.3	127.7
	dL	0.0	0.0	0.1	-0.1	-0.2	-0.5	-0.7	-0.9
- All Dams		4.3	6.0	13.7	36.5	56.9	75.7	91.8	101.5
	dL	1.6	1.0	0.6	-1.3	-7.6	-14.2	-18.2	-27.1
Diversion Channel + Dams									
- Uribante-Caparo		2.9	4.1	9.6	27.3	42.6	57.5	68.4	76.1
	dL	0.2	-0.9	-3.5	-10.5	-21.9	-32.4	-41.6	-52.5
- Bocono - Masparro		2.9	5.0	12.9	37.4	64.1	89.6	110.1	127.1
	dL	0.2	0.0	-0.2	-0.4	-0.4	-0.3	0.1	-1.5
- Urb-Cpr + Bcn-Msp		3.0	4.4	10.1	27.0	42.5	57.3	67.5	74.7
	dL	0.3	-0.6	-3.0	-10.8	-22.0	-32.6	-42.5	-53.9

Table 5.3.1 CRITICAL CHANNEL LENGTH FOR CASE STUDY (1/2)

Present Condition

unit ; km

Navigable Period (month)	5	6	7	8	9	10	11	12
	Q210d	Q180d	Q150d	Q120d	Q 90d	Q 60d	Q 30d	Q 1d
95.7km - S.Fernando	0.0	0.2	0.6	1.2	3.0	4.7	5.4	8.1
S.Fernando- Bruzual	0.0	0.9	5.7	22.4	32.7	41.9	50.7	57.0
Bruzual - Santos Luzardo	2.7	3.9	6.8	14.3	28.8	43.4	53.9	63.5
Total	2.7	5.0	13.1	37.9	64.5	90.0	110.0	128.6
	0.5%	0.9%	2.3%	6.7%	11.4%	15.9%	19.4%	22.7%
Navigable Length	564.9	562.6	554.5	529.7	503.1	477.6	457.6	439.0
	99.5%	99.1%	97.7%	93.3%	88.6%	84.1%	80.6%	77.3%

CASE 1 : Chirel River - Closure

unit ; km

Navigable Period (month)	5	6	7	8	9	10	11	12
	Q210d	Q180d	Q150d	Q120d	Q 90d	Q 60d	Q 30d	Q 1d
95.7km - S.Fernando	-	0.0	0.3	0.9	1.5	2.6	4.2	4.8
S.Fernando- Bruzual	-	0.6	5.6	22.2	32.1	41.4	50.0	56.0
Bruzual - Santos Luzardo	-	3.9	6.8	14.3	28.8	43.4	53.9	63.5
Total	-	4.5	12.7	37.4	62.4	87.4	108.1	124.3
	-	0.8%	2.2%	6.6%	11.0%	15.4%	19.0%	21.9%
Navigable Length	-	563.1	554.9	530.2	505.2	480.2	459.5	443.3
	-	99.2%	97.8%	93.4%	89.0%	84.6%	81.0%	78.1%
Effect Against Present Condition								
95.7km - S.Fernando	-	0.2	0.3	0.3	1.5	2.1	1.2	3.3
	-	100.0%	50.0%	25.0%	50.0%	44.7%	22.2%	40.7%
S.Fernando- Bruzual	-	0.3	0.1	0.2	0.6	0.5	0.7	1.0
	-	33.3%	1.8%	0.9%	1.8%	1.2%	1.4%	1.8%
Bruzual - Santos Luzardo	-	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%
Total	-	0.5	0.4	0.5	2.1	2.6	1.9	4.3
	-	10.0%	3.1%	1.3%	3.3%	2.9%	1.7%	3.3%

CASE 2 : Boquerones River - Closure

unit ; km

Navigable Period (month)	5	6	7	8	9	10	11	12
	Q210d	Q180d	Q150d	Q120d	Q 90d	Q 60d	Q 30d	Q 1d
95.7km - S.Fernando	-	0.0	0.3	0.9	1.5	3.0	3.8	5.1
S.Fernando- Bruzual	-	0.6	5.6	22.2	32.1	41.4	50.3	56.3
Bruzual - Santos Luzardo	-	3.9	6.8	14.3	28.8	43.4	53.9	63.5
Total	-	4.5	12.7	37.4	62.4	87.8	108.0	124.9
	-	0.8%	2.2%	6.6%	11.0%	15.5%	19.0%	22.0%
Navigable Length	-	563.1	554.9	530.2	505.2	479.8	459.6	442.7
	-	99.2%	97.8%	93.4%	89.0%	84.5%	81.0%	78.0%
Effect Against Present Condition								
95.7km - S.Fernando	-	0.2	0.3	0.3	1.5	1.7	1.6	3.0
	-	100.0%	50.0%	25.0%	50.0%	36.2%	29.6%	37.0%
S.Fernando- Bruzual	-	0.3	0.1	0.2	0.6	0.5	0.4	0.7
	-	33.3%	1.8%	0.9%	1.8%	1.2%	0.8%	1.2%
Bruzual - Santos Luzardo	-	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%
Total	-	0.5	0.4	0.5	2.1	2.2	2.0	3.7
	-	10.0%	3.1%	1.3%	3.3%	2.4%	1.8%	2.9%

Table 5.3.1 CRITICAL CHANNEL LENGTH FOR CASE STUDY (2/2)

CASE 3 : Yeguas River - Open

unit ; km

Navigable Period (month)	5	6	7	8	9	10	11	12
	Q210d	Q180d	Q150d	Q120d	Q 90d	Q 60d	Q 30d	Q 1d
95.7km - S.Fernando	0.0	0.2	0.6	1.2	3.0	4.7	5.4	8.1
S.Fernando- Bruzual	0.2	1.2	12.5	29.3	38.6	46.4	56.3	62.6
Bruzual - Santos Luzardo	2.7	3.9	6.8	14.3	28.8	43.4	53.9	63.5
Total	2.9	5.3	19.9	44.8	70.4	94.5	115.6	134.2
	0.5%	0.9%	3.5%	7.9%	12.4%	16.6%	20.4%	23.6%
Navigable Length	564.7	562.3	547.7	522.8	497.2	473.1	452.0	433.4
	99.5%	99.1%	96.5%	92.1%	87.6%	83.4%	79.6%	76.4%
Effect Against Present Condition								
95.7km - S.Fernando	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%
S.Fernando- Bruzual	-0.2	-0.3	-6.8	-6.9	-5.9	-4.5	-5.6	-5.6
	-	-33.3%	-119.3%	-30.8%	-18.0%	-10.7%	-11.0%	-9.8%
Bruzual - Santos Luzardo	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%
Total	-0.2	-0.3	-6.8	-6.9	-5.9	-4.5	-5.6	-5.6
	-7.4%	-6.0%	-51.9%	-18.2%	-9.1%	-5.0%	-5.1%	-4.4%

CASE 4 : Garzas River - Closure

unit ; km

Navigable Period (month)	5	6	7	8	9	10	11	12
	Q210d	Q180d	Q150d	Q120d	Q 90d	Q 60d	Q 30d	Q 1d
95.7km - S.Fernando	-	0.2	0.6	1.2	3.0	4.7	5.4	8.1
S.Fernando- Bruzual	-	0.9	4.2	15.6	24.9	34.2	43.5	50.7
Bruzual - Santos Luzardo	-	3.9	6.8	14.3	28.8	43.4	53.9	63.5
Total	-	5.0	11.6	31.1	56.7	82.3	102.8	122.3
	-	0.9%	2.0%	5.5%	10.0%	14.5%	18.1%	21.5%
Navigable Length	-	562.6	556.0	536.5	510.9	485.3	464.8	445.3
	-	99.1%	98.0%	94.5%	90.0%	85.5%	81.9%	78.5%
Effect Against Present Condition								
95.7km - S.Fernando	-	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%
S.Fernando- Bruzual	-	-0.0	1.5	6.8	7.8	7.7	7.2	6.3
	-	-0.0%	26.3%	30.4%	23.9%	18.4%	14.2%	11.1%
Bruzual - Santos Luzardo	-	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%
Total	-	0.0	1.5	6.8	7.8	7.7	7.2	6.3
	-	0.0%	11.5%	17.9%	12.1%	8.6%	6.5%	4.9%

Table 5.3.2 DISCHARGE DIVERSION : APURE VS. CHIREL RIVERS

	H (m.MSL)	Q (m3/s)	dQ (m3/s)	Ratio of Q	B (m)	A (m2)	R (m)
- Chirel R. / div. -							
Apure River (Before div.)							
Q 1	36.01	210	-	-	-	-	-
Q 30	36.23	284	-	-	-	-	-
Q 60	36.49	371	-	-	-	-	-
Q 90	36.88	486	-	-	-	-	-
Q120	37.41	699	-	-	-	-	-
Q150	38.28	1068	-	-	-	-	-
Q180	39.27	1573	-	-	-	-	-
Q210	40.15	2064	-	-	-	-	-
Present Condition							
Apure R.(No.20)							
Q 1	36.01	150	-	0.71	141.4	690	4.76
Q 30	36.23	201	-	0.71	142.1	721	4.95
Q 60	36.49	260	-	0.70	143.0	758	5.17
Q 90	36.88	336	-	0.69	144.4	814	5.49
Q120	37.41	477	-	0.68	146.3	891	5.92
Q150	38.28	712	-	0.67	149.4	1020	6.62
Q180	39.27	1025	-	0.65	152.2	1169	7.42
Q210	40.15	1312	-	0.64	155.4	1304	8.09
Chirel R.(No.21)							
Q 1	36.01	60	-	0.29	112.3	362	3.18
Q 30	36.23	83	-	0.29	114.2	387	3.35
Q 60	36.49	111	-	0.30	116.3	417	3.54
Q 90	36.88	150	-	0.31	120.2	463	3.80
Q120	37.41	222	-	0.32	126.1	529	4.13
Q150	38.28	356	-	0.33	134.4	642	4.70
Q180	39.27	548	-	0.35	143.7	779	5.33
Q210	40.15	752	-	0.36	147.6	908	6.03
After Improvement (Submerged Weir)							
Apure R.(No.20)							
Q 1	36.01	208	58	0.99	141.4	690	4.76
Q 30	36.23	280	79	0.99	142.1	721	4.95
Q 60	36.49	359	99	0.97	143.0	758	5.17
Q 90	36.88	454	118	0.94	144.4	814	5.49
Q120	37.41	621	145	0.89	146.3	891	5.92
Q150	38.28	877	165	0.82	149.4	1020	6.62
Q180	39.27	1195	170	0.76	152.2	1169	7.42
Q210	40.15	1479	167	0.72	155.4	1304	8.09
Chirel R.(Wair)							
Q 1	36.01	2	-58	0.01	13.0	18	1.29
Q 30	36.23	4	-79	0.01	187.3	59	0.31
Q 60	36.49	12	-99	0.03	188.3	108	0.57
Q 90	36.88	32	-118	0.06	189.9	182	0.95
Q120	37.41	78	-145	0.11	192.0	283	1.46
Q150	38.28	191	-165	0.18	195.5	451	2.29
Q180	39.27	378	-170	0.24	199.4	647	3.20
Q210	40.15	585	-167	0.28	202.9	824	4.00

Table 5.3.3 DISCHARGE DIVERSION : APURE VS. BRAVO RIVERS

	H (m,MSL)	Q (m3/s)	dQ (m3/s)	Ratio of Q	B (m)	A (m2)	R (m)
- Bravo R. / div. -							
Apure River (Before div.)							
Q 1	46.57	215	-	-	-	-	-
Q 30	46.72	268	-	-	-	-	-
Q 60	46.95	339	-	-	-	-	-
Q 90	47.30	431	-	-	-	-	-
Q120	47.76	586	-	-	-	-	-
Q150	48.60	857	-	-	-	-	-
Q180	49.48	1181	-	-	-	-	-
Q210	50.45	1562	-	-	-	-	-
Present Condition							
Apure R.(No.9)							
Q 1	46.57	157	-	0.73	142.2	384	2.7
Q 30	46.72	195	-	0.73	142.9	406	2.8
Q 60	46.95	246	-	0.73	144.1	439	3.0
Q 90	47.30	311	-	0.72	145.7	490	3.3
Q120	47.76	420	-	0.72	147.5	557	3.7
Q150	48.60	605	-	0.71	150.7	682	4.4
Q180	49.48	823	-	0.70	152.2	816	5.2
Q210	50.45	1077	-	0.69	153.7	964	6.1
Bravo R.(No.8)							
Q 1	46.57	58	-	0.27	70.9	160	2.2
Q 30	46.72	72	-	0.27	72.4	170	2.3
Q 60	46.95	93	-	0.27	74.7	187	2.5
Q 90	47.30	119	-	0.28	78.2	214	2.7
Q120	47.76	166	-	0.28	80.7	251	3.0
Q150	48.60	253	-	0.29	83.6	320	3.7
Q180	49.48	358	-	0.30	85.8	394	4.4
Q210	50.45	485	-	0.31	88.1	479	5.2
After Improvement (Submerged Weir)							
Apure R.(No.9)							
Q 1	46.57	209	52	0.97	142.2	384	2.7
Q 30	46.72	263	67	0.98	142.9	406	2.8
Q 60	46.95	327	81	0.97	144.1	439	3.0
Q 90	47.30	405	93	0.94	145.7	490	3.3
Q120	47.76	534	114	0.91	147.5	557	3.7
Q150	48.60	743	139	0.87	150.7	682	4.4
Q180	49.48	984	161	0.83	152.2	816	5.2
Q210	50.45	1259	181	0.81	153.7	964	6.1
Bravo R. (Wair)							
Q 1	46.57	6	-52	0.03	13.0	18	1.3
Q 30	46.72	5	-67	0.02	72.4	29	0.4
Q 60	46.95	12	-81	0.03	73.3	46	0.6
Q 90	47.30	26	-93	0.06	74.7	72	0.9
Q120	47.76	52	-114	0.09	76.6	106	1.4
Q150	48.60	114	-139	0.13	79.9	172	2.1
Q180	49.48	197	-161	0.17	83.5	244	2.8
Q210	50.45	303	-181	0.19	87.4	327	3.6

Table 6.2.1 CRITICAL SECTIONS AND COUNTERMEASURES (1/7)

STA. NO.	CRITICAL DEPTH(Dc) No.	Nav.mon. (mon)	FLOW IMPR. INITIAL Nav.mon (mon)	FINAL Nav.mon (mon)	CRITICAL WIDTH(Wc) No.	Nav.mon. (mon)	CRITICAL CURVATURE(Rc) No.	R (m)	CHANNEL IMPROVEMENT STP (Cases of works)	MTP
<<APURE RIVER ST-A1: RIVER MOUTH-SAN FERNANDO PORT>>										
River Mouth(Orinoco R.)										
2K	NoData	-	-	-	-	-	-	-		
4K	-do-	-	-	-	-	-	-	-		
6K	-do-	-	-	-	-	-	-	-		
8K	-do-	-	-	-	-	-	-	-		
	-do-	-	-	-	-	-	C1.1	500 *	-	CC1.1(1900m)
10K	-do-	-	-	-	-	-	C1.2	320 *	-	"
12K	-do-	-	-	-	-	-	-	-	-	"
14K	-do-	-	-	-	-	-	-	-		
16K	-do-	-	-	-	-	-	-	-		
18K	-do-	-	-	-	-	-	-	-		
20K	-do-	-	-	-	-	-	C1.3	500 *	-	RA(600m)
22K	-do-	-	-	-	-	-	C1.4	500 *	-	RA(600m)
24K	-do-	-	-	-	-	-	-	-		
26K	-do-	-	-	-	-	-	-	-		
28K	-do-	-	-	-	-	-	-	-		
30K	-do-	-	-	-	-	-	-	-		
32K	-do-	-	-	-	-	-	C1.5	250 **	CC1.2(2500m)	-
34K	-do-	-	-	-	-	-	-	-	"	-
36K	-do-	-	-	-	-	-	-	-		
38K	-do-	-	-	-	-	-	-	-		
40K	-do-	-	-	-	-	-	-	-		
42K	-do-	-	-	-	#3	10	-	-	-	-
44K	-do-	-	-	-	-	-	-	-		
46K	-do-	-	-	-	-	-	-	-		
48K	-do-	-	-	-	-	-	-	-		
50K	-do-	-	-	-	-	-	-	-	-	CC1.3(3100m)
52K	-do-	-	-	-	-	-	-	-	-	"
54K	-do-	-	-	-	-	-	C1.6	350 *	-	"
56K	-do-	-	-	-	-	-	C1.7	400 *	-	"
58K	-do-	-	-	-	-	-	-	-		
60K	-do-	-	-	-	-	-	-	-		
62K	-do-	-	-	-	-	-	-	-		
64K	-do-	-	-	-	-	-	-	-		
66K	-do-	-	-	-	-	-	-	-		
68K	-do-	-	-	-	#5	11	C1.8	300 **	CC1.4(2300m)	-
70K	-do-	-	-	-	-	-	-	-	"	-
72K	-do-	-	-	-	-	-	C1.9	250 **	"	-
74K	-do-	-	-	-	-	-	-	-	"	-
76K	-do-	-	-	-	-	-	-	-		
78K	-do-	-	-	-	-	-	-	-		
80K	-do-	-	-	-	-	-	-	-		
82K	-do-	-	-	-	-	-	-	-		
84K	-do-	-	-	-	#6	11	-	-	-	-
86K	-do-	-	-	-	-	-	-	-		
88K	-do-	-	-	-	-	-	-	-		
90K	-do-	-	-	-	-	-	-	-		
92K	-do-	-	-	-	-	-	-	-		
94K	-do-	-	-	-	-	-	-	-		
K570/95.74K		-	-	-	-	-	-	-		
K568	-	-	-	-	#7	10	-	-	-	-
K566	-	-	-	-	-	-	-	-		
K564	D1.1	8 *	9(10)	9(11)	-	-	-	-	-	-
K562	-	-	-	-	-	-	-	-	CC1.5(1600m)	-
K560	D1.2	6 **	7(7)**	7(7)**	-	-	C1.10	300 **	"	-
K558	-	-	-	-	-	-	C1.11	250 **	"	-
	D1.3	8 *	8(10)	8(10)	-	-	-	-	-	-
K556	-	-	-	-	#8	10	C1.12	200 **	RA(800m)	-
K554	-	-	-	-	-	-	-	-		
K552	-	-	-	-	-	-	-	-		
K550	-	-	-	-	-	-	-	-		
K548	D1.4	9	9(12)	9(12)	-	-	-	-	-	-
K546	-	-	-	-	-	-	-	-		
K544	D1.5	9	10(12)	11(12)	-	-	-	-	-	-
K542	-	-	-	-	#9	8 *	-	-	-	SI
K540	D1.6	10	11(12)	11(12)	-	-	-	-	-	-
K538	D1.7	8 *	9(11)	9(11)	-	-	-	-	-	-
K536	-	-	-	-	-	-	-	-		
K534	-	-	-	-	-	-	-	-		
K532	-	-	-	-	-	-	-	-		
K530	-	-	-	-	-	-	-	-		
K528	-	-	-	-	-	-	-	-		
K526	-	-	-	-	-	-	-	-		
Chirel	R.Div	-	-	-	-	-	-	-		
K524	-	-	-	-	-	-	-	-		

Table 6.2.1 CRITICAL SECTIONS AND COUNTERMEASURES (2/7)

STA. NO.	CRITICAL DEPTH(Dc) No.	Nav.mon. (mon)	FLOW IMPR. INITIAL Nav.mon (mon)	FLOW IMPR. FINAL Nav.mon (mon)	CRITICAL WIDTH(Wc) No.	Nav.mon. (mon)	CRITICAL CURVATURE(Rc) No.	R (m)	CHANNEL IMPROVEMENT STP (Cases of works)	MTP (Cases of works)
K522	D1.8	10	11	12	-	-	-	-	-	-
K520	-	-	-	-	-	-	-	-		
K518	-	-	-	-	-	-	-	-		
K516	-	-	-	-	-	-	-	-		
Boquerones R.Div.			-	-	-	-	-	-		
K514	-	-	-	-	-	-	-	-		
K512	D1.9	11	12	12	-	-	-	-	-	-
K510	-	-	-	-	-	-	-	-		
K508	D1.10	8 *	9	9	-	-	-	-	-	-
K506	-	-	-	-	-	-	-	-		
K504	-	-	-	-	-	-	-	-		
K502	-	-	-	-	-	-	-	-		
K500	D1.11	11	12	12	-	-	-	-	-	-
K498	D1.12	7 **	7 **	7 **	-	-	-	-	SI	-
S.Fernando Pt.			-	-	-	-	-	-		

<<APURE RIVER ST-A2: SAN FERNANDO PORT-PORTUGUESA R.>>

STA. NO.	CRITICAL DEPTH(Dc) No.	Nav.mon. (mon)	FLOW IMPR. INITIAL Nav.mon (mon)	FLOW IMPR. FINAL Nav.mon (mon)	CRITICAL WIDTH(Wc) No.	Nav.mon. (mon)	CRITICAL CURVATURE(Rc) No.	R (m)	CHANNEL IMPROVEMENT STP (Cases of works)	MTP (Cases of works)
S.Fernando Pt.										
K496	-	-	-	-	-	-	-	-		
K494	-	-	-	-	-	-	-	-		
K492	D2.1	8 *	8 *	8 *	-	-	-	-	-	SI
K490	-	-	-	-	-	-	-	-		
K488	D2.2	5 **	5 **	5 **	-	-	-	-	SI	-
K486	D2.3	8 *	8 *	8 *	-	-	-	-	-	SI
K484	D2.4	9	10	11	-	-	-	-	-	-
K482	D2.5	8 *	9	9	-	-	-	-	-	-
K480	-	-	-	-	-	-	-	-		
K478	-	-	-	-	-	-	-	-		
K476	D2.6	11	12	12	-	-	-	-	-	-
K474	D2.7	7 **	8 *	8 *	-	-	-	-	-	SI
Portuguesa R.			-	-	-	-	-	-		
										-

<<APURE RIVER ST-A3: PORTUGUESA R.-BRUZUAL PORT>>

STA. NO.	CRITICAL DEPTH(Dc) No.	Nav.mon. (mon)	FLOW IMPR. INITIAL Nav.mon (mon)	FLOW IMPR. FINAL Nav.mon (mon)	CRITICAL WIDTH(Wc) No.	Nav.mon. (mon)	CRITICAL CURVATURE(Rc) No.	R (m)	CHANNEL IMPROVEMENT STP (Cases of works)	MTP (Cases of works)
Portuguesa R.										
K472	-	-	-	-	-	-	-	-		
	D3.1	9	10	10	-	-	-	-	-	-
K470	D3.2	9	9	10	#16	10	-	-	-	-
K468	D3.3	10	11	11	-	-	-	-	-	-
K466	D3.4	9	10	10	-	-	-	-	-	-
K464	-	-	-	-	-	-	C3.1	450 *	-	RA(700m)
K462	D3.5	7 *	7 *	7 *	-	-	-	-	-	SI
K460	D3.6	8	8	9	-	-	-	-	-	-
Yeguas R.Con		-	-	-	-	-	-	-		
K458	-	-	-	-	-	-	C3.2	400 *	-	RA(600m)
K456	D3.7	5 **	6 **	6 **	-	-	-	-	SI	-
K454	D3.8	9	11	12	-	-	-	-	-	-
K452	-	-	-	-	#17	8	-	-		
K450	-	-	-	-	-	-	-	-		
K448	D3.9	7 *	7 *	7 *	-	-	-	-	-	SI
K446	D3.10	6 **	7 *	7 *	-	-	-	-	-	SI
Garzas R.con		-	-	-	-	-	-	-		
	-	-	-	-	-	-	C3.3	400 *	-	RA(500m)
K444	D3.11	9	11(12)	12(12)	-	-	-	-	-	-
K442	D3.12	6 **	7(7)*	6(7)*	-	-	-	-	-	SI
	-	-	-	-	-	-	C3.4	400 *	-	RA(500m)
K440	D3.13	6 **	7(7)*	6(7)*	-	-	-	-	-	SI
K438	-	-	-	-	-	-	-	-		
	-	-	-	-	-	-	C3.5	450 *	-	RA(800m)
K436	D3.14	6 **	6(7)*	6(7)*	-	-	-	-	-	SI
K434	-	-	-	-	#18	8	-	-		
K432	D3.15	8	9(12)	10(12)	-	-	-	-	-	-
K430	-	-	-	-	-	-	-	-		
	-	-	-	-	-	-	C3.6	400 *	-	RA(500m)
K428	D3.16	9	10(12)	10(12)	-	-	-	-	-	-
	D3.17	7 *	7(8)	7(8)	-	-	-	-	-	-
K426	D3.18	6 **	6(7)*	6(7)*	-	-	-	-	-	SI
K424	-	-	-	-	-	-	-	-		
K422	D3.19	6 **	7(7)*	7(7)*	-	-	-	-	-	SI
K420	D3.20	7 *	8(10)	8(10)	-	-	-	-	-	-
	-	-	-	-	-	-	C3.7	500 *	-	RA(600m)
K418	D3.21	8	9(12)	10(12)	-	-	-	-	-	-
	D3.22	9	10(12)	10(12)	-	-	-	-	-	-
K416	D3.23	7 *	7(8)	7(9)	#19	5 **	-	-	-	-
K414	-	-	-	-	-	-	-	-		

Table 6.2.1 CRITICAL SECTIONS AND COUNTERMEASURES (3/7)

STA. NO.	CRITICAL DEPTH(Dc) No.	CRITICAL DEPTH(Dc) Nav.mon. (mon)	FLOW IMPR. INITIAL Nav.mon (mon)	FLOW IMPR. FINAL Nav.mon (mon)	CRITICAL WIDTH(Wc) No.	CRITICAL WIDTH(Wc) Nav.mon. (mon)	CRITICAL CURVATURE(Rc) No.	CRITICAL CURVATURE(Rc) R (m)	CHANNEL IMPROVEMENT STP (Cases of works)	CHANNEL IMPROVEMENT MTP (Cases of works)
K412	D3.24	7 *	7 *	7 *	-	-	-	-	-	SI
K410	D3.25	7 *	7 *	7 *	-	-	-	-	-	SI
	D3.26	10	12	12	-	-	-	-	-	-
K408	-	-	-	-	-	-	C3.8	250 **	RA(600m)	-
K406	D3.27	7 *	8	8	-	-	-	-	-	-
K404	-	-	-	-	-	-	-	-		
K402	-	-	-	-	-	-	-	-		
K400	-	-	-	-	-	-	C3.9	200 **	RA(500m)	-
Garzas R.Div		-	-	-	-	-	-	-		
K398	-	-	-	-	-	-	-	-		
K396	-	-	-	-	-	-	-	-		
K394	D3.28	7 *	7 *	7 *	-	-	-	-	-	SI
Yeguas R.Div		-	-	-	-	-	-	-		
K392	-	-	-	-	-	-	C3.10	300 **	RA(600m)	-
K390	D3.29	7 *	7 *	7 *	-	-	-	-	-	SI
K388	-	-	-	-	-	-	-	-		
K386	-	-	-	-	-	-	-	-		
K384	D3.30	9	10	10	-	-	-	-	-	-
K382	D3.31	7 *	7 *	7 *	-	-	-	-	-	SI
K380	D3.32	6 **	7 *	6 **	#21	9	-	-	-	SI
K378	-	-	-	-	-	-	-	-		
K376	D3.33	10	12	12	-	-	-	-	-	-
K374	-	-	-	-	-	-	-	-		
K372	-	-	-	-	-	-	-	-		
K370	-	-	-	-	-	-	-	-		
K368	D3.34	9	11	12	-	-	-	-	-	-
K366	-	-	-	-	-	-	-	-		
K364	-	-	-	-	-	-	C3.11	400 *	-	RA(600m)
K362	-	-	-	-	#22	10	-	-		
K360	-	-	-	-	-	-	-	-		
K358	-	-	-	-	-	-	C3.12	350 *	-	RA(1000m)
K356	-	-	-	-	-	-	-	-		
K354	-	-	-	-	-	-	C3.13	200 **	CC3.1(1400m)	-
	-	-	-	-	-	-	C3.14	300 **	"	
K352	D3.35	6 **	6 **	6 **	-	-	-	-	"	-
K350	-	-	-	-	-	-	-	-		
	D3.36	7 *	7 *	7 *	-	-	-	-	-	SI
K348	D3.37	5 **	5 **	4 **	-	-	-	-	SI	SI
K346	D3.38	5 **	5 **	5 **	-	-	-	-	SI	-
K344	D3.39	6 **	6 **	6 **	-	-	-	-	SI	-
K342	D3.40	10	12	12	-	-	-	-	-	-
K340	D3.41	7 *	8	8	-	-	-	-	-	-
K338	D3.42	6 **	6 **	6 **	-	-	-	-	SI	-
K336	D3.43	6 **	6 **	6 **	-	-	-	-	SI	-
K334	-	-	-	-	-	-	-	-		
K332A	D3.44	7 *	8	7 *	-	-	-	-	-	SI
K330A	-	-	-	-	#24	8	-	-		
K328A	D3.45	10	12	12	-	-	-	-	-	-
K326A	-	-	-	-	-	-	-	-		
K324A	-	-	-	-	-	-	-	-		
K332	D3.46	7 *	7 *	7 *	-	-	-	-	-	SI
K330	-	-	-	-	-	-	-	-		
	D3.47	8	9	9	-	-	-	-	-	-
K328	D3.48	7 *	8	8	-	-	-	-	-	-
K326	-	-	-	-	-	-	-	-		
K324	D3.49	9	12	12	-	-	-	-	-	-
K322	D3.50	10	12	12	-	-	-	-	-	-
K320	-	-	-	-	-	-	-	-		
K318	-	-	-	-	-	-	C3.15	550 *		RA(800m)
K316	-	-	-	-	-	-	-	-		
K314	D3.51	10	12	12	-	-	-	-	-	-
K312	D3.52	11	12	12	-	-	-	-	-	-
K310	D3.53	9	10	11	-	-	-	-	-	-
K308	-	-	-	-	-	-	-	-		
K306	-	-	-	-	-	-	-	-		
	D3.54	8	9	9	-	-	-	-	-	-
Guaritico R.Con.			-	-	-	-	-	-		
K304	-	-	-	-	-	-	-	-		
	D3.55	7 *	7 *	7 *	-	-	-	-	-	SI
K302	D3.56	7 *	7 *	7 *	-	-	-	-	-	SI
K300		-	-	-	-	-	-	-		
K298	D3.57	8	9	10	-	-	-	-	-	-
K296	D3.58	6 **	6 **	6 **	-	-	-	-	SI	-
K294	-	-	-	-	-	-	-	-		
K292	D3.59	6 **	6 **	6 **	-	-	-	-	SI	-
K290	D3.60	6 **	6 **	6 **	-	-	-	-	SI	-

Table 6.2.1 CRITICAL SECTIONS AND COUNTERMEASURES (4/7)

STA. NO.	CRITICAL DEPTH(Dc) No.	Nav.mon. (mon)	FLOW IMPR. INITIAL Nav.mon (mon)	FINAL Nav.mon (mon)	CRITICAL WIDTH(Wc) No.	Nav.mon. (mon)	CRITICAL CURVATURE(Rc) No.	R (m)	CHANNEL IMPROVEMENT STP (Cases of works)	MTP
K288	D3.61	9	10	10	-	-	-	-	-	-
K286	-	-	-	-	-	-	-	-		
K284	-	-	-	-	-	-	-	-		
K282	-	-	-	-	-	-	-	-		
K280	-	-	-	-	-	-	-	-		
K278	-	-	-	-	-	-	-	-		
K276	-	-	-	-	-	-	-	-		
K274	-	-	-	-	-	-	-	-		
K272	-	-	-	-	#28	9	-	-		
K270	-	-	-	-	-	-	-	-		
K268	-	-	-	-	-	-	-	-		
K266	-	-	-	-	-	-	C3.16	350 *	-	RA(1000m)
K264	D3.62	10	12	12	-	-	-	-	-	-
K262	-	-	-	-	-	-	-	-		
K260	-	-	-	-	-	-	-	-		
K258	D3.63	10	12	12	-	-	-	-	-	-
K256	D3.64	8	8	9	-	-	-	-	-	-
K254	-	-	-	-	-	-	-	-		
K252	D3.65	5 **	6 **	5 **	-	-	-	-	SI	SI
K250	D3.66	7 *	7 *	7 *	-	-	-	-	-	SI
K248	D3.67	8	9	10	-	-	-	-	-	-
K246	-	-	-	-	-	-	-	-		
K244	D3.68	8	9	10	-	-	-	-	-	-
	D3.69	6 **	6 **	6 **	-	-	-	-	SI	-
K242	D3.70	10	12	12	#30	9	-	-	-	-
K240	D3.71	9	10	10	-	-	-	-	-	-
K238	D3.72	7 *	8	8	-	-	-	-	-	-
	D3.73	6 **	6 **	6 **	-	-	-	-	SI	-
K236	D3.74	7 *	7 *	7 *	-	-	-	-	-	SI
K234	D3.75	7 *	7 *	7 *	-	-	-	-	-	SI
K232	-	-	-	-	-	-	-	-		
	D3.76	9	10	11	-	-	-	-	-	-
K230	D3.77	8	8	9	-	-	-	-	-	-
K228	D3.78	5 **	5 **	5 **	-	-	-	-	SI	-
Bruzual		-	-	-	-	-	-	-		

<<APURE RIVER ST-A4: BRUZUAL PORT-SANTOS LUZARDO PORT>>

STA. NO.	CRITICAL DEPTH(Dc) No.	Nav.mon. (mon)	FLOW IMPR. INITIAL Nav.mon (mon)	FINAL Nav.mon (mon)	CRITICAL WIDTH(Wc) No.	Nav.mon. (mon)	CRITICAL CURVATURE(Rc) No.	R (m)	CHANNEL IMPROVEMENT STP (Cases of works)	MTP
Bruzual		-	-	-	-	-	-	-		
K226	D4.1	7 *	8	8	-	-	-	-	-	-
K224	D4.2	7 *	7 *	7 *	-	-	-	-	-	SI
K222	D4.3	6 **	6 **	6 **	-	-	-	-	SI	-
	D4.4	10	12	12	-	-	-	-	-	-
K220	D4.5	8	8	8	-	-	-	-	-	-
K218	D4.6	10	12	12	-	-	-	-	-	-
K216	-	-	-	-	-	-	-	-		
Masparro R.Con.			-	-	-	-	-	-		
K214	D4.7	9	10	10	-	-	-	-	-	-
K212	D4.8	4 **	4 **	4 **	-	-	-	-	SI	-
K210	D4.9	6 **	7 *	6 **	-	-	-	-	-	SI
K208	D4.10	7 *	7 *	7 *	-	-	-	-	-	SI
K206	-	-	-	-	-	-	-	-		
K204	-	-	-	-	#33	9	-	-		
K202	D4.11	7 *	8	8	-	-	-	-	-	-
	D4.12	8	9	9	-	-	-	-	-	-
Paguey R.Con		-	-	-	-	-	-	-		
K200	-	-	-	-	-	-	-	-		
K198	-	-	-	-	-	-	-	-		
	D4.13	11	12	12	-	-	-	-	-	-
K196	D4.14	8	9	10	-	-	-	-	-	-
K194	D4.15	9	10	11	-	-	-	-	-	-
CanaguaR.Con		-	-	-	-	-	-	-		
K192	-	-	-	-	-	-	-	-		
K190	D4.16	8	8	8	-	-	-	-	-	-
K188	D4.17	9	10	11	-	-	-	-	-	-
K186	D4.18	10	12	12	-	-	-	-	-	-
K184	-	-	-	-	-	-	-	-		
K182	-	-	-	-	-	-	-	-		
K180	D4.19	8	9	10	-	-	-	-	-	-
K178	D4.20	11	12	12	-	-	-	-	-	-
K176	-	-	-	-	-	-	-	-		
	-	-	-	-	-	-	C4.1	300 **	RA(1100m)	-
K174	D4.21	4 **	4 **	4 **	-	-	-	-	SI	-
K172	D4.22	9	12	12	-	-	-	-	-	-
K170	D4.23	9	12	12	-	-	-	-	-	-
K168	D4.24	6 **	7 *	7 *	-	-	-	-	-	SI
K166	D4.25	7 *	8	8	-	-	-	-	-	-

Table 6.2.1 CRITICAL SECTIONS AND COUNTERMEASURES (5/7)

STA. NO.	CRITICAL DEPTH(Dc) No.	CRITICAL DEPTH(Dc) Nav.mon. (mon)	FLOW IMPR. INITIAL Nav.mon (mon)	FLOW IMPR. FINAL Nav.mon (mon)	CRITICAL WIDTH(Wc) No.	CRITICAL WIDTH(Wc) Nav.mon. (mon)	CRITICAL CURVATURE(Rc) No.	CRITICAL CURVATURE(Rc) R (m)	CHANNEL IMPROVEMENT STP (Cases of works)	CHANNEL IMPROVEMENT MTP (Cases of works)
K164	D4.26	4 **	4 **	4 **	-	-	-	-	SI	-
K162	D4.27	8	9	9	-	-	-	-	-	-
K160	D4.28	11	12	12	-	-	C4.2	350 *	-	RA(500m)
	D4.29	8	9	10	-	-	-	-	-	-
K156	D4.30	8	9	9	-	-	-	-	-	-
K154	D4.31	11	12	12	-	-	-	-	-	-
K152	D4.32	7 *	7 *	7 *	-	-	-	-	-	SI
K150	D4.33	8	8	8	-	-	-	-	-	-
K148	D4.34	6 **	7 *	7 *	-	-	-	-	-	SI
Suripa R.Con		-	-	-	-	-	-	-		
K146	-	-	-	-	-	-	-	-		
K144	D4.35	11	12	12	-	-	-	-	-	-
K142	D4.36	10	12	12	-	-	-	-	-	-
K140	D4.37	4 **	4 **	4 **	-	-	-	-	SI	-
K138	D4.38	4 **	4 **	4 **	-	-	-	-	SI	-
K136	-	-	-	-	-	-	-	-	CC4.3(3200m)	-
	D4.39	4 **	5 **	4 **	-	-	-	-	"	-
	-	-	-	-	-	-	C4.3	200 **	"	-
K134	D4.40	10	12	12	-	-			"	-
K132	D4.41	5 **	7 *	7 *	-	-	-	-	"	-
	D4.42	5 **	7 *	5 **	-	-	-	-	"	-
K130	D4.43	4 **	4 **	4 **	-	-	-	-	SI	-
K128	-	-	-	-	-	-	-	-		
	D4.44	8	10	12	-	-	-	-	-	-
K126	D4.45	5 **	7 *	7 *	-	-	-	-	-	SI
K124	D4.46	11	12	12	#38	8	-	-	-	SI
La Tigura R.Con.			-	-	-	-	C4.4	500 *	-	RA(700m)
K122	D4.47	-	-	-	-	-	-	-	-	-
K120	D4.48	4 **	4 **	4 **	-	-	-	-	SI	-
K118	D4.49	6 **	8	8	-	-	-	-	-	-
K116	-	-	-	-	-	-	C4.5	200 **	RA(500m)	-
K114	-	-	-	-	-	-	-	-		
K112	-	-	-	-	#39	9	-	-		
	D4.50	9	12	12	-	-	-	-	-	-
K110	D4.51	9	12	12	-	-	-	-	-	-
K108	D4.52	8	10	11	-	-	-	-	-	-
K106	-	-	-	-	-	-	C4.6	400 *	-	RA(600m)
K104	D4.53	7 *	8	8	-	-			-	-
K102	-	-	-	-	-	-	-	-		
K100	D4.54	8	10	12	-	-	-	-	-	-
	D4.55	6 **	8	8	-	-	-	-	-	-
K 98	D4.56	9	11	12	#40	10	-	-	-	-
K 96	-	-	-	-	-	-	-	-		
K 94	D4.57	10	12	12	-	-	-	-	-	-
K 92	-	-	-	-	-	-	C4.7	350 *	-	RA(600m)
K 90	D4.58	8	9	10	-	-	-	-	-	-
	D4.59	8	9	10	-	-	-	-	-	-
K 88	-	-	-	-	-	-	C4.8	250 **	RA(400m)	-
K 86	-	-	-	-	#41	8	-	-		
K 84	-	-	-	-	-	-	C4.9	350 *	-	RA(600m)
K 82	D4.60	9	11	12	-	-	-	-	-	-
	D4.61	6 **	7 *	7 *	-	-	-	-	-	SI
K 80	D4.62	8	9	9	-	-	-	-	-	-
K 78	D4.63	4 **	5 **	4 **	-	-	-	-	SI	SI
K 76	D4.64	7 *	8	8	#42	11	-	-	-	-
K 74	D4.65	8	9	9	-	-	-	-	-	-
K 72	D4.66	8	9	10	-	-	-	-	-	-
K 70	-	-	-	-	-	-	C4.10	350 *	-	RA(500m)
K 68	-	-	-	-	-	-	-	-		
K 66	D4.67	11	12	12	-	-	-	-	-	-
K 64	D4.68	7 *	6 **	6 **	-	-	-	-	SI	SI
K 62	D4.69	6 **	6 **	6 **	#43	9	-	-	SI	-
K 60	-	-	-	-	-	-	-	-		
	D4.70	11	12	12	-	-	-	-	-	-
K 58	D4.71	9	10	11	-	-	-	-	-	-
K 56	D4.72	10	12	12	-	-	-	-	-	-
K 54	-	-	-	-	-	-	-	-		
	D4.73	9	11	12	-	-	-	-	-	-
K 52	D4.74	8	9	9	-	-	C4.11	400 *	-	RA(1000m)
K 50	D4.75	10	12	12	-	-	-	-	-	-
K 48	D4.76	8	8	9	#44	10	-	-	-	-
K 46	D4.77	9	8	9	-	-	-	-	-	-
K 44	-	-	-	-	-	-	-	-		
K 42	D4.78	7 *	8	8	-	-	-	-	-	-
K 40	-	-	-	-	-	-	-	-		
K 38	D4.79	7 *	8	8	-	-	-	-	-	-

Table 6.2.1 CRITICAL SECTIONS AND COUNTERMEASURES (6/7)

STA. NO.	CRITICAL DEPTH(Dc) No.	CRITICAL DEPTH(Dc) Nav.mon. (mon)	FLOW IMPR. INITIAL Nav.mon (mon)	FLOW IMPR. FINAL Nav.mon (mon)	CRITICAL WIDTH(Wc) No.	CRITICAL WIDTH(Wc) Nav.mon. (mon)	CRITICAL CURVATURE(Rc) No.	CRITICAL CURVATURE(Rc) R (m)	CHANNEL IMPROVEMENT STP (Cases of works)	CHANNEL IMPROVEMENT MTP (Cases of works)
K 36	D4.80	6 **	7 *	7 *	#45	11	-	-	-	SI
K 34	D4.81	10	12	12	-	-	-	-	-	-
	D4.82	9	12	12	-	-	-	-	-	-
K 32	D4.83	9	10	12	-	-	-	-	-	-
K 30	D4.84	6 **	7 *	7 *	-	-	-	-	-	SI
K 28	D4.85	10	12	12	-	-	-	-	-	-
K 26	D4.86	6 **	7 *	6 **	-	-	-	-	-	SI
K 24	D4.87	10	12	12	-	-	-	-	-	-
K 22	D4.88	8	8	8	#46	11	-	-	-	-
K 20	D4.89	8	8	8	-	-	-	-	-	-
K 18	D4.90	10	12	12	-	-	-	-	-	-
K 16	D4.91	7 *	8	7 *	#47	10	-	-	-	SI
K 14	D4.92	7 *	7 *	7 *	-	-	-	-	-	SI
K 12	-	-	-	-	-	-	-	-		
	-	-	-	-	-	-	C4.12	250 **	RA(600m)	-
K 10	D4.93	11	12	12	-	-	-	-	-	-
	D4.94	4 **	5 **	4 **	-	-	-	-	SI	SI
Uribante R.Con.			-	-	-	-	-	-		
K 8	-	-	-	-	-	-	-	-		
	D4.95	7 *	7 *	6 **	-	-	-	-	-	SI
S.Luzardo Pt.			-	-	#48	10	-	-	-	-
<<PORTUGUESA RIVER ST-P1: APURE R.-COJEDES R.>>										
River Mouth(Apure R.)										
1	-	-	-	-	#1	10	-	-	-	CCP.1(5000m)
2	-	-	-	-	-	-	-	-	-	"
	-	-	-	-	-	-	CP.1	220 *	-	"
	-	-	-	-	-	-	-	-	-	"
3	#3	11	-	-	#3	9	-	-	-	"
4	-	-	-	-	#4	11	CP.2	220 *	-	"
	-	-	-	-	-	-	CP.3	160 *	-	RA(400m)
5	-	-	-	-	#5	10	-	-	-	-
	-	-	-	-	-	-	CP.4	140 **	CCP.2(1600m)	-
6	-	-	-	-	-	-	CP.5	170 *	"	-
7	-	-	-	-	#7	8 *	-	-	-	CCP.3(2800m)
8	-	-	-	-	-	-	-	-	CCP.4(EX:1900m)	
	-	-	-	-	-	-	CP.6	170 *	"	-
9	-	-	-	-	-	-	CP.7	185 *	"	-
10	-	-	-	-	#10	7 **	-	-	SI	-
11	-	-	-	-	-	-	CP.8	140 **	RA(500m)	-
12	-	-	-	-	-	-	-	-		
13	-	-	-	-	-	-	-	-		
14	-	-	-	-	-	-	-	-		
15	-	-	-	-	-	-	-	-	-	CCP.5(750m)
16	-	-	-	-	-	-	CP.9	220 *	-	RA(500m)
17	-	-	-	-	#17	10	CP.10	160 *	-	RA(400m)
	-	-	-	-	-	-	CP.11	185 *	COC-6(EX:3000m)	
18	-	-	-	-	-	-	CP.12	185 *	"	-
19	-	-	-	-	#19	10	-	-	"	-
	-	-	-	-	-	-	CP.13	160 *	"	-
	-	-	-	-	-	-	-	-	-	-
20	-	-	-	-	#20	10	CP.14	195 *	-	RA(300m)
	-	-	-	-	-	-	CP.15	160 *	-	RA(400m)
21	-	-	-	-	#21	10	-	-	-	-
	-	-	-	-	-	-	CP.16	185 *	-	RA(400m)
	-	-	-	-	-	-	-	-	-	-
22	#22	8 *	-	-	#22	8 *	-	-	-	SI
23	-	-	-	-	-	-	CP.17	185 *	-	RA(400m)
	-	-	-	-	-	-	CP.18	185 *	-	RA(400m)
	-	-	-	-	-	-	CP.19	170 *	-	RA(400m)
	-	-	-	-	-	-	CP.20	170 *	-	RA(400m)
24	-	-	-	-	#24	11	-	-	-	-
25	-	-	-	-	-	-	CP.21	220 *	-	RA(400m)
	-	-	-	-	-	-	CP.22	185 *	CCP.7(3000m)	-
	-	-	-	-	-	-	CP.23	210 *	"	-
	-	-	-	-	-	-	CP.24	120 **	"	-
26	-	-	-	-	#26	9	-	-	-	-
	-	-	-	-	-	-	CP.25	130 **	RA(500m)	-
27	-	-	-	-	#27	9	-	-	-	-
	-	-	-	-	-	-	CP.26	220 *	-	RA(500m)
28	-	-	-	-	#28	10	-	-	-	-
29	-	-	-	-	#29	7 **	-	-	SI	-
30	-	-	-	-	#30	9	-	-		
	-	-	-	-	-	-	CP.27	130 **	RA(300m)	-
	-	-	-	-	-	-	-	-	-	-

Table 6.2.1 CRITICAL SECTIONS AND COUNTERMEASURES (7/7)

STA. NO.	CRITICAL DEPTH(Dc) No.	CRITICAL DEPTH(Dc) Nav.mon. (mon)	FLOW IMPR. INITIAL Nav.mon (mon)	FLOW IMPR. FINAL Nav.mon (mon)	CRITICAL WIDTH(Wc) No.	CRITICAL WIDTH(Wc) Nav.mon. (mon)	CRITICAL CURVATURE(Rc) No.	CRITICAL CURVATURE(Rc) R (m)	CHANNEL IMPROVEMENT STP (Cases of works)	CHANNEL IMPROVEMENT MTP (Cases of works)
31	#31	11	-	-	#31	9	-	-	-	-
Cojedes R.	-	-	-	-	-	-	-	-		
<<PORTUGUESA RIVER ST-P2: COJEDES R.-EL BAUL PORT>>										
Cojedes R.										
32	-	-	-	-	#32	8 *	-	-	-	SI
	-	-	-	-	-	-	CP.28	210 *	-	CCP.8(1200m)
33	-	-	-	-	#33	7 **	-	-	-	"
	-	-	-	-	-	-	CP.29	140 **	RA(400m)	-
34	-	-	-	-	#34	8 *	-	-	-	SI
	-	-	-	-	-	-	CP.30	130 **	RA(300m)	-
	-	-	-	-	-	-	CP.31	160 *	-	RA(300m)
35	-	-	-	-	#35	8 *	-	-	-	SI
36	-	-	-	-	#36	9	-	-	-	CCP.9(1100m)
37	-	-	-	-	#37	7 **	-	-	SI	-
	-	-	-	-	-	-	CP.32	170 *	-	RA(400m)
38	-	-	-	-	#38	7 **	-	-	SI	-
El Baul Pt.	-	-	-	-	-	-	-	-		
39	-	-	-	-	-	-	-	-		

REMARKS:

Critical Sections;

"**": Critical sections subject to improvement under Sort-Term Plan
- For Dc and Wc <8 nav.months in stretches-A1,A2,P1 and P2
- For Dc and Wc <7 nav.months in stretches-A3 and A4
- For Rc <320 m in Apure river and Rc <150 m in Portuguesa river

"*" : Critical sections subject to improvement under Mid-Term Plan
- For Dc and Wc <9 nav.months in stretches-A1,A2,P1 and P2
- For Dc and Wc <8 nav.months in stretches-A3 and A4
- For Rc <560 m in Apure river and Rc <240 m in Portuguesa river

Cases of Flow improvement;
EX : Existing conditions
INITIAL: Caparo-Uribante Viejo der.ch./Initial
FINAL: Caparo-Uribante Viejo der.ch./Final
Nav.months in ( ): INITIAL/FINAL + Anabranch wk.(Chirel+Bravo)

Cases of channel improvement;
CC : Cut-off channel works　　RA : Realignment works
SI : Section improvement works

Table 6.3.1 QUANTITY AND PROJECT COST OF WORKS : SHORT-TERM PLAN

Work item	Unit	Unit cost (US$)	Stretch-A1 Q'ty	Stretch-A1 Amoun ($1000)	Stretch-A2 Q'ty	Stretch-A2 Amoun ($1000)	Stretch-A3 Q'ty	Stretch-A3 Amoun ($1000)	Stretch-A4 Q'ty	Stretch-A4 Amoun ($1000)	Stretch-P1 Q'ty	Stretch-P1 Amoun ($1000)	Stretch-P2 Q'ty	Stretch-P2 Amoun ($1000)	Total Q'ty	Total Amoun ($1000)
I. CONSTRUCTION COST				7,480		398		9,028		14,070		7,890		1,147		40,013
1. Preparatory Works(10%)	l.s.			680		36		821		1,279		717		104		3,637
2. Derivation Channel				0		0		0		3,020		0		0		3,020
21. New channel works	m	337	-	0	-	0	-	0	7,000	2,359	-	0	-	0	7,000	2,359
22. Diversion gate works	l.s.	308,300	-	0	-	0	-	0	1	308	-	0	-	0	1	308
23. Spillway works	l.s.	352,900	-	0	-	0	-	0	1	353	-	0	-	0	1	353
3. Anabranch Treatment				577		0		452		0		0		0		1,029
31. Submerged dike works	m	2,800	206	577	-	0	92	258	-	0	-	0	-	0	298	835
32. Closing dike works	m	1,020	-	0	-	0	190	194	-	0	-	0	-	0	190	194
4. Alignment Normalization				5,674		0		2,797		5,081		6,964		425		20,941
41. Realignment works																
a) Apure R.	m	1,020	800	816	0	0	1,700	1,734	2,600	2,652	-	0	-	0	5,100	5,202
b) Portuguesa R.	m	607	-	0	-	0	-	0	-	0	1,300	789	700	425	2,000	1,214
42. Cut-off channel works																
a) Apure R.	m	759	6,400	4,858	0	0	1,400	1,063	3,200	2,429	-	0	-	0	11,000	8,350
b) Portuguesa R.	m	650	-	0	-	0	-	0	-	0	9,500	6,175	0	0	9,500	6,175
5. Section Improvement				351		351		4,719		4,317		0		588		10,326
a) Apure R.	m	502	700	351	700	351	9,400	4,719	8,600	4,317	-	0	-	0	19,400	9,738
b) Portuguesa R.	m	111	-	0	-	0	-	0	-	0	0	0	5,300	588	5,300	588
6. Miscellaneous works(3%)	l.s.			198		11		239		373		209		30		1,060
II. LAND ACQUISITION	l.s.			1		0		0		2		2		0		5
1. Derivation Channel	ha	13	-	0	-	0	-	0	60	1	-	0	-	0	60	1
2. Cut-off channel works	ha	13	95	1	0	0	21	0	48	1	121	2	0	0	285	4
III. ADMINISTRATION COST (5% of I+II)	l.s.			374		20		451		704		395		57		2,001
IV. ENGINEERING SERVICES	l.s.			1,272		68		1,535		2,392		1,341		195		6,803
(D/D: 7% of I)				524		28		632		985		552		80		2,801
(C/S: 10% of I)				748		40		903		1,407		789		115		4,002
V. PHYSICAL CONTINGENCY (10% of I to IV)	l.s.			913		49		1,101		1,717		963		140		4,883
TOTAL				10,040		535		12,115		18,885		10,591		1,539		53,705

Table 6.3.2 QUANTITY AND PROJECT COST OF WORKS : MID-TERM PLAN

	Work item	Unit	Unit cost (US$)	Stretch-A1 Q'ty	Stretch-A1 Amoun ($1000)	Stretch-A2 Q'ty	Stretch-A2 Amoun ($1000)	Stretch-A3 Q'ty	Stretch-A3 Amoun ($1000)	Stretch-A4 Q'ty	Stretch-A4 Amoun ($1000)	Stretch-P1 Q'ty	Stretch-P1 Amoun ($1000)	Stretch-P2 Q'ty	Stretch-P2 Amoun ($1000)	Total Q'ty	Total Amoun ($1000)
I.	CONSTRUCTION COST				6,084		1,251		18,623		12,594		12,912		4,112		55,576
1.	Preparatory Works(10%)	l.s.			553		114		1,693		1,145		1,174		374		5,053
2.	Derivation Channel				0		0		0		0		0		0		0
21.	New channel works	m	337	-	0	-	0	-	0	-	0	-	0	-	0	0	0
22.	Diversion gate works	l.s.	308,300	-	0	-	0	-	0	-	0	-	0	-	0	0	0
23.	Spillway works	l.s.	352,900	-	0	-	0	-	0	-	0	-	0	-	0	0	0
3.	Anabranch Treatment				0		0		0		0		0		0		0
31.	Submerged dike works	m	2,800	-	0	-	0	-	0	-	0	-	0	-	0	0	0
32.	Closing dike works	m	1,020	-	0	-	0	-	0	-	0	-	0	-	0	0	0
4.	Alignment Normalization				5,019		0		7,752		4,590		8,532		1,920		27,813
41.	Realignment works																
	a) Apure R.	m	1,020	1,200	1,224	0	0	7,600	7,752	4,500	4,590	-	0	-	0	13,300	13,566
	b) Portuguesa R.	m	607	-	0	-	0	-	0	-	0	4,900	2,974	700	425	5,600	3,399
42.	Cut-off channel works																
	a) Apure R.	m	759	5,000	3,795	0	0	0	0	0	0	-	0	-	0	5,000	3,795
	b) Portuguesa R.	m	650	-	0	-	0	-	0	-	0	8,550	5,558	2,300	1,495	10,850	7,053
5.	Section Improvement				351		1,104		8,685		6,526		2,864		1,709		21,239
	a) Apure R.	m	502	700	351	2,200	1,104	17,300	8,685	13,000	6,526	-	0	-	0	33,200	16,666
	b) Portuguesa R.	m	111	-	0	-	0	-	0	-	0	25,800	2,864	15,400	1,709	41,200	4,573
6.	Miscellaneous works(3%)	l.s.			161		33		493		333		342		109		1,471
II.	LAND ACQUISITION	l.s.			1		0		0		0		1		0		2
1.	Derivation Channel	ha	13	-	0	-	0	-	0	-	0	-	0	-	0	0	0
2.	Cut-off channel works	ha	13	75	1	0	0	0	0	0	0	109	1	30	0	214	2
III.	ADMINISTRATION COST (5% of I+II)	l.s.			304		63		931		630		646		206		2,780
IV.	ENGINEERING SERVICES	l.s.			1,034		213		3,166		2,141		2,195		699		9,448
	(D/D: 7% of I)				426		88		1,304		882		904		288		3,892
	(C/S: 10% of I)				608		125		1,862		1,259		1,291		411		5,556
V.	PHYSICAL CONTINGENCY (10% of I to IV)	l.s.			742		153		2,272		1,537		1,575		502		6,781
	TOTAL				8,165		1,680		24,992		16,902		17,329		5,519		74,587

Table 6.4.1 BENEFIT/COST ANALYSIS FOR CHANNEL STABILIZATION (1/2)

- Short-Term Plan - Unit: US$1000

Year	Benefit	Cost				Net Cash Flow
		Project	Operation	M & R	Total	
	a	b	c	d	e=b+c+d	f=a-e
1	-	1,294	-	-	1,294	(1,294)
2	-	1,300	-	-	1,300	(1,300)
3	-	8,503	-	-	8,503	(8,503)
4	2,198	8,503	440	90	9,033	(6,834)
5	4,397	8,503	879	180	9,563	(5,166)
6	6,595	8,503	1,319	271	10,093	(3,497)
7	8,794	8,503	1,759	361	10,623	(1,829)
8	10,992		2,198	451	2,649	8,343
9	10,992		2,198	451	2,649	8,343
10	10,992		2,198	451	2,649	8,343
11	10,992		2,198	451	2,649	8,343
12	10,992		2,198	451	2,649	8,343
13	10,992		2,198	451	2,649	8,343
14	10,992		2,198	451	2,649	8,343
15	10,992		2,198	451	2,649	8,343
16	10,992		2,198	451	2,649	8,343
17	10,992		2,198	451	2,649	8,343
18	10,992		2,198	451	2,649	8,343
19	10,992		2,198	451	2,649	8,343
20	10,992		2,198	451	2,649	8,343
21	10,992		2,198	451	2,649	8,343
22	10,992		2,198	451	2,649	8,343
23	10,992		2,198	451	2,649	8,343
24	10,992		2,198	451	2,649	8,343
25	10,992		2,198	451	2,649	8,343
26	10,992		2,198	451	2,649	8,343
27	10,992		2,198	451	2,649	8,343
28	10,992		2,198	451	2,649	8,343
29	10,992		2,198	451	2,649	8,343
30	10,992		2,198	451	2,649	8,343
31	10,992		2,198	451	2,649	8,343
32	10,992		2,198	451	2,649	8,343
33	10,992		2,198	451	2,649	8,343
34	10,992		2,198	451	2,649	8,343
35	10,992		2,198	451	2,649	8,343
36	10,992		2,198	451	2,649	8,343
37	10,992		2,198	451	2,649	8,343
38	10,992		2,198	451	2,649	8,343
39	10,992		2,198	451	2,649	8,343
40	10,992		2,198	451	2,649	8,343
41	10,992		2,198	451	2,649	8,343
42	10,992		2,198	451	2,649	8,343
43	10,992		2,198	451	2,649	8,343
44	10,992		2,198	451	2,649	8,343
45	10,992		2,198	451	2,649	8,343
46	10,992		2,198	451	2,649	8,343
47	10,992		2,198	451	2,649	8,343
48	10,992		2,198	451	2,649	8,343
49	10,992		2,198	451	2,649	8,343
50	10,992		2,198	451	2,649	8,343
51	10,992		2,198	451	2,649	8,343
52	10,992		2,198	451	2,649	8,343
53	10,992		2,198	451	2,649	8,343
54	10,992		2,198	451	2,649	8,343
55	10,992		2,198	451	2,649	8,343
56	10,992		2,198	451	2,649	8,343
57	10,992		2,198	451	2,649	8,343

IRR (%) = 17.7
B/C = 1.72 (at discount rate: 8%)
B - C = 38,677 (at discount rate: 8%)

Table 6.4.1 BENEFIT/COST ANALYSIS FOR CHANNEL STABILIZATION (2/2)

- Mid Term Plan -

Unit: US$1000

Year	Benefit	Cost				Net Cash Flow
		Project	Operation	M & R	Total	
	a	b	c	d	e=b+c+d	f=a-e
1	-	3,091			3,091	(3,091)
2	-	3,100			3,100	(3,100)
3	-	10,159			10,159	(10,159)
4	2,086	10,159	417	108	10,684	(8,598)
5	4,173	10,159	835	216	11,209	(7,036)
6	6,259	10,159	1,252	323	11,734	(5,475)
7	8,346	10,159	1,669	431	12,259	(3,914)
8	10,432	10,159	2,086	539	12,784	(2,352)
9	12,518	10,159	2,504	647	13,309	(791)
10	14,605	10,159	2,921	755	13,835	770
11	16,691	10,159	3,338	862	14,360	2,332
12	18,778	10,143	3,756	970	14,869	3,909
13	20,864		4,173	1,078	5,251	15,613
14	20,864		4,173	1,078	5,251	15,613
15	20,864		4,173	1,078	5,251	15,613
16	20,864		4,173	1,078	5,251	15,613
17	20,864		4,173	1,078	5,251	15,613
18	20,864		4,173	1,078	5,251	15,613
19	20,864		4,173	1,078	5,251	15,613
20	20,864		4,173	1,078	5,251	15,613
21	20,864		4,173	1,078	5,251	15,613
22	20,864		4,173	1,078	5,251	15,613
23	20,864		4,173	1,078	5,251	15,613
24	20,864		4,173	1,078	5,251	15,613
25	20,864		4,173	1,078	5,251	15,613
26	20,864		4,173	1,078	5,251	15,613
27	20,864		4,173	1,078	5,251	15,613
28	20,864		4,173	1,078	5,251	15,613
29	20,864		4,173	1,078	5,251	15,613
30	20,864		4,173	1,078	5,251	15,613
31	20,864		4,173	1,078	5,251	15,613
32	20,864		4,173	1,078	5,251	15,613
33	20,864		4,173	1,078	5,251	15,613
34	20,864		4,173	1,078	5,251	15,613
35	20,864		4,173	1,078	5,251	15,613
36	20,864		4,173	1,078	5,251	15,613
37	20,864		4,173	1,078	5,251	15,613
38	20,864		4,173	1,078	5,251	15,613
39	20,864		4,173	1,078	5,251	15,613
40	20,864		4,173	1,078	5,251	15,613
41	20,864		4,173	1,078	5,251	15,613
42	20,864		4,173	1,078	5,251	15,613
43	20,864		4,173	1,078	5,251	15,613
44	20,864		4,173	1,078	5,251	15,613
45	20,864		4,173	1,078	5,251	15,613
46	20,864		4,173	1,078	5,251	15,613
47	20,864		4,173	1,078	5,251	15,613
48	20,864		4,173	1,078	5,251	15,613
49	20,864		4,173	1,078	5,251	15,613
50	20,864		4,173	1,078	5,251	15,613
51	20,864		4,173	1,078	5,251	15,613
52	20,864		4,173	1,078	5,251	15,613
53	20,864		4,173	1,078	5,251	15,613
54	20,864		4,173	1,078	5,251	15,613
55	20,864		4,173	1,078	5,251	15,613
56	20,864		4,173	1,078	5,251	15,613
57	20,864		4,173	1,078	5,251	15,613
58	20,864		4,173	1,078	5,251	15,613
59	20,864		4,173	1,078	5,251	15,613
60	20,864		4,173	1,078	5,251	15,613
61	20,864		4,173	1,078	5,251	15,613
62	20,864		4,173	1,078	5,251	15,613

IRR (%) = 13.7

B/C = 1.46 (at discount rate: 8%)

B - C = 46,666 (at discount rate: 8%)

FIGURES

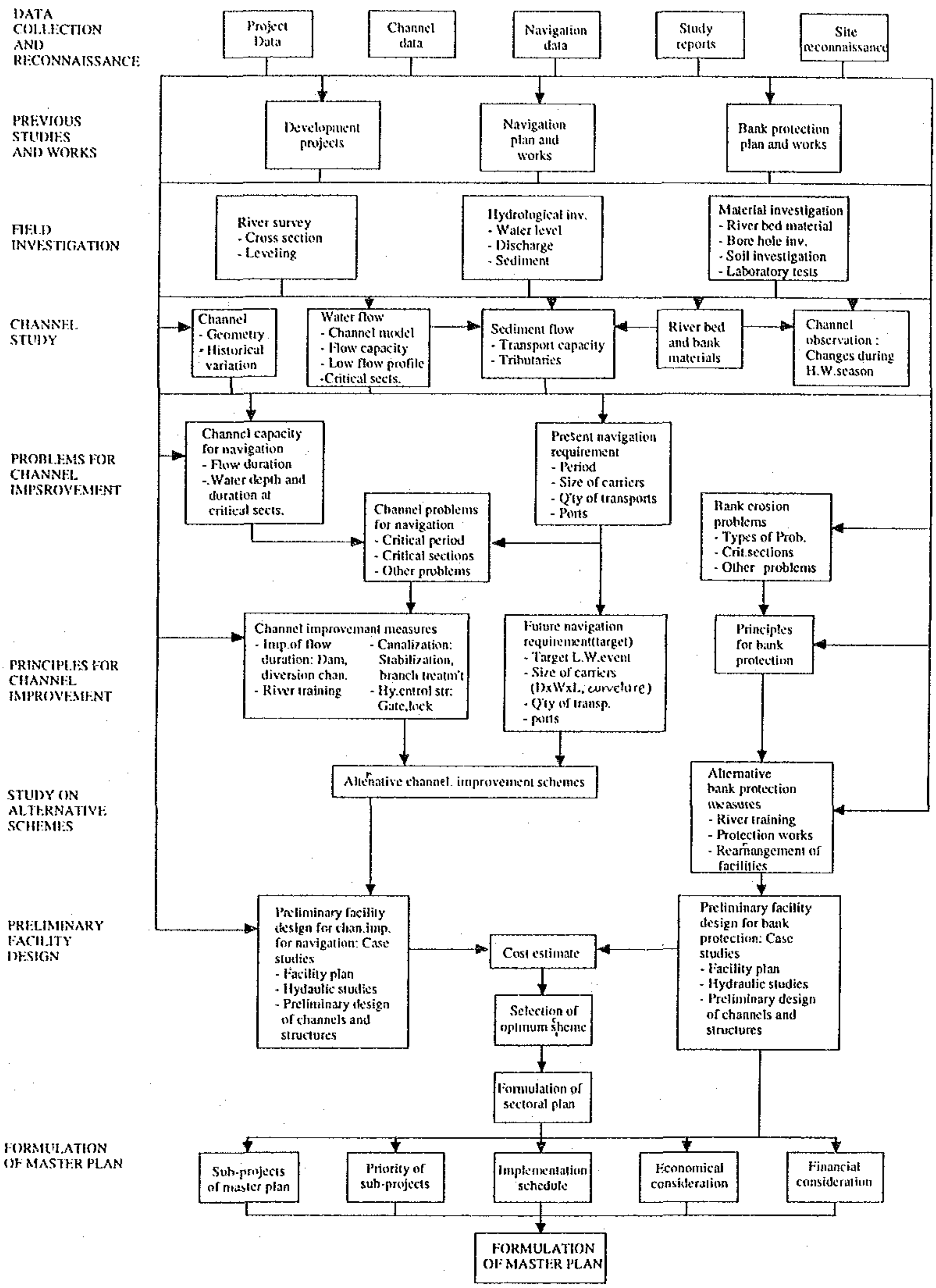


Fig. 1.1.1 Flow of Channel Stabilization Study

THE REPUBLIC OF VENEZUELA
COMPREHENSIVE IMPROVEMENT
OF THE APURE RIVER BASIN

JAPAN INTERNATIONAL COOPERATION AGENCY

LIST OF EXISTING, ON-GOING AND PROPOSED DAMS

CODE	NAME OF DAM	STATUS	OWNER	PURPOSE
D1	LA HONDA	EXISTING	CADAFE	HP
D2	LAS CUEVAS	PROPOSED	CADAFE	HP
D3	BORDE SECO	UNDER CONST.	CADAFE	HP
D4	LA VUELTOSA	UNDER CONST.	CADAFE	HP
D5	STO.DOMINGO	EXISTING	CADAFE	HP
D6	MASPARRO	EXISTING	MARNR	IR,HP,FC,LI
D7	BOCONO-TUCUPIDO	EXISTING	MARNR	IR,FC,HP
D8	MESA DE CAVACA	PROPOSED	MARNR	IR,FC
D9	VEGA HONDA	PROPOSED	MARNR	IR,HP,FC
D10	MORADOR	PROPOSED	MARNR	IR,HP,FC
D11	YACAMBU	UNDER CONST.	MARNR	WS,IR
D12	DOS BOCAS	PROPOSED	MARNR	WS,IR,HP,FC
D13	LAS MAJAGUAS	EXISTING	MARNR	IR,FC
D14	RIITO	PROPOSED	MARNR	WS
D15	LAS PALMAS	UNDER CONST.	MARNR	WS,IR,HP,FC
D16	CABUY	EXISTING	MARNR	IR
D17	LA PALMERA	PROPOSED	MARNR	WS
D18	TINACO	PROPOSED	MARNR	IR
D19	CACHINCHE	EXISTING	INOS	WS,IR
D20	LA BALSA	EXISTING	INOS	WS
D21	TIZNADOS	EXISTING	MARNR	WS,IR,FC

REMARKS:

1. PURPOSE:
   WS:WATER SUPPLY HP:HYDRO-POWER LI:LAND IMPROVEMENT
   IR:IRRIGATION FC:FLOOD CONTROL
2. OWNER:
   MARNR :MINISTERIO DEL AMBIENTE Y DE LOS RECURSOS NATURALES RENOVABLES.
   INOS :INSTITUTO NACIONAL DE OBRAS SANITARIAS.
   CADAFE:COMPANIA ANONIMA DE DESARROLLO Y FOMENTO ELECTRICO

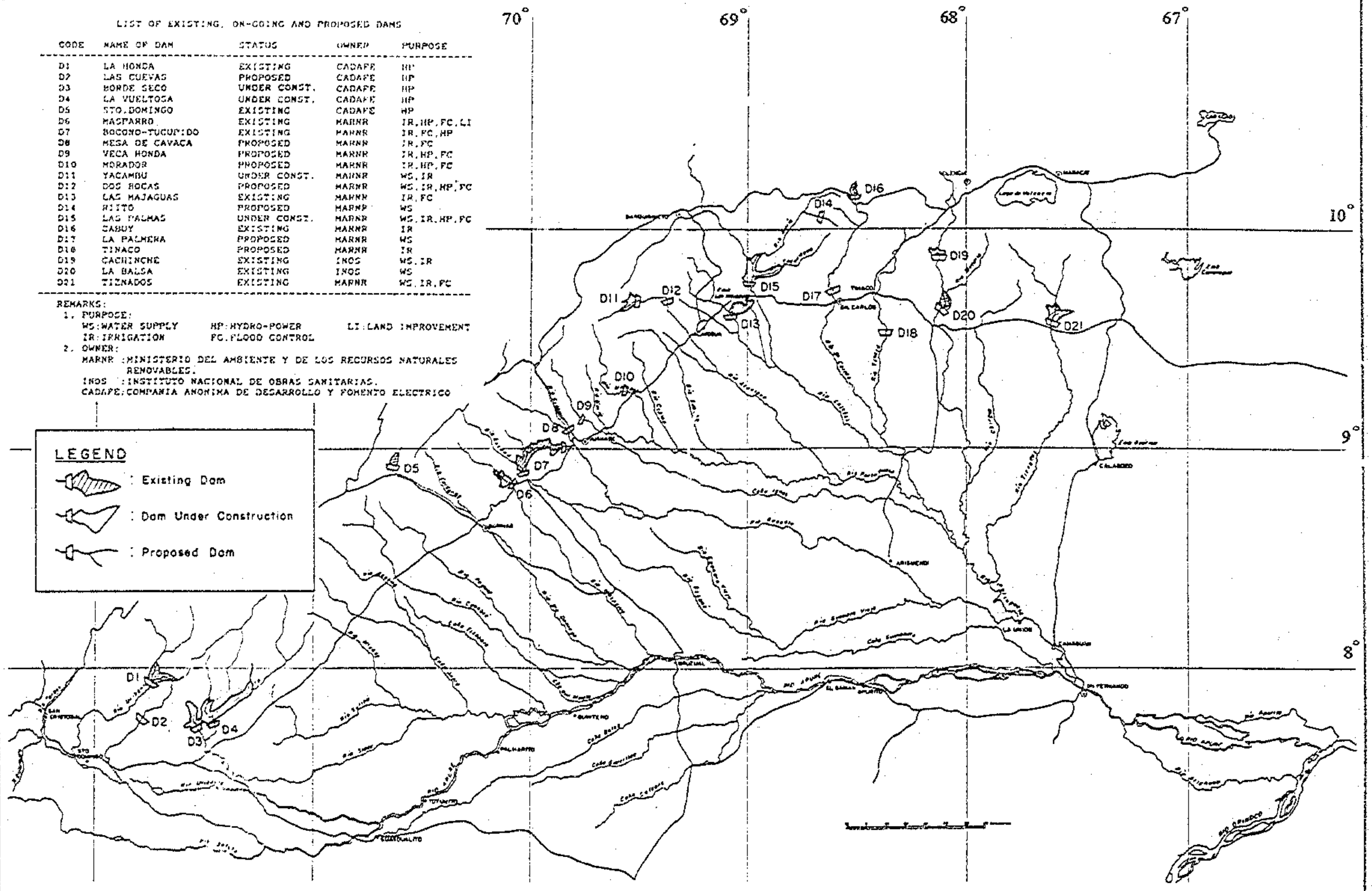


Fig. 2.1.1 Location of Existing and Proposed Dams

THE REPUBLIC OF VENEZUELA
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OF THE APURE RIVER BASIN

JAPAN INTERNATIONAL COOPERATION AGENCY

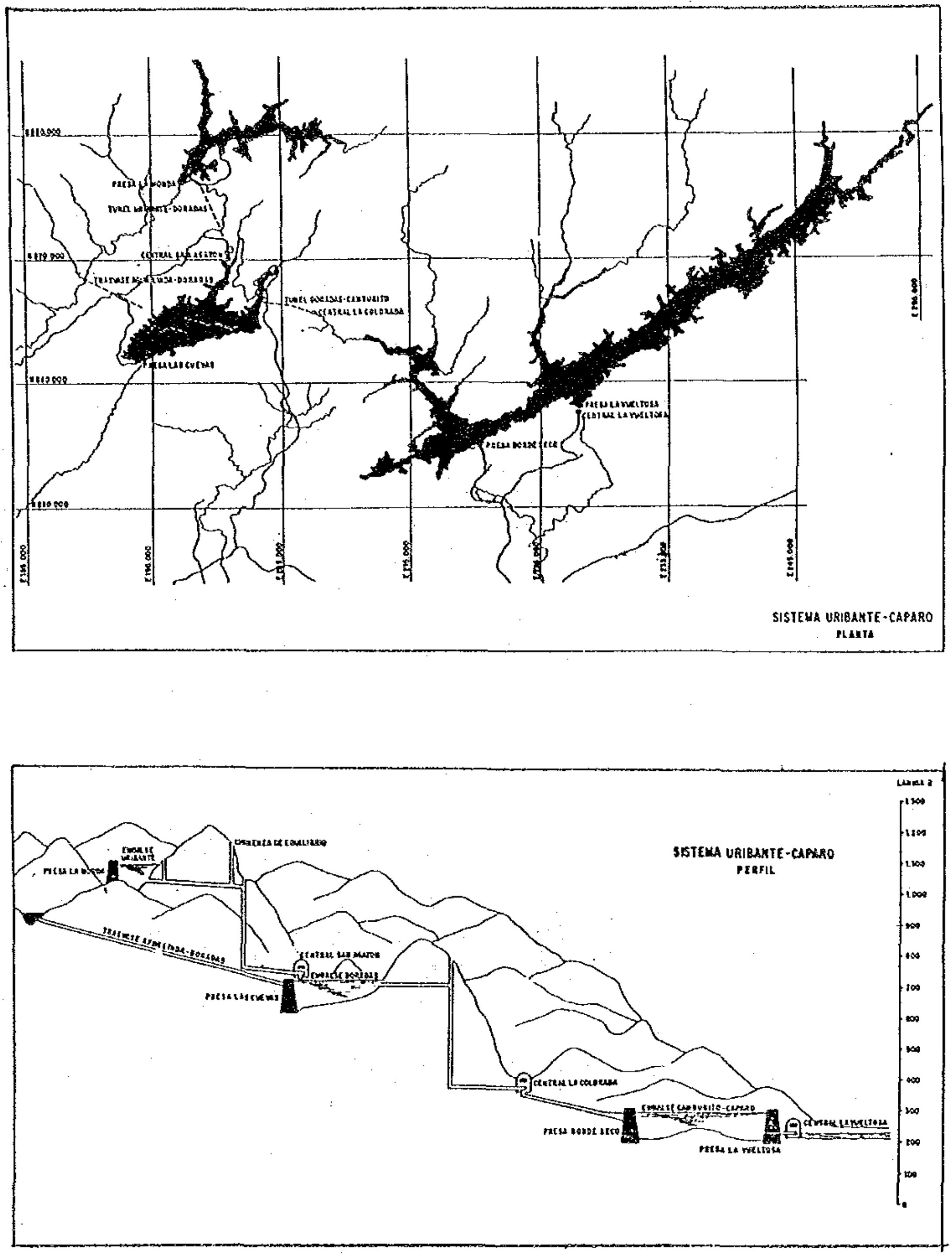

Fig. 2.1.2 Uribante-Caparo Project

THE REPUBLIC OF VENEZUELA
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JAPAN INTERNATIONAL COOPERATION AGENCY

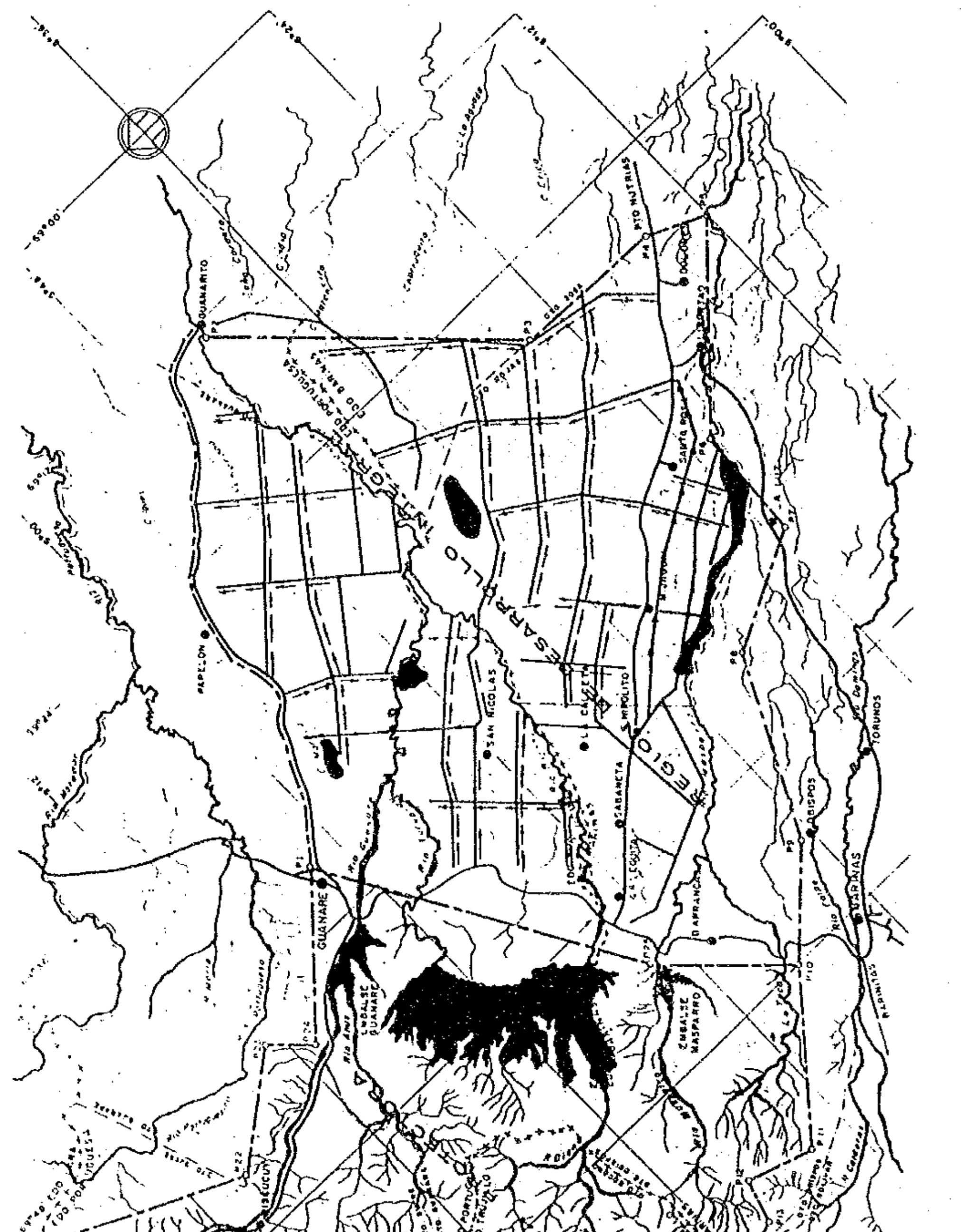

Fig. 2.1.3 Guanare-Masparro Project

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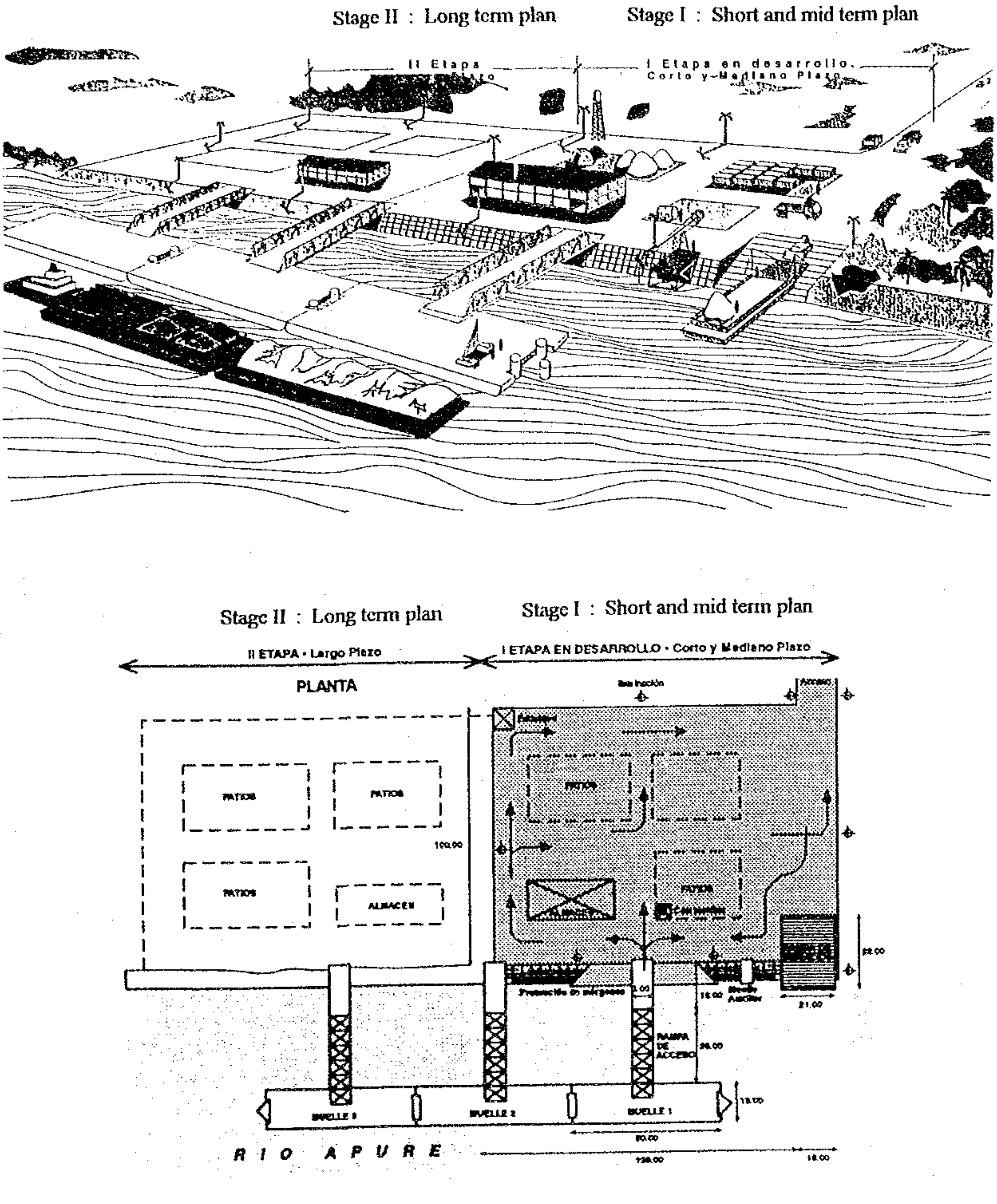

Fig. 2.2.1 General View of San Fernando Fluvial Port

THE REPUBLIC OF VENEZUELA COMPREHENSIVE IMPROVEMENT OF THE APURE RIVER BASIN
JAPAN INTERNATIONAL COOPERATION AGENCY

EXISTING AND PROPOSED CHANNEL IMPROVEMENT WORKS

CODE	PROJECT/WORKS	STATUS
(1)	Dike Project	
(1)1	San Fernando - Biruaca - Achaguas - Apurito road dike	Existing
(1)2	Apurito - San Fernando dike	Existing
(1)3	San Vicente - Palmarito dike	Existing
(1)4	Old channel closing at Pto. Nutrias	Existing On-going
(2)	Bank Protection Works	
(2)1	Guasdualito	Existing
(2)2	Totumito	Existing
(2)3	Palmarito	Existing
(2)4	Quintero	Existing
(2)5	San Vicente	Existing
(2)6	Bruzual bridge	Existing
(2)7	El Saman	Existing
(2)8	Apurito	Existing
(2)9	Confluence of Portuguesa river	Existing
(2)10	San Fernando town, bridge, and airport	Existing
(2)11	El Negro	Existing
(2)12	Arichuna	Existing
(3)	Apurito Guide Dike Project	Existing
(4)	Submerged Dike on Chirel River	On-going
(5)	Cut-off Channel of Portuguesa River	
(5)1	Cut-off channel at Camaguan	Design
(5)2	Cut-off channel at La Muerta	Design
(6)	Caparo - Uribante Viejo Diversion Channel	Design
(7)	Channel Improvement of Upper Portuguesa River	
(7)1	Stabilization of Acarigua River - Turen pilot channel system	Study
(7)2	Margenal dike of Portuguesa and Rico river	Study
(8)	Cojedes - Frasco Diversion Channel	Study

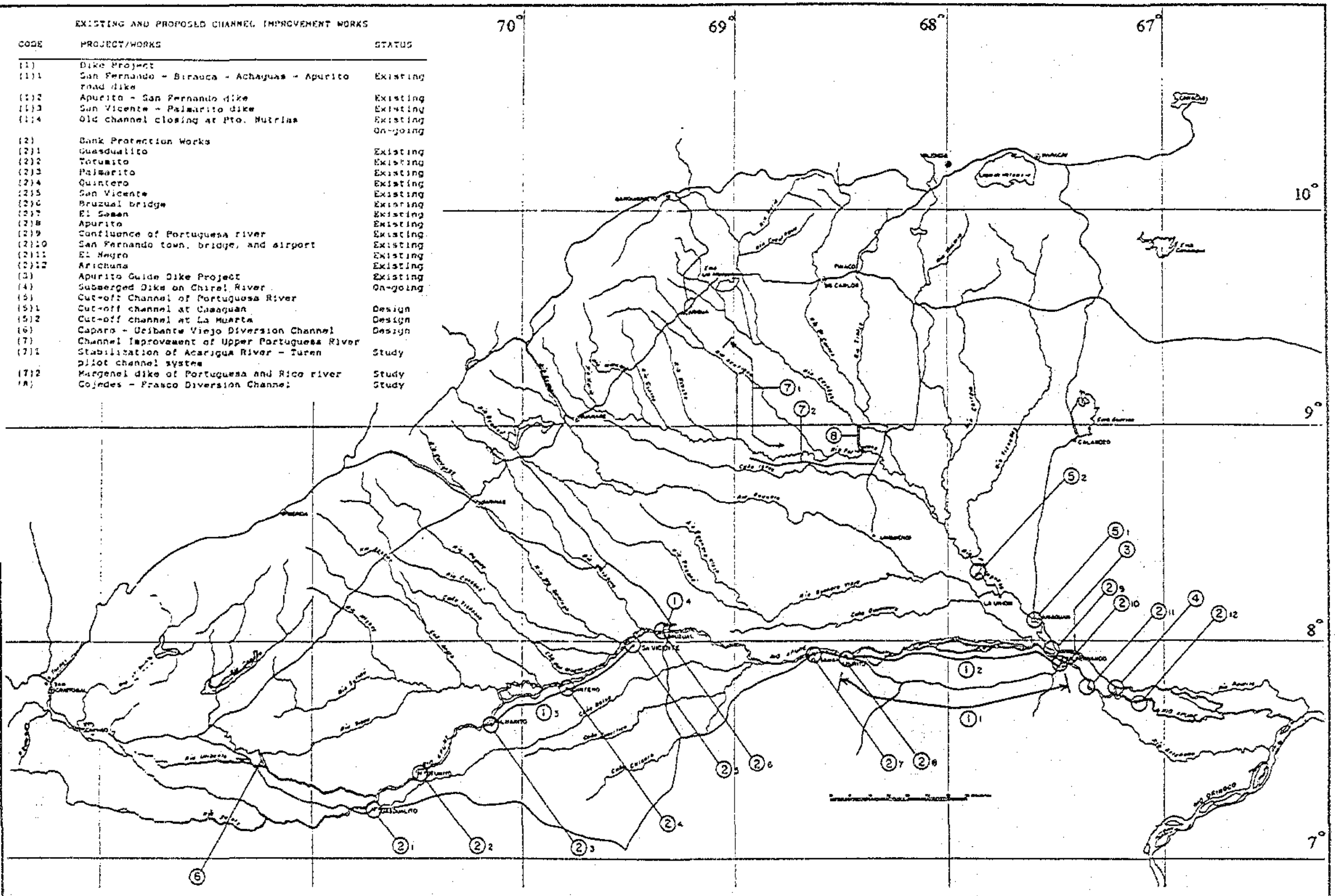

Fig. 2.3.1 Location of Existing and Proposed Channel Improvement Projects

THE REPUBLIC OF VENEZUELA
COMPREHENSIVE IMPROVEMENT
OF THE APURE RIVER BASIN

JAPAN INTERNATIONAL COOPERATION AGENCY

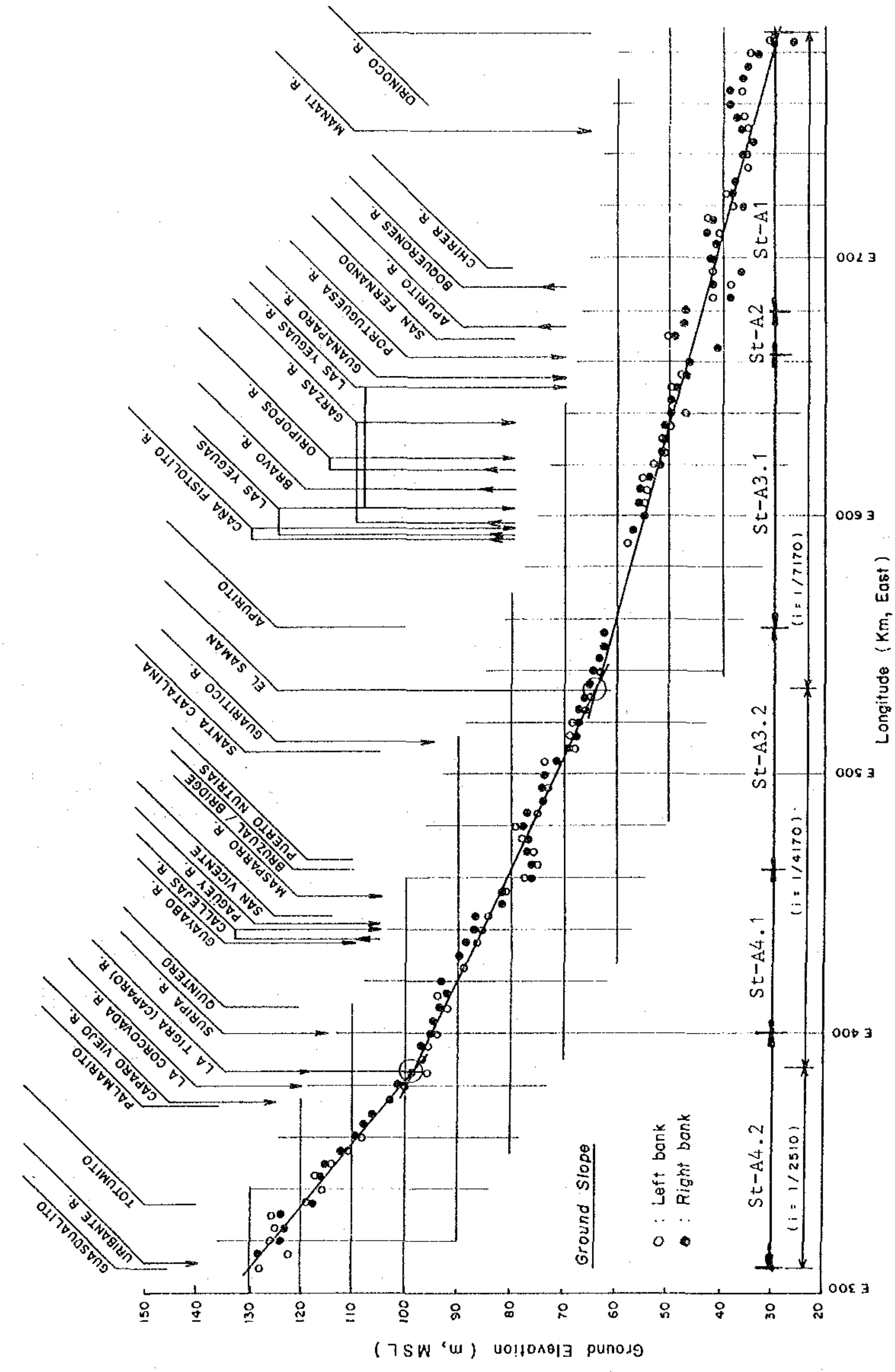

Fig. 3.2.1 River Bank Elevation of Apure River

THE REPUBLIC OF VENEZUELA
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OF THE APURE RIVER BASIN

JAPAN INTERNATIONAL COOPERATION AGENCY

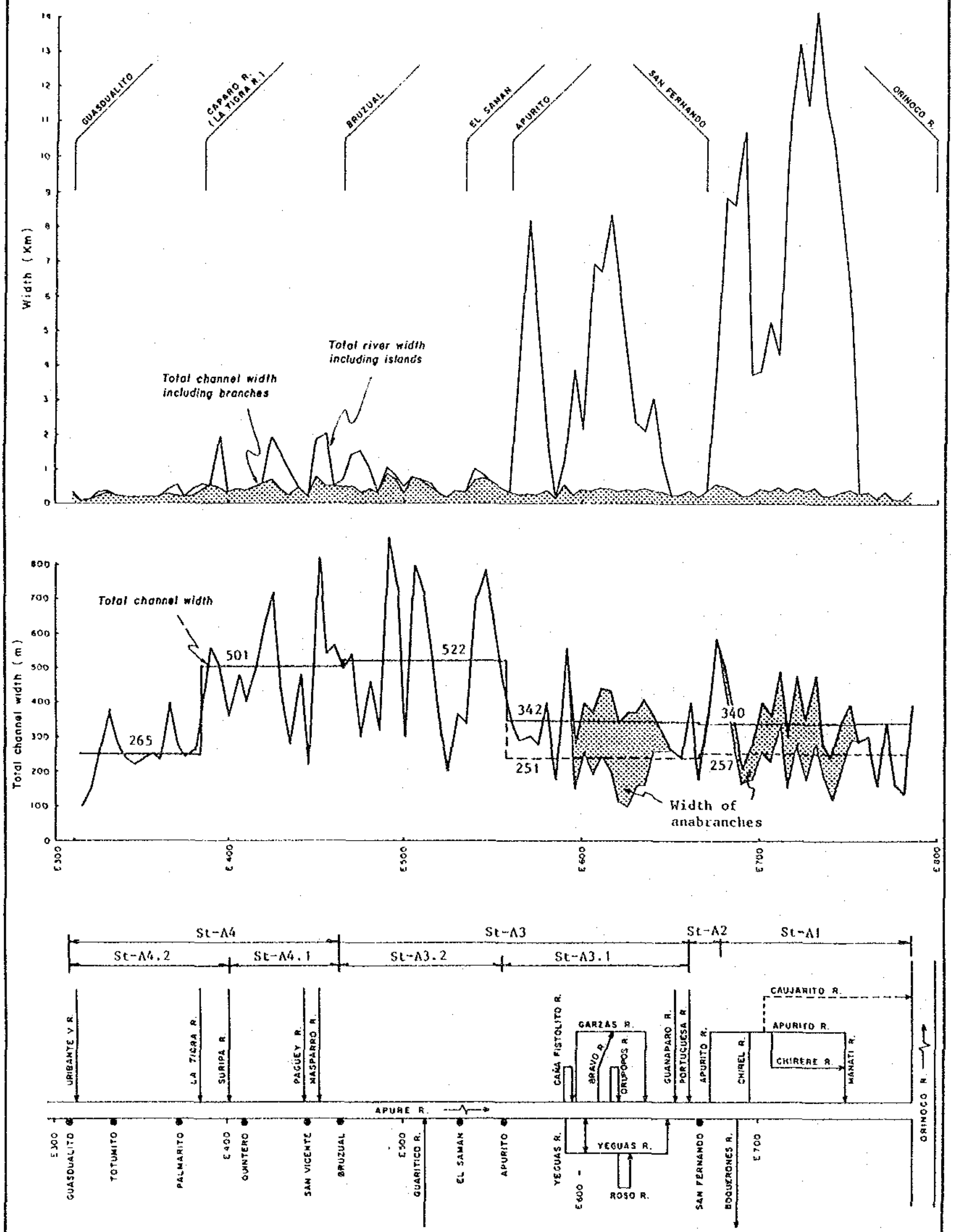

Fig. 3.2.2 River Width of Apure River

THE REPUBLIC OF VENEZUELA
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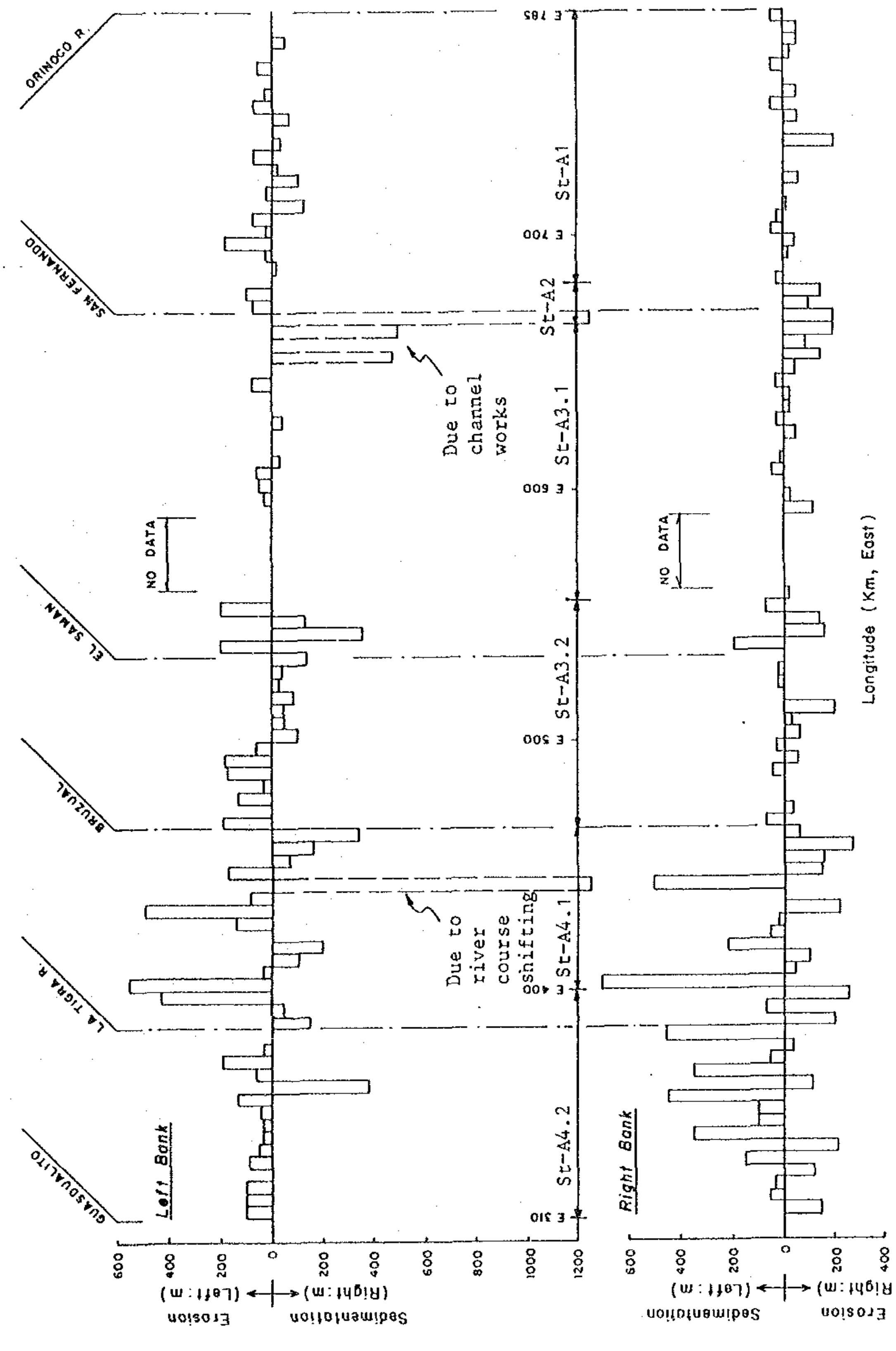


Fig. 3.3.1 River Bank Variation of Apure

THE REPUBLIC OF VENEZUELA COMPREHENSIVE IMPROVEMENT OF THE APURE RIVER BASIN
JAPAN INTERNATIONAL COOPERATION AGENCY

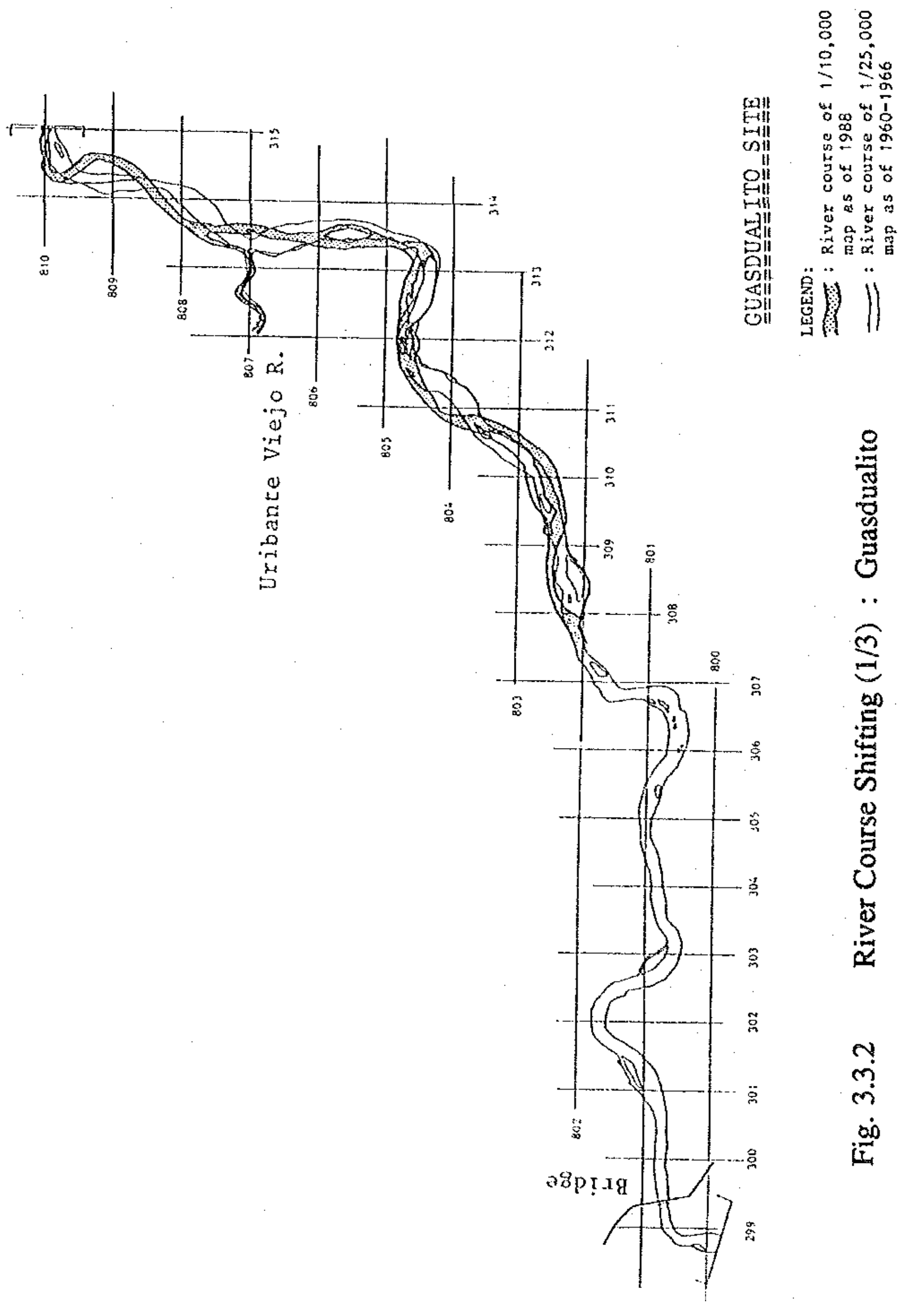
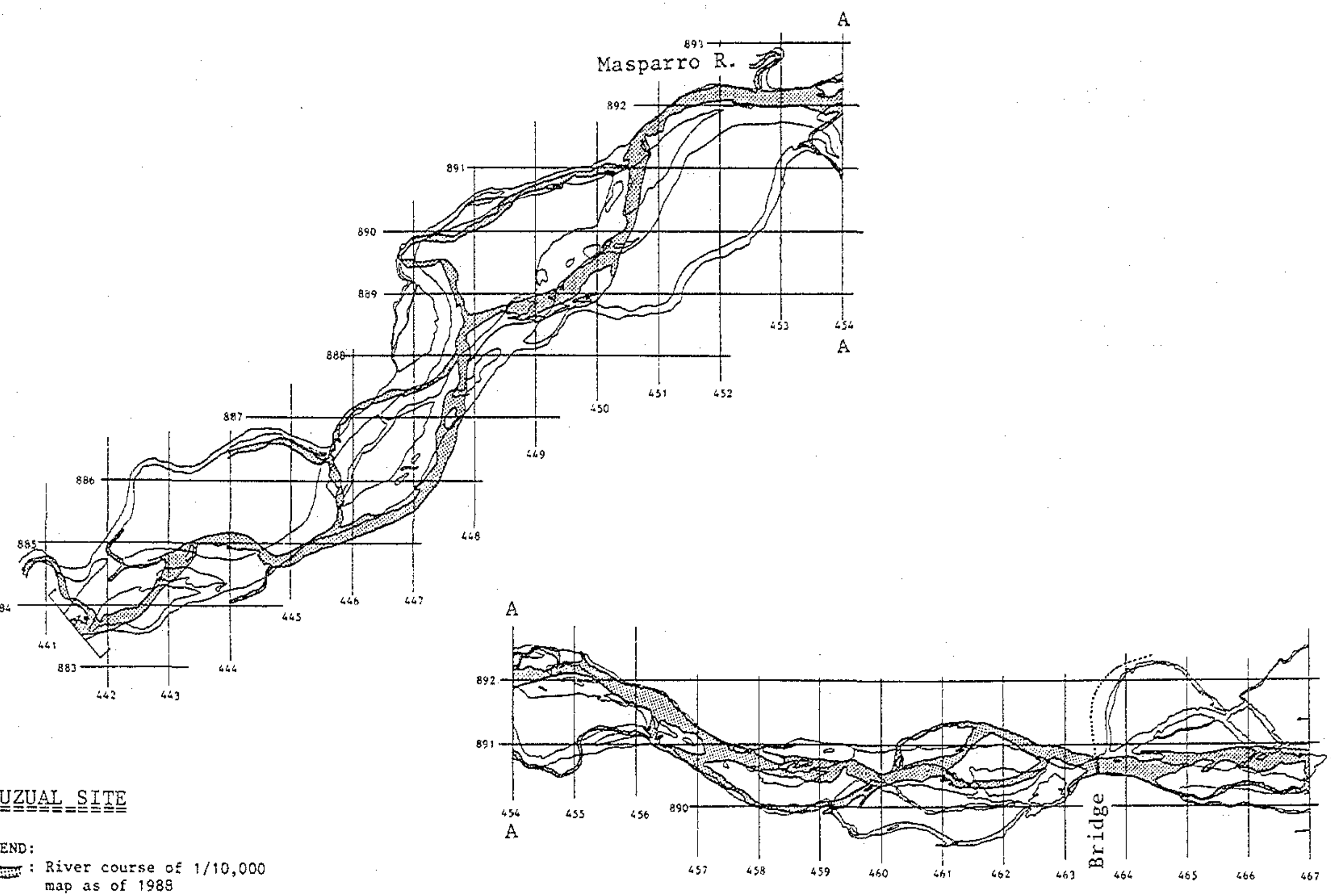


Fig. 3.3.2 River Course Shifting (1/3) : Guasdualito

THE REPUBLIC OF VENEZUELA COMPREHENSIVE IMPROVEMENT OF THE APURE RIVER BASIN
JAPAN INTERNATIONAL COOPERATION AGENCY

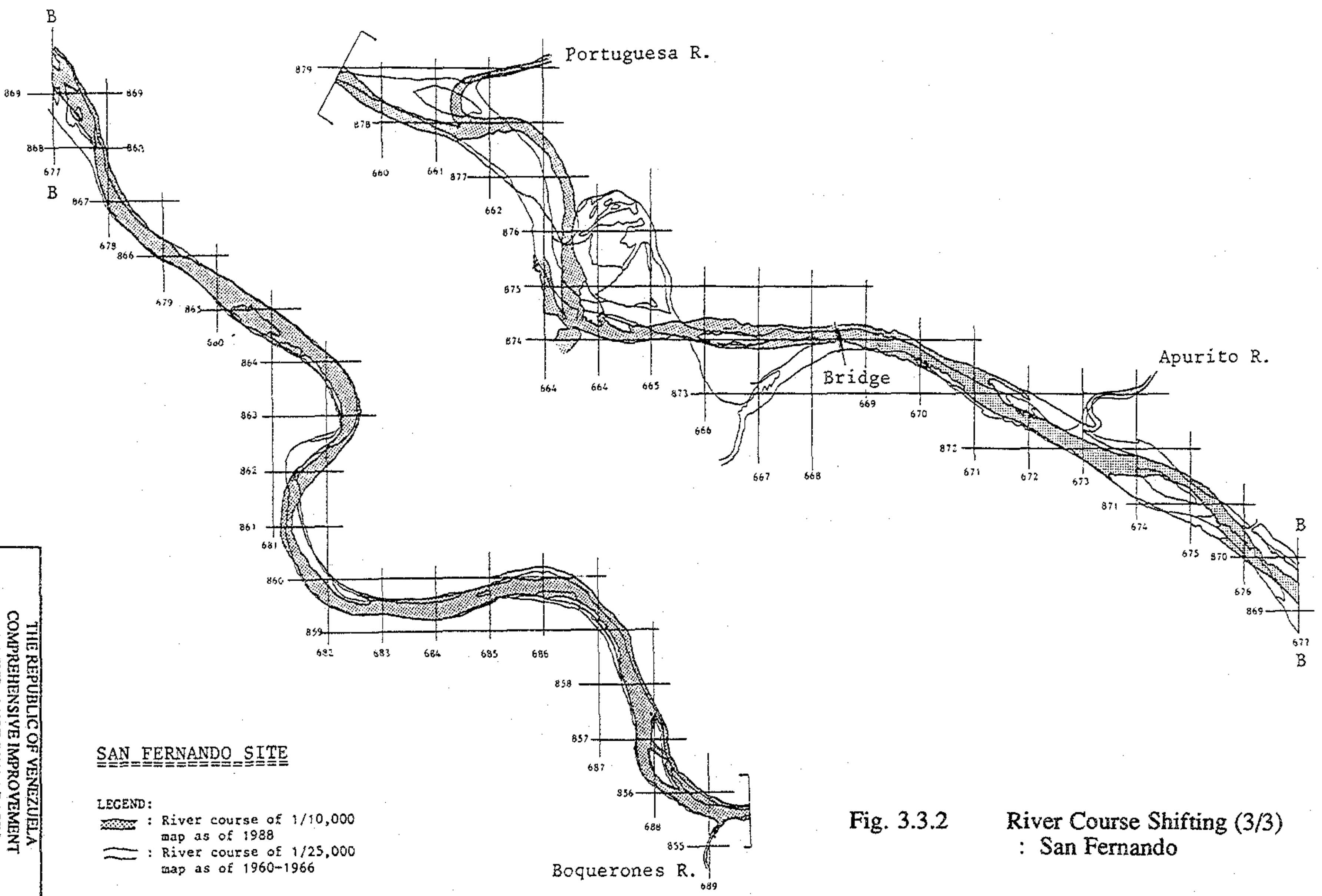


BRUZUAL SITE

LEGEND:
: River course of 1/10,000 map as of 1988
: River course of 1/25,000 map as of 1960-1966

Fig. 3.3.2 River Course Shifting (2/3) : Bruzual

THE REPUBLIC OF VENEZUELA
COMPREHENSIVE IMPROVEMENT
OF THE APURE RIVER BASIN
JAPAN INTERNATIONAL COOPERATION AGENCY



SAN FERNANDO SITE

LEGEND:
: River course of 1/10,000 map as of 1988
: River course of 1/25,000 map as of 1960-1966

Fig. 3.3.2 River Course Shifting (3/3) : San Fernando

THE REPUBLIC OF VENEZUELA
COMPREHENSIVE IMPROVEMENT
OF THE APURE RIVER BASIN

JAPAN INTERNATIONAL COOPERATION AGENCY

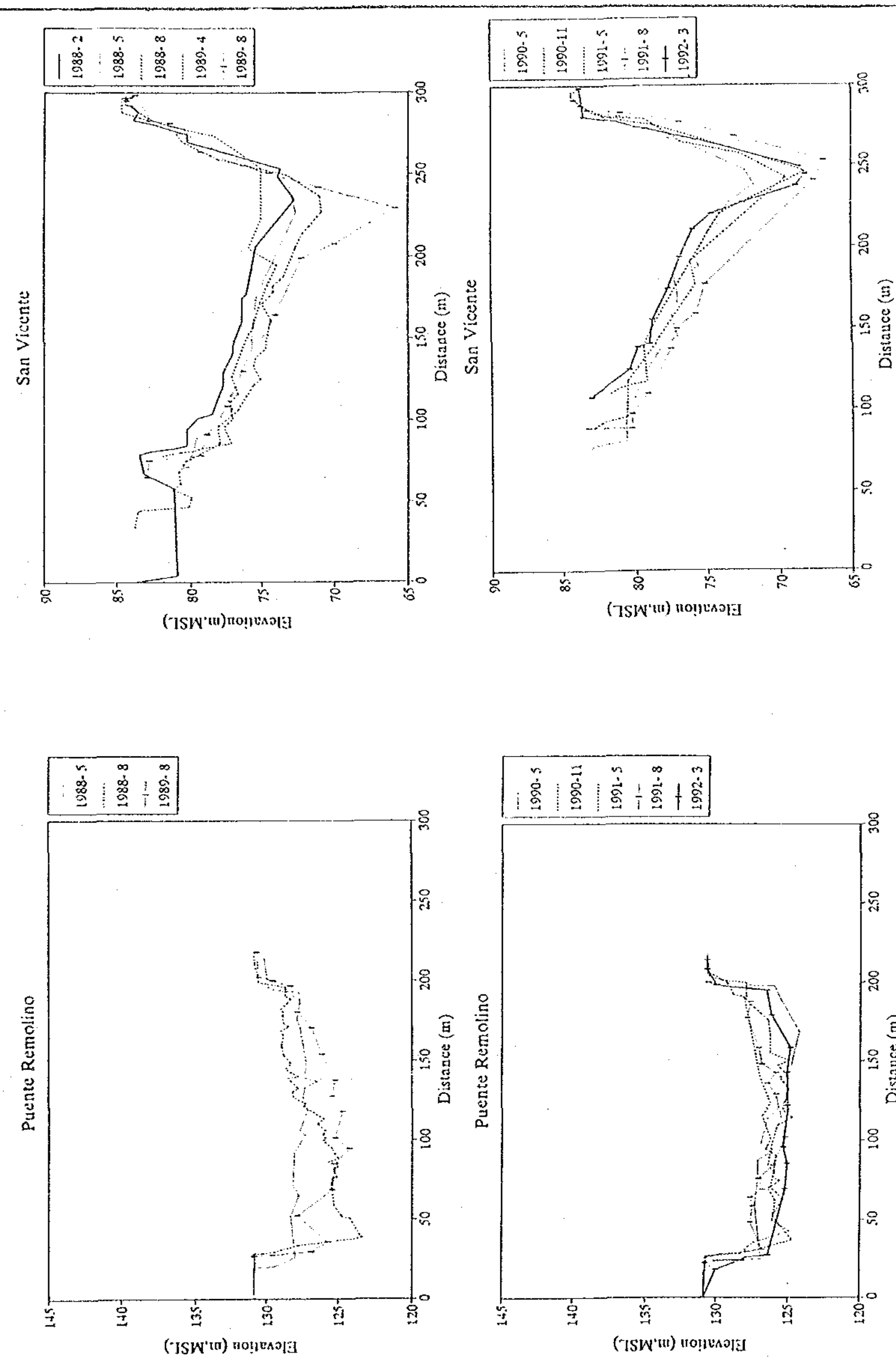


Fig. 3.3.3 Changes of Representative River Sections (1/3)

THE REPUBLIC OF VENEZUELA
COMPREHENSIVE IMPROVEMENT
OF THE APURE RIVER BASIN

JAPAN INTERNATIONAL COOPERATION AGENCY

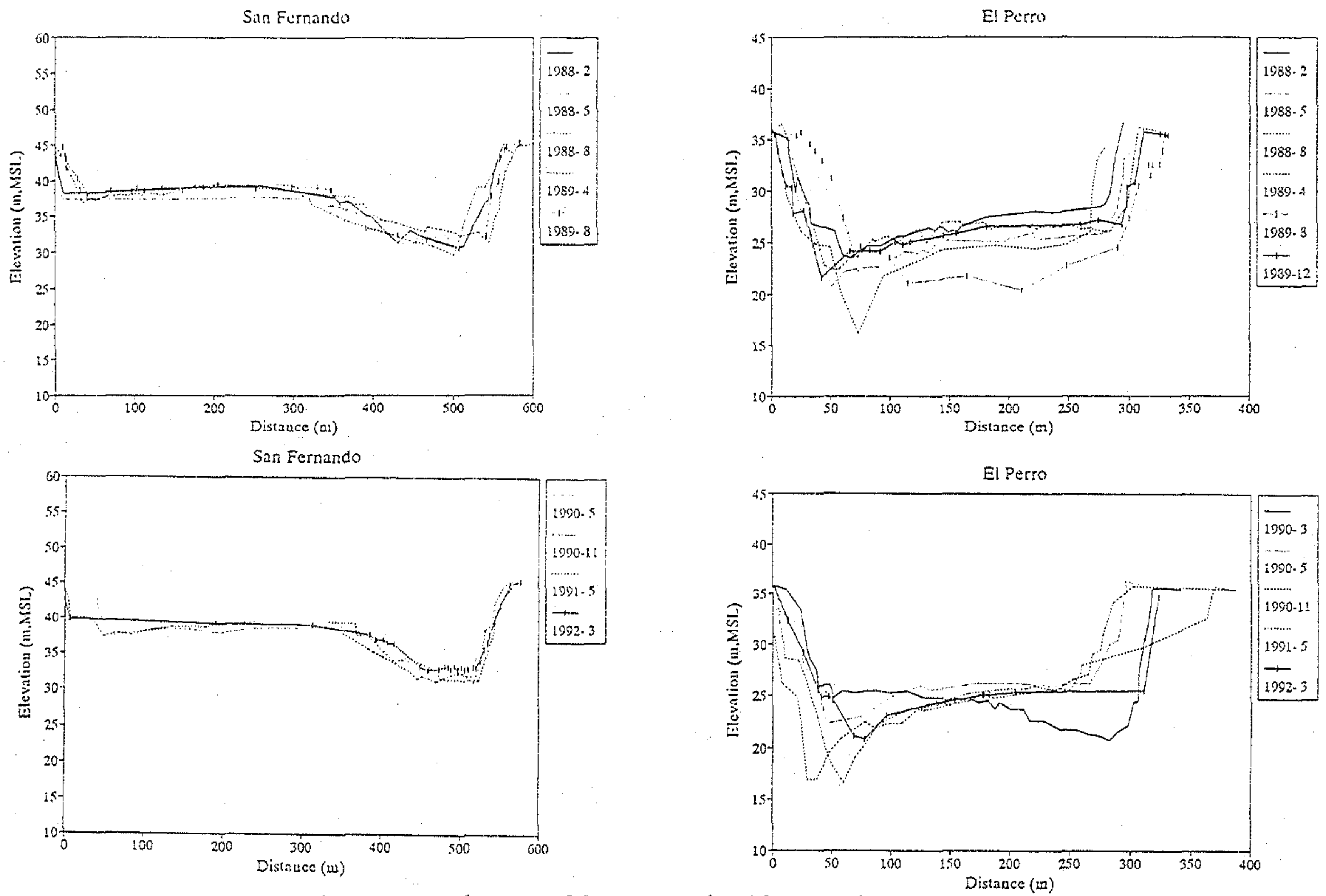


Fig. 3.3.3 Changes of Representative River Sections (2/3)

THE REPUBLIC OF VENEZUELA
COMPREHENSIVE IMPROVEMENT
OF THE APURE RIVER BASIN

JAPAN INTERNATIONAL COOPERATION AGENCY

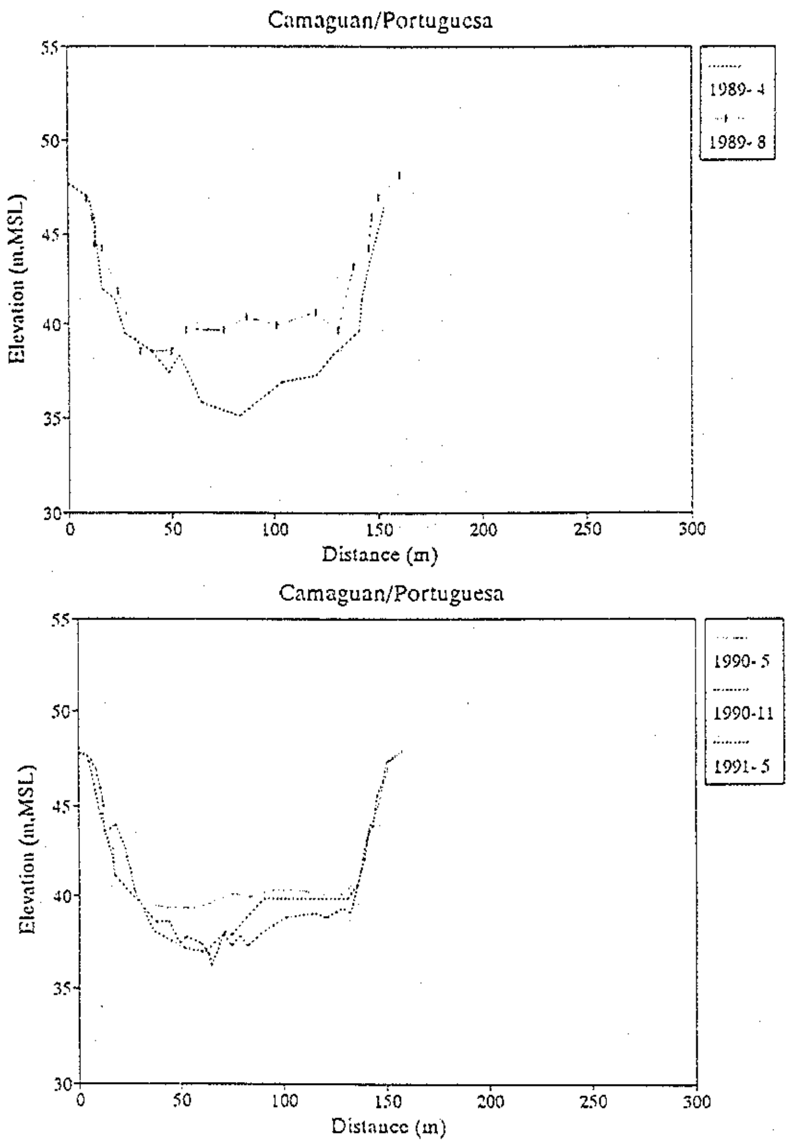


Fig. 3.3.3 Changes of Representative River Sections (3/3)

THE REPUBLIC OF VENEZUELA
COMPREHENSIVE IMPROVEMENT
OF THE APURE RIVER BASIN

JAPAN INTERNATIONAL COOPERATION AGENCY

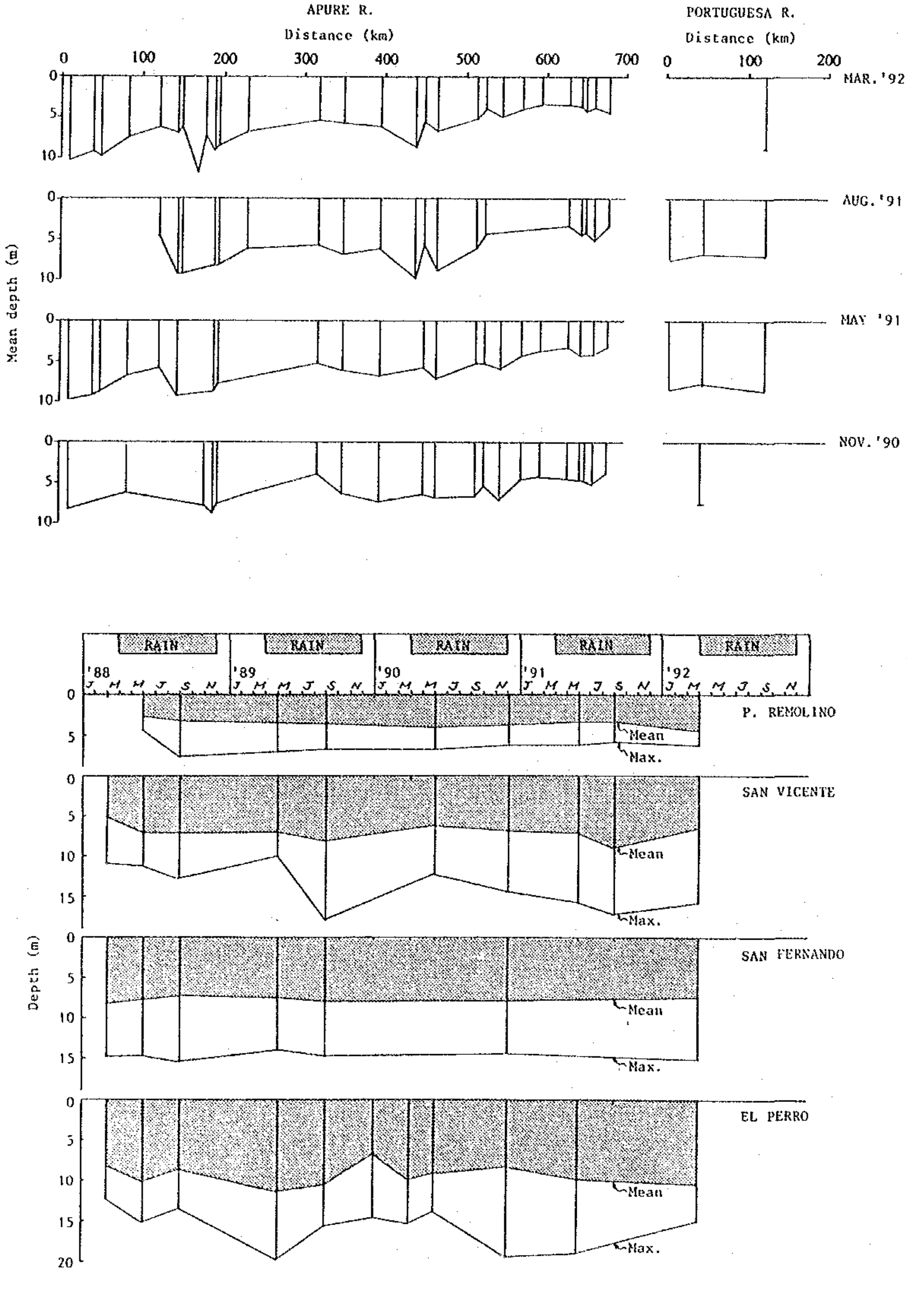


Fig. 3.3.4 Changes of Channel Depth

THE REPUBLIC OF VENEZUELA
COMPREHENSIVE IMPROVEMENT
OF THE APURE RIVER BASIN

JAPAN INTERNATIONAL COOPERATION AGENCY

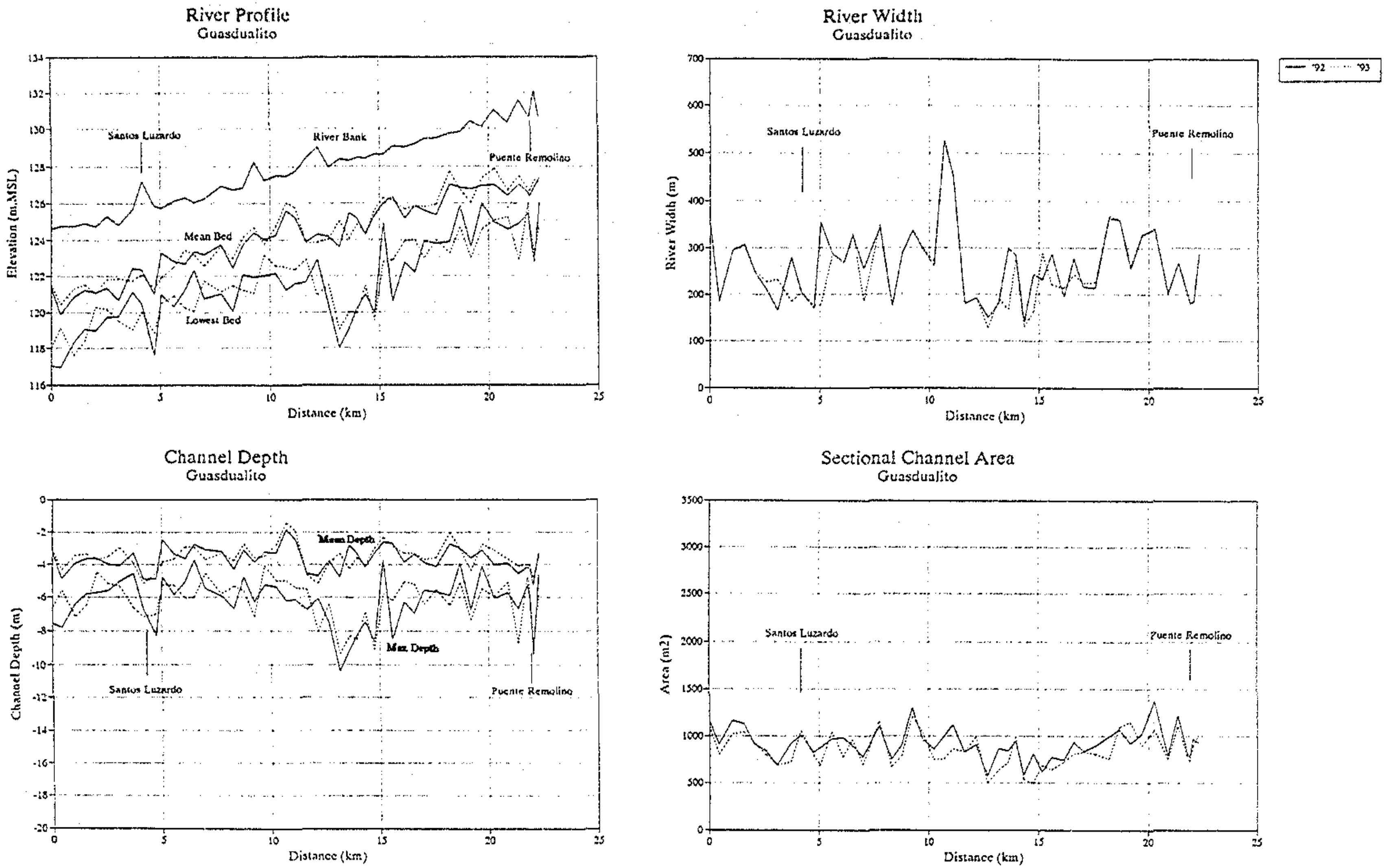


Fig. 3.4.1 Variation of Channel through Flood Season : Guasdualito (1/2)

THE REPUBLIC OF VENEZUELA
COMPREHENSIVE IMPROVEMENT
OF THE APURE RIVER BASIN

JAPAN INTERNATIONAL COOPERATION AGENCY

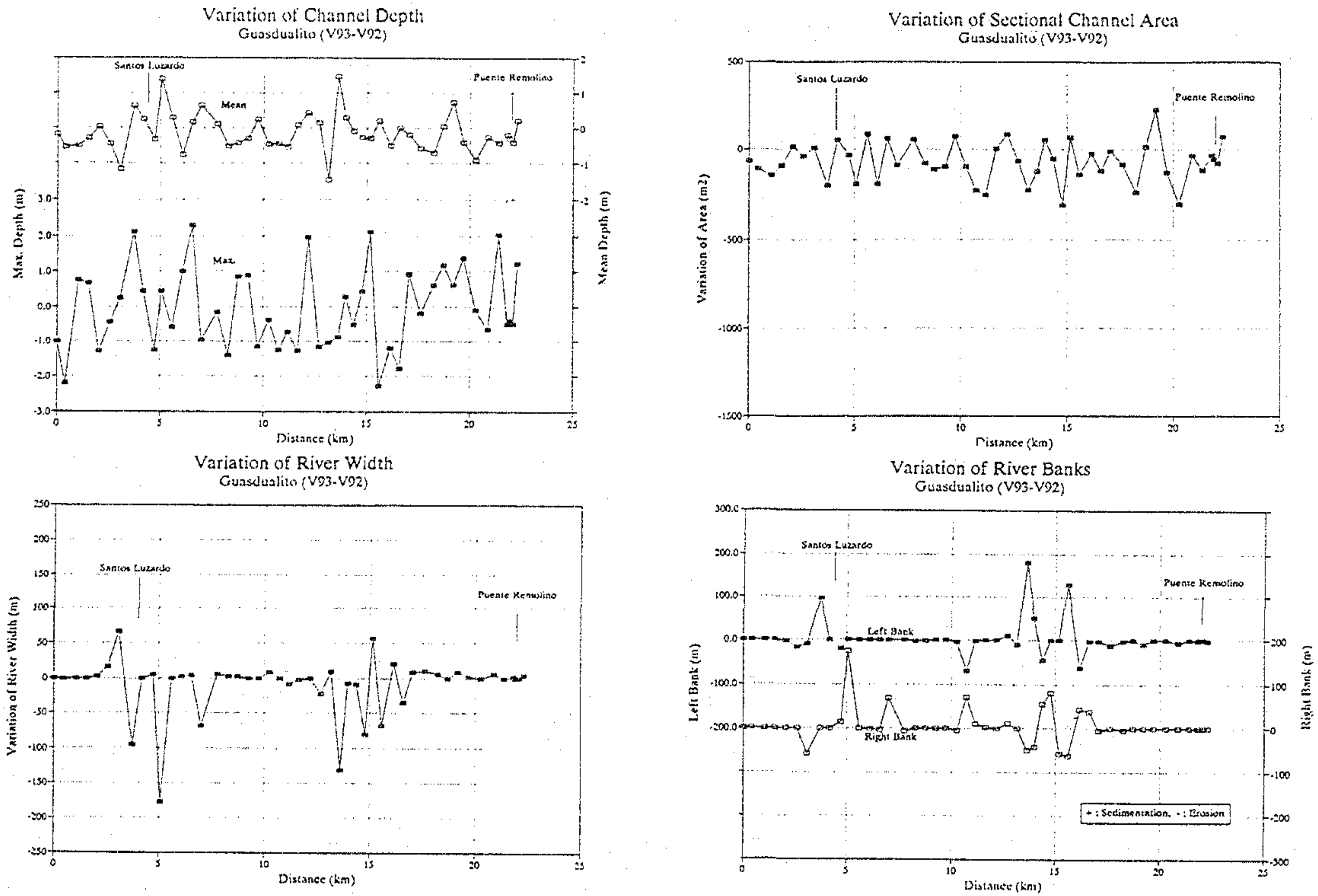


Fig. 3.4.1 Variation of Channel through Flood Season : Guasdualito (2/2)

THE REPUBLIC OF VENEZUELA
COMPREHENSIVE IMPROVEMENT
OF THE APURE RIVER BASIN

JAPAN INTERNATIONAL COOPERATION AGENCY

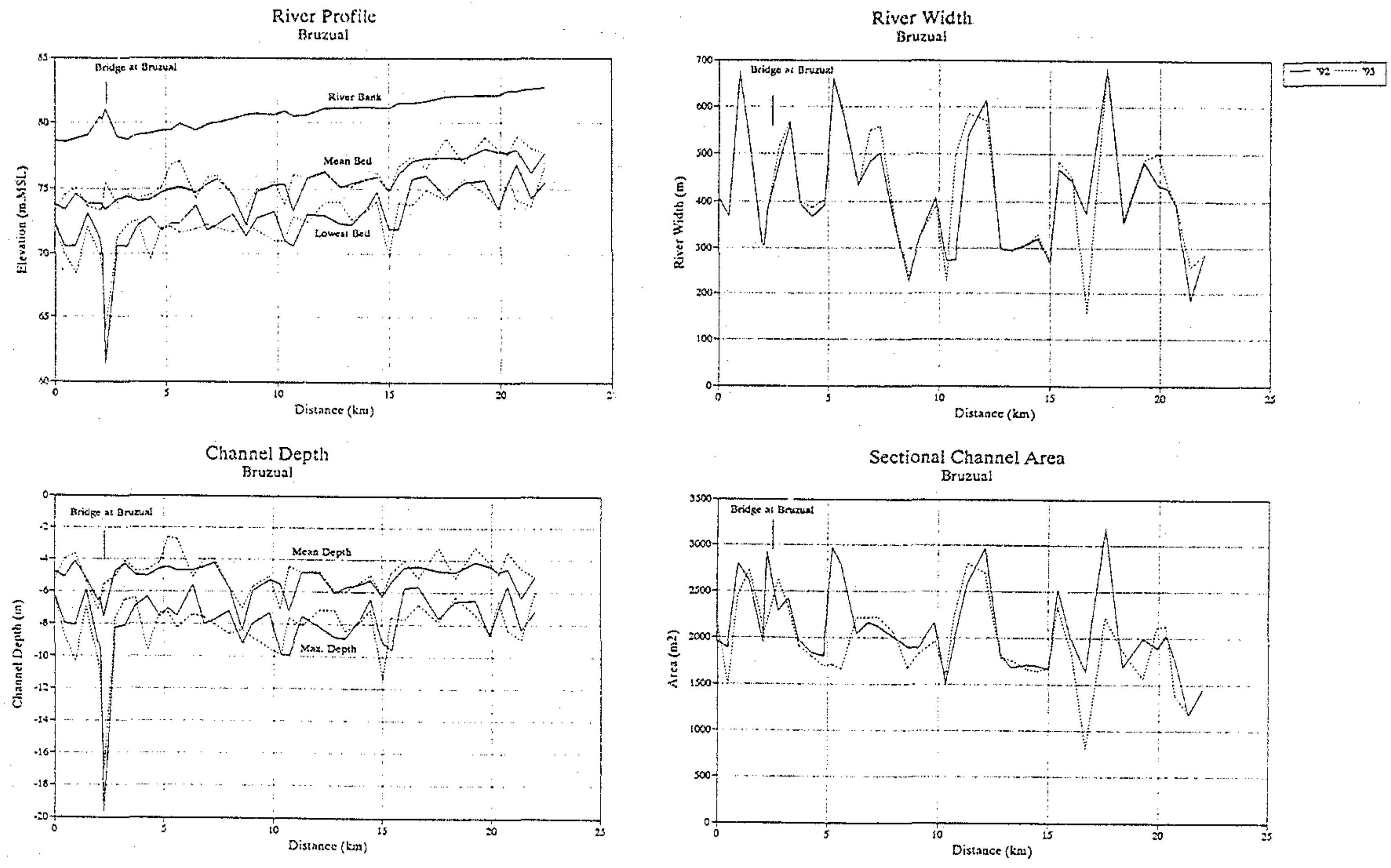


Fig. 3.4.2 Variation of Channel through Flood Season : Bruzual (1/2)

THE REPUBLIC OF VENEZUELA
COMPREHENSIVE IMPROVEMENT
OF THE APURE RIVER BASIN

JAPAN INTERNATIONAL COOPERATION AGENCY

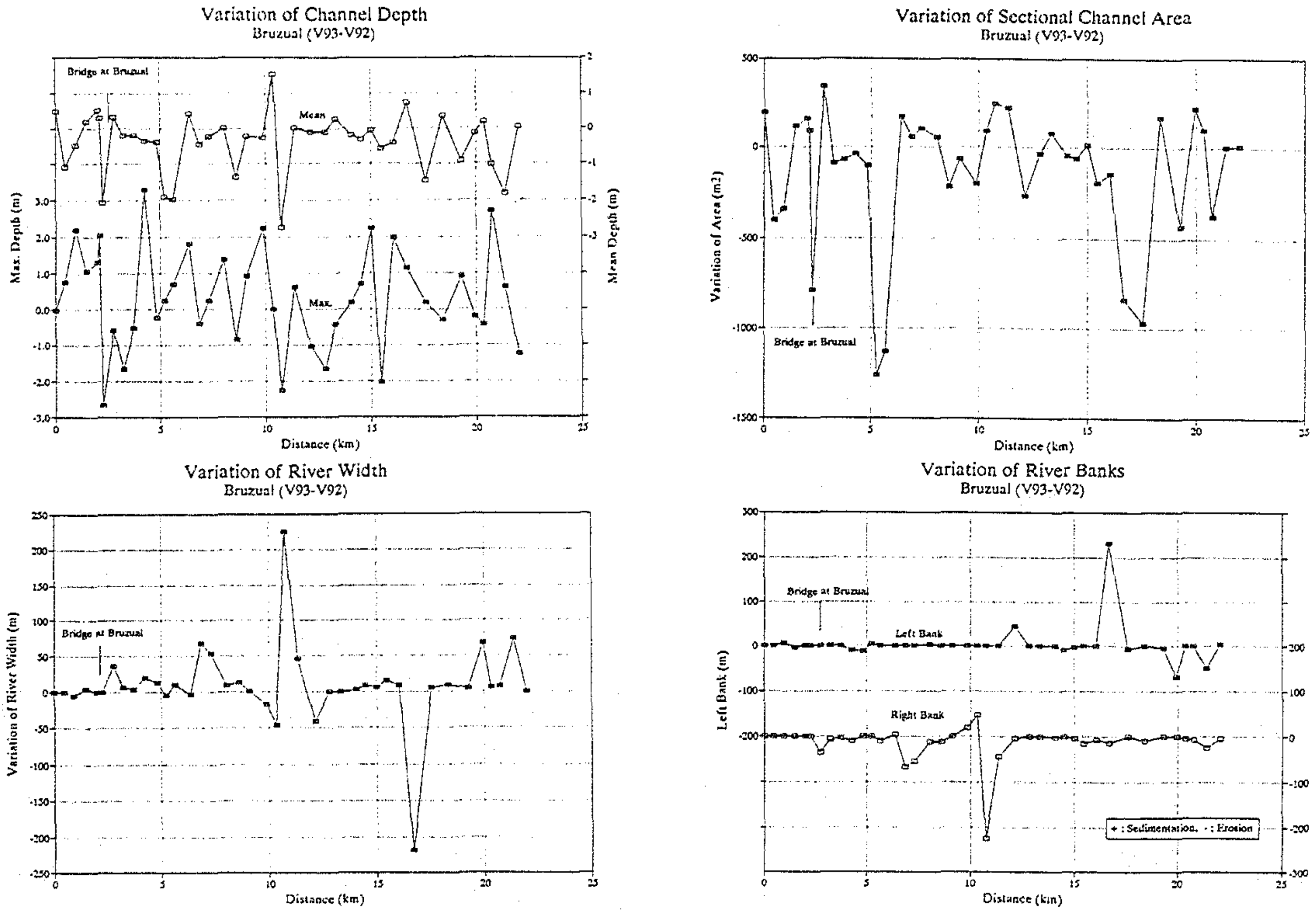


Fig. 3.4.2 Variation of Channel through Flood Season : Bruzual (2/2)

THE REPUBLIC OF VENEZUELA
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OF THE APURE RIVER BASIN
JAPAN INTERNATIONAL COOPERATION AGENCY

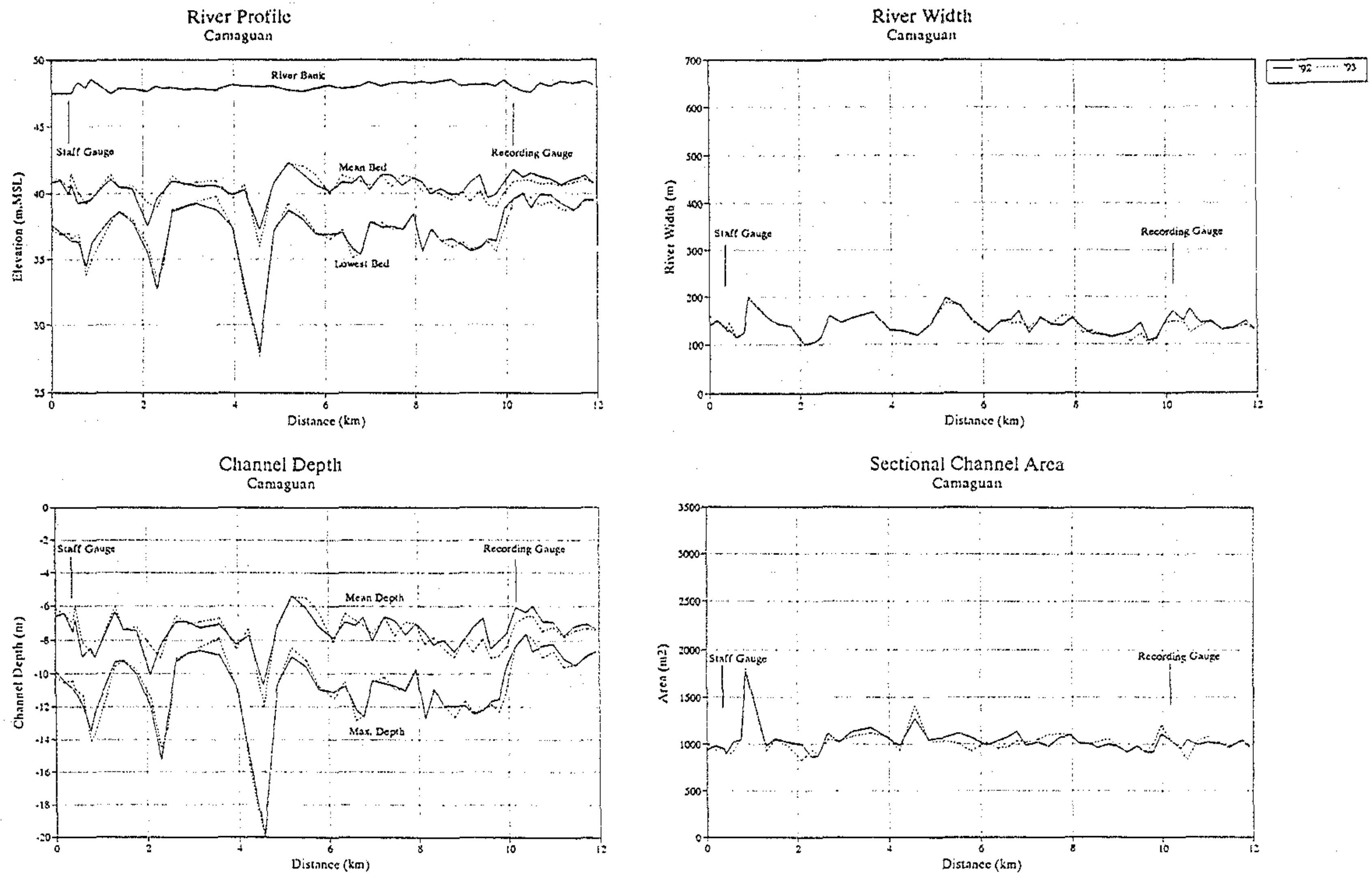

Fig. 3.4.3 Variation of Channel through Flood Season : Camaguan (1/2)

THE REPUBLIC OF VENEZUELA
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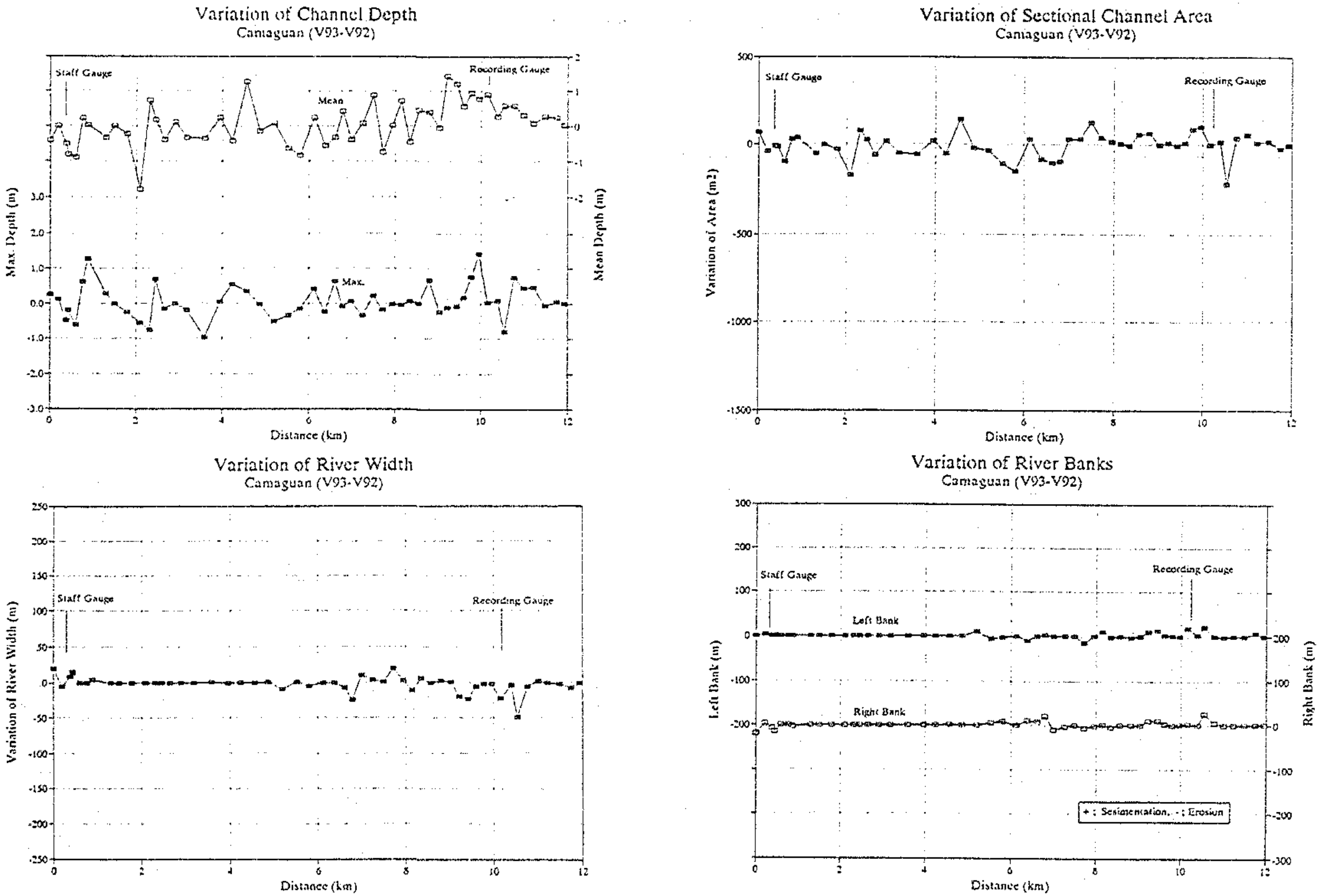

Fig. 3.4.3 Variation of Channel through Flood Season : Camaguan (2/2)

THE REPUBLIC OF VENEZUELA
COMPREHENSIVE IMPROVEMENT
OF THE APURE RIVER BASIN

JAPAN INTERNATIONAL COOPERATION AGENCY

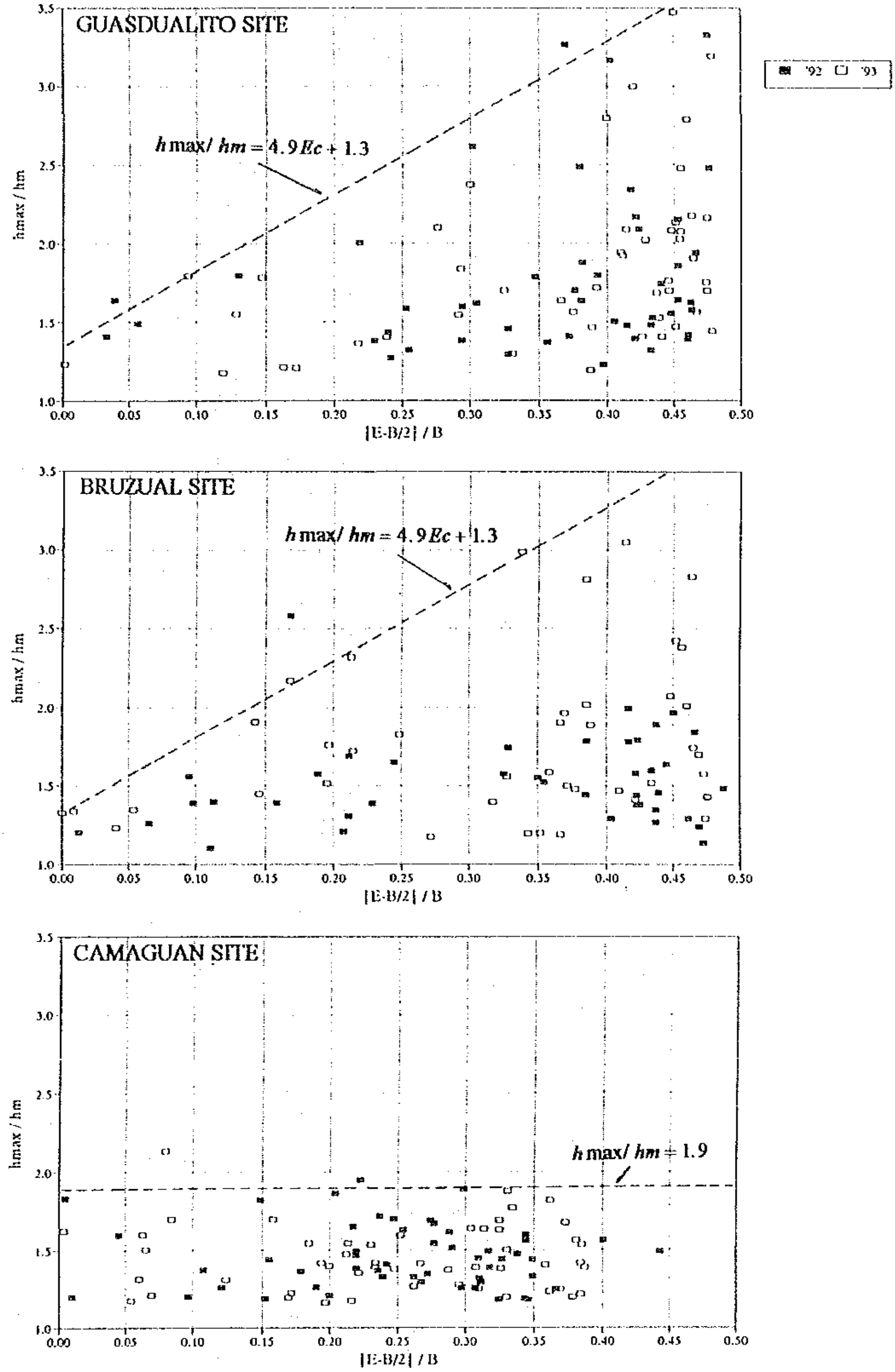

Fig. 3.4.4 Relationship between Eccentricity and Depth Ratio

THE REPUBLIC OF VENEZUELA
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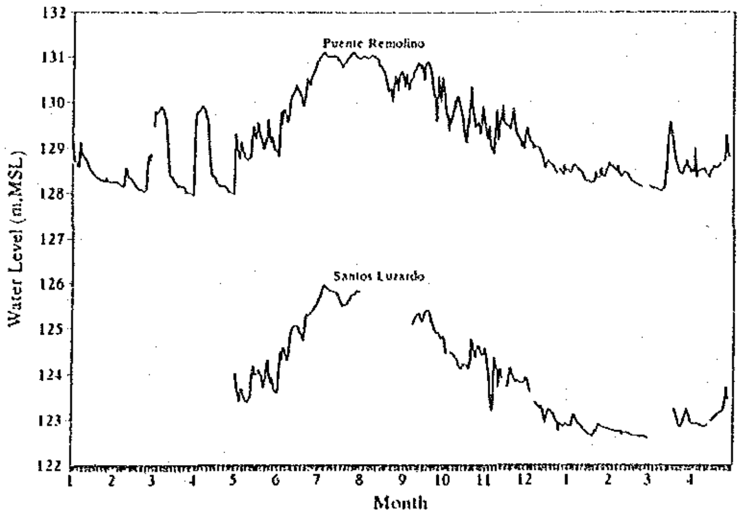
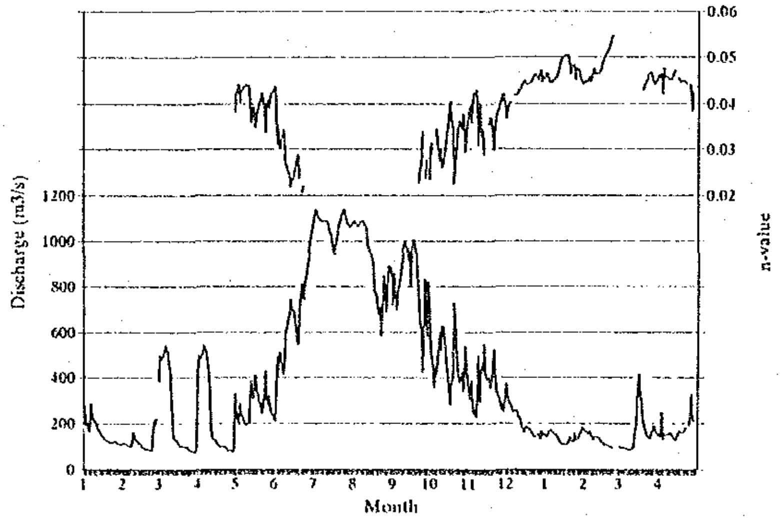
JAPAN INTERNATIONAL COOPERATION AGENCY

Water Level in 1992 and 1993
Guasduslito - Santos Luzardo



Change of n-value and Discharge
Guasdualito-Santos Luzardo('92-'93)



Relation between Discharge and n-value
Guasdualito - Santos Luzardo

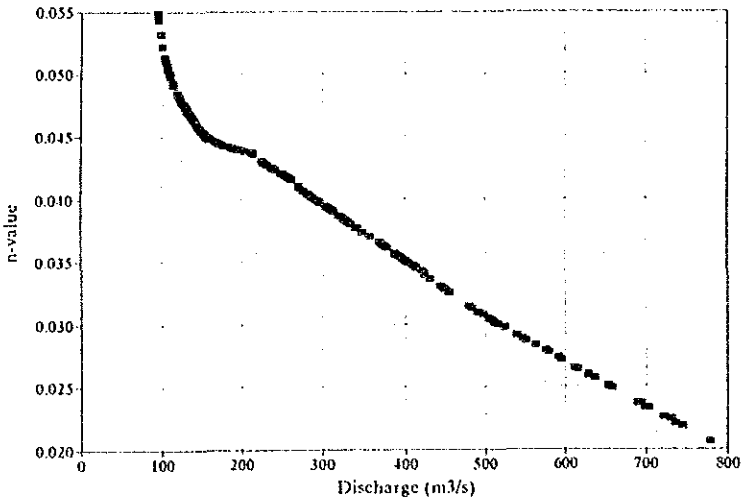


Fig. 3.4.5 Estimation of Roughness : Guasdualito

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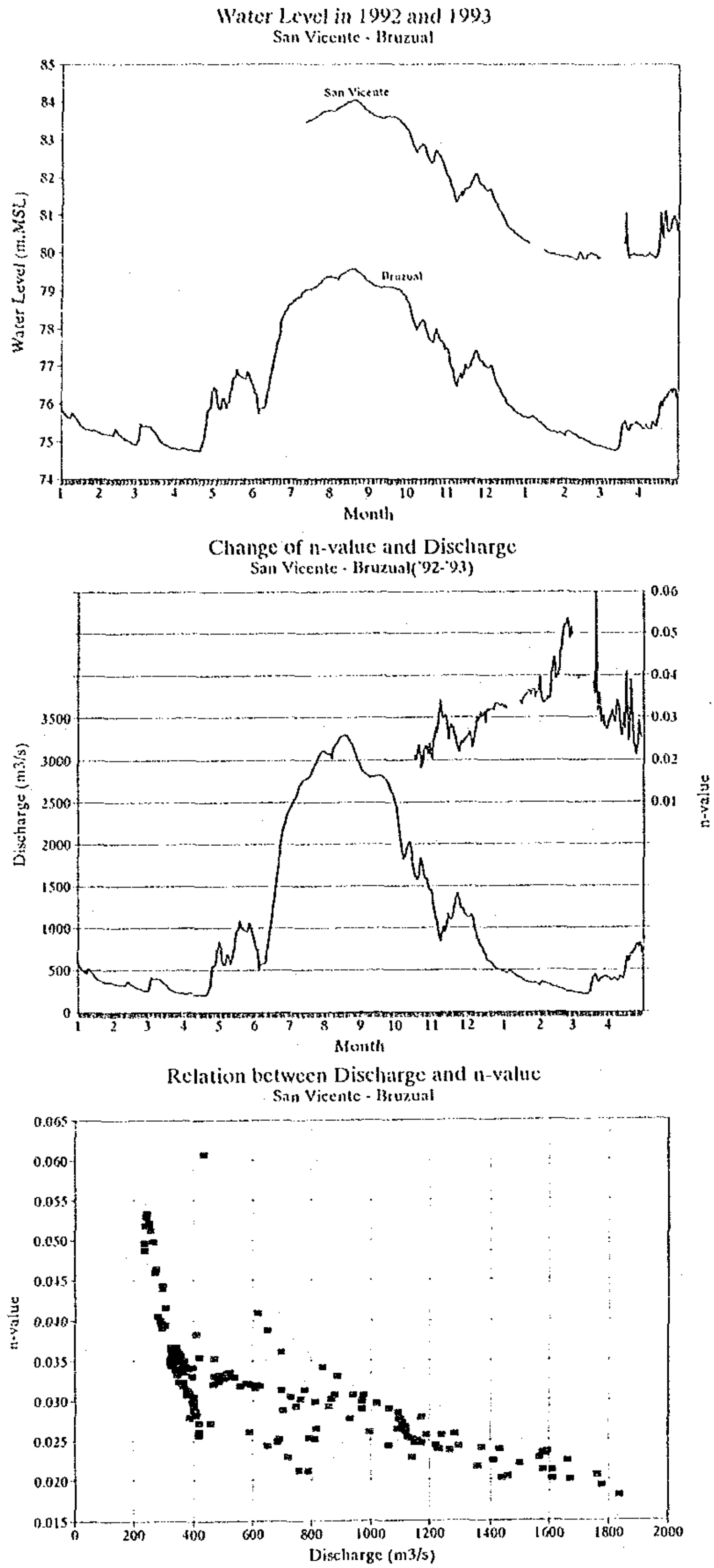

Fig. 3.4.6 Estimation of Roughness : Bruzual

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COMPREHENSIVE IMPROVEMENT
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JAPAN INTERNATIONAL COOPERATION AGENCY

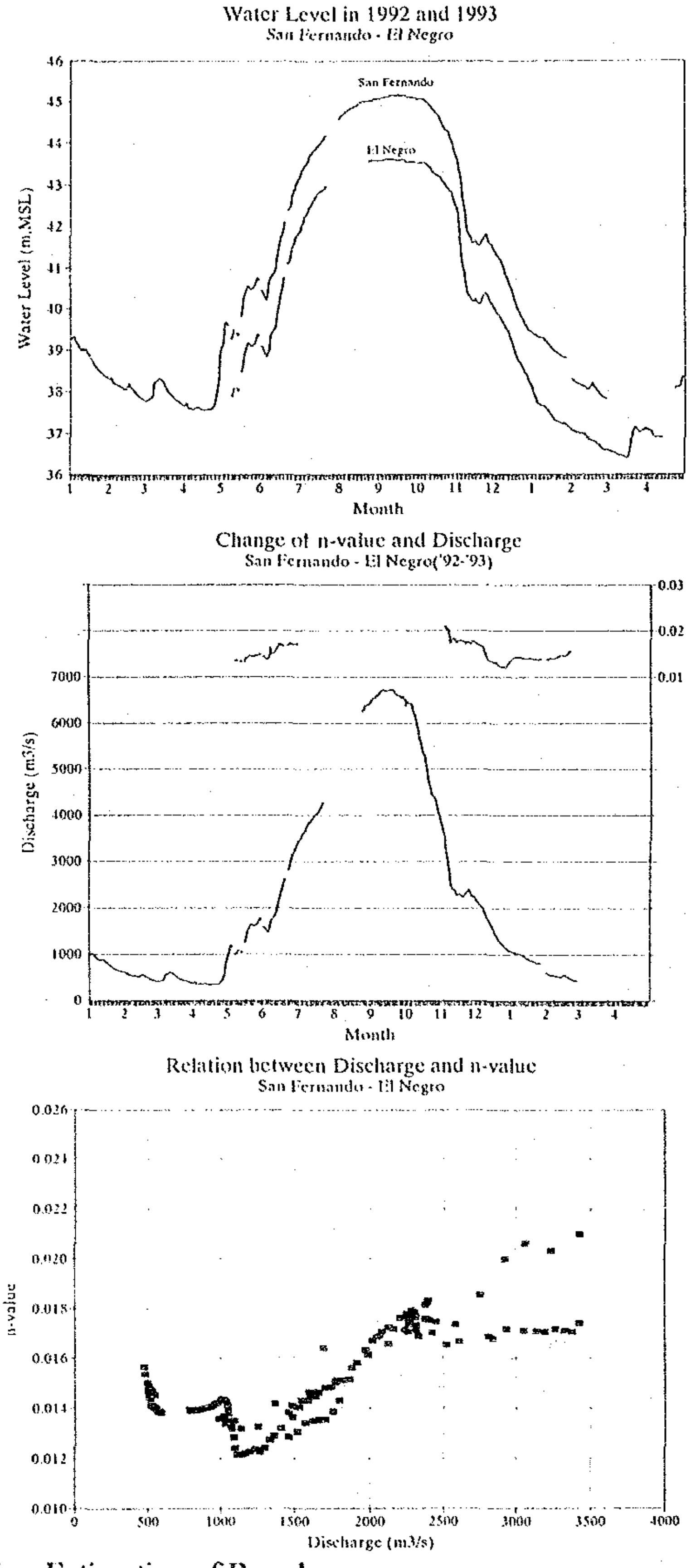

Fig. 3.4.7 Estimation of Roughness : San Fernando

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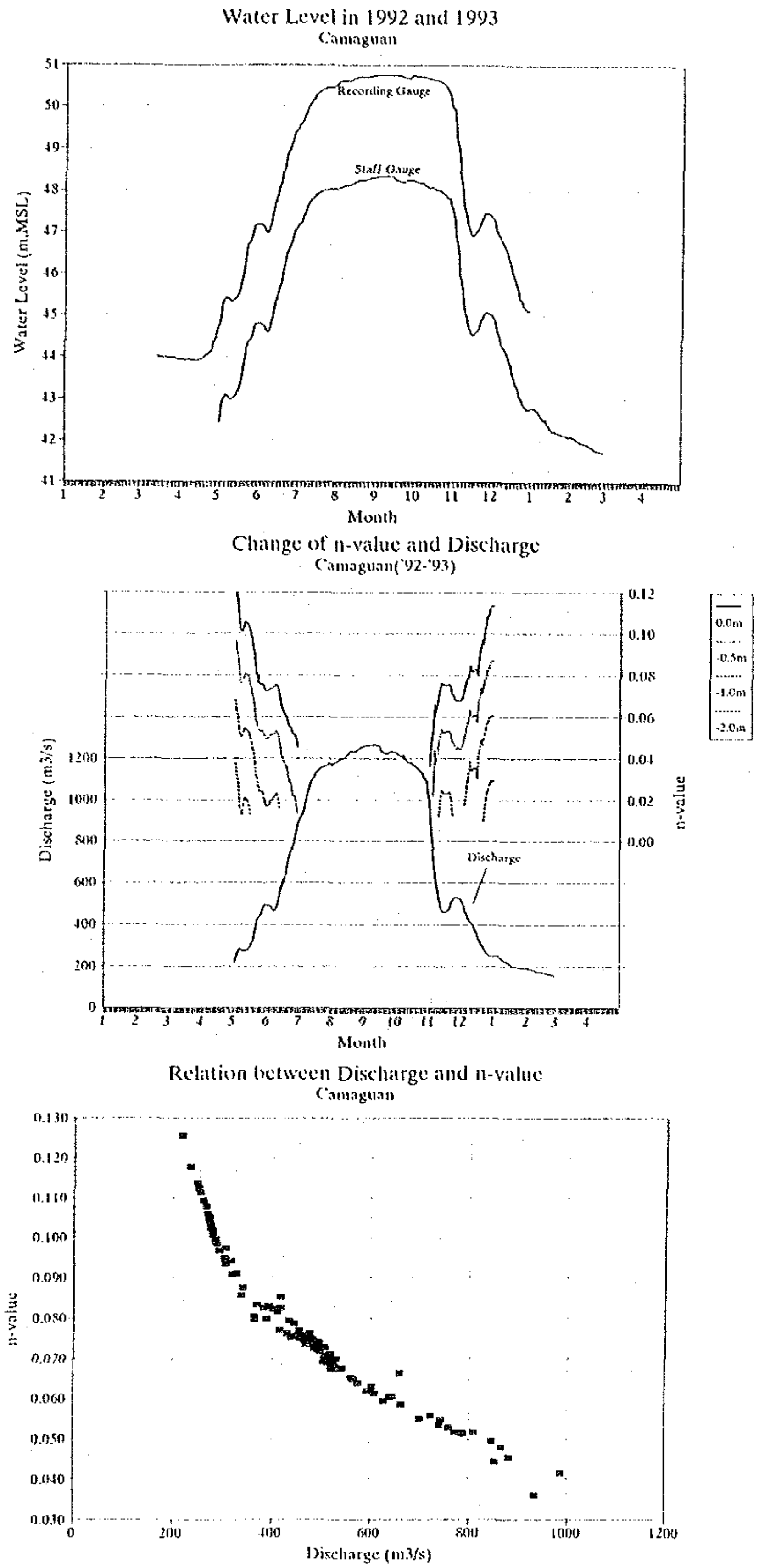

Fig. 3.4.8 Estimation of Roughness
: Camaguan

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JAPAN INTERNATIONAL COOPERATION AGENCY

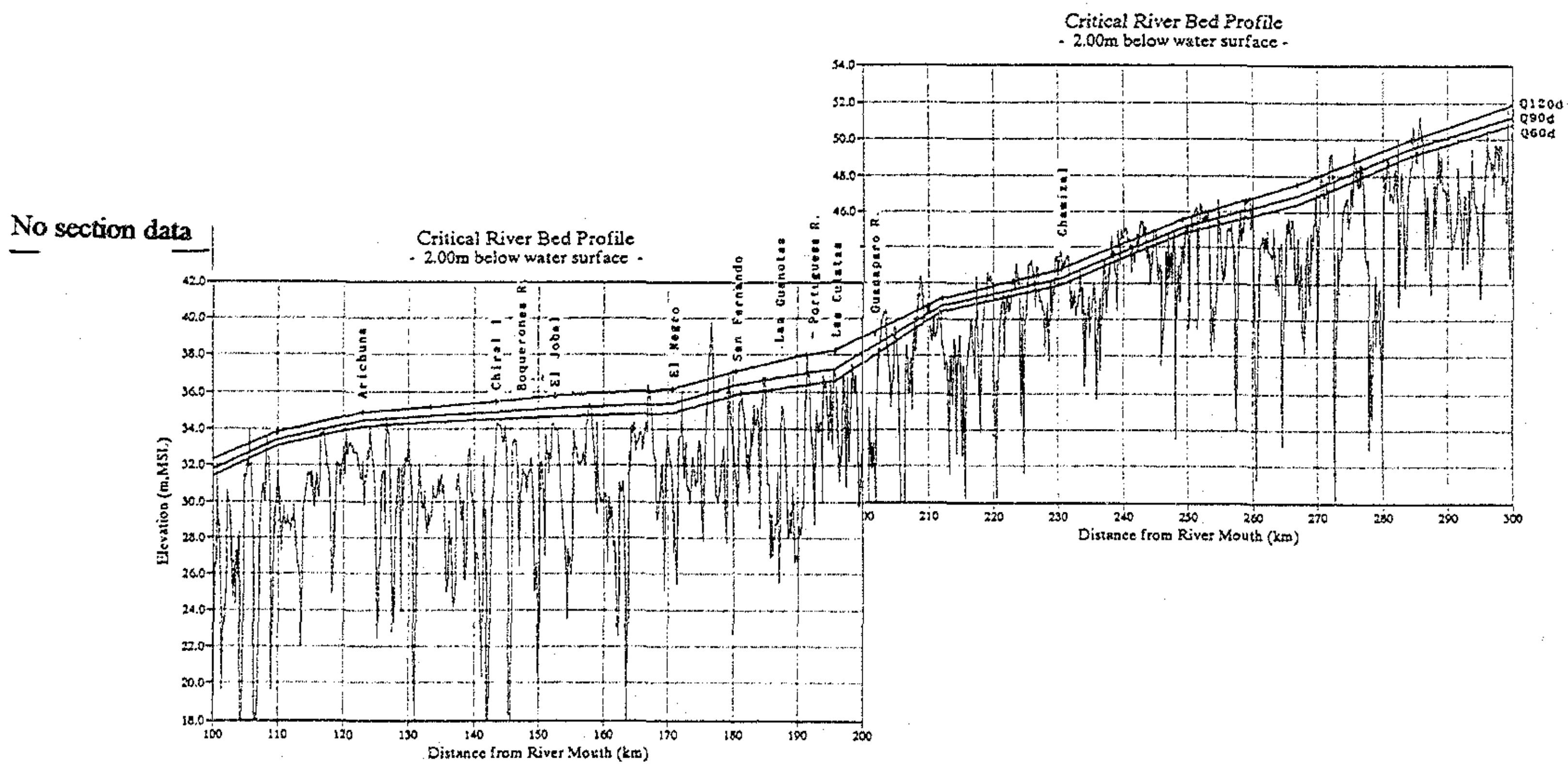

Fig. 4.2.1 Critical River Bed Profile : Apure River (1/3)

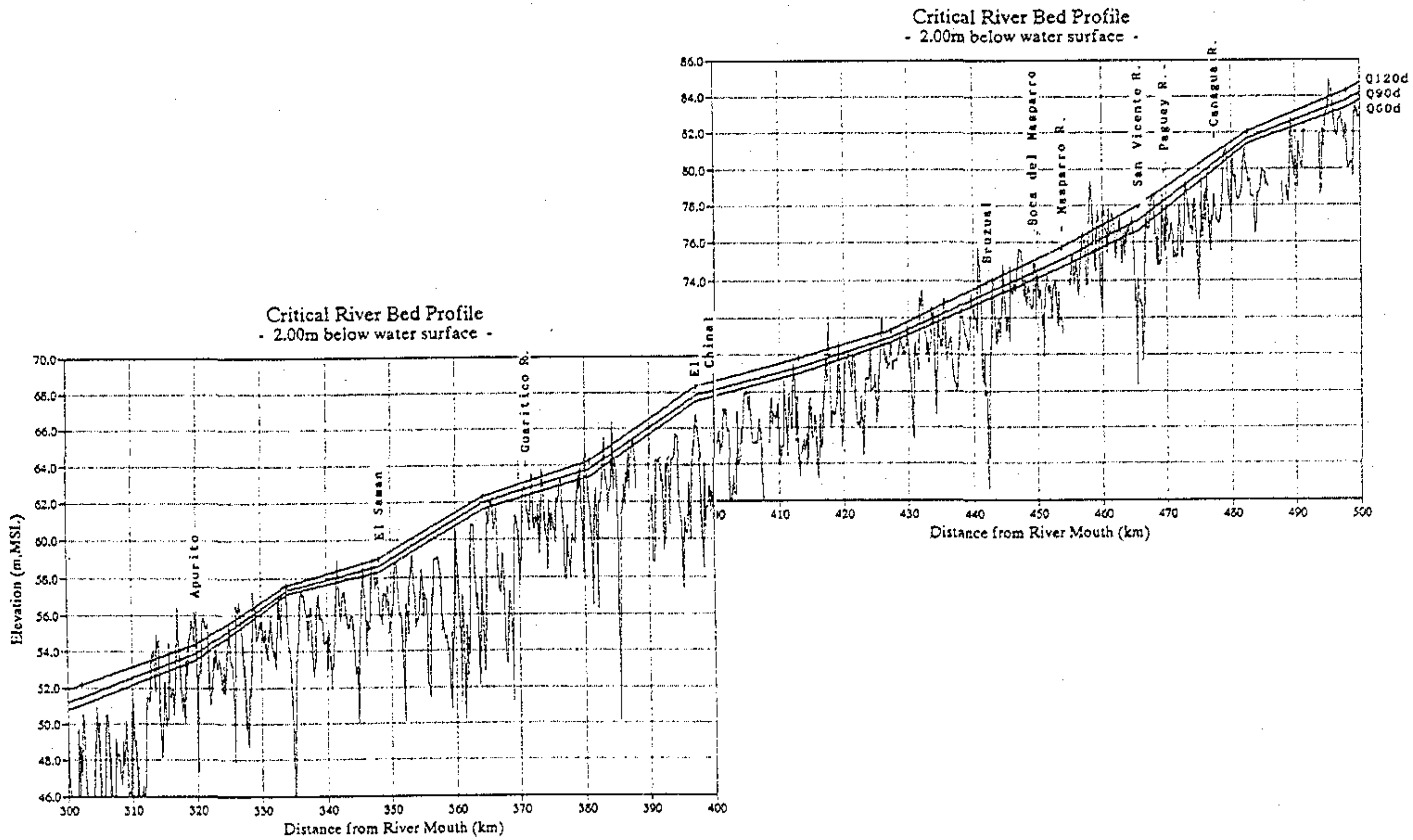

Fig. 4.2.1 Critical River Bed Profile : Apure River (2/3)

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COMPREHENSIVE IMPROVEMENT
OF THE APURE RIVER BASIN

JAPAN INTERNATIONAL COOPERATION AGENCY

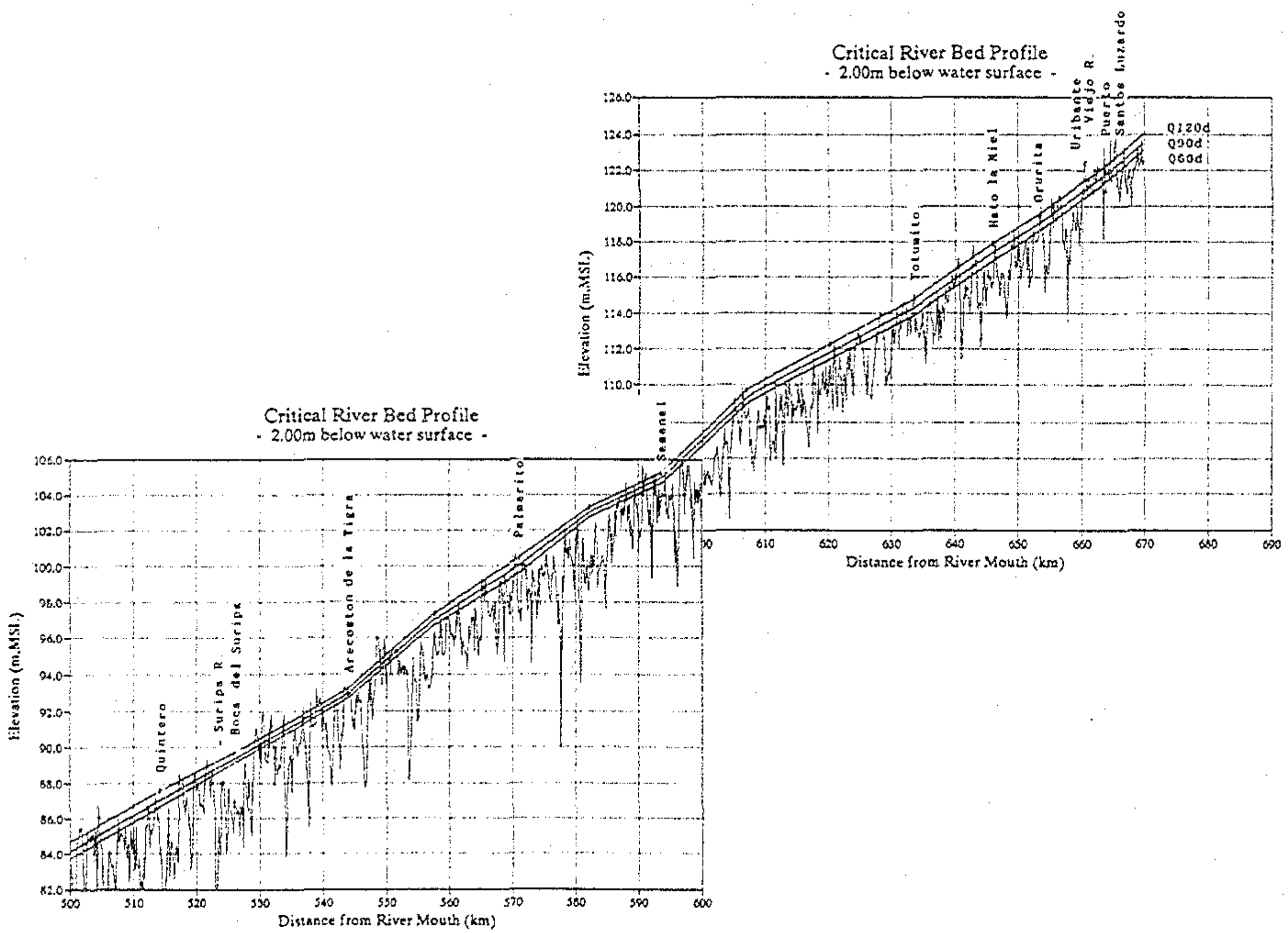
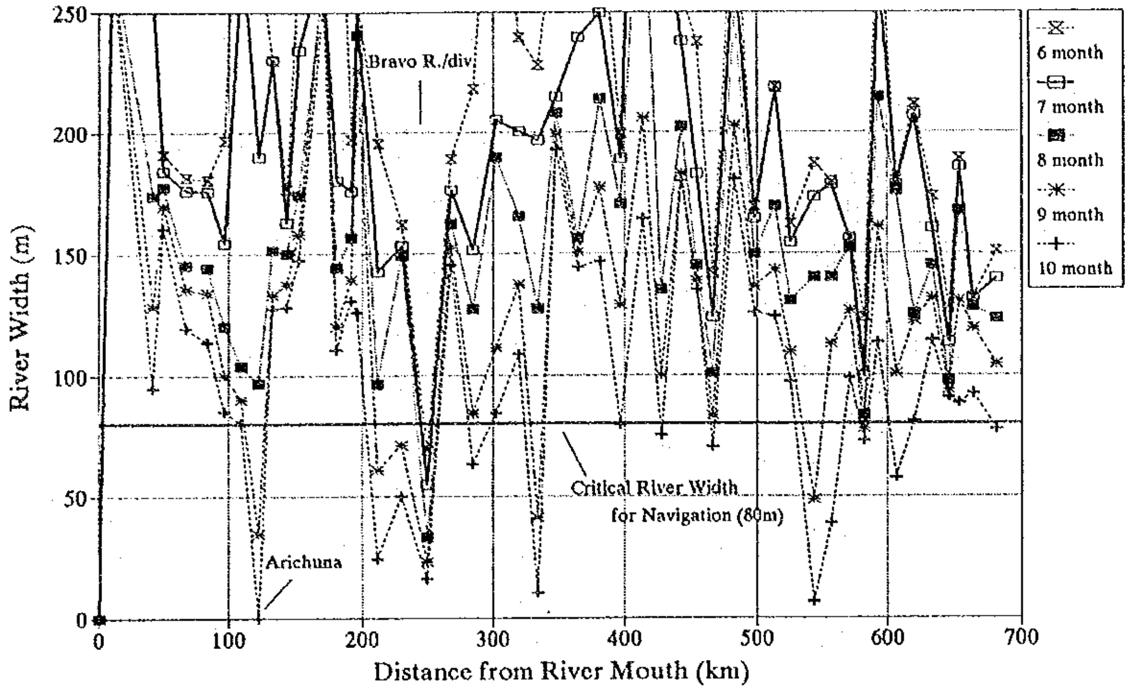
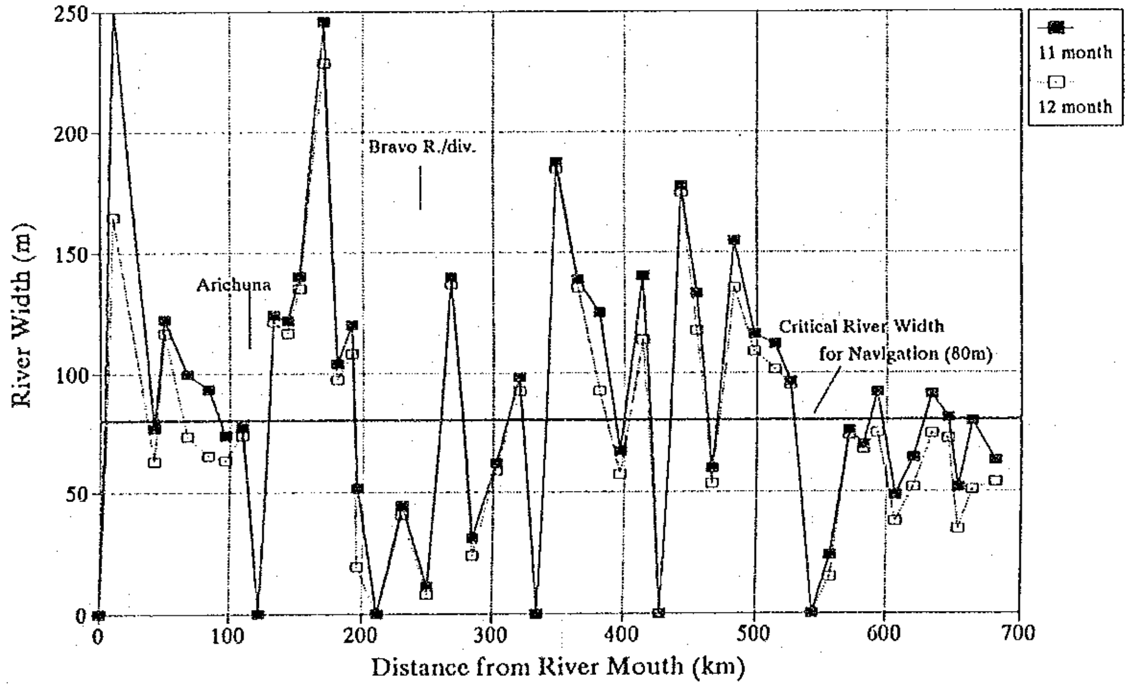


Fig. 4.2.1 Critical River Bed Profile : Apure River (3/3)

THE REPUBLIC OF VENEZUELA
COMPREHENSIVE IMPROVEMENT
OF THE APURE RIVER BASIN

JAPAN INTERNATIONAL COOPERATION AGENCY





Note : River width was measured at 2.00 m below water surface

Fig. 4.2.2 Critical River Width : Apure River

THE REPUBLIC OF VENEZUELA
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JAPAN INTERNATIONAL COOPERATION AGENCY

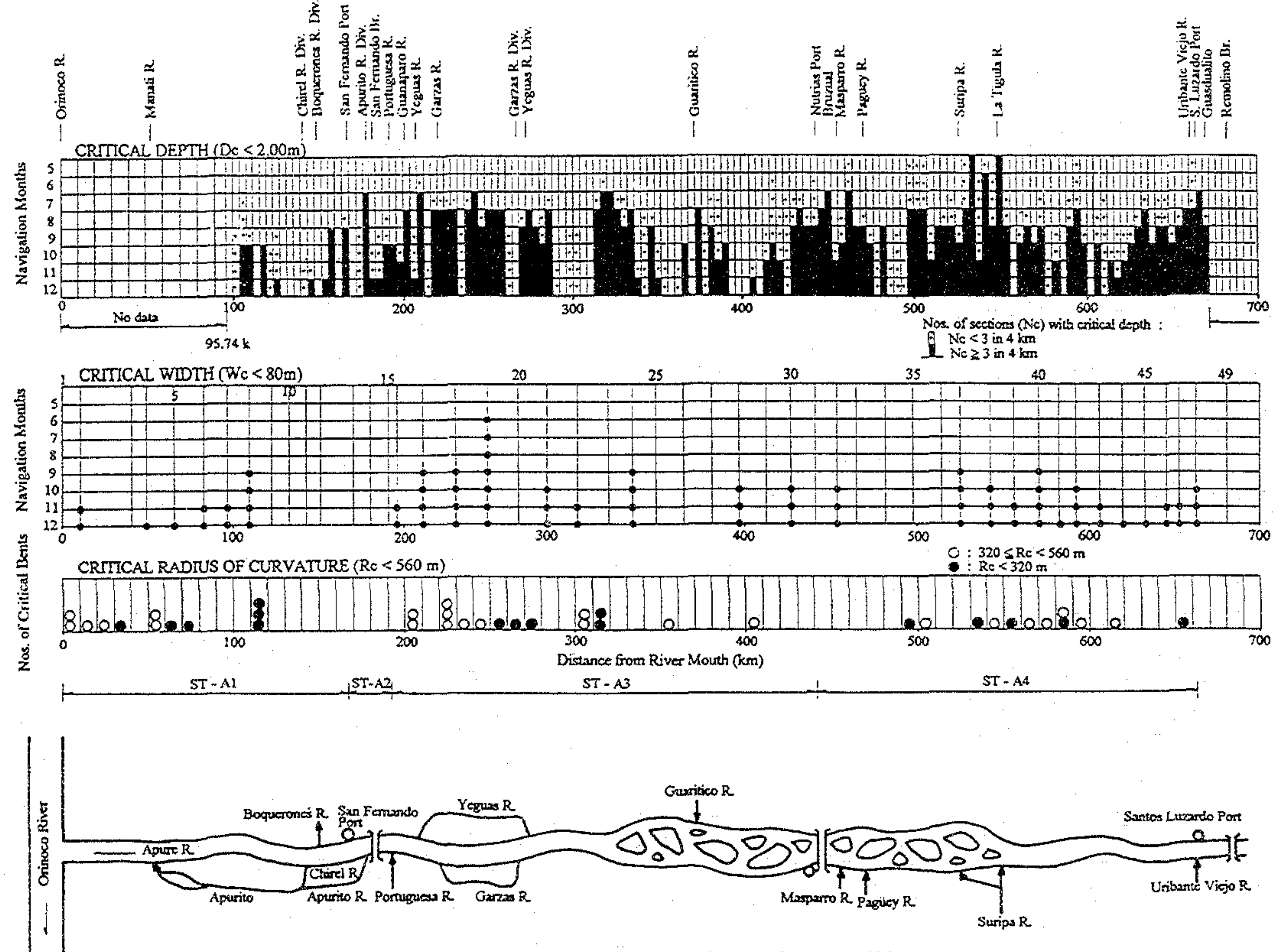

Fig. 4.2.3 Critical Sections of Apure River

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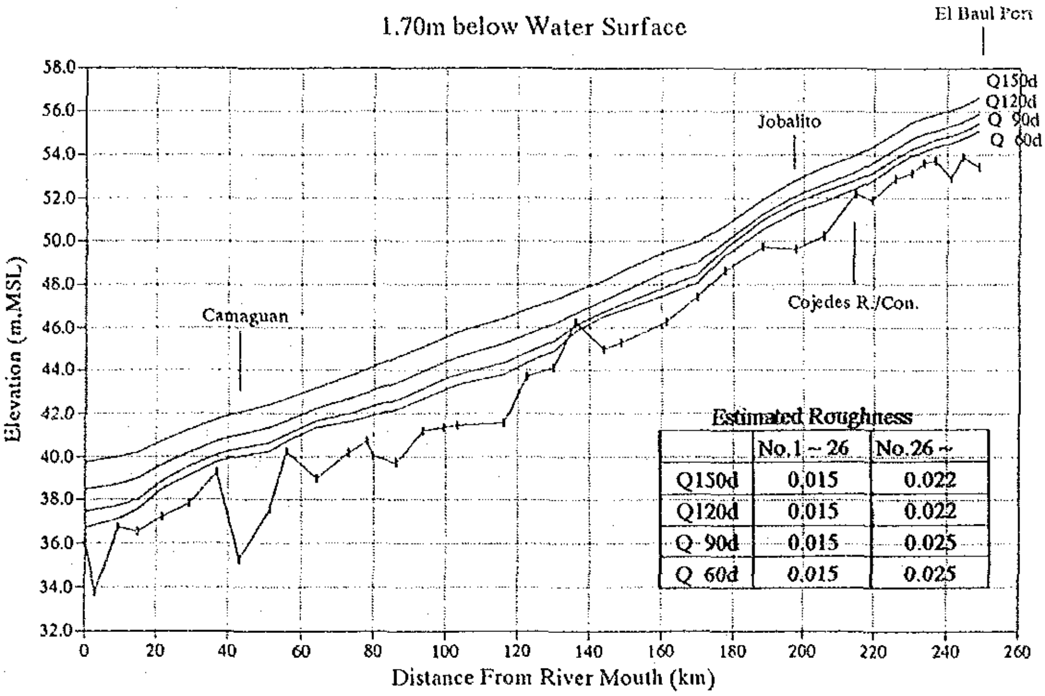

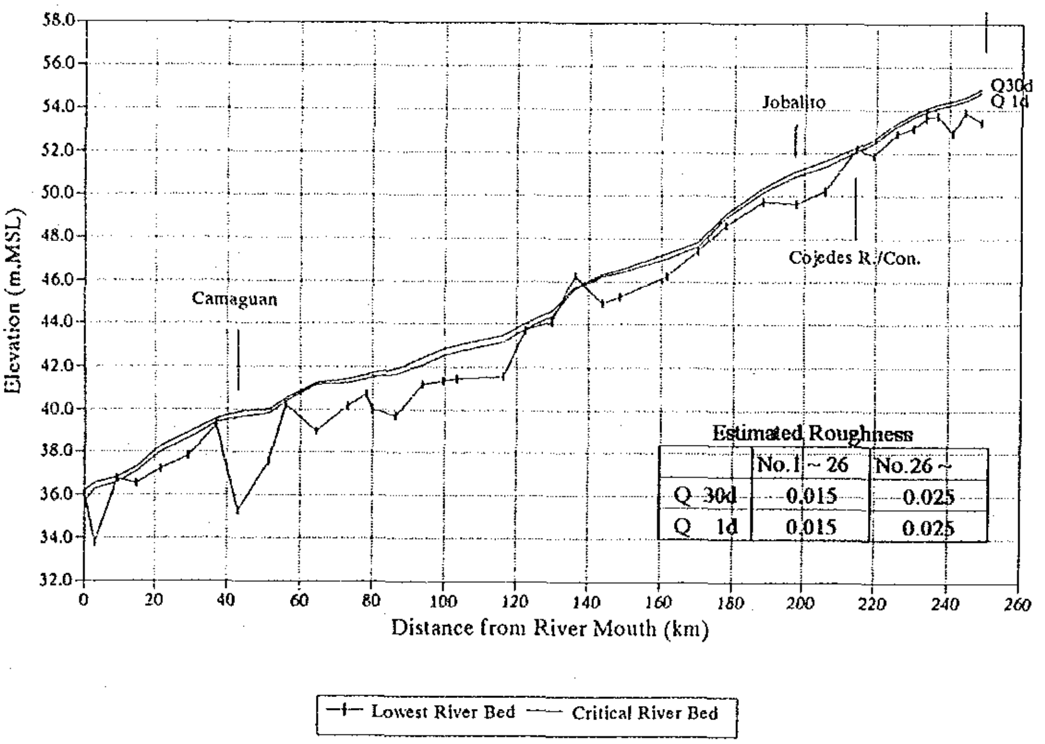

Fig. 4.3.1 Critical River Bed Profile : Portuguesa River

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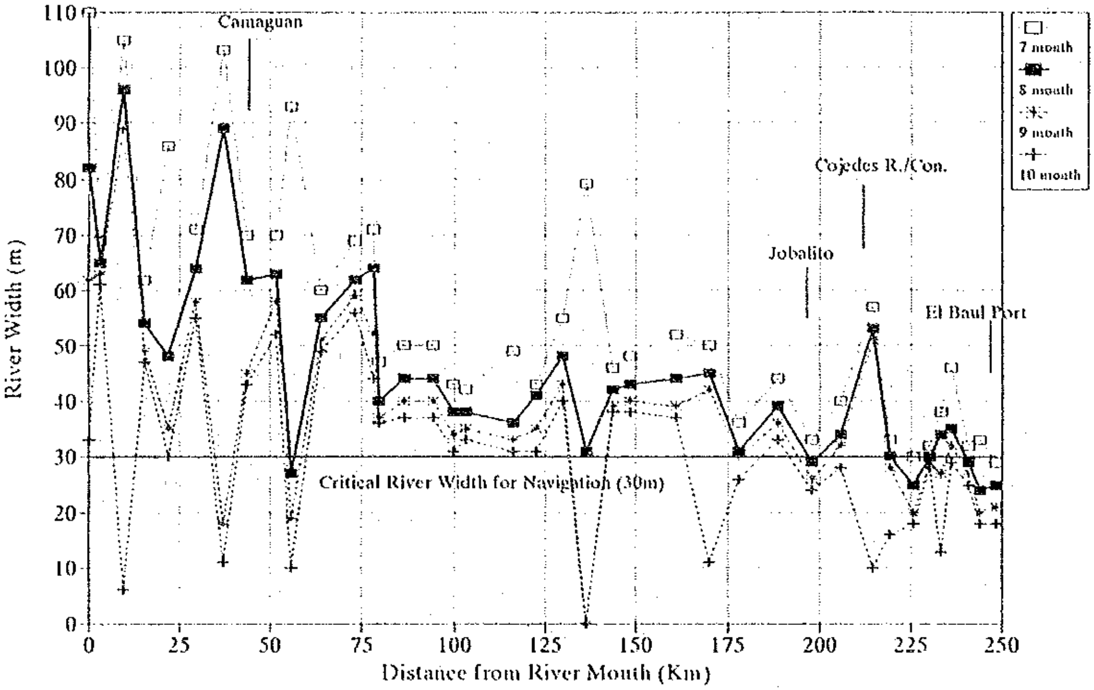
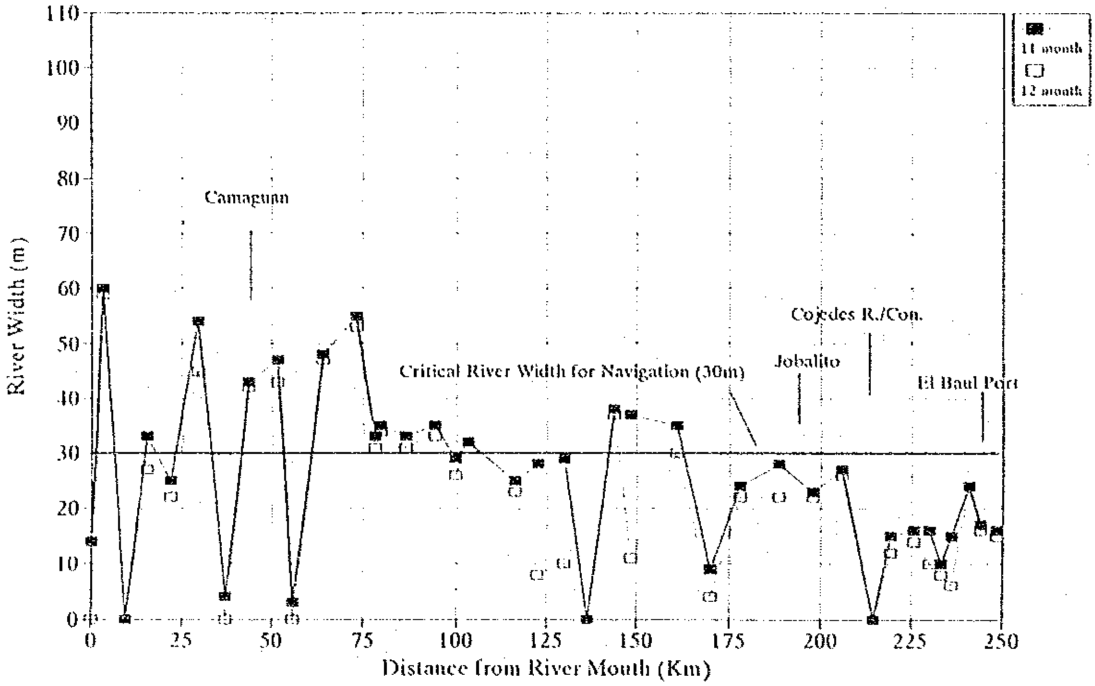
OF THE APURE RIVER BASIN

JAPAN INTERNATIONAL COOPERATION AGENCY





Note : River width was measured at 1.70 m below water surface

Fig. 4.3.2 Critical River Width of Portuguesa River

THE REPUBLIC OF VENEZUELA COMPREHENSIVE IMPROVEMENT OF THE APURE RIVER BASIN
JAPAN INTERNATIONAL COOPERATION AGENCY

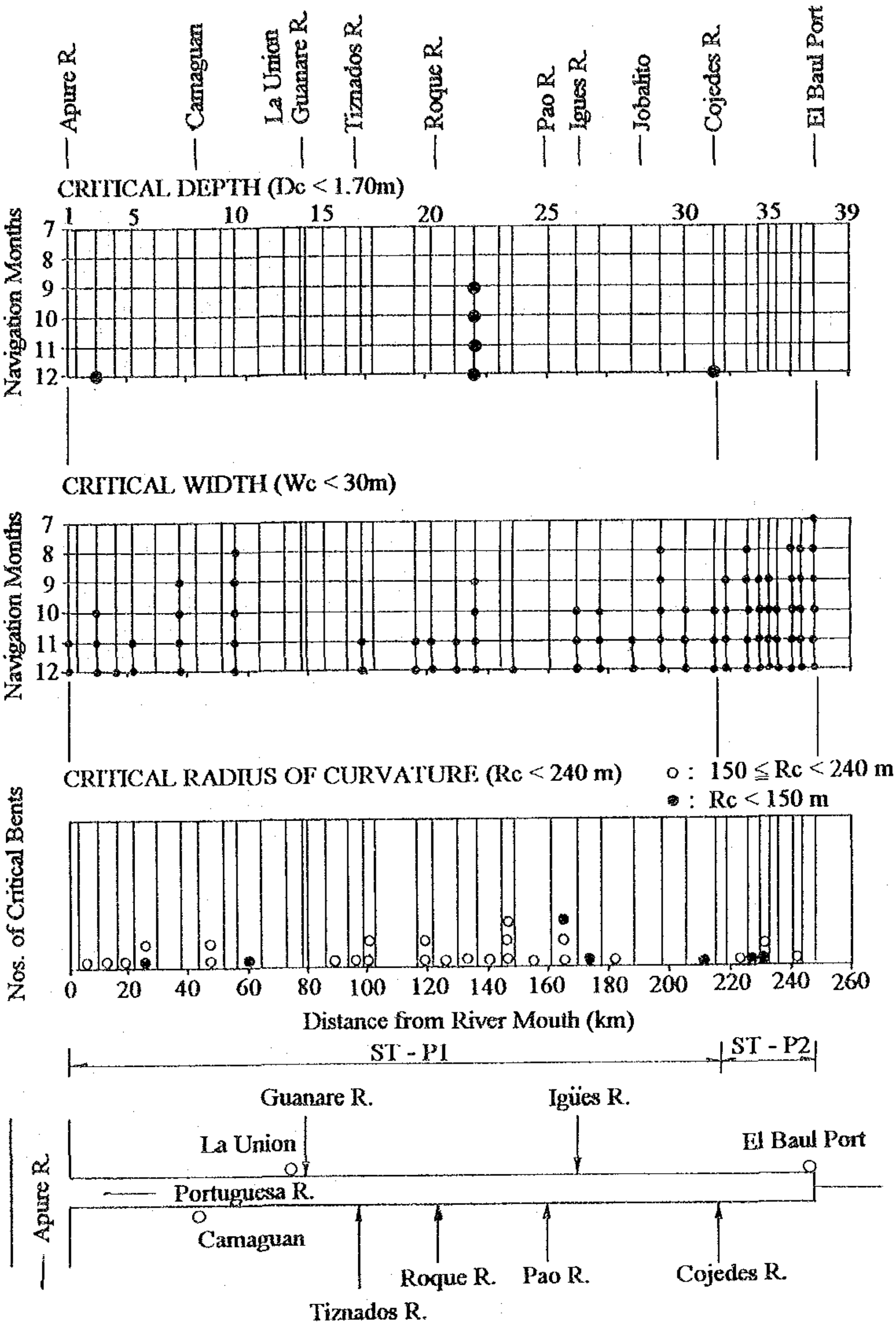


Fig. 4.3.3 Critical Sections of Portuguesa River

THE REPUBLIC OF VENEZUELA
COMPREHENSIVE IMPROVEMENT
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JAPAN INTERNATIONAL COOPERATION AGENCY

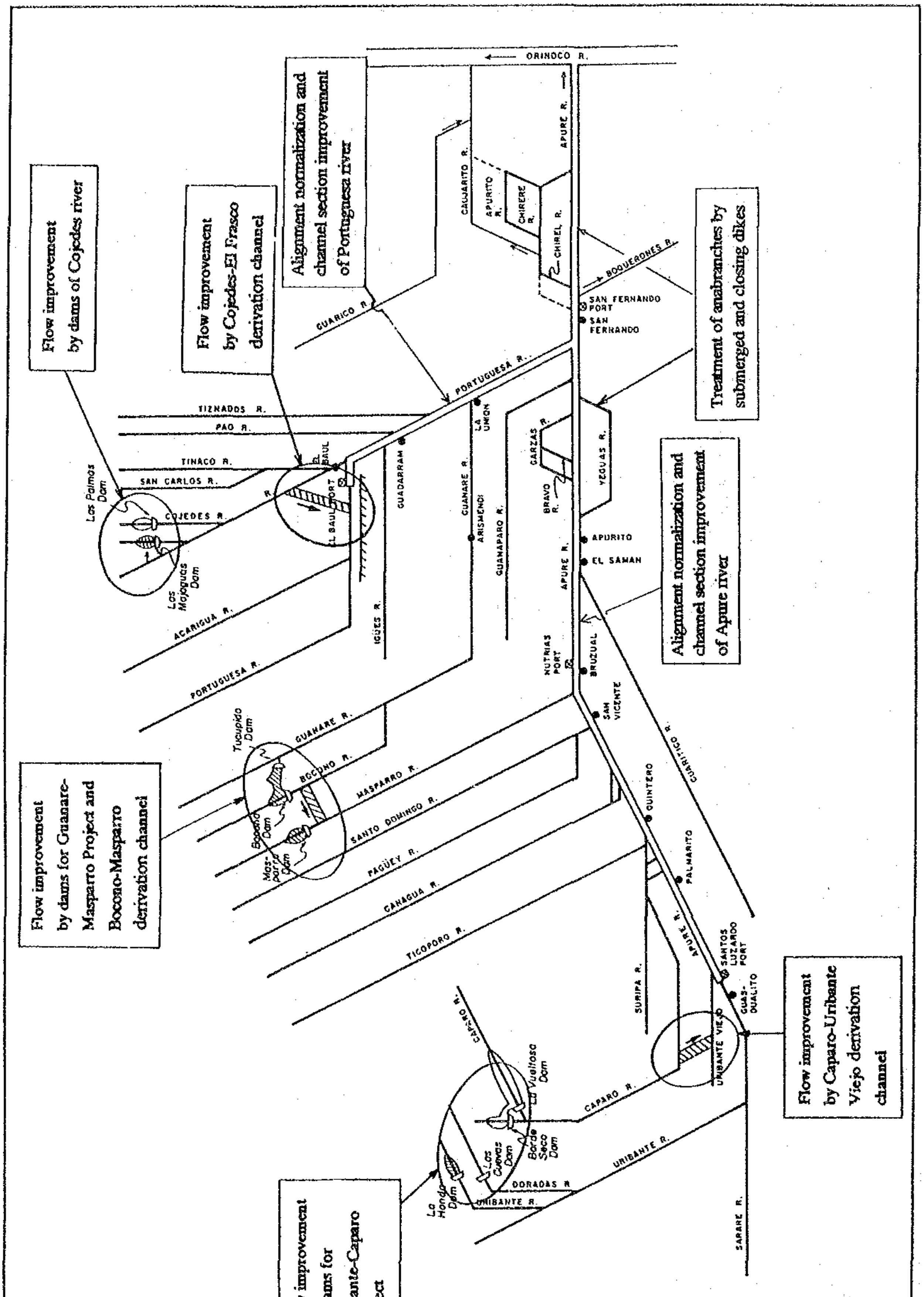

Fig. 5.1.1
Measures for Channel Stabilization

THE REPUBLIC OF VENEZUELA COMPREHENSIVE IMPROVEMENT OF THE APURE RIVER BASIN
JAPAN INTERNATIONAL COOPERATION AGENCY

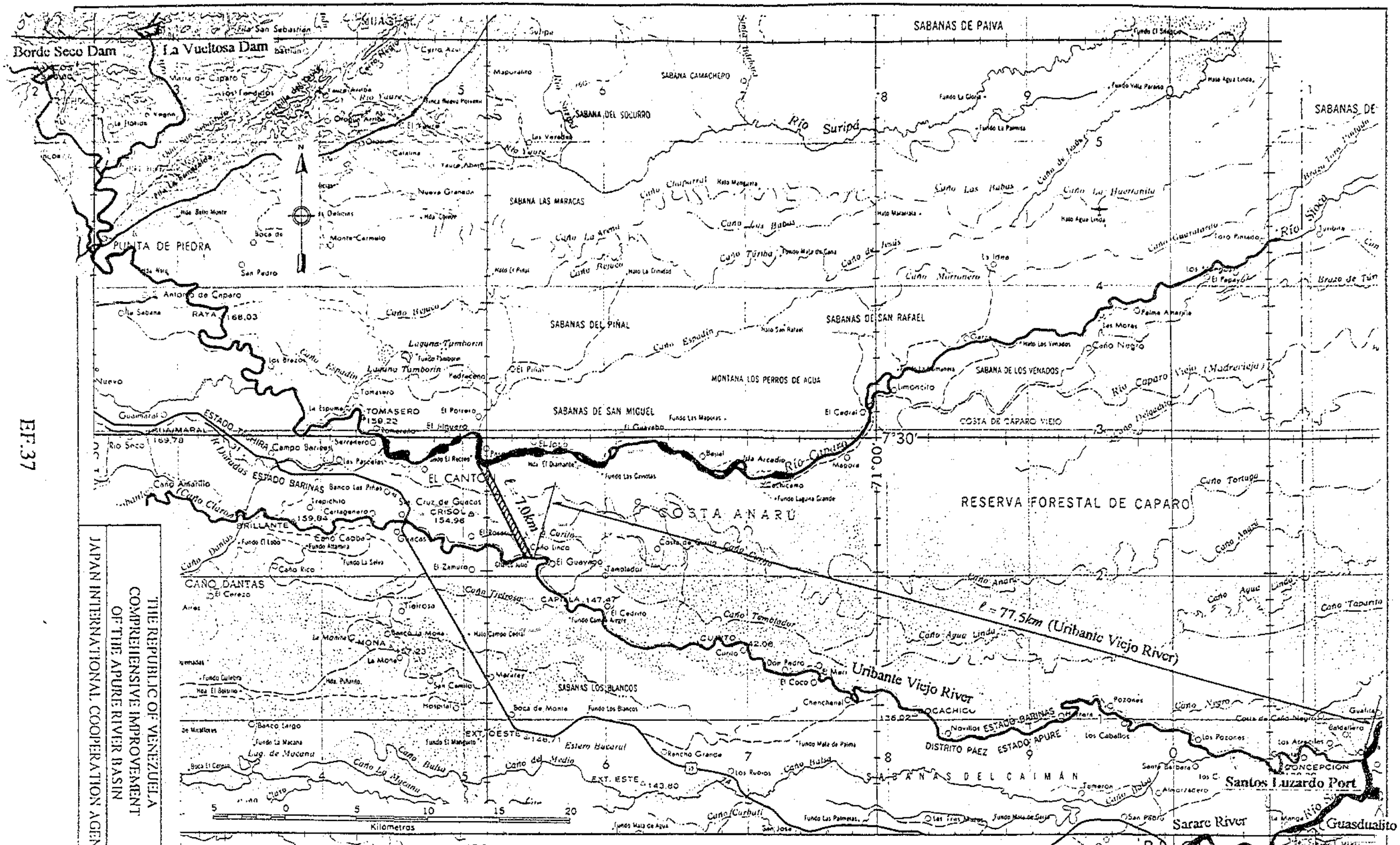

Fig. 5.2.1 Caparo - Uribante Viejo Derivation Channel

THE REPUBLIC OF VENEZUELA
COMPREHENSIVE IMPROVEMENT
OF THE APURE RIVER BASIN

JAPAN INTERNATIONAL COOPERATION AGENCY

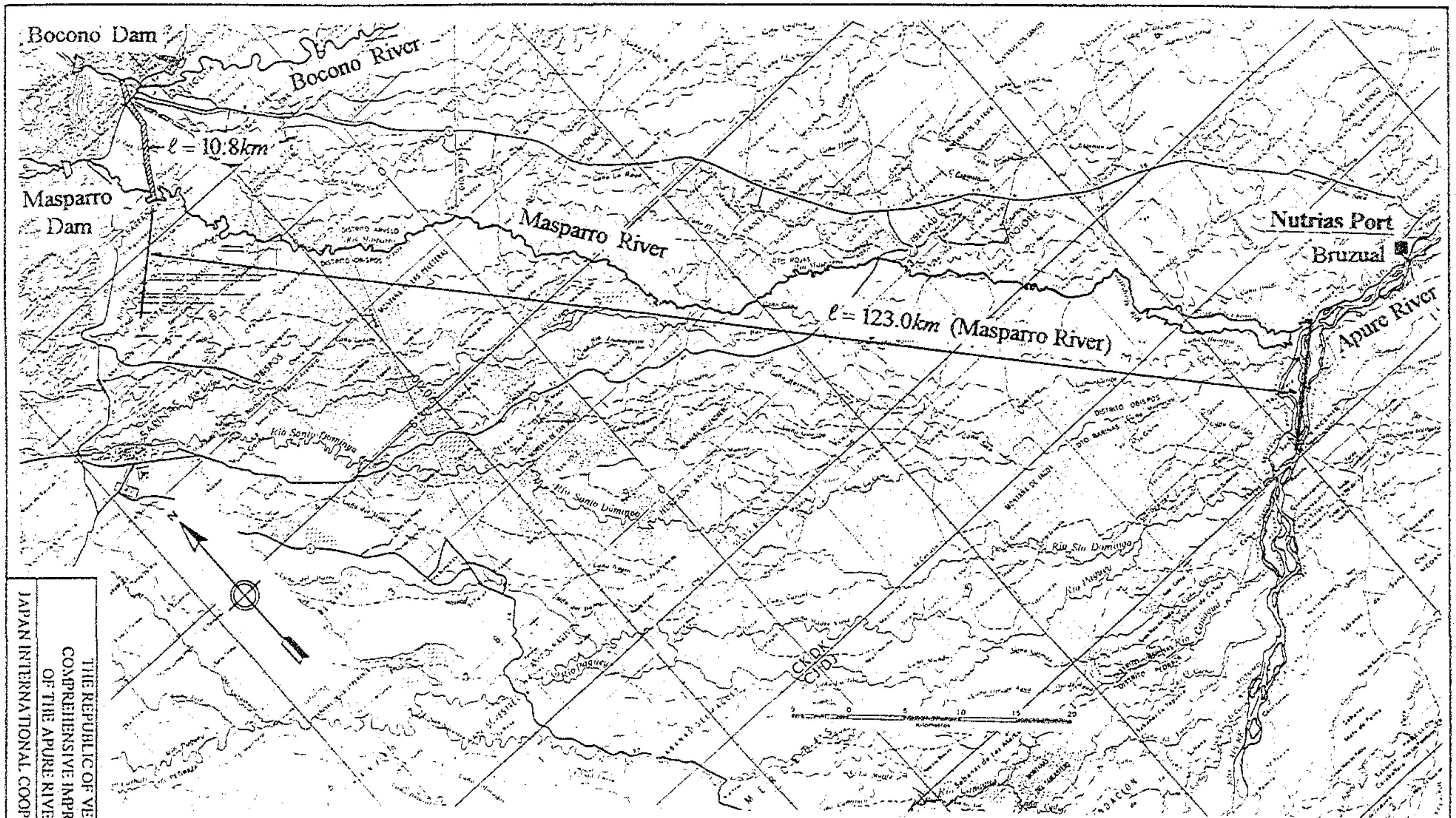

Fig. 5.2.2 Bocono - Masparro Derivation Channel

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OF THE APURE RIVER BASIN

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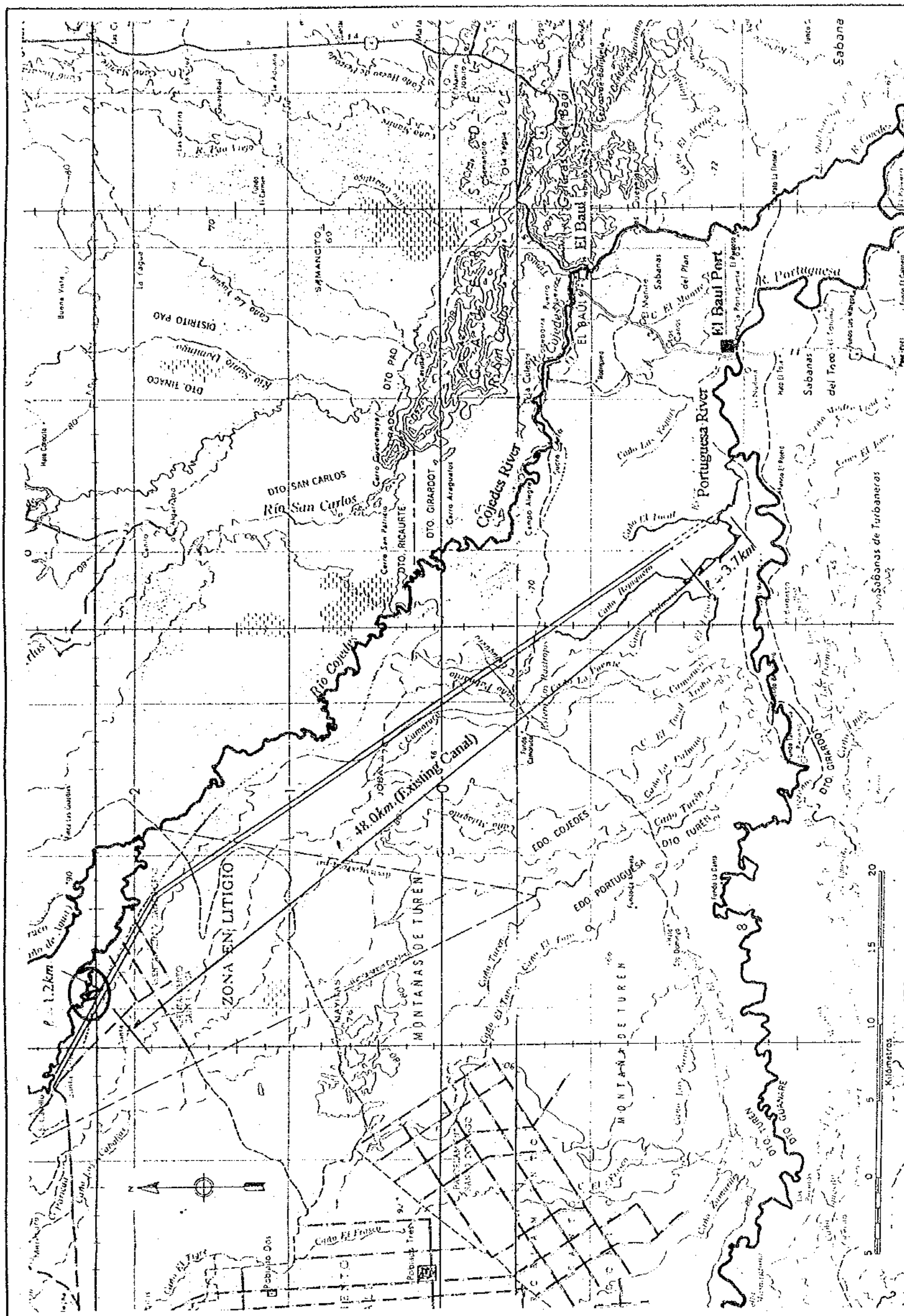

Fig. 5.2.3 Cojedes - El Frasco Derivation Channel

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COMPREHENSIVE IMPROVEMENT
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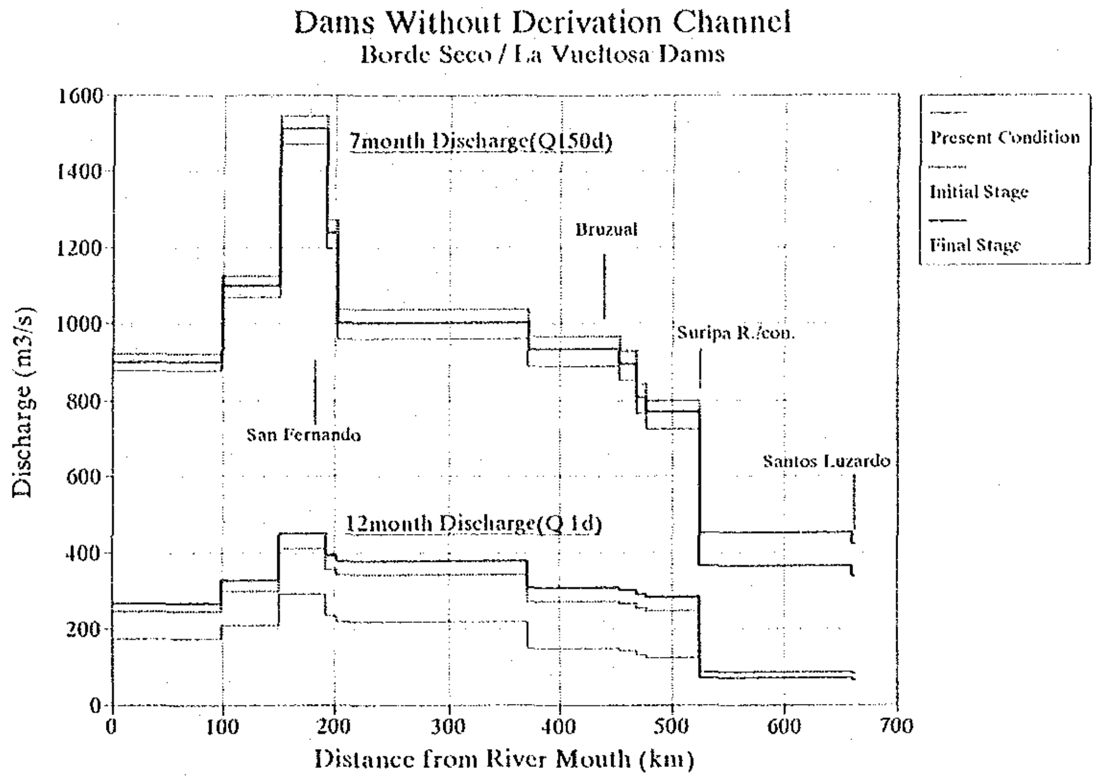


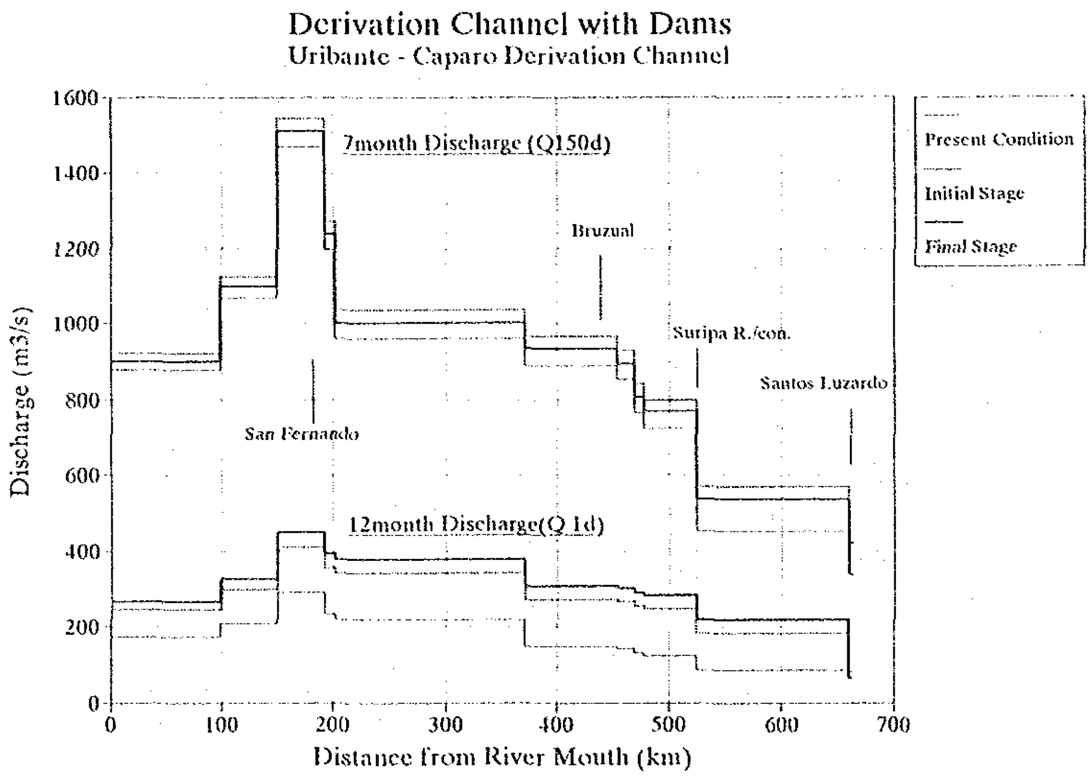
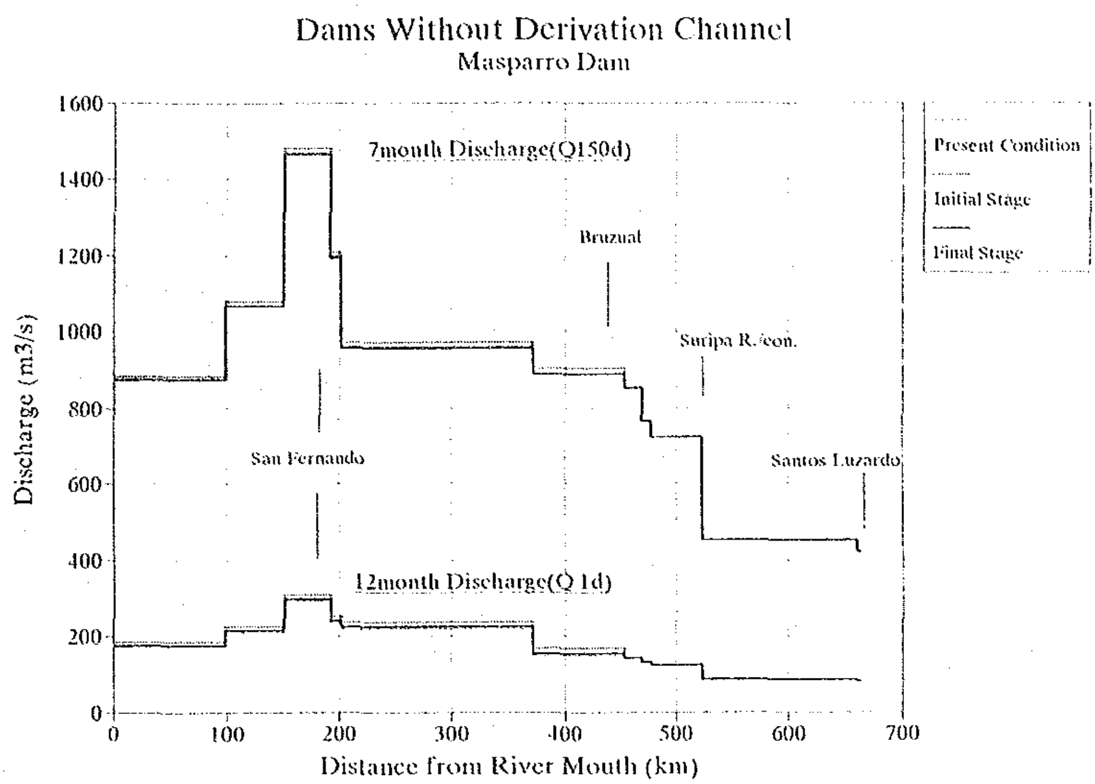


Fig. 5.2.4 Hydraulic Effect of Flow Improvement Schemes (1/2)

THE REPUBLIC OF VENEZUELA COMPREHENSIVE IMPROVEMENT OF THE APURE RIVER BASIN
JAPAN INTERNATIONAL COOPERATION AGENCY



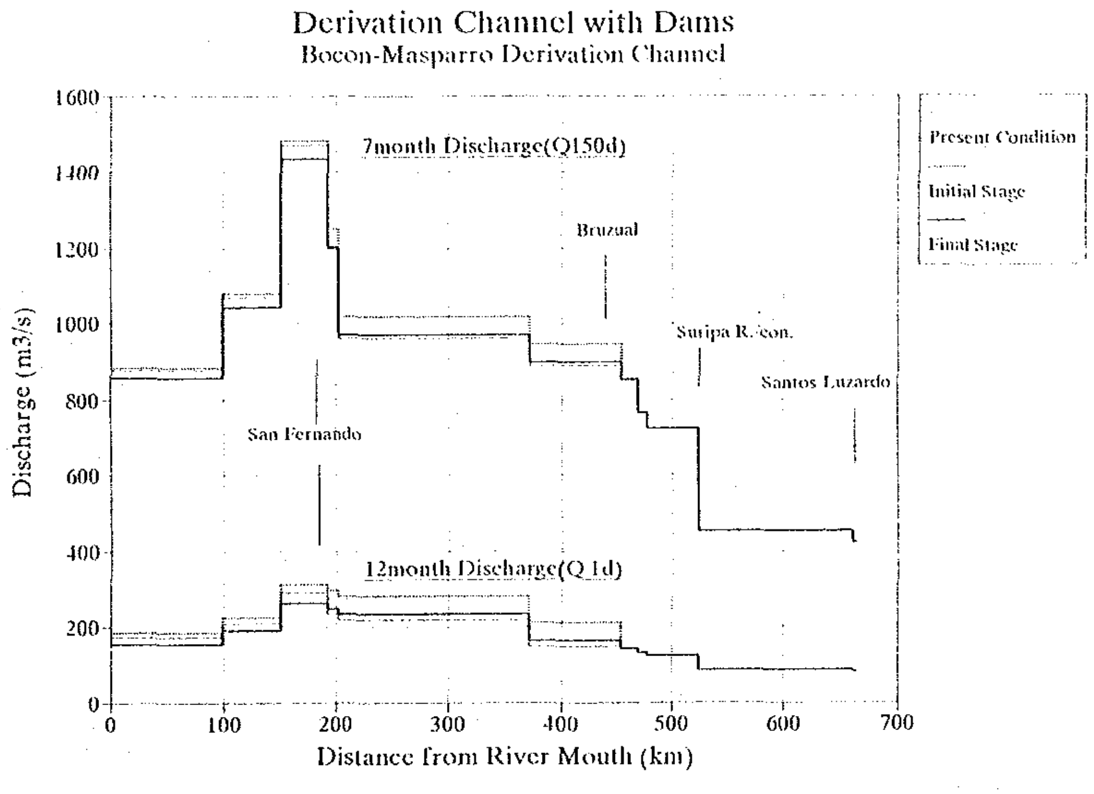


Fig. 5.2.4 Hydraulic Effect of Flow Improvement Schemes (2/2)

THE REPUBLIC OF VENEZUELA
COMPREHENSIVE IMPROVEMENT
OF THE APURE RIVER BASIN
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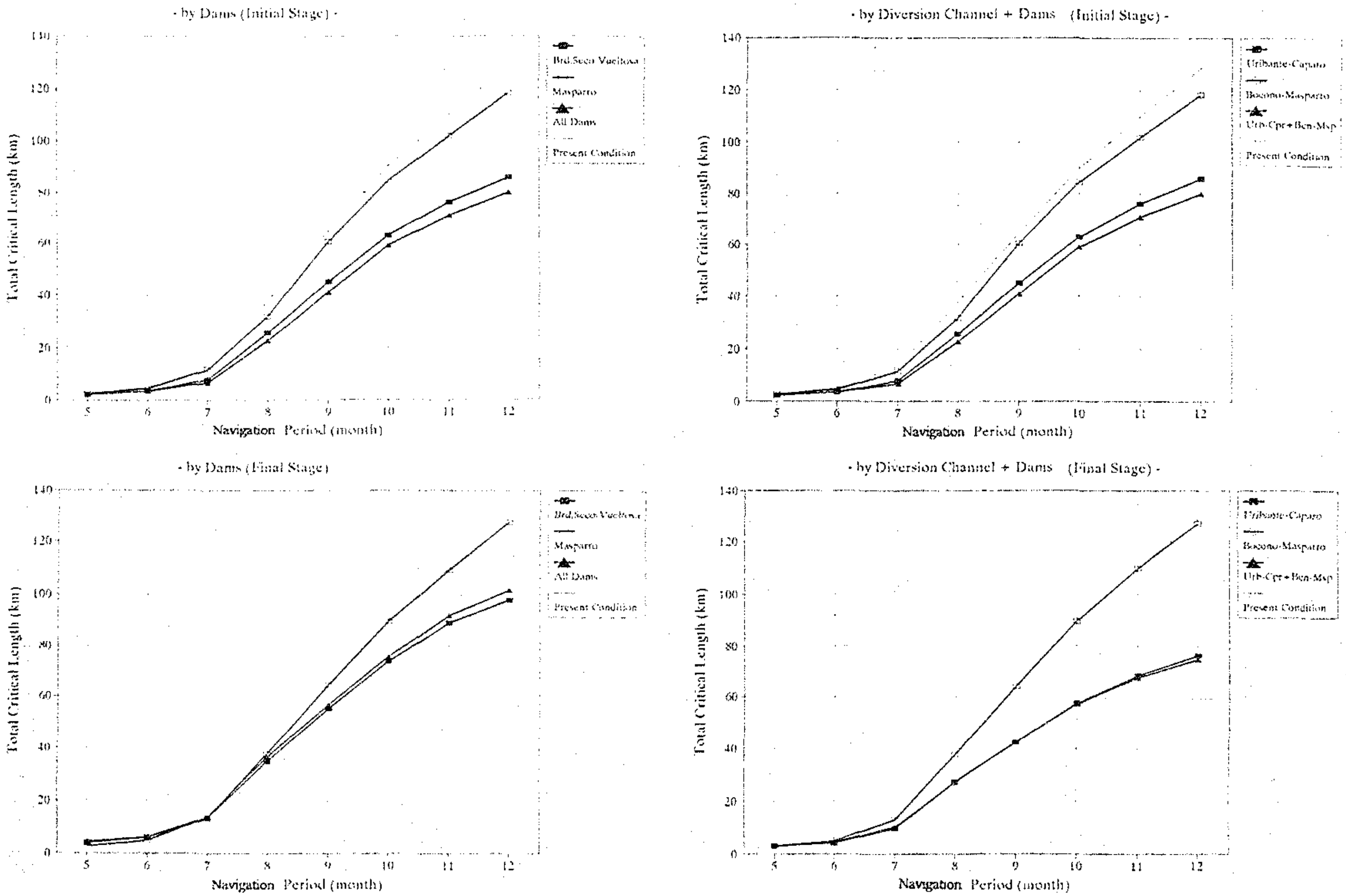

Fig. 5.2.5 Critical Channel Length

THE REPUBLIC OF VENEZUELA
COMPREHENSIVE IMPROVEMENT
OF THE APURE RIVER BASIN

JAPAN INTERNATIONAL COOPERATION AGENCY

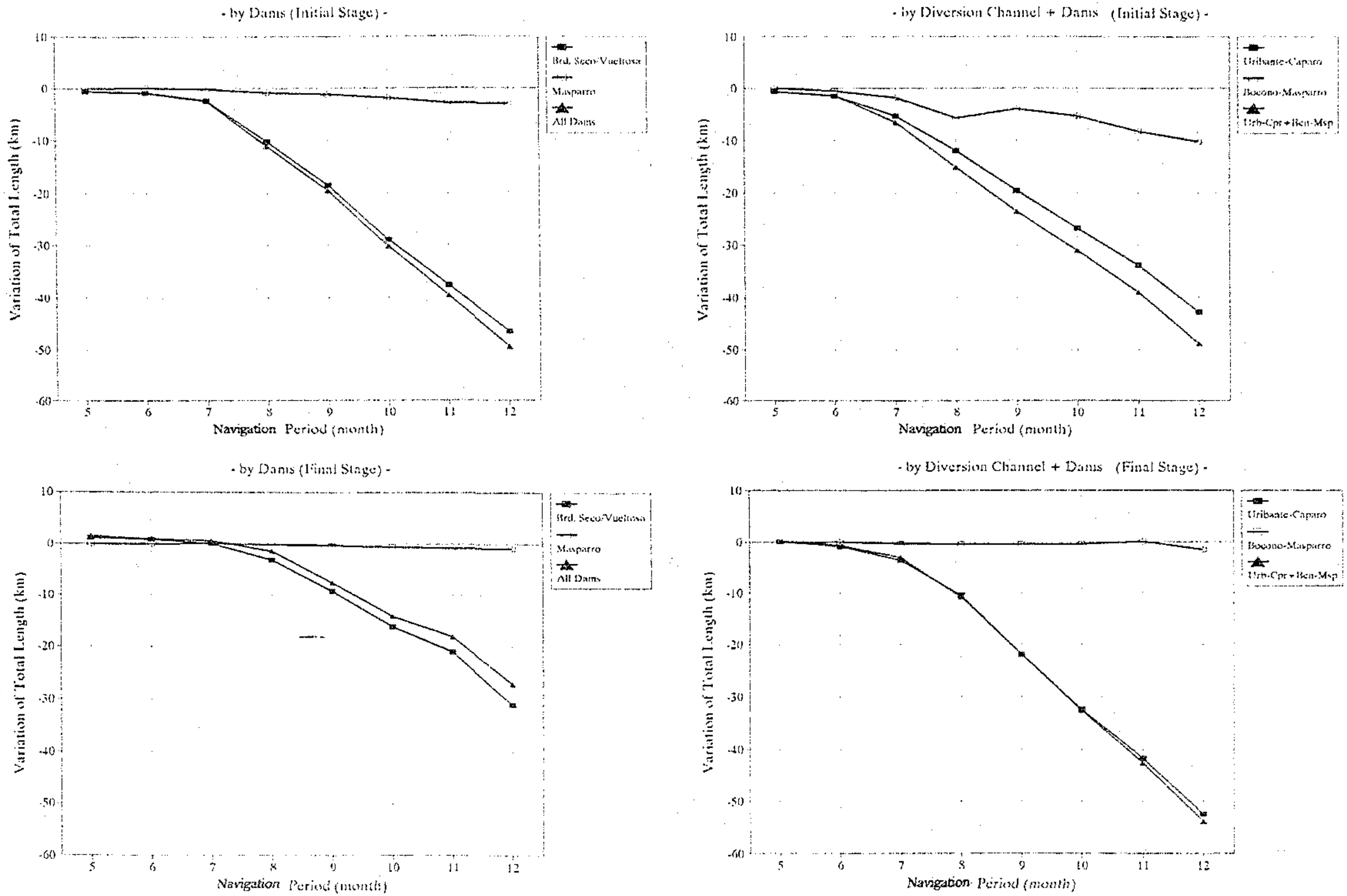

Fig. 5.2.6 Improvement of Critical Channel Length

THE REPUBLIC OF VENEZUELA
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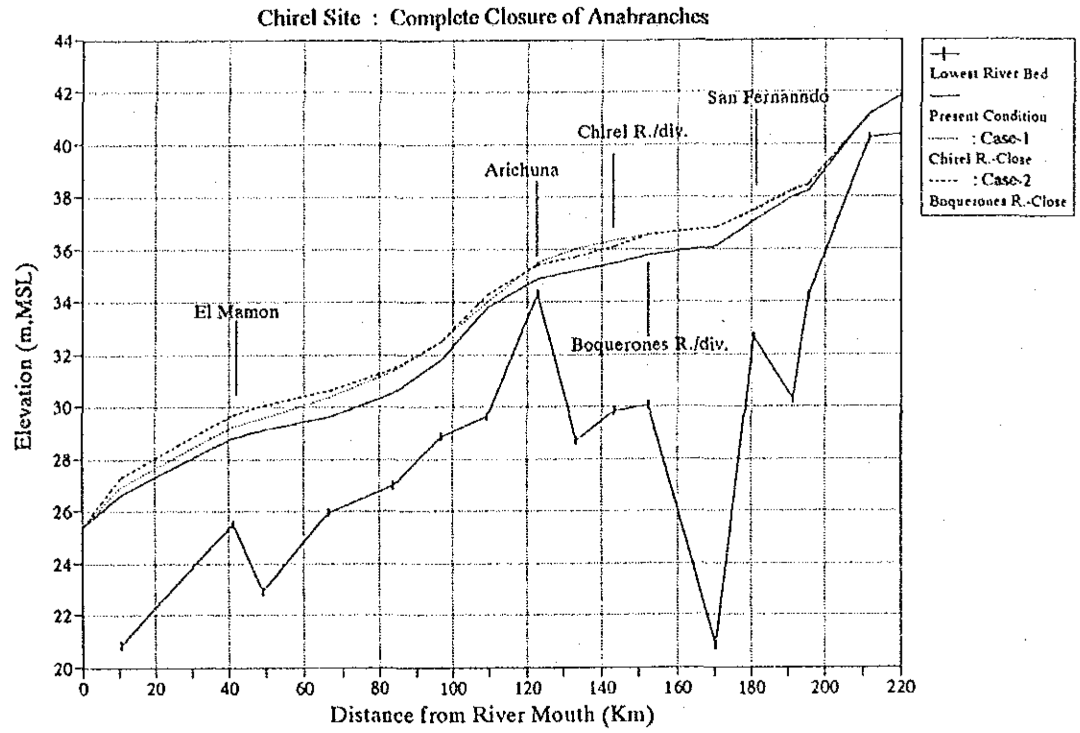
JAPAN INTERNATIONAL COOPERATION AGENCY



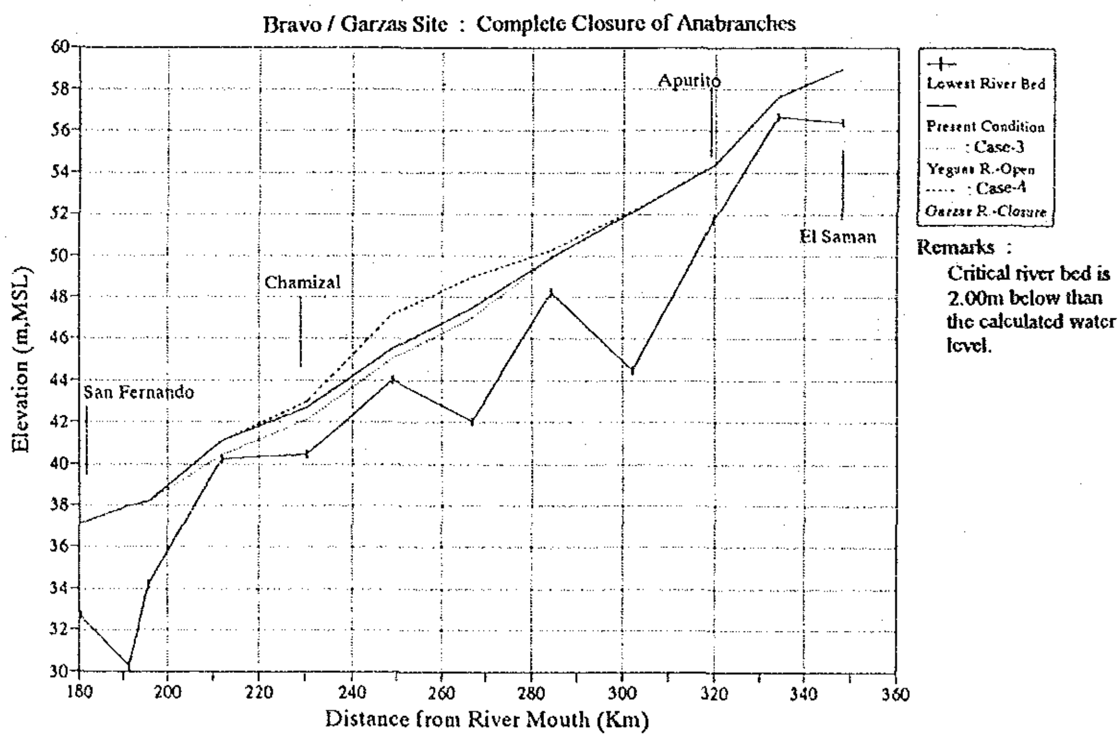


Fig. 5.3.1 Critical River Bed Profiles for Case Study (Q120d)

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OF THE APURE RIVER BASIN

JAPAN INTERNATIONAL COOPERATION AGENCY

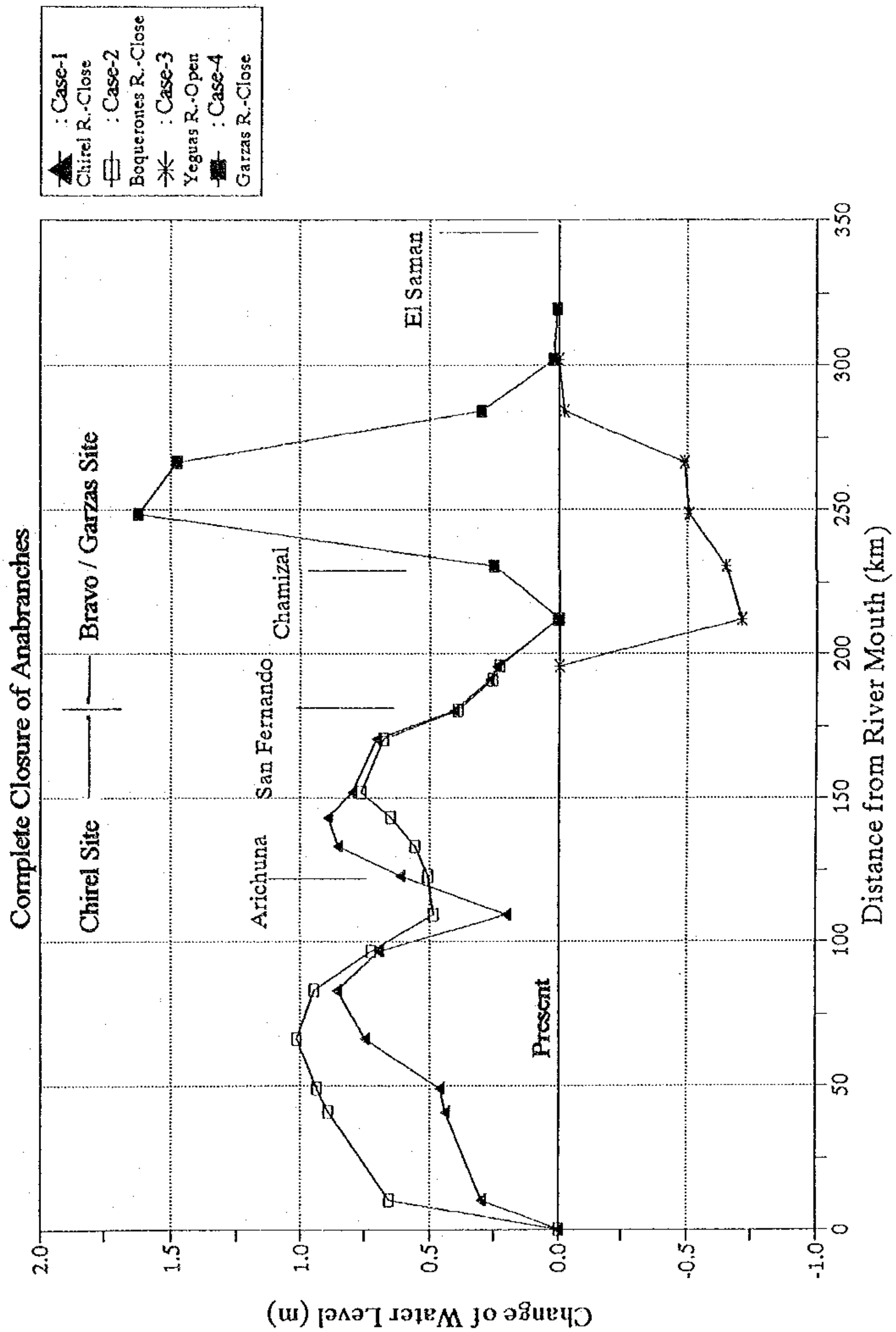

Fig. 5.3.2 Hydraulic Effect of Anabranch Treatment (Q120d)

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OF THE APURE RIVER BASIN

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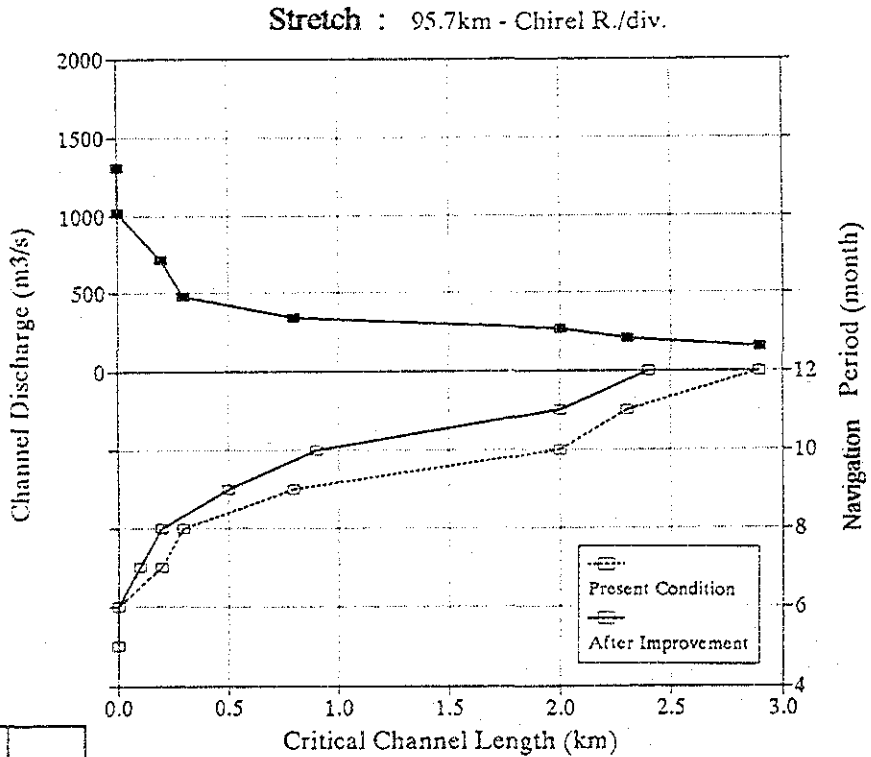

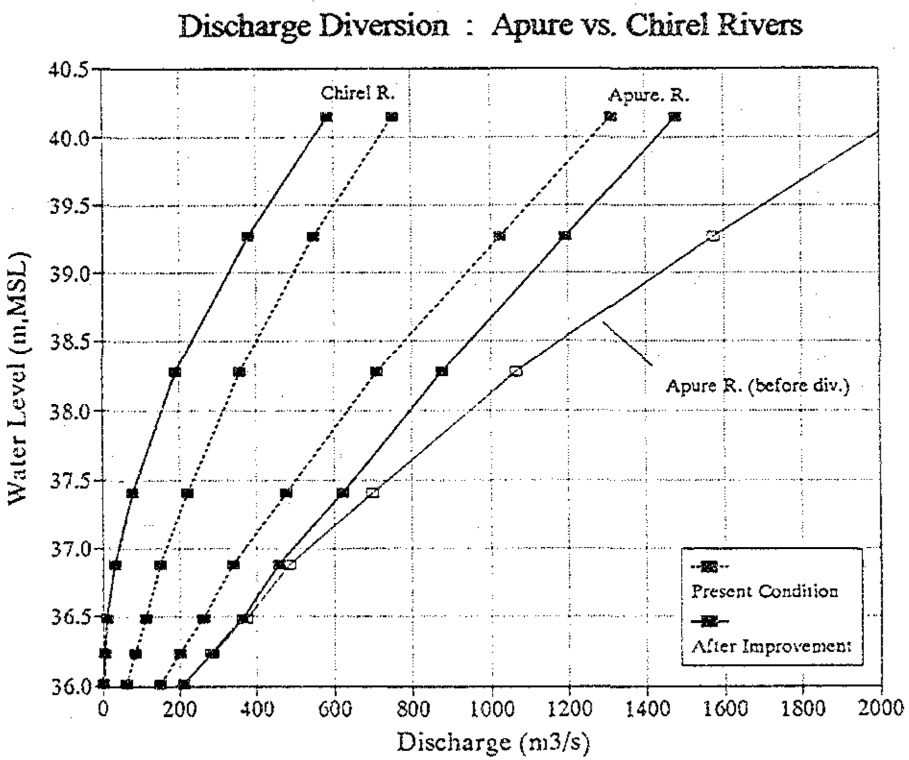

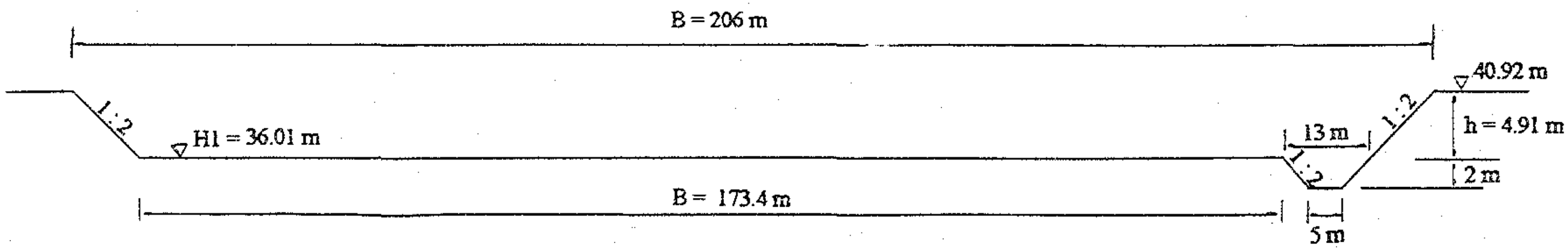

- Cross Section of Submerged Dike at Chirel River -

Fig. 5.3.3 Effect of Submerged Dike of Chirel River

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JAPAN INTERNATIONAL COOPERATION AGENCY