

SECTOR F

TABLES



Table 1.1-1 Inventory of Hydrometeorological Stations

Climatological Station

Serial	Location	Type	Organization	Latitude °-' N	Longitude °-' W	Altitude EL m	Time in operation
0682	Colonia Tovar	CL	SM	10-25	67-18	1,435	1931-
0673	Agua Fria	PR	MA	10-24	67-11	1,741	1948-
0465	El Consejo	PC	AC	10-15	67-16	570	
0671	Las Tejerias	PR	MA	10-16	67-10		
0672	Insti. Pignatelli	PR	MA	10-22	67-02	1,240	1958-
0676	Paracotos	PR	MA	10-16	66-58	620	1961-
0675	Rio Arriba	PR	MA	10-09	67-01	395	1959-
0455	Macaguita	PR	MA	10-07	66-56	480	1961-
0182	Cua-Tovar	CL	MA	10-09	66-52	230	1951-
0579	Palmira	PR	MA	10-05	66-51	440	1991-
0661	Charallave	PR	MA	10-16	66-51	400	1946-
0460	La Veraniega	PR	MA	10-09	66-46	170	1969-
0299	Santa Teresa	PR	MA	10-13	66-39	158	1954-

Note: PR= Pluviograph, PC=Pluviometer, CL=Climatological Station, SM=Aeronautical Meteorological St
MA=MARNR, AC=Tuy River Agency

Hydrometric Station

Serial	River	Location	Latitude °-' N	Longitude °-' W	Altitude	C.A. km ²	Time in operation
0682	Tuy	Colonia Tovar	10-25	67-17	1,635	2	1948-79
0579	Tuy	Las caballerias	10-16	67-15	575	122	1986-
0455	Tuy	Hda. Barrios	10-15	67-16	552	213	1941-77
0460	Tuy	Hda. Tazon	10-09	66-55	415	1,143	1941-78
0182	Tuy	Ocumare	10-08	66-46		1,711	1992-
0675	Tuy	Hda. San Antonio	10-13	66-43	134	1,843	1967-
0299	Tuy	Pte. Sta. Teresa	10-13	66-39		2,348	1943-47
0661	Agua Fria	Agua Fria	10-25	67-11		9	1951-64, 1974
0671	Guare	Rio Arriba	10-09	67-01	395	92	1958-75, 1993
0676	Guare	Tacata	10-12	67-00	297	185	1961-77
0672	Ocumarito	Desecho	10-06	66-48	189	123	1959-76, 1980
0673	Sucuta	La Cochinera	10-06	66-44	204	65	1951-64, 1974
0674	Talma	Hda. Sousa	10-08	66-53	239	78	1972-75, 1981

Note: C.A.: Catchment Area

Table 1.4-1 Features by Sub-Basin

Basin	River		Catchment			River	Name of the Major Twon
			Area		Max. Height	Length	
			(Km ²)	(%)	(EL m)	(km)	
Upper	1	Tuy	165.0	8.9	2,420	21.5	Colonia Tovar
	1-1	Lagunetas	73.0	3.9	2,340	20.0	
	2	Qda. El Socorro	105.0	5.7	1,520	5.0	El Consejo
	2-1	Qda. Morocopo	35.0	1.9	1,500	8.0	
	3	Qda. Guayas	140.0	7.5	1,640	13.5	Las Tejerias
	4	Cagua	82.0	4.4	1,360	11.5	
	5	Qda. Maitana	203.0	10.9	1,460	27.0	
	6	Guare	195.0	10.5	1,380	22.0	Tacata
		Sub-total	998.0	53.8	2,420	55.0	
Middle	7	Qda. de Sacua	83.0	4.5	1,020	9.0	Cua
	8	Qda. Aniagua	92.0	5.0	1,320	11.5	Paracotos
	8-1	Tarma	98.0	5.3	1,600	18.0	
	9	Ocumarito	146.0	7.9	1,420	21.0	
	10	Qda. de Mume	67.0	3.6	1,020	12.0	
	11	Qda. Charallave	145.0	7.8	1,100	33.0	Charallave
	12	Sucuta	152.0	8.2	1,160	22.5	Ocumare del Tuy
	13	Qda. Seca	75.0	4.0	660	7.5	San Francisco de Yare
		Sub-total	858.0	46.2	1,600	50.0	
	Total	1,856.0	100.0				

Table 1.5-1 (1/2) Monthly Average Discharge of the Tuy River

Hd. Barrios, Tuy River (C.A.=248 km²)

Unit: m³/s

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
1958	0.47	0.27	0.25	0.13	0.90	2.01	1.70	1.47	1.08	1.05	0.61	0.31	0.85
1959	0.26	0.36	0.51	0.25	1.06	0.70	0.64	0.68	0.77	0.86	0.63	0.11	0.57
1960	0.32	0.15	0.18	0.60	0.63	0.99	1.09	1.39	1.55	1.08	1.13	0.83	0.83
1961	0.17	0.12	0.18	0.14	0.07	0.11	0.77	1.19	1.05	0.83	0.83	0.31	0.48
1962	0.13	0.09	0.15	0.10	0.21	0.63	0.78	1.59	1.19	0.73	0.43	0.10	0.51
1963	0.07	0.05	0.05	0.21	1.44	2.10	0.95	0.65	1.64	0.82	0.91	0.21	0.76
1964	0.12	0.08	0.08	0.13	0.24	0.52	1.07	1.14	1.24	1.20	0.14	0.18	0.51
1965	0.18	0.11	0.08	0.12	0.59	1.40	1.07	1.48	0.79	1.10	1.06	0.39	0.70
1966	0.12	0.08	0.06	0.09	0.30	1.59	2.19	1.99	1.34	1.53	1.75	1.49	1.04
1967	0.71	0.45	0.28	0.38	0.44	0.73	0.61	1.25	0.82	0.95	0.70	0.50	0.65
1968	0.25	0.21	0.15	0.40	0.87	1.07	0.85	1.06	0.81	0.23	0.34	0.12	0.53
1969	0.13	0.10	0.09	0.88	1.14	2.31	1.85	2.17	1.54	2.15	2.43	0.74	1.29
1970	0.38	0.26	0.43	0.21	0.36	1.93	2.00	1.63	1.85	1.17	0.76	0.89	0.99
1971	0.28	0.18	0.15	0.49	0.75	0.54	0.42	0.58	0.69	0.69	0.53	0.14	0.45
1972	0.21	0.13	0.24	0.33	1.02	0.40	0.35	0.30	0.28	0.40	0.42	0.37	0.37
1973	0.20	0.18	0.27	0.44	0.27	0.15	0.29	0.25	0.32	0.54	1.10	0.16	0.35
1974	0.19	0.19	0.17	0.10	0.22	0.09	0.22	0.64	1.61	2.33	1.23	0.40	0.62
1975	0.55	0.51	0.52	0.32	0.45	0.48	0.16	0.55	1.39	-	2.04	1.98	-
1976	0.90	0.50	0.10	0.70	0.30	0.10	0.50	0.60	0.50	1.20	0.20	0.20	0.48
1977	0.01	0.01	0.01	0.01	0.02	0.08	-	-	0.08	0.18	0.03	0.01	-
Max.	0.90	0.51	0.52	0.88	1.44	2.31	2.19	2.17	1.85	2.33	2.43	1.98	1.29
Min.	0.01	0.01	0.01	0.01	0.02	0.08	0.16	0.25	0.08	0.18	0.03	0.01	0.35
Ave.	0.28	0.20	0.20	0.30	0.56	0.90	0.92	1.08	1.03	1.00	0.86	0.47	0.67

Hd. Tazon, Tuy River (C.A.=1,180 km²)

Unit: m³/s

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
1958	1.61	1.17	0.87	0.94	2.44	9.00	16.10	10.60	11.90	7.22	4.51	2.85	5.77
1959	2.16	1.62	1.21	0.72	2.24	3.73	2.93	5.02	4.09	5.52	5.46	2.27	3.08
1960	1.28	0.92	0.57	1.36	3.01	8.03	10.40	18.80	12.20	6.55	6.56	6.65	6.36
1961	2.77	2.06	1.61	1.31	0.82	1.66	7.70	6.44	8.48	6.66	6.66	3.82	4.17
1962	2.22	2.10	1.82	0.78	1.80	4.61	5.41	6.77	4.96	5.76	4.13	1.91	3.52
1963	1.44	0.89	0.79	1.84	9.10	13.20	9.54	6.92	12.30	7.67	5.27	3.47	6.04
1964	2.23	1.71	1.10	0.95	1.17	2.79	5.78	10.80	8.60	5.99	3.27	2.24	3.89
1965	1.69	1.60	0.90	0.57	1.89	10.50	15.10	14.50	9.68	12.20	11.20	5.19	7.08
1966	3.95	2.37	1.54	1.55	1.95	13.30	13.00	16.00	10.90	14.20	12.80	8.64	8.35
1967	5.55	3.78	2.37	3.78	2.59	3.28	4.74	7.14	3.69	3.99	2.97	3.13	3.92
1968	1.87	1.23	0.74	1.17	4.12	10.91	11.96	12.10	11.98	8.54	4.62	2.86	6.01
1969	4.31	4.01	4.03	3.79	4.54	20.02	-	31.83	18.19	17.11	11.78	11.24	-
1970	4.76	3.30	2.90	1.65	2.45	9.22	14.01	18.58	13.47	10.07	6.61	8.89	7.99
1971	7.05	3.05	1.15	2.86	1.84	1.48	2.59	6.83	8.07	6.93	4.91	2.28	4.09
1972	4.33	2.33	2.09	1.94	6.09	1.58	3.75	6.29	5.51	4.83	2.35	1.82	3.58
1973	1.65	1.09	0.77	0.96	0.70	0.55	0.55	1.14	3.91	5.83	6.52	2.69	2.20
1974	1.68	0.84	0.51	0.31	0.80	0.20	0.57	2.28	2.31	4.71	1.51	0.88	1.38
1975	0.68	0.52	0.28	0.17	0.21	0.41	0.12	2.50	2.18	12.77	4.14	2.40	2.20
1976	1.70	1.30	1.30	1.30	1.10	1.20	8.40	3.70	1.60	14.00	4.70	3.40	3.64
1977	2.23	1.07	0.68	0.27	0.64	5.06	3.45	6.49	6.20	3.90	9.43	3.33	3.56
Max.	7.05	4.01	4.03	3.79	9.10	20.02	16.10	31.83	18.19	17.11	12.80	11.24	8.35
Min.	0.68	0.52	0.28	0.17	0.21	0.20	0.12	1.14	1.60	3.90	1.51	0.88	1.38
Ave.	2.76	1.85	1.36	1.41	2.48	6.04	7.16	9.74	8.01	8.22	5.97	4.00	4.57

Table 1.5-1 (2/2) Monthly Average Discharge of the Tuy River

Toma de Agua, Tuy River (C.A.=1,856 km²)

Unit: m³/s

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
1958	2.53	1.84	1.37	1.48	3.84	14.16	25.32	16.67	18.72	11.36	7.09	4.48	9.08
1959	3.40	2.55	1.90	1.13	3.52	5.87	4.61	7.90	6.43	8.68	8.59	3.57	4.84
1960	2.01	1.45	0.90	2.14	4.73	12.63	16.36	29.57	19.19	10.30	10.32	10.46	10.00
1961	4.36	3.24	2.53	2.06	1.29	2.61	12.11	10.13	13.34	10.48	10.48	6.01	6.56
1962	3.49	3.30	2.86	1.23	2.83	7.25	8.51	10.65	7.80	9.06	6.50	3.00	5.54
1963	2.26	1.40	1.24	2.89	14.31	20.76	15.01	10.88	19.35	12.06	8.29	5.46	9.50
1964	3.51	2.69	1.73	1.49	1.84	4.39	9.09	16.99	13.53	9.42	5.14	3.52	6.12
1965	2.66	2.52	1.42	0.90	2.97	16.52	23.75	22.81	15.23	19.19	17.62	8.16	11.14
1966	6.21	3.73	2.42	2.44	3.07	20.92	20.45	25.17	17.14	22.33	20.13	13.59	13.13
1967	8.73	5.95	3.73	5.95	4.07	5.16	7.46	11.23	5.80	6.28	4.67	4.92	6.17
1968	2.94	1.93	1.16	1.84	6.48	17.16	18.81	19.03	18.84	13.43	7.27	4.50	9.45
1969	6.78	6.31	6.34	5.96	7.14	31.49	-	50.06	28.61	26.91	18.53	17.68	-
1970	7.49	5.19	4.56	2.60	3.85	14.50	22.04	29.22	21.19	15.84	10.40	13.98	12.57
1971	11.09	4.80	1.81	4.50	2.89	2.33	4.07	10.74	12.69	10.90	7.72	3.59	6.43
1972	6.81	3.66	3.29	3.05	9.58	2.49	5.90	9.89	8.67	7.60	3.70	2.86	5.63
1973	2.60	1.71	1.21	1.51	1.10	0.87	0.87	1.79	6.15	9.17	10.26	4.23	3.46
1974	2.64	1.32	0.80	0.49	1.26	0.31	0.90	3.59	3.63	7.41	2.38	1.38	2.17
1975	1.07	0.82	0.44	0.27	0.33	0.64	0.19	3.93	3.43	20.09	6.51	3.77	3.46
1976	2.67	2.04	2.04	2.04	1.73	1.89	13.21	5.82	2.52	22.02	7.39	5.35	5.73
1977	3.51	1.68	1.07	0.42	1.01	7.96	5.43	10.21	9.75	6.13	14.83	5.24	5.60
Max.	11.09	6.31	6.34	5.96	14.31	31.49	25.32	50.06	28.61	26.91	20.13	17.68	13.13
Min.	1.07	0.82	0.44	0.27	0.33	0.31	0.19	1.79	2.52	6.13	2.38	1.38	2.17
Ave.	4.34	2.91	2.14	2.22	3.89	9.49	11.27	15.31	12.60	12.93	9.39	6.29	7.19

Table 1.5-2 Monthly Average Discharge of the Ocumarito River

El Desecho, Ocumarito River (C.A.=122.7 km²) Unit: m³/s

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
1960	0.26	0.12	0.06	0.12	0.34	1.78	2.25	4.81	2.80	1.52	1.54	1.18	1.40
1961	0.78	0.53	0.39	0.25	0.16	0.51	2.47	5.33	3.13	1.43	1.65	1.13	1.49
1962	0.79	0.49	0.45	0.23	0.32	1.83	3.31	4.29	3.68	1.79	0.95	0.64	1.57
1963	0.47	0.31	0.37	0.38	2.17	3.33	2.72	2.27	3.51	2.09	1.26	0.85	1.65
1964	0.62	0.47	0.35	0.29	0.31	0.66	1.46	2.07	1.72	1.16	0.75	0.51	0.87
1965	0.55	0.85	0.37	0.26	0.29	1.81	3.89	5.18	4.18	3.51	2.10	1.59	2.06
1966	1.14	0.73	0.50	0.35	0.30	1.42	4.24	4.29	4.16	3.18	2.85	4.06	2.28
1967	2.08	1.35	0.84	0.64	0.50	0.60	1.35	2.03	0.99	0.91	0.81	1.39	1.13
Max.	2.08	1.35	0.84	0.64	2.17	3.33	4.24	5.33	4.18	3.51	2.85	4.06	2.28
Min.	0.26	0.12	0.06	0.12	0.16	0.51	1.35	2.03	0.99	0.91	0.75	0.51	0.87
Ave.	0.84	0.61	0.42	0.31	0.55	1.49	2.71	3.78	3.02	1.95	1.49	1.42	1.56

Table 2.1-1 (1/2) Major Features of the Existing Reservoirs

Item	Ocumarito	Lagartijo	Taguacita	Camatagua
Dam				
Start operation	1969	1962	1986	1968
Name of river	Ocumarito	Lagartijo	Taguacita	Guárico
Location:				
Longitude (W)	10°04'38"	10°10'21"	10°11'27"	09°48'32"
Latitude (N)	66°49'43"	66°41'53"	66°33'30"	66°55'08"
Purpose	U	U, F, R	U, F	U, I, F, R
Type	Concrete arch	Rockfill		Rockfill
Height				
Crest length				
Design discharge (m ³ /s)				
Maximum	-	9.0	9.0	19.0
Normal	-	3.8	-	-
Spillway (m ³ /s)				
Normal	860	1,200		
Emergency	1,000			
Operation	Hidrocapital	Hidrocapital	Hidrocapital	MARNR
Reservoir				
Capacity (million m ³)				
Surcharge	3.90	33.00		172.11
Effective	6.00	70.00	119.10	1,532.09
Dead		10.00	3.30	41.80
Gross	10.85	113.00	122.40	1,746.00
Water level (EL. m)				
High	248.30	192.85		304.00
Normal	245.50	189.75	172.40	301.66
Low	232.80		104.00	261.00
Operation Rule				

Purpose: U: Urban I: Irrigation F: Flood control R: Recreation

Table 2.1-1 (2/2) Major Features of the Existing Reservoirs

Item	Qda. Seca	La Mariposa	La Pereza	Agua Fria
Dam				
Start operation	1961	1949	1969	1949
Name of river	Qda. Seca	Valle	La Pereza	Jarillo
Location:				
Longitude (W)	10°14'43"	10°25'21"	10°26'43"	10°20'43"
Latitude (N)	66°43'47"	66°56'29"	66°43'47"	67°09'51"
Purpose	U	U	U	U
Type				
Height				
Crest length				
Design discharge (m ³ /s)				
Maximum	-	-		
Normal	4.0	5.0	8.0	1.75
Spillway (m ³ /s)				
Normal		725		380
Emergency				500
Operation	Hidrocapital	Hidrocapital	Hidrocapital	Hidrocapital
Reservoir				
Capacity (million m ³)				
Surcharge	1.25	1.00		0.60
Effective	6.50	7.00		5.75
Dead	0.75			0.05
Gross	8.50	9.00	8.00	6.40
Water level (EL m)				
High	170.40	984.20	1,068.50	1,718.00
Normal	169.50	981.00		1,716.50
Low				
Operation Rule				

Purpose: U: Urban I: Irrigation F: Flood control R: Recreation

Table 2.3-1 Major Features of the Water Source

River	Cagua	Guare	Aniagua
Location		Tácata	
Catchment Area (km ²)	53	183	62
Discharge (m ³ /s)			
Average monthly	0.25	0.75	0.25
Dam			
Studied	No	Yes	No
Type	-	Rockfill	-
Height (m)	-	61	-
Ave. regulated Q (m ³ /s)	-	1.5	-
Cost	-		-

River	Tarma	Sucuta
Location		
Catchment Area (km ²)	57	71
Discharge (m ³ /s)		
Average monthly	0.23	0.29
Dam		
Studied	No	No
Type	-	-
Height	-	-
Ave. regulated Q (m ³ /s)	-	-
Cost	-	-

Table 3.3-1 (1/2) Optimization Study of Torrent Diversion

Diversion Capacity	Ave. Annual Diverted Water per 100km ²		Ave. Annual Diverted Water from Intake		Div. volume	Ave. Annual Dev. Water	Annual Benefit *1 (B)	Initial Cost	Annual Cost (C)	B-C	B/C	Unit Cost
	m ³ /s/100km ²	mcm/yr	m ³ /s	mcm/yr								
Sucuta			65.0 km ²									
0.933	0.00	0.00	0.00	0.61	0.00	0.00	0.00	0.00	0.00			
1.0	1.03	0.03	0.67	0.65	0.04	0.43	0.14	6.10	0.73	-0.59	0.19	1.718
1.5	7.26	0.23	4.72	0.98	0.37	2.76	0.90	8.60	1.03	-0.13	0.87	0.374
2.0	11.60	0.37	7.54	1.30	0.69	4.29	1.40	12.50	1.50	-0.10	0.94	0.349
3.0	15.95	0.51	10.37	1.95	1.34	5.84	1.91	16.40	1.97	-0.06	0.97	0.337
4.0	17.54	0.56	11.40	2.60	1.99	6.40	2.09	18.70	2.24	-0.15	0.93	0.351
Tarma			78.0 km ²									
0.933	0.00	0.00	0.00	0.73	0.00	0.00	0.00	0.00	0.00			
1.0	1.03	0.03	0.80	0.78	0.05	0.51	0.17	4.70	0.56	-0.40	0.30	1.103
1.5	7.26	0.23	5.66	1.17	0.44	3.27	1.07	17.90	2.15	-1.08	0.50	0.657
2.0	11.60	0.37	9.05	1.56	0.83	5.12	1.67	22.80	2.74	-1.06	0.61	0.535
3.0	15.95	0.51	12.44	2.34	1.61	6.97	2.28	29.20	3.50	-1.23	0.65	0.503
4.0	17.54	0.56	13.68	3.12	2.39	7.64	2.50	34.40	4.13	-1.63	0.61	0.540
Aniagua-Tarma			131.3 km ²									
0.933	0.00	0.00	0.00	1.23	0.00	0.00	0.00	0.00	0.00			
1.0	1.03	0.03	1.35	1.31	0.09	0.86	0.28	8.39	1.01	-0.73	0.28	1.170
1.5	7.26	0.23	9.53	1.97	0.74	5.38	1.76	26.27	3.15	-1.39	0.56	0.586
2.0	11.60	0.37	15.23	2.63	1.40	8.45	2.76	33.80	4.06	-1.29	0.68	0.480
3.0	15.95	0.51	20.94	3.94	2.71	10.52	3.44	44.70	5.36	-1.92	0.64	0.510
4.0	17.54	0.56	23.03	5.25	4.03	11.28	3.69	52.10	6.25	-2.56	0.59	0.554
Guare-Tarma			317.3 km ²									
0.933	0.00	0.00	0.00	2.96	0.00	0.00	0.00	0.00	0.00			
1.0	1.03	0.03	3.27	3.17	0.21	1.96	0.64	17.80	2.14	-1.49	0.30	1.087
1.5	7.26	0.23	23.04	4.76	1.80	11.29	3.69	49.10	5.89	-2.20	0.63	0.522
2.0	11.60	0.37	36.81	6.35	3.39	15.86	5.19	62.70	7.52	-2.34	0.69	0.475
3.0	15.95	0.51	50.61	9.52	6.56	19.38	6.34	81.90	9.83	-3.49	0.64	0.507
4.0	17.54	0.56	55.65	12.69	9.73	20.30	6.64	92.70	11.12	-4.49	0.60	0.548
Cagua-Tarma			367.2 km ²									
0.933	0.00	0.00	0.00	3.43	0.00	0.00	0.00	0.00	0.00			
1.0	1.03	0.03	3.78	3.67	0.25	2.24	0.73	21.00	2.52	-1.79	0.29	1.123
1.5	7.26	0.23	26.66	5.51	2.08	12.60	4.12	57.90	6.95	-2.83	0.59	0.551
2.0	11.60	0.37	42.60	7.34	3.92	17.44	5.70	74.70	8.96	-3.26	0.64	0.514
3.0	15.95	0.51	58.57	11.02	7.59	20.55	6.72	99.60	11.95	-5.23	0.56	0.582
4.0	17.54	0.56	64.41	14.69	11.26	20.55	6.72	114.40	13.73	-7.01	0.49	0.668

Note: *1: Unit benefit (\$/m³) 0.327

Table 3.3-1 (2/2) Optimization Study of Torrent Diversion

Diversion Capacity	Initial Cost											
	Sucuta-Lagartijo		Tarma-Lagartijo		Aniagua-Tarma		Guare-Aniagua		Cagua-Guare		Total	
	m ³ /s/100km ²	m ³ /s	\$mil	m ³ /s	\$mil	m ³ /s	\$mil	m ³ /s	\$mil	m ³ /s	\$mil	\$mil
Sucuta												
0.933	0.00	0										0.00
1.0	0.04	6.1										6.10
1.5	0.37	8.6										8.60
2.0	0.69	12.5										12.50
3.0	1.34	16.4										16.40
4.0	1.99	18.7										18.70
Tarma												
0.933			0.00	0								0.00
1.0			0.05	4.7								4.70
1.5			0.44	17.9								17.90
2.0			0.83	22.8								22.80
3.0			1.61	29.2								29.20
4.0			2.39	34.4								34.40
Aniagua-Tarma												
0.933			0.00	0	0.00	0						0.00
1.0			0.09	6.8	0.04	1.6						8.39
1.5			0.74	22.0	0.30	4.3						26.27
2.0			1.40	27.6	0.57	6.2						33.80
3.0			2.71	36.2	1.10	8.5						44.70
4.0			4.03	42.2	1.63	9.9						52.10
Guare-Tarma												
0.933			0.00	0	0.00	0	0.00	0				0.00
1.0			0.21	12.7	0.16	2.9	0.12	2.2				17.80
1.5			1.80	30.6	1.36	9.2	1.05	9.3				49.10
2.0			3.39	39.5	2.55	11.6	1.98	11.6				62.70
3.0			6.56	53.1	4.95	13.8	3.84	15.0				81.90
4.0			9.73	57.2	7.34	17.4	5.70	18.1				92.70
Cagua-Tarma												
0.933			0.00	0	0.00	0	0.00	0	0.00	0		0.00
1.0			0.25	13.2	0.19	3.2	0.16	2.9	0.03	1.7		21.00
1.5			2.08	32.6	1.64	10.0	1.34	10.1	0.28	5.2		57.90
2.0			3.92	41.7	3.09	12.3	2.52	12.9	0.53	7.8		74.70
3.0			7.59	55.5	5.98	16.5	4.88	17	1.03	10.6		99.60
4.0			11.26	62.7	8.87	18.5	7.24	20.3	1.53	12.9		114.40

Note: *1: Unit benefit (\$/m³)

Table 4.2-1 Unit Construction Cost of Tuy IV-Taguaza-Cuira System

Item	Unit	Taguaza-Taguacita inter-connection	Taguaza Final	Tuy IV - Cuira
Major works		Construction of Taguaza dam Embankment $V_1=4 \times 10^6 \text{ m}^3$ Pipeline for gravity flow $Q= 4.0 \text{ m}^3/\text{s}$ (maximum) $L_1= 10 \text{ km}$ ($\phi 300\text{mm}$) $L_2= 11 \text{ km}$ ($\phi 1,700\text{mm}$)	Taguaza dam (final) Embankment $V= 6 \times 10^6 \text{ m}^3$ Pipeline for pumped flow $Q= 8.0 \text{ m}^3/\text{s}$ $L= 38 \text{ km}$ Pumping station $Q= 24 \text{ m}^3/\text{s}$	Construction of Cuira dam Pipeline for pumped flow $Q= 10.0 \text{ m}^3/\text{s}$ $L= 17 \text{ km}$ Pumping station $Q= 12 \text{ m}^3/\text{s}$
Hydrological features				
Catchment area	km^2	(238)	238	542
Annual average rainfall	mm	(1,800)	1,800	1,700
Annual developed water		$1.5 \text{ m}^3/\text{s} \times 0.0864 \times 365 = 47.3$	$8 \text{ m}^3/\text{s} \times 0.0864 \times 365 = 252$	$10 \text{ m}^3/\text{s} \times 0.0864 \times 365 = 315$
Annual average intake	m^3/s	1.5	8.0	10.0
Annual developed water	$10^6 \text{ m}^3/\text{yr}$	47.3	252.3	315.4
Equivalent depth	mm/yr	200	1,060	582
Initial cost	\$ mil.	dam : 56 pipeline : 40 pumping station : - total : 96	dam : 84 pipeline : 95 pumping station : 30 total : 209	dam : 80 pipeline : 40 pumping station : 45 total : 165
Annualized initial cost	\$ mil.	10.6	23.0	18.2
Annual maintenance cost	\$ mil.	1.8	4.5	3.3
Annual power cost	\$ mil.	0.0	8.5	12.9
Annualized total cost *1	\$ mil.	12.4	36.0	34.4
Unit cost	$\$/\text{m}^3$	0.262	0.143	0.109

*1: Annualized total cost = Annualized initial cost + Annual maintenance cost + Annual power cost

Annualized initial cost = Initial cost \times Present worth of an annuity factor

Present worth of an annuity factor: 0.11 in the case of project life of 50-year and interest rate of 12%

Table 4.2-2 Cost of Tuy System (Production)

TUY		1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2004
PLANTA Y EQUIPOS												
Producción	MMUS\$	980,0	986,0	987,0	987,0	995,0	995,0	995,0	995,0	995,0	995,0	995,0
Tratamiento	MMUS\$	101,6	101,6	101,6	101,6	101,6	101,6	101,6	101,6	101,6	101,6	101,6
Distribución	MMUS\$	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0
Comercial	MMUS\$	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0
Recolección	MMUS\$	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0
Total	MMUS\$	1.087,6	1.087,6	1.088,6	1.088,6	1.096,6	1.096,6	1.096,6	1.096,6	1.096,6	1.096,6	1.096,6
PRODUCCIÓN/FACTURACIÓN												
PRODUCCIÓN PROPIA	Hm3	561,34	561,34	565,86	578,47	578,47	578,47	578,47	578,47	578,47	578,47	578,47
CONSUMOS/INOCES												
PRODUCCIÓN												
Electricidad (Cadafé)	kwh/m3	3,7374	3,7374	3,6252	3,4384	3,3636	3,3636	3,3636	3,3636	3,3636	3,3636	3,3636
Cloro	mg/l	6,2973	6,2973	7,2230	5,0743	4,0000	4,0000	4,0000	4,0000	4,0000	4,0000	4,0000
Hipoclorito de Calcio	mg/l	0,0018	0,0019	0,0018	0,0018	0,0018	0,0018	0,0018	0,0018	0,0018	0,0018	0,0018
Sulfato de Aluminio	mg/l	20,7988	20,7988	20,7988	20,7988	21,0000	21,0000	21,0000	21,0000	21,0000	21,0000	21,0000
Sulfato de Cobre	mg/l	0,0521	0,0521	0,0521	0,0521	0,0521	0,0521	0,0521	0,0521	0,0521	0,0521	0,0521
Polímero AC-004	mg/l	0,1159	0,1159	0,1159	0,1159	0,1159	0,1159	0,1159	0,1159	0,1159	0,1159	0,1159
Polímero C-575	mg/l	565,2204	565,2204	565,2204	565,2204	565,2204	565,2204	565,2204	565,2204	565,2204	565,2204	565,2204
Cal	mg/l	0,0000	0,0000	1,5000	4,5000	6,0000	6,0000	6,0000	6,0000	6,0000	6,0000	6,0000
Mano de obra conducción	H-año	286	286	286	286	286	286	286	286	286	286	286
Mano de obra tratamiento	H-año	158	158	158	158	158	158	158	158	158	158	158
Materiales para conducción	% Inv-br	0,155%	0,250%	0,250%	0,250%	0,250%	0,250%	0,250%	0,250%	0,250%	0,250%	0,250%
Materiales para tratamiento	% Inv-br	0,100%	0,250%	0,250%	0,250%	0,250%	0,250%	0,250%	0,250%	0,250%	0,250%	0,250%
INDIRECTOS												
Gerencia corporativa	H-año	0	0,50	1	1	1	1	1	1	1	1	1
Mano de obra propia del sistema	H-año	32	32	32	32	32	32	32	32	32	32	32
Servicio de vigilancia y otros	H-año											
Materiales, suministros y servicios	% G-Para	130%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
MONTO TOTAL												
PRODUCCIÓN												
Electricidad (Cadafé)	MMUS\$	65,176	63,428	62,240	50,862	49,551	49,551	49,551	49,551	49,551	49,551	49,551
Cloro	MMUS\$	1,662	1,656	1,453	1,044	0,823	0,823	0,823	0,823	0,823	0,823	0,823
Hipoclorito de Calcio	MMUS\$	0,005	0,005	0,005	0,005	0,005	0,005	0,005	0,005	0,005	0,005	0,005
Sulfato de Aluminio	MMUS\$	2,242	2,234	2,252	2,302	2,325	2,325	2,325	2,325	2,325	2,325	2,325
Sulfato de Cobre	MMUS\$	0,012	0,012	0,012	0,012	0,012	0,012	0,012	0,012	0,012	0,012	0,012
Polímero AC-004	MMUS\$	0,107	0,106	0,105	0,171	0,171	0,171	0,171	0,171	0,171	0,171	0,171
Polímero C-575	MMUS\$	0,177	0,104	0,105	0,107	0,107	0,107	0,107	0,107	0,107	0,107	0,107
Cal	MMUS\$	0,000	0,000	0,000	0,001	0,001	0,001	0,001	0,001	0,001	0,001	0,001
Mano de obra conducción	MMUS\$	3,094	2,358	2,358	2,358	2,358	2,358	2,358	2,358	2,358	2,358	2,358
Mano de obra tratamiento	MMUS\$	1,263	0,979	0,978	0,978	0,978	0,978	0,978	0,978	0,978	0,978	0,978
Materiales para conducción	MMUS\$	1,623	2,465	2,468	2,468	2,468	2,468	2,468	2,468	2,468	2,468	2,468
Materiales para tratamiento	MMUS\$	0,199	0,254	0,254	0,254	0,254	0,254	0,254	0,254	0,254	0,254	0,254
Subtotal producción	MMUS\$	96,639	63,468	62,292	60,261	59,072	59,072	59,072	59,072	59,072	59,072	59,072
INDIRECTOS												
Gerencia corporativa 1	MMUS\$	0,000	0,012	0,050	0,050	0,050	0,050	0,050	0,050	0,050	0,050	0,050
Mano de obra propia del sistema	MMUS\$	0,145	0,104	0,104	0,104	0,104	0,104	0,104	0,104	0,104	0,104	0,104
Servicio de vigilancia y otros	MMUS\$	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000
Materiales, servicios y suministros	MMUS\$	0,200	0,116	0,154	0,154	0,154	0,154	0,154	0,154	0,154	0,154	0,154
Subtotal costos indirectos	MMUS\$	0,345	0,233	0,309	0,309	0,309	0,309	0,309	0,309	0,309	0,309	0,309
IMPUESTOS	MMUS\$	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000
TOTAL GENERAL	MMUS\$	96,98	63,69	62,60	60,56	59,38	59,38	59,38	59,38	59,38	59,38	59,38

Source: "Hidrocapital Proyecciones de ingresos y gastos, Años 1995-2005, Caracas, 23 de abril de 1996"

Table 4.3-1 Features of River Flow

River	Ocumarito	Lagartijo	Taguacita	Tuy	Tuy
Station	El Desecho	La Esperanza	La Botica	Tazon	San Antonio
Catchment area (km ²)	123	302	141	1,180	1,843
Average flow (m ³ /s)					
1939-78	1.76	4.48	3.81	6.33	11.08
1949-78	1.80	4.67	3.89	6.08	11.28
1959-78	1.72	4.58	3.80	5.20	9.61
1969-78	1.81	4.72	3.66	4.15	8.89
Average sepcific flow (m ³ /s/100km ²)					
1959-78	1.46	1.56	2.60	0.35	0.44
Average runoff height (mm)					
1959-78	460	490	820	110	140

Table 4.3-2 (1/2) Major Features of the Existing Reservoirs

Item	Ocumarito	Lagartijo	Taguacita	Taguaza
Dam				
Start operation	1969	1962	1986	1998
Name of river	Ocumarito	Lagartijo	Taguacita	Taguaza
Location:				
Longitude (W)	10°04'38"	10°10'21"	10°11'27"	
Latitude (N)	66°49'43"	66°41'53"	66°33'30"	
Purpose	U	U	U	U
Type	Concrete arch	Rockfill	Concrete gravity	Rockfill
Height		60	34	90
Crest length		173	120	390
Design discharge (m ³ /s)		3		
Maximum	-	9.0	9.0	8.5
Normal	-	3.8	1.5	8.0
Spillway (m ³ /s)				
Normal	860	1,200	1,400	242
Emergency	1,000			
Operation	Hidrocapital	Hidrocapital	Hidrocapital	
Reservoir				
Catchment area (km ²)	123	302	145	238
Average rainfall (mm)	1,140 (Cúa)	1,110 (Sta Teresa)	1,700	1,800
Capacity (×10 ⁶ m ³)				
Surcharge	3.90	33.00		
Effective	6.00	70.00	1.20	
Dead		10.00	0.00	
Gross	10.85	113.00	1.20	184
Water level (EL m)				
High	248.30	192.85		
Normal	245.50	189.75	172.40	147.35
Low	232.80		104.00	142.20

Purpose: U: Urban I: Irrigation F: Flood control R: Recreation

Table 4.3-2 (2/2) Major Features of the Existing Reservoirs

Item	Cuira	Camatagua		
Dam				
Start operation	-	1968		
Name of river	Cuira	Guárico		
Location:				
Longitude (W)		09°48'32"		
Latitude (N)		66°55'08"		
Purpose	U	U, I, F, R		
Type		Rockfill		
Height				
Crest length				
Design discharge (m ³ /s)				
Maximum		19.0		
Normal	approx.11.0	-		
Spillway (m ³ /s)				
Normal				
Emergency				
Operation		MARNR		
Reservoir				
Catchment area (km ²)	542			
Average rainfall (mm)	1,700			
Capacity (×10 ⁶ m ³)				
Surcharge		172.11		
Effective	214	1,532.09		
Dead		41.80		
Gross		1,746.00		
Water level (EL m)				
High		304.00		
Normal		301.66		
Low		261.00		

Purpose: U: Urban I: Irrigation F: Flood control R: Recreation

Table 4.3-3 Calculation Sheet of Ocumantito-Lagartijo Diversion

		Taguacita	Lagartijo Es	Tuy Tazon	Tuy San Ant	Ocumantito	inflow	rain	evapo	storage	Spill	Deficit		Q	
		141km ²	302km ²	1180km ²	1843km ²	129km ²	mcm	mcm	mcm	mcm	m ³ /s	mcm	mcm	Full	
		10.850													
		yes/no													
3	31	1.77	1.29	0.30	0.81	0.49	1.3124	0.011	0.185	7.669	0.000	0.000	0.000	7.669	0
4	30	1.37	1.83	1.08	2.34	0.68	1.7626	0.040	0.172	6.552	0.000	0.000	0.000	6.552	0
5	31	1.03	1.10	0.53	1.07	0.34	0.9107	0.091	0.152	4.562	0.000	0.000	0.000	4.562	0
6	30	0.83	1.50	2.06	3.13	0.42	1.0886	0.127	0.113	2.917	0.000	0.000	0.000	2.917	0
7	31	1.06	1.42	1.15	2.18	0.26	0.6964	0.128	0.112	0.790	0.000	0.000	1.610	2.400	0
8	31	1.06	2.32	1.91	4.45	0.35	0.9374	0.118	0.119	0.436	0.000	0.000	1.904	2.400	0
9	30	2.87	5.20	1.49	4.46	0.38	0.9850	0.090	0.125	0.602	0.000	0.000	1.798	2.400	0
10	31	2.94	4.16	1.59	4.85	0.41	1.0981	0.079	0.131	0.607	0.000	0.000	1.793	2.400	0
11	30	11.27	10.70	2.87	9.29	2.90	7.5168	0.068	0.119	7.116	0.000	0.000	0.000	7.116	0
12	31	5.55	4.52	3.14	7.03	0.93	2.4909	0.066	0.116	6.719	0.000	0.000	0.000	6.719	0
1974	1	31	5.58	5.90	2.08	6.03	3.0266	0.030	0.120	6.816	0.000	0.000	0.000	6.816	0
	2	28	3.46	3.82	0.99	3.25	1.9596	0.009	0.140	6.081	0.000	0.000	0.000	6.081	0
	3	31	2.74	3.06	0.68	2.10	1.6606	0.011	0.185	4.728	0.000	0.000	0.000	4.728	0
	4	30	2.10	2.17	0.28	1.17	1.3219	0.040	0.172	3.171	0.000	0.000	0.000	3.171	0
	5	31	1.65	2.19	0.75	1.79	1.3928	0.091	0.152	1.663	0.000	0.000	0.737	2.400	0
	6	30	2.33	1.40	0.26	0.95	0.9590	0.127	0.113	0.625	0.000	0.000	1.775	2.400	0
	7	31	3.26	2.06	1.74	3.26	1.4731	0.128	0.112	1.050	0.000	0.000	1.350	2.400	0
	8	31	3.06	4.87	4.93	12.13	3.3480	0.116	0.119	2.907	0.000	0.000	0.000	2.907	0
	9	30	3.20	10.83	8.12	17.25	8.4240	0.090	0.125	8.548	0.000	0.000	0.000	8.548	0
	10	31	4.65	9.29	8.54	16.36	3.8569	0.079	0.131	9.514	0.000	0.000	0.000	9.514	0
	11	30	4.93	4.83	6.91	12.41	2.5661	0.066	0.119	9.280	0.000	0.000	0.000	9.280	0
	12	31	5.48	3.97	4.14	7.18	2.4373	0.066	0.116	8.829	0.000	0.000	0.000	8.829	0
1975	1	31	3.19	4.35	2.18	6.07	1.7410	0.030	0.120	7.641	0.000	0.000	0.000	7.641	0
	2	28	2.61	3.32	1.08	3.59	1.0886	0.009	0.140	6.035	0.000	0.000	0.000	6.035	0
	3	31	2.00	2.48	0.50	2.41	0.9107	0.011	0.185	3.932	0.000	0.000	0.000	3.932	0
	4	30	1.53	1.83	0.71	1.76	0.6221	0.040	0.172	1.674	0.000	0.000	0.726	2.400	0
	5	31	1.19	2.10	0.58	2.36	0.9107	0.091	0.152	0.411	0.000	0.000	1.989	2.400	0
	6	30	5.03	3.37	1.97	3.28	7.1280	0.127	0.113	6.794	0.000	0.000	0.000	6.794	0
	7	31	6.77	7.39	1.00	6.48	9.9636	0.128	0.112	13.935	3.085	1.152	0.000	10.850	1
	8	31	7.84	5.61	4.40	8.35	12.1867	0.116	0.119	20.185	9.545	3.489	0.000	10.850	1
	9	30	3.50	8.40	4.59	9.34	7.9315	0.090	0.125	15.999	5.149	1.886	0.000	10.850	1
	10	31	4.13	8.84	12.37	21.65	4.9283	0.079	0.131	12.888	2.038	0.761	0.000	10.850	1
	11	30	3.40	5.77	7.82	12.55	3.4214	0.066	0.119	11.471	0.621	0.240	0.000	10.850	1
	12	31	3.81	4.42	7.27	10.37	3.1873	0.066	0.116	11.149	0.299	0.112	0.000	10.850	1
1976	1	31	2.77	4.26	5.33	7.42	2.1159	0.030	0.120	10.037	0.000	0.000	0.000	10.037	0
	2	29	2.31	3.48	3.16	4.63	1.4282	0.009	0.140	8.679	0.000	0.000	0.000	8.679	0
	3	31	1.77	3.06	1.76	2.94	1.1249	0.011	0.185	6.790	0.000	0.000	0.000	6.790	0
	4	30	1.43	2.13	1.33	1.92	0.8294	0.040	0.172	4.740	0.000	0.000	0.000	4.740	0
	5	31	1.29	2.10	1.45	3.93	1.0446	0.091	0.152	2.884	0.000	0.000	0.000	2.884	0
	6	30	3.07	2.70	2.75	4.91	2.4883	0.127	0.113	2.639	0.000	0.000	0.000	2.639	0
	7	31	6.90	8.84	7.79	15.44	5.2764	0.128	0.112	5.092	0.000	0.000	0.000	5.092	0
	8	31	5.48	5.48	8.79	15.64	6.5353	0.116	0.119	8.786	0.000	0.000	0.000	8.786	0
	9	30	4.43	4.53	7.66	13.11	5.7802	0.090	0.125	11.784	0.934	0.360	0.000	10.850	1
	10	31	6.48	4.90	12.05	12.86	6.5085	0.079	0.131	14.468	3.618	1.351	0.000	10.850	1
	11	30	3.87	3.93	9.61	13.44	4.1213	0.066	0.119	12.171	1.321	0.510	0.000	10.850	1
	12	31	3.13	3.13	5.78	8.49	3.4819	0.066	0.116	11.444	0.594	0.222	0.000	10.850	1
1977	1	31	3.06	2.29	2.84	4.49	2.3034	0.030	0.120	10.224	0.000	0.000	0.000	10.224	0
	2	28	2.25	1.68	1.34	2.29	1.5725	0.009	0.140	9.102	0.000	0.000	0.000	9.102	0
	3	31	1.74	1.29	0.60	1.22	1.2856	0.011	0.185	7.374	0.000	0.000	0.000	7.374	0
	4	30	1.33	0.93	0.26	0.73	0.9072	0.040	0.172	3.402	0.000	0.000	0.000	3.402	0
	5	31	1.03	1.03	1.30	1.56	1.7142	0.091	0.152	4.216	0.000	0.000	0.000	4.216	0
	6	30	1.77	7.87	2.97	7.46	14.3597	0.127	0.113	15.842	4.992	1.926	0.000	10.850	1
	7	31	2.23	7.10	5.05	13.57	7.1245	0.128	0.112	15.151	4.301	1.606	0.000	10.850	1
	8	31	3.77	14.55	5.41	16.52	12.5617	0.116	0.119	20.570	9.720	3.629	0.000	10.850	1
	9	30	3.37	11.27	6.98	15.89	6.7651	0.090	0.125	14.833	3.983	1.536	0.000	10.850	1
	10	31	3.03	5.65	6.06	11.32	5.2497	0.079	0.131	13.209	2.359	0.881	0.000	10.850	1
	11	30	6.60	6.03	6.13	15.73	4.1990	0.066	0.119	12.248	1.398	0.540	0.000	10.850	1
	12	31	4.87	4.23	3.66	8.87	2.9998	0.066	0.116	10.962	0.112	0.042	0.000	10.850	1
1978	1	31	3.77	3.03	1.78	4.84	2.2231	0.030	0.120	10.144	0.000	0.000	0.000	10.144	0
	2	28	2.68	2.21	0.81	2.68	1.4757	0.009	0.140	8.925	0.000	0.000	0.000	8.925	0
	3	31	2.03	1.68	0.33	1.52	1.2053	0.011	0.185	7.117	0.000	0.000	0.000	7.117	0
	4	30	2.27	1.53	0.69	1.80	1.0627	0.040	0.172	5.300	0.000	0.000	0.000	5.300	0
	5	31	1.29	1.81	0.80	2.29	0.6696	0.091	0.152	3.069	0.000	0.000	0.000	3.069	0
	6	30	2.37	3.50	2.37	5.81	2.8253	0.127	0.113	3.161	0.000	0.000	0.000	3.161	0
	7	31	7.61	7.03	2.28	9.94	3.8569	0.128	0.112	4.165	0.000	0.000	0.000	4.165	0
	8	31	7.29	6.23	3.37	11.37	3.7498	0.116	0.119	5.103	0.000	0.000	0.000	5.103	0
	9	30	4.57	4.73	2.06	8.16	2.6438	0.090	0.125	4.964	0.000	0.000	0.000	4.964	0
	10	31	4.32	4.48	1.61	7.56	2.7052	0.079	0.131	4.779	0.000	0.000	0.000	4.779	0
	11	30	5.13	3.97	1.19	4.86	2.0218	0.066	0.119	4.000	0.000	0.000	0.000	4.000	0
	12	31	5.06	2.65	1.22	4.47	1.9284	0.066	0.116	3.040	0.000	0.000	0.000	3.040	0
		7905	3.78	4.58	5.20	9.61	1.714			21.262			8.571	5.4	
		total days					ave. Q							month	

Table 4.3-3 Calculation Sheet of Ocumarito-Lagartijo Diversion

	to Hidroscop		Total Intake			to total max of Tuy I,II			inflow	rain	evapo.	storage		
	m ³ /s	mcm	m ³ /s	m ³ /s	mcm	m ³ /s	m ³ /s	mcm					mcm	mcm
	3	31	1.204	3.224	0.300	0.300	0.804	1.504	7.496	7.000	2.8678	0.074	1.013	13.200
	4	30	0.932	2.415	1.080	1.080	2.799	2.012	6.688	6.988	3.9370	0.134	0.990	-1.832
	5	31	0.700	1.876	0.530	0.530	1.420	1.230	7.770	7.000	2.4454	0.460	0.865	-8.209
	6	30	0.564	1.463	2.060	2.060	5.340	2.624	6.376	6.376	3.2270	0.891	0.640	-4.548
	7	31	0.721	1.931	1.150	1.150	3.080	1.871	7.129	7.000	3.1568	0.824	0.621	-6.889
	8	31	0.721	1.931	1.910	1.910	5.116	2.631	6.369	6.369	5.1575	0.754	0.646	-2.294
	9	30	1.952	5.059	1.490	1.490	3.862	3.442	5.558	5.558	11.1871	0.493	0.669	5.104
	10	31	1.999	5.355	1.590	1.590	4.259	3.589	5.411	5.411	9.2480	0.408	0.711	2.952
	11	30	4.100	10.627	2.870	2.870	7.439	6.970	2.030	2.030	23.0186	0.369	0.603	26.024
	12	31	4.100	10.981	3.140	3.140	8.410	7.240	1.760	1.760	10.0483	0.417	0.604	31.171
1974	1	31	3.916	10.490	2.080	2.080	5.571	5.995	3.004	3.004	13.1161	0.132	0.655	35.719
	2	28	2.353	5.692	0.990	0.990	2.395	3.343	5.657	5.657	7.6703	0.062	0.750	29.015
	3	31	1.863	4.990	0.680	0.680	1.821	2.543	6.457	6.457	6.8026	0.074	1.013	17.565
	4	30	1.428	3.701	0.280	0.280	0.726	1.708	7.292	7.000	4.6685	0.134	0.990	3.254
	5	31	1.122	3.005	0.750	0.750	2.009	1.728	7.128	7.000	4.8685	0.460	0.865	-5.786
	6	30	1.584	4.107	0.260	0.260	0.674	1.844	7.156	7.000	3.0119	0.891	0.640	-6.381
	7	31	2.217	5.937	1.740	1.740	4.660	3.957	5.043	5.043	4.5795	0.824	0.621	-0.225
	8	31	2.081	5.573	4.980	3.147	8.430	5.228	3.772	3.772	10.8264	0.754	0.646	9.332
	9	30	2.176	5.640	8.120	3.147	8.158	5.323	3.677	3.677	23.2992	0.493	0.669	22.926
	10	31	3.162	8.469	8.540	3.147	8.430	6.309	2.691	2.691	20.6523	0.408	0.711	36.063
	11	30	3.352	8.689	6.910	3.147	8.158	6.500	2.500	2.500	10.3911	0.369	0.603	39.745
	12	31	3.726	9.581	4.140	3.147	8.430	6.874	2.126	2.126	8.8256	0.417	0.604	42.689
1975	1	31	2.169	5.810	2.180	2.180	5.839	4.349	4.651	4.651	9.6704	0.132	0.655	39.379
	2	28	1.775	4.284	1.080	1.080	2.613	2.855	6.145	6.145	6.6663	0.062	0.750	30.491
	3	31	1.360	3.643	0.500	0.500	1.339	1.860	7.140	7.000	5.5132	0.074	1.013	16.316
	4	30	1.040	2.697	0.710	0.710	1.840	1.750	7.250	7.000	3.9370	0.134	0.990	1.254
	5	31	0.809	2.167	0.580	0.580	1.553	1.389	7.611	7.000	4.6685	0.460	0.865	-5.986
	6	30	3.420	8.866	1.970	1.970	5.106	5.390	3.610	3.610	7.2501	0.891	0.640	6.645
	7	31	4.100	10.981	1.000	1.000	2.678	5.100	3.900	3.900	16.4265	0.824	0.621	14.686
	8	31	4.100	10.981	4.400	3.147	8.430	7.247	1.753	1.753	12.4714	0.754	0.646	22.571
	9	30	2.843	7.369	4.930	3.147	8.158	5.990	3.010	3.010	18.0714	0.493	0.669	32.666
	10	31	2.808	7.522	12.370	3.147	8.430	5.956	3.044	3.044	19.6520	0.408	0.711	43.861
	11	30	2.312	5.993	7.820	3.147	8.158	5.459	3.541	3.541	12.4133	0.369	0.603	46.863
	12	31	2.591	6.939	7.270	3.147	8.430	5.738	3.262	3.262	9.8260	0.417	0.604	47.765
1976	1	31	1.884	5.045	5.330	3.147	8.430	5.031	3.969	3.969	9.4703	0.132	0.655	46.082
	2	29	1.571	3.936	3.160	3.147	7.886	4.718	4.282	4.282	7.2372	0.062	0.750	41.903
	3	31	1.204	3.224	1.760	1.760	4.714	2.964	6.036	6.036	6.8026	0.074	1.013	31.588
	4	30	0.972	2.520	1.330	1.330	3.447	2.302	6.698	6.698	4.5824	0.134	0.990	17.965
	5	31	0.877	2.349	1.450	1.450	3.884	2.327	6.673	6.673	4.6685	0.460	0.865	4.355
	6	30	2.088	5.411	2.750	2.750	7.128	4.838	4.162	4.162	5.8087	0.891	0.640	3.771
	7	31	4.100	10.981	7.790	3.147	8.430	7.247	1.753	1.753	19.6520	0.824	0.621	23.661
	8	31	4.100	10.981	8.790	3.147	8.430	7.247	1.753	1.753	12.1824	0.754	0.646	31.257
	9	30	3.089	8.007	7.660	3.147	8.158	6.237	2.763	2.763	9.7457	0.493	0.669	33.665
	10	31	4.100	10.981	12.050	3.147	8.430	7.247	1.753	1.753	10.8931	0.408	0.711	39.560
	11	30	2.948	7.642	9.610	3.147	8.158	6.096	2.904	2.904	8.4548	0.369	0.603	40.253
	12	31	2.128	5.701	5.780	3.147	8.430	5.276	3.724	3.724	6.9582	0.417	0.604	37.049
1977	1	31	2.081	5.573	2.840	2.840	7.607	4.921	4.079	4.079	5.0906	0.132	0.655	30.691
	2	28	1.530	3.701	1.340	1.340	3.242	2.870	6.130	6.130	3.3733	0.062	0.750	18.547
	3	31	1.183	3.169	0.600	0.600	1.607	1.783	7.217	7.000	2.8678	0.074	1.013	1.726
	4	30	0.904	2.344	0.260	0.260	0.674	1.164	7.838	7.000	2.0008	0.134	0.990	-8.459
	5	31	0.700	1.876	1.300	1.300	3.482	2.000	7.000	7.000	2.2898	0.460	0.865	-8.364
	6	30	1.204	3.120	2.970	2.970	7.698	4.174	4.826	4.826	16.9312	0.891	0.640	13.172
	7	31	1.516	4.062	5.050	3.147	8.430	4.664	4.336	4.336	15.7838	0.824	0.621	17.545
	8	31	2.564	6.886	5.410	3.147	8.430	5.711	3.289	3.289	32.3457	0.754	0.646	41.189
	9	30	2.292	5.940	6.980	3.147	8.158	5.439	3.561	3.561	24.2458	0.493	0.669	56.030
	10	31	2.060	5.519	6.060	3.147	8.430	5.208	3.792	3.792	12.5604	0.408	0.711	58.129
	11	30	4.100	10.627	6.130	3.147	8.158	7.247	1.753	1.753	12.9727	0.369	0.603	66.326
	12	31	3.687	9.875	3.650	3.147	8.430	6.835	2.165	2.165	9.4036	0.417	0.604	69.742
1978	1	31	2.564	6.886	1.780	1.780	4.768	4.344	4.656	4.656	6.7359	0.132	0.655	63.482
	2	28	1.822	4.409	0.810	0.810	1.960	2.632	6.368	6.368	4.4375	0.062	0.750	51.628
	3	31	1.380	3.697	0.330	0.330	0.884	1.710	7.290	7.000	3.7348	0.074	1.013	35.874
	4	30	1.544	4.001	0.690	0.690	1.788	2.234	6.766	6.766	3.2916	0.134	0.990	20.772
	5	31	0.877	2.349	0.800	0.800	2.143	1.877	7.323	7.000	4.0238	0.460	0.865	5.641
	6	30	1.612	4.177	2.370	2.370	6.143	3.982	5.018	5.018	7.5298	0.891	0.640	3.273
	7	31	4.100	10.981	2.280	2.280	6.107	6.380	2.620	2.620	15.6282	0.824	0.621	17.314
	8	31	4.100	10.981	3.370	3.147	8.430	7.247	1.753	1.753	13.8497	0.754	0.646	26.577
	9	30	3.571	9.255	2.060	2.060	5.340	5.631	3.369	3.369	10.1759	0.493	0.669	27.844
	10	31	2.938	7.868	1.610	1.610	4.312	4.548	4.452	4.452	9.9594	0.408	0.711	25.575
	11	30	3.488	9.042	1.190	1.190	3.084	4.678	4.322	4.322	8.5409	0.369	0.603	22.680
	12	31	3.441	9.216	1.220	1.220	3.268	4.661	4.339	4.339	5.8911	0.417	0.604	16.762
7305			2.410	76.069			2.930	75.421		4.173				
total														

Table 4.3-3 Calculation Sheet of Ocumaro-Lagartijo Diversion

		Lagartijo Reservoir with Ocumaro Diversion													
		inflow	rain	evapo.	storage	Spill		Deficit	Final V				to Hi		
		mcm	mcm	mcm	mcm	mcm	m3/s	mcm	mcm	Ful	Empty	75mcm	20mcm	m3/s	
		m3/s							81.000	yes/no	yes/no	yes/no	yes/no		
1974	3 31	7.600	2.8678	0.074	1.013	29.768	0.000	0.000	0.000	29.768	0	0	0	7.600	
	4 30	7.588	3.9370	0.134	0.990	13.180	0.000	0.000	0.000	13.180	0	0	0	7.588	
	5 31	7.600	2.4454	0.460	0.865	-5.136	0.000	0.000	13.636	8.500	0	1	0	2.509	
	6 30	6.976	3.2270	0.891	0.640	-6.103	0.000	0.000	14.603	8.500	0	1	0	1.342	
	7 31	7.600	3.1568	0.824	0.621	-8.436	0.000	0.000	16.936	8.500	0	1	0	1.254	
	8 31	6.969	5.1575	0.754	0.646	-4.901	0.000	0.000	13.401	8.500	0	1	0	1.566	
	9 30	6.158	11.7871	0.493	0.669	3.549	0.000	0.000	4.951	8.500	0	1	0	4.248	
	10 31	6.011	9.2480	0.408	0.711	1.345	0.000	0.000	7.155	8.500	0	1	0	3.339	
	11 30	2.630	23.0196	0.369	0.603	24.469	0.000	0.000	0.000	24.469	0	0	0	2.630	
	12 31	2.360	10.0493	0.417	0.604	28.009	0.000	0.000	0.000	28.009	0	0	0	2.360	
	1 31	3.604	13.1161	0.132	0.655	30.949	0.000	0.000	0.000	30.949	0	0	0	3.604	
	2 28	6.257	7.6703	0.062	0.750	22.794	0.000	0.000	0.000	22.794	0	0	0	6.257	
1975	3 31	7.057	6.8026	0.074	1.013	9.757	0.000	0.000	0.000	9.757	0	0	0	7.057	
	4 30	7.600	4.6685	0.134	0.990	-6.129	0.000	0.000	14.629	8.500	0	1	0	1.956	
	5 31	7.600	4.8685	0.460	0.865	-7.393	0.000	0.000	15.893	8.500	0	1	0	1.666	
	6 30	7.600	3.0119	0.891	0.640	-7.936	0.000	0.000	16.436	8.500	0	1	0	1.259	
	7 31	5.643	4.5795	0.824	0.621	-1.832	0.000	0.000	10.332	8.500	0	1	0	1.786	
	8 31	4.972	10.8264	0.754	0.646	7.725	0.000	0.000	0.775	8.500	0	1	0	4.082	
	9 30	4.277	23.2992	0.493	0.669	20.539	0.000	0.000	0.000	20.539	0	0	0	4.277	
	10 31	3.291	20.6523	0.408	0.711	32.074	0.000	0.000	0.000	32.074	0	0	0	3.291	
	11 30	3.100	10.3911	0.369	0.603	34.196	0.000	0.000	0.000	34.196	0	0	0	3.100	
	12 31	2.726	8.8256	0.417	0.604	35.532	0.000	0.000	0.000	35.532	0	0	0	2.726	
	1 31	5.251	9.6704	0.132	0.655	30.615	0.000	0.000	0.000	30.615	0	0	0	5.251	
	2 28	6.745	6.6663	0.062	0.750	20.276	0.000	0.000	0.000	20.276	0	0	0	6.745	
1976	3 31	7.600	5.5132	0.074	1.013	4.494	0.000	0.000	4.006	8.500	0	1	0	6.104	
	4 30	7.600	3.9370	0.134	0.990	-8.118	0.000	0.000	16.618	8.500	0	1	0	1.189	
	5 31	7.600	4.6685	0.460	0.865	-7.593	0.000	0.000	16.093	8.500	0	1	0	1.592	
	6 30	4.210	7.2501	0.891	0.640	5.090	0.000	0.000	3.410	8.500	0	1	0	2.694	
	7 31	4.500	19.5132	0.824	0.621	16.163	0.000	0.000	0.000	16.163	0	0	0	4.500	
	8 31	2.353	17.8282	0.754	0.646	27.798	0.000	0.000	0.000	27.798	0	0	0	2.353	
	9 30	3.610	23.2204	0.493	0.669	41.487	0.000	0.000	0.000	41.487	0	0	0	3.610	
	10 31	3.644	21.6995	0.408	0.711	53.113	0.000	0.000	0.000	53.113	0	0	0	3.644	
	11 30	4.141	13.0342	0.369	0.603	55.181	0.000	0.000	0.000	55.181	0	0	0	4.141	
	12 31	3.862	10.1250	0.417	0.604	54.775	0.000	0.000	0.000	54.775	0	0	0	3.862	
	1 31	4.569	9.4703	0.132	0.655	51.484	0.000	0.000	0.000	51.484	0	0	0	4.569	
	2 29	4.882	7.2372	0.062	0.750	45.602	0.000	0.000	0.000	45.602	0	0	0	4.882	
1977	3 31	6.636	6.8026	0.074	1.013	33.690	0.000	0.000	0.000	33.690	0	0	0	6.636	
	4 30	7.298	4.5824	0.134	0.990	18.702	0.000	0.000	0.000	18.702	0	0	0	7.298	
	5 31	7.279	4.6685	0.460	0.865	3.465	0.000	0.000	5.015	8.500	0	1	0	5.400	
	6 30	4.762	5.8087	0.891	0.640	2.215	0.000	0.000	6.285	8.500	0	1	0	2.338	
	7 31	2.353	19.6520	0.824	0.621	22.054	0.000	0.000	0.000	22.054	0	0	0	2.353	
	8 31	2.353	12.1824	0.754	0.646	28.043	0.000	0.000	0.000	28.043	0	0	0	2.353	
	9 30	3.363	10.6795	0.493	0.669	29.830	0.000	0.000	0.000	29.830	0	0	0	3.363	
	10 31	2.353	14.5109	0.408	0.711	37.736	0.000	0.000	0.000	37.736	0	0	0	2.353	
	11 30	3.504	9.7755	0.369	0.603	38.194	0.000	0.000	0.000	38.194	0	0	0	3.504	
	12 31	4.324	7.5519	0.417	0.604	33.977	0.000	0.000	0.000	33.977	0	0	0	4.324	
	1 31	4.679	5.0908	0.132	0.655	26.011	0.000	0.000	0.000	26.011	0	0	0	4.679	
	2 28	6.730	3.3733	0.062	0.750	12.416	0.000	0.000	0.000	12.416	0	0	0	6.730	
1978	3 31	7.600	2.8678	0.074	1.013	-6.012	0.000	0.000	14.512	8.500	0	1	0	2.182	
	4 30	7.600	2.0008	0.134	0.990	-10.054	0.000	0.000	18.554	8.500	0	1	0	0.442	
	5 31	7.600	2.2898	0.460	0.865	-9.971	0.000	0.000	18.471	8.500	0	1	0	0.703	
	6 30	5.426	21.9230	0.891	0.640	16.609	0.000	0.000	0.000	16.609	0	0	0	5.426	
	7 31	4.936	20.0852	0.824	0.621	23.676	0.000	0.000	0.000	23.676	0	0	0	4.936	
	8 31	3.889	37.7025	0.754	0.646	51.070	0.000	0.000	0.000	51.070	0	0	0	3.889	
	9 30	4.161	28.2284	0.493	0.669	68.338	0.000	0.000	0.000	68.338	0	0	0	4.161	
	10 31	4.392	14.9193	0.408	0.711	71.189	0.000	0.000	0.000	71.189	0	0	0	4.392	
	11 30	2.353	14.3711	0.369	0.603	79.229	0.000	0.000	0.000	79.229	0	0	1	2.353	
	12 31	2.765	9.5152	0.417	0.604	81.149	0.149	0.056	0.000	81.000	1	0	1	2.765	
	1 31	5.256	6.7359	0.132	0.655	73.134	0.000	0.000	0.000	73.134	0	0	0	5.256	
	2 28	6.968	4.4375	0.062	0.750	60.027	0.000	0.000	0.000	60.027	0	0	0	6.968	
1979	3 31	7.600	3.7348	0.074	1.013	42.467	0.000	0.000	0.000	42.467	0	0	0	7.600	
	4 30	7.366	3.2916	0.134	0.990	25.809	0.000	0.000	0.000	25.809	0	0	0	7.366	
	5 31	7.600	4.0238	0.460	0.865	9.072	0.000	0.000	0.000	9.072	0	0	0	7.600	
	6 30	5.618	7.5298	0.891	0.640	2.289	0.000	0.000	6.211	8.500	0	1	0	3.222	
	7 31	3.220	15.6282	0.824	0.621	15.707	0.000	0.000	0.000	15.707	0	0	0	3.220	
	8 31	2.353	13.8497	0.754	0.646	23.363	0.000	0.000	0.000	23.363	0	0	0	2.353	
	9 30	3.569	10.1759	0.493	0.669	23.075	0.000	0.000	0.000	23.075	0	0	0	3.569	
	10 31	5.052	9.5594	0.408	0.711	19.198	0.000	0.000	0.000	19.198	0	0	0	5.052	
	11 30	4.922	8.5409	0.369	0.603	14.749	0.000	0.000	0.000	14.749	0	0	0	4.922	
	12 31	4.839	5.8911	0.417	0.604	7.223	0.000	0.000	1.277	8.500	0	1	0	4.463	
	7305 total							7.666	0.213	40.650	1.05	2.30	1.4	3.4	4.050
											month	month			

Table 4.3-3 Calculation Sheet of Ocumarito-Lagartijo Diversion

rocsp	Total intake by Hidrocaptal			deficit of total intake deficit of Lagartijo intake		min of the left two		additional intake		total intake	
	mcm	m3/s	mcm	m3/s	m3/s	m3/s	mcm	mcm	mcm	m3/s	
				0							
3	31	20.356	9.104	24.383	30.000	0.496	0.000	0.000	0.000	24.383	9.104
4	30	19.669	9.600	24.883	30.000	0.000	0.012	0.000	0.000	24.883	9.600
5	31	6.720	3.739	10.015	30.000	5.861	5.091	5.091	13.636	23.651	8.830
6	30	3.478	3.966	10.280	16.384	5.634	6.258	5.634	14.603	24.883	9.600
7	31	3.360	3.125	8.370	1.781	6.475	6.345	6.345	16.996	17.761	3.783
8	31	5.265	4.597	12.312	0.000	5.003	5.634	5.003	13.401	0.000	4.597
9	30	11.012	7.690	19.932	0.000	1.910	3.352	1.910	4.951	0.000	7.690
10	31	8.944	6.929	18.558	0.000	2.671	4.261	2.671	7.155	0.000	6.929
11	30	6.817	9.600	24.883	0.000	0.000	4.970	0.000	0.000	0.000	24.883
12	31	6.321	9.600	25.713	0.000	0.000	5.240	0.000	0.000	0.000	25.713
1974	1	31	9.652	9.600	25.713	0.000	3.956	0.000	0.000	0.000	25.713
	2	28	15.137	9.600	23.224	0.000	1.343	0.000	0.000	0.000	23.224
	3	31	18.601	9.600	25.713	0.000	0.543	0.000	0.000	0.000	25.713
	4	30	5.070	3.664	9.497	0.000	5.644	5.644	14.629	0.000	3.664
	5	31	4.463	3.538	9.477	0.000	5.934	5.934	15.893	0.000	9.477
	6	30	3.263	3.103	8.043	0.000	6.497	6.341	16.436	0.000	8.043
	7	31	4.782	5.742	15.380	0.000	3.858	5.814	10.332	0.000	5.742
	8	31	10.934	9.311	24.938	0.000	0.289	3.318	0.289	0.775	0.000
	9	30	11.085	9.600	24.883	0.000	0.000	3.323	0.000	0.000	24.883
	10	31	8.813	9.600	25.713	0.000	0.000	4.309	0.000	0.000	25.713
	11	30	8.038	9.600	24.883	0.000	0.000	4.500	0.000	0.000	24.883
	12	31	7.302	9.600	25.713	0.000	0.000	4.874	0.000	0.000	25.713
1975	1	31	14.064	9.600	25.713	0.000	0.000	2.349	0.000	0.000	25.713
	2	28	16.318	9.600	23.224	0.000	0.000	0.855	0.000	0.000	23.224
	3	31	16.350	7.964	21.332	0.000	1.636	1.496	4.006	0.000	21.332
	4	30	3.082	2.939	7.619	0.000	6.661	6.411	16.618	0.000	7.619
	5	31	4.263	2.981	7.984	0.000	6.619	6.008	16.053	0.000	7.984
	6	30	7.501	8.284	21.473	0.000	1.316	4.706	1.316	3.410	0.000
	7	31	12.053	9.600	25.713	0.000	0.000	3.100	0.000	0.000	25.713
	8	31	6.301	9.600	25.713	0.000	0.000	5.247	0.000	0.000	25.713
	9	30	9.356	9.600	24.883	0.000	0.000	3.990	0.000	0.000	24.883
	10	31	9.761	9.600	25.713	0.000	0.000	3.955	0.000	0.000	25.713
	11	30	10.732	9.600	24.883	0.000	0.000	3.459	0.000	0.000	24.883
	12	31	10.343	9.600	25.713	0.000	0.000	3.738	0.000	0.000	25.713
1976	1	31	12.238	9.600	25.713	0.000	0.000	3.031	0.000	0.000	25.713
	2	29	12.232	9.600	24.054	0.000	0.000	2.718	0.000	0.000	24.054
	3	31	17.775	9.600	25.713	0.000	0.000	0.954	0.000	0.000	25.713
	4	30	18.915	9.600	24.883	0.000	0.000	0.302	0.000	0.000	24.883
	5	31	14.464	7.728	20.697	0.000	1.872	2.200	1.872	5.015	0.000
	6	30	6.060	7.175	18.599	0.000	2.425	5.262	2.425	6.285	0.000
	7	31	6.301	9.600	25.713	0.000	0.000	5.247	0.000	0.000	25.713
	8	31	6.301	9.600	25.713	0.000	0.000	5.247	0.000	0.000	25.713
	9	30	8.718	9.600	24.883	0.000	0.000	4.237	0.000	0.000	24.883
	10	31	6.301	9.600	25.713	0.000	0.000	5.247	0.000	0.000	25.713
	11	30	9.033	9.600	24.883	0.000	0.000	4.056	0.000	0.000	24.883
	12	31	11.582	9.600	25.713	0.000	0.000	3.276	0.000	0.000	25.713
1977	1	31	12.533	9.600	25.713	0.000	0.000	2.921	0.000	0.000	25.713
	2	28	18.281	9.600	23.224	0.000	0.000	0.870	0.000	0.000	23.224
	3	31	5.844	3.965	10.620	0.000	5.635	5.418	5.418	14.512	0.000
	4	30	1.145	1.606	4.163	0.000	7.894	7.158	18.554	0.000	4.163
	5	31	1.884	2.704	7.242	0.000	6.896	6.897	18.471	0.000	7.242
	6	30	14.065	9.600	24.883	0.000	0.000	2.174	0.000	0.000	24.883
	7	31	13.221	9.600	25.713	0.000	0.000	2.664	0.000	0.000	25.713
	8	31	10.416	9.600	25.713	0.000	0.000	3.711	0.000	0.000	25.713
	9	30	10.785	9.600	24.883	0.000	0.000	3.439	0.000	0.000	24.883
	10	31	11.764	9.600	25.713	0.000	0.000	3.208	0.000	0.000	25.713
	11	30	6.098	9.600	24.883	0.000	0.000	5.247	0.000	0.000	24.883
	12	31	7.407	9.600	25.713	0.149	0.000	4.835	0.000	0.000	25.713
1978	1	31	14.079	9.600	25.713	0.149	0.000	2.344	0.000	0.000	25.713
	2	28	16.856	9.600	23.224	0.149	0.000	0.632	0.000	0.000	23.224
	3	31	20.356	9.310	24.937	0.149	0.290	0.000	0.000	0.000	24.937
	4	30	19.094	9.600	24.883	0.149	0.000	0.234	0.000	0.000	24.883
	5	31	20.356	9.277	24.848	0.149	0.323	0.000	0.000	0.000	24.848
	6	30	8.352	7.204	18.672	0.149	2.396	4.378	2.396	6.211	0.149
	7	31	8.624	9.600	25.713	0.000	0.000	4.380	0.000	0.000	25.713
	8	31	6.301	9.600	25.713	0.000	0.000	5.247	0.000	0.000	25.713
	9	30	10.289	9.600	24.883	0.000	0.000	3.631	0.000	0.000	24.883
	10	31	13.532	9.600	25.713	0.000	0.000	2.548	0.000	0.000	25.713
	11	30	12.757	9.600	24.883	0.000	0.000	2.678	0.000	0.000	24.883
	12	31	11.952	9.123	24.436	0.000	0.477	3.137	0.477	1.277	0.000
	7305	127.815	8.651	279.305							282.974
	total	ave/year		10.192							13.861

Table 4.3-4 Optimization Study of Ocumarito-Lagartijo Diversion with El Peñón Dam

Diversion Capacity	Ave. Annual Diverted Water		Annual Benefit *1 (B)	Annual Cost			B-C	B/C	Unit Cost
	m ³ /s	mcm/yr		Pipe	Dam	Total (C)			
m ³ /s	mcm/yr	m ³ /s	\$mil/yr	\$mil/yr	\$mil/yr	\$mil/yr	\$mil/yr		\$/m ³
without El Peñón									
0.0	-	-	-	-	-	-			-
0.5	5.13	0.16	1.68	1.31	0.00	1.31	0.37	1.28	0.255
1.0	7.80	0.25	2.55	1.81	0.00	1.81	0.74	1.41	0.232
2.0	10.20	0.32	3.34	2.33	0.00	2.33	1.01	1.43	0.228
3.0	10.56	0.33	3.45	2.80	0.00	2.80	0.65	1.23	0.265
4.0	10.63	0.34	3.48	3.04	0.00	3.04	0.44	1.14	0.286
5.0	10.63	0.34	3.48	3.36	0.00	3.36	0.12	1.03	0.316
with El Peñón of 10×10 ⁶ m ³ (effective storage capacity)									
0.0	0.50	0.02	0.16	0.00	2.20	2.20	-2.04	0.07	4.400
0.5	5.63	0.18	1.84	1.31	2.20	3.51	-1.67	0.52	0.623
1.0	9.00	0.29	2.94	1.81	2.20	4.01	-1.07	0.73	0.446
2.0	11.77	0.37	3.85	2.33	2.20	4.53	-0.68	0.85	0.385
3.0	12.40	0.39	4.05	2.80	2.20	5.00	-0.95	0.81	0.403
4.0	12.69	0.40	4.15	3.04	2.20	5.24	-1.09	0.79	0.413
5.0	12.82	0.41	4.19	3.36	2.20	5.56	-1.37	0.75	0.434
with El Peñón of 20×10 ⁶ m ³ (effective storage capacity)									
0.0	1.00	0.03	0.33	0.00	2.58	2.58	-2.25	0.13	2.580
0.5	6.13	0.19	2.00	1.31	2.58	3.89	-1.89	0.52	0.635
1.0	9.64	0.31	3.15	1.81	2.58	4.39	-1.24	0.72	0.455
2.0	12.94	0.41	4.23	2.33	2.58	4.91	-0.68	0.86	0.379
3.0	13.67	0.43	4.47	2.80	2.58	5.38	-0.91	0.83	0.394
4.0	13.96	0.44	4.56	3.04	2.58	5.62	-1.06	0.81	0.403
5.0	14.10	0.45	4.61	3.36	2.58	5.94	-1.33	0.78	0.421
with El Peñón of 30×10 ⁶ m ³ (effective storage capacity)									
0.0	1.50	0.05	0.49	0.00	2.81	2.81	-2.32	0.17	1.873
0.5	6.63	0.21	2.17	1.31	2.81	4.12	-1.95	0.53	0.621
1.0	10.14	0.32	3.32	1.81	2.81	4.62	-1.30	0.72	0.456
2.0	13.86	0.44	4.53	2.33	2.81	5.14	-0.61	0.88	0.371
3.0	14.67	0.47	4.80	2.80	2.81	5.61	-0.81	0.86	0.382
4.0	14.96	0.47	4.89	3.04	2.81	5.85	-0.96	0.84	0.391
5.0	15.10	0.48	4.94	3.36	2.81	6.17	-1.23	0.80	0.409
with El Peñón of 40×10 ⁶ m ³ (effective storage capacity)									
0.0	2.00	0.06	0.65	0.00	3.03	3.03	-2.38	0.22	1.515
0.5	7.13	0.23	2.33	1.31	3.03	4.34	-2.01	0.54	0.609
1.0	10.64	0.34	3.48	1.81	3.03	4.84	-1.36	0.72	0.455
2.0	14.36	0.46	4.70	2.33	3.03	5.36	-0.66	0.88	0.373
3.0	15.41	0.49	5.04	2.80	3.03	5.83	-0.79	0.86	0.378
4.0	15.96	0.51	5.22	3.04	3.03	6.07	-0.85	0.86	0.380
5.0	16.10	0.51	5.26	3.36	3.03	6.39	-1.13	0.82	0.397

Note: *1: Unit benefit (\$/m³) 0.327

Table 4.3-5 Construction Cost of Ocumarito-Lagartijo Diversion by Development Scale

	unit	qty	unit cost \$	cost \$
0.5 cumecs				
Intake	unit	1	451,000	451,000
River crossing	unit	4	85,000	340,000
Additional tunneling	m	100	2,000	200,000
Pipeline 900mm	m	16,500	401	6,616,500
Pipeline installation	m	16,500	70	1,155,000
				8,762,500
Total (25% additional)				10,953,125
1.0 cumecs				
Intake	unit	1	451,000	451,000
River crossing	unit	4	85,000	340,000
Additional tunneling	m	100	2,000	200,000
Pipeline 1050mm	m	16,500	594	9,801,000
Pipeline installation	m	16,500	80	1,320,000
				12,112,000
Total (25% additional)				15,140,000
2.0 cumecs				
Intake	unit	1	451,000	451,000
River crossing	unit	4	85,000	340,000
Additional tunneling	m	100	2,000	200,000
Pipeline 1350mm	m	16,500	793	13,076,250
Pipeline installation	m	16,500	90	1,485,000
				15,552,250
Total (25% additional)				19,440,313
3.0 cumecs				
Intake	unit	1	451,000	451,000
River crossing	unit	4	85,000	340,000
Additional tunneling	m	100	2,000	200,000
Pipeline 1650mm	m	16,500	971	16,021,500
Pipeline installation	m	16,500	100	1,650,000
				18,662,500
Total (25% additional)				23,328,125
4.0 cumecs				
Intake	unit	1	451,000	451,000
River crossing	unit	4	85,000	340,000
Additional tunneling	m	100	2,000	200,000
Pipeline 1800mm	m	16,500	1,059	17,473,500
Pipeline installation	m	16,500	110	1,815,000
				20,279,500
Total (25% additional)				25,349,375
5.0 cumecs				
Intake	unit	1	451,000	451,000
River crossing	unit	4	85,000	340,000
Additional tunneling	m	100	2,000	200,000
Pipeline 2000mm	m	16,500	1,179	19,453,500
Pipeline installation	m	16,500	120	1,980,000
				22,424,500
Total (25% additional)				28,030,625

Table 4.3-6 (1/2) Construction Cost of Ocumarito-Tuy III Pumping by Development Scale

5 cumecs	unit	qty	unit cost	cost
Transmission Pipeline 1500mm	m	3,000	877	2,631,000
Pump 1.0 cumecs x 200 m	units	6	600,000	3,600,000
Excavation and removal				
rock	m ³	19,875	35	695,625
soil	m ³	6,625	15	99,375
Concrete	m ³	1,857	380	705,660
Reinforcing Bar	kg	185,700	0.9	167,130
				7,898,790
Total (25% contingency and indirect work)				9,873,488

4 cumecs	unit	qty	unit cost	cost
Transmission Pipeline 1350mm	m	3,000	821	2,464,000
Pump 1.0 cumecs x 200 m	units	5	600,000	3,000,000
Excavation and removal				
rock	m ³	18,094	35	633,290
soil	m ³	6,058	15	90,870
Concrete	m ³	1,620	380	615,600
Reinforcing Bar	kg	162,000	0.9	145,800
				6,949,560
Total (25% contingency and indirect work)				8,686,950

3 cumecs	unit	qty	unit cost	cost
Transmission Pipeline 1200mm	m	3,000	712	2,136,000
Pump 1.0 cumecs x 200 m	units	3	600,000	1,800,000
Excavation in rock and removal				
rock	m ³	18,094	35	633,290
soil	m ³	6,058	15	90,870
Concrete	m ³	1,620	380	615,600
Reinforcing Bar	kg	162,000	0.9	145,800
				5,421,560
Total (25% contingency and indirect work)				6,776,950

Table 4.3-6 (2/2) Construction Cost of Ocumarito-Tuy III Pumping by Development Scale

2 cumecs	unit	qty	unit cost	cost
Transmission Pipeline 1050mm	m	3,000	630	1,890,000
Pump 1.0 cumecs x 200 m	units	3	600,000	1,800,000
Excavation in rock and removal				
rock	m ³	16,313	35	570,955
soil	m ³	5,438	15	81,570
Concrete	m ³	1,382	380	525,160
Reinforcing Bar	kg	138,200	0.9	124,380
				4,992,065
Total (25%, contingency and indirect work)				6,240,081

1 cumecs	unit	qty	unit cost	cost
Transmission Pipeline 800mm	m	3,000	378	1,134,000
Pump 0.5 cumecs x 200 m	units	3	400,000	1,200,000
Excavation in rock and removal		26,500		
rock	m ³	14,531	35	508,585
soil	m ³	4,844	15	72,660
Concrete	m ³	1,145	380	435,100
Reinforcing Bar	kg	114,500	0.9	103,050
				3,453,395
Total (25%, contingency and indirect work)				4,316,744

0.5 cumecs	unit	qty	unit cost	cost
Transmission Pipeline 600mm	m	3,000	295	886,000
Pump 0.5 cumecs x 200 m	units	2	400,000	800,000
Excavation in rock and removal				
rock	m ³	12,750	35	446,250
soil	m ³	4,250	15	63,750
Concrete	m ³	907	380	344,660
Reinforcing Bar	kg	90,700	0.9	81,630
				2,622,290
Total (25%, contingency and indirect work)				3,277,863

Table 4.4-1 Calculation Sheet of Guare Dam Reservoir Operation Simulation (1960)

Year	Month	Date	Days	Inflow		Rain-eva	Reserve	Spill			Deficit	Final V	outflow
				m3/s	mcm	mcm	40.000				40.000		
1960	Jan	1	1	0.392	0.0339	-0.0065	39.835	0.0000	0.000	0.000	0.0000	39.835	0.159
1960	0	2	1	0.346	0.0299	-0.0065	39.666	0.0000	0.000	0.000	0.0000	39.666	0.159
1960	0	3	1	0.346	0.0299	-0.0065	39.498	0.0000	0.000	0.000	0.0000	39.498	0.159
1960	0	4	1	0.392	0.0339	-0.0065	39.333	0.0000	0.000	0.000	0.0000	39.333	0.159
1960	0	5	1	0.346	0.0299	-0.0065	39.164	0.0000	0.000	0.000	0.0000	39.164	0.159
1960	0	6	1	0.392	0.0339	-0.0065	38.999	0.0000	0.000	0.000	0.0000	38.999	0.159
1960	0	7	1	0.443	0.0383	-0.0065	38.839	0.0000	0.000	0.000	0.0000	38.839	0.159
1960	0	8	1	0.443	0.0383	-0.0065	38.678	0.0000	0.000	0.000	0.0000	38.678	0.159
1960	0	9	1	0.494	0.0427	-0.0065	38.522	0.0000	0.000	0.000	0.0000	38.522	0.159
1960	0	10	1	0.494	0.0427	-0.0065	38.366	0.0000	0.000	0.000	0.0000	38.366	0.159
1960	0	11	1	0.494	0.0427	-0.0065	38.210	0.0000	0.000	0.000	0.0000	38.210	0.159
1960	0	12	1	0.549	0.0474	-0.0065	38.059	0.0000	0.000	0.000	0.0000	38.059	0.159
1960	0	13	1	0.549	0.0474	-0.0065	37.907	0.0000	0.000	0.000	0.0000	37.907	0.159
1960	0	14	1	0.549	0.0474	-0.0065	37.756	0.0000	0.000	0.000	0.0000	37.756	0.159
1960	0	15	1	0.549	0.0474	-0.0065	37.605	0.0000	0.000	0.000	0.0000	37.605	0.159
1960	0	16	1	0.479	0.0414	-0.0065	37.447	0.0000	0.000	0.000	0.0000	37.447	0.159
1960	0	17	1	0.494	0.0427	-0.0065	37.291	0.0000	0.000	0.000	0.0000	37.291	0.159
1960	0	18	1	0.392	0.0339	-0.0065	37.126	0.0000	0.000	0.000	0.0000	37.126	0.159
1960	0	19	1	0.392	0.0339	-0.0065	36.962	0.0000	0.000	0.000	0.0000	36.962	0.159
1960	0	20	1	0.392	0.0339	-0.0065	36.797	0.0000	0.000	0.000	0.0000	36.797	0.159
1960	0	21	1	0.392	0.0339	-0.0065	36.632	0.0000	0.000	0.000	0.0000	36.632	0.159
1960	0	22	1	0.346	0.0299	-0.0065	36.463	0.0000	0.000	0.000	0.0000	36.463	0.159
1960	0	23	1	0.298	0.0258	-0.0065	36.290	0.0000	0.000	0.000	0.0000	36.290	0.159
1960	0	24	1	0.298	0.0258	-0.0065	36.117	0.0000	0.000	0.000	0.0000	36.117	0.159
1960	0	25	1	0.298	0.0258	-0.0065	35.944	0.0000	0.000	0.000	0.0000	35.944	0.159
1960	0	26	1	0.298	0.0258	-0.0065	35.771	0.0000	0.000	0.000	0.0000	35.771	0.159
1960	0	27	1	0.252	0.0218	-0.0065	35.594	0.0000	0.000	0.000	0.0000	35.594	0.159
1960	0	28	1	0.252	0.0218	-0.0065	35.417	0.0000	0.000	0.000	0.0000	35.417	0.159
1960	0	29	1	0.252	0.0218	-0.0065	35.240	0.0000	0.000	0.000	0.0000	35.240	0.159
1960	0	30	1	0.252	0.0218	-0.0065	35.064	0.0000	0.000	0.000	0.0000	35.064	0.159
1960	0	31	1	0.252	0.0218	-0.0065	34.887	0.0000	0.000	0.000	0.0000	34.887	0.159
1960	Feb	1	1	0.206	0.0178	-0.0094	34.703	0.0000	0.000	0.000	0.0000	34.703	0.159
1960	0	2	1	0.206	0.0178	-0.0094	34.519	0.0000	0.000	0.000	0.0000	34.519	0.159
1960	0	3	1	0.206	0.0178	-0.0094	34.335	0.0000	0.000	0.000	0.0000	34.335	0.159
1960	0	4	1	0.206	0.0178	-0.0094	34.151	0.0000	0.000	0.000	0.0000	34.151	0.159
1960	0	5	1	0.182	0.0157	-0.0094	33.965	0.0000	0.000	0.000	0.0000	33.965	0.159
1960	0	6	1	0.158	0.0137	-0.0094	33.777	0.0000	0.000	0.000	0.0000	33.777	0.159
1960	0	7	1	0.125	0.0108	-0.0094	33.586	0.0000	0.000	0.000	0.0000	33.586	0.159
1960	0	8	1	0.158	0.0137	-0.0094	33.398	0.0000	0.000	0.000	0.0000	33.398	0.159
1960	0	9	1	0.182	0.0157	-0.0094	33.212	0.0000	0.000	0.000	0.0000	33.212	0.159
1960	0	10	1	0.182	0.0157	-0.0094	33.026	0.0000	0.000	0.000	0.0000	33.026	0.159
1960	0	11	1	0.182	0.0157	-0.0094	32.840	0.0000	0.000	0.000	0.0000	32.840	0.159
1960	0	12	1	0.206	0.0178	-0.0094	32.656	0.0000	0.000	0.000	0.0000	32.656	0.159
1960	0	13	1	0.206	0.0178	-0.0094	32.472	0.0000	0.000	0.000	0.0000	32.472	0.159
1960	0	14	1	0.182	0.0157	-0.0094	32.286	0.0000	0.000	0.000	0.0000	32.286	0.159
1960	0	15	1	0.158	0.0137	-0.0094	32.098	0.0000	0.000	0.000	0.0000	32.098	0.159
1960	0	16	1	0.158	0.0137	-0.0094	31.910	0.0000	0.000	0.000	0.0000	31.910	0.159
1960	0	17	1	0.158	0.0137	-0.0094	31.722	0.0000	0.000	0.000	0.0000	31.722	0.159
1960	0	18	1	0.182	0.0157	-0.0094	31.536	0.0000	0.000	0.000	0.0000	31.536	0.159
1960	0	19	1	0.206	0.0178	-0.0094	31.353	0.0000	0.000	0.000	0.0000	31.353	0.159
1960	0	20	1	0.206	0.0178	-0.0094	31.169	0.0000	0.000	0.000	0.0000	31.169	0.159
1960	0	21	1	0.182	0.0157	-0.0094	30.983	0.0000	0.000	0.000	0.0000	30.983	0.159
1960	0	22	1	0.158	0.0137	-0.0094	30.795	0.0000	0.000	0.000	0.0000	30.795	0.159
1960	0	23	1	0.158	0.0137	-0.0094	30.607	0.0000	0.000	0.000	0.0000	30.607	0.159
1960	0	24	1	0.158	0.0137	-0.0094	30.419	0.0000	0.000	0.000	0.0000	30.419	0.159
1960	0	25	1	0.158	0.0137	-0.0094	30.231	0.0000	0.000	0.000	0.0000	30.231	0.159
1960	0	26	1	0.158	0.0137	-0.0094	30.043	0.0000	0.000	0.000	0.0000	30.043	0.159
1960	0	27	1	0.158	0.0137	-0.0094	29.855	0.0000	0.000	0.000	0.0000	29.855	0.159
1960	0	28	1	0.158	0.0137	-0.0094	29.666	0.0000	0.000	0.000	0.0000	29.666	0.159
1960	0	29	1	0.125	0.0108	-0.0094	29.476	0.0000	0.000	0.000	0.0000	29.476	0.159
1960	Mar	1	1	0.092	0.0080	-0.0113	29.280	0.0000	0.000	0.000	0.0000	29.280	0.159
1960	0	2	1	0.066	0.0057	-0.0113	29.082	0.0000	0.000	0.000	0.0000	29.082	0.159
1960	0	3	1	0.037	0.0032	-0.0113	28.882	0.0000	0.000	0.000	0.0000	28.882	0.159
1960	0	4	1	0.066	0.0057	-0.0113	28.684	0.0000	0.000	0.000	0.0000	28.684	0.159
1960	0	5	1	0.037	0.0032	-0.0113	28.484	0.0000	0.000	0.000	0.0000	28.484	0.159
1960	0	6	1	0.037	0.0032	-0.0113	28.283	0.0000	0.000	0.000	0.0000	28.283	0.159
1960	0	7	1	0.092	0.0080	-0.0113	28.088	0.0000	0.000	0.000	0.0000	28.088	0.159
1960	0	8	1	0.092	0.0080	-0.0113	27.892	0.0000	0.000	0.000	0.0000	27.892	0.159
1960	0	9	1	0.092	0.0080	-0.0113	27.697	0.0000	0.000	0.000	0.0000	27.697	0.159
1960	0	10	1	0.092	0.0080	-0.0113	27.501	0.0000	0.000	0.000	0.0000	27.501	0.159
1960	0	11	1	0.092	0.0080	-0.0113	27.305	0.0000	0.000	0.000	0.0000	27.305	0.159
1960	0	12	1	0.092	0.0080	-0.0113	27.110	0.0000	0.000	0.000	0.0000	27.110	0.159
1960	0	13	1	0.092	0.0080	-0.0113	26.914	0.0000	0.000	0.000	0.0000	26.914	0.159
1960	0	14	1	0.125	0.0108	-0.0113	26.722	0.0000	0.000	0.000	0.0000	26.722	0.159
1960	0	15	1	0.158	0.0137	-0.0113	26.532	0.0000	0.000	0.000	0.0000	26.532	0.159

Table 4.4-1 Calculation Sheet of Guare Dam Reservoir Operation Simulation (1960)

Year	Month	Date	Days	Inflow		Rain- evp	Reserve	Spill		Deficit Final V			outflow
				m3/s	mcm					40.000		40.000	
1960	0	30	1	0.470	0.0406	-0.0054	13.213	0.0000	0.000	0.000	0.0000	13.213	0.159
1960	0	31	1	0.626	0.0541	-0.0054	13.069	0.0000	0.000	0.000	0.0000	13.069	0.159
1960	Jun	1	1	0.358	0.0309	0.0003	12.908	0.0000	0.000	0.000	0.0000	12.908	0.159
1960	0	2	1	0.321	0.0277	0.0003	12.744	0.0000	0.000	0.000	0.0000	12.744	0.159
1960	0	3	1	0.358	0.0309	0.0003	12.583	0.0000	0.000	0.000	0.0000	12.583	0.159
1960	0	4	1	0.574	0.0496	0.0003	12.441	0.0000	0.000	0.000	0.0000	12.441	0.159
1960	0	5	1	0.835	0.0722	0.0003	12.321	0.0000	0.000	0.000	0.0000	12.321	0.159
1960	0	6	1	0.574	0.0496	0.0003	12.179	0.0000	0.000	0.000	0.0000	12.179	0.159
1960	0	7	1	1.253	0.1082	0.0003	12.095	0.0000	0.000	0.000	0.0000	12.095	0.159
1960	0	8	1	1.253	0.1082	0.0003	12.011	0.0000	0.000	0.000	0.0000	12.011	0.159
1960	0	9	1	2.732	0.2361	0.0003	12.055	0.0000	0.000	0.000	0.0000	12.055	0.159
1960	0	10	1	2.813	0.2430	0.0003	12.106	0.0000	0.000	0.000	0.0000	12.106	0.159
1960	0	11	1	1.148	0.0992	0.0003	12.014	0.0000	0.000	0.000	0.0000	12.014	0.159
1960	0	12	1	0.897	0.0767	0.0003	11.898	0.0000	0.000	0.000	0.0000	11.898	0.159
1960	0	13	1	0.783	0.0677	0.0003	11.774	0.0000	0.000	0.000	0.0000	11.774	0.159
1960	0	14	1	0.835	0.0722	0.0003	11.654	0.0000	0.000	0.000	0.0000	11.654	0.159
1960	0	15	1	1.201	0.1037	0.0003	11.566	0.0000	0.000	0.000	0.0000	11.566	0.159
1960	0	16	1	7.323	0.6327	0.0003	12.007	0.0000	0.000	0.000	0.0000	12.007	0.159
1960	0	17	1	3.991	0.3448	0.0003	12.160	0.0000	0.000	0.000	0.0000	12.160	0.159
1960	0	18	1	2.249	0.1943	0.0003	12.162	0.0000	0.000	0.000	0.0000	12.162	0.159
1960	0	19	1	2.088	0.1804	0.0003	12.150	0.0000	0.000	0.000	0.0000	12.150	0.159
1960	0	20	1	2.410	0.2082	0.0003	12.167	0.0000	0.000	0.000	0.0000	12.167	0.159
1960	0	21	1	2.249	0.1943	0.0003	12.169	0.0000	0.000	0.000	0.0000	12.169	0.159
1960	0	22	1	2.088	0.1804	0.0003	12.157	0.0000	0.000	0.000	0.0000	12.157	0.159
1960	0	23	1	2.249	0.1943	0.0003	12.160	0.0000	0.000	0.000	0.0000	12.160	0.159
1960	0	24	1	2.410	0.2082	0.0003	12.176	0.0000	0.000	0.000	0.0000	12.176	0.159
1960	0	25	1	2.652	0.2291	0.0003	12.213	0.0000	0.000	0.000	0.0000	12.213	0.159
1960	0	26	1	5.403	0.4669	0.0003	12.488	0.0000	0.000	0.000	0.0000	12.488	0.159
1960	0	27	1	3.168	0.2737	0.0003	12.570	0.0000	0.000	0.000	0.0000	12.570	0.159
1960	0	28	1	2.652	0.2291	0.0003	12.607	0.0000	0.000	0.000	0.0000	12.607	0.159
1960	0	29	1	16.137	1.3943	0.0003	13.809	0.0000	0.000	0.000	0.0000	13.809	0.159
1960	0	30	1	6.786	0.5863	0.0003	14.204	0.0000	0.000	0.000	0.0000	14.204	0.159
1960	Jul	1	1	3.378	0.2919	-0.0006	14.303	0.0000	0.000	0.000	0.0000	14.303	0.159
1960	0	2	1	3.523	0.3044	-0.0006	14.414	0.0000	0.000	0.000	0.0000	14.414	0.159
1960	0	3	1	3.667	0.3169	-0.0006	14.538	0.0000	0.000	0.000	0.0000	14.538	0.159
1960	0	4	1	3.523	0.3044	-0.0006	14.650	0.0000	0.000	0.000	0.0000	14.650	0.159
1960	0	5	1	3.233	0.2794	-0.0006	14.737	0.0000	0.000	0.000	0.0000	14.737	0.159
1960	0	6	1	2.944	0.2544	-0.0006	14.798	0.0000	0.000	0.000	0.0000	14.798	0.159
1960	0	7	1	3.523	0.3044	-0.0006	14.910	0.0000	0.000	0.000	0.0000	14.910	0.159
1960	0	8	1	3.523	0.3044	-0.0006	15.021	0.0000	0.000	0.000	0.0000	15.021	0.159
1960	0	9	1	3.089	0.2669	-0.0006	15.095	0.0000	0.000	0.000	0.0000	15.095	0.159
1960	0	10	1	2.944	0.2544	-0.0006	15.157	0.0000	0.000	0.000	0.0000	15.157	0.159
1960	0	11	1	3.233	0.2794	-0.0006	15.243	0.0000	0.000	0.000	0.0000	15.243	0.159
1960	0	12	1	5.426	0.4688	-0.0006	15.519	0.0000	0.000	0.000	0.0000	15.519	0.159
1960	0	13	1	6.911	0.5971	-0.0006	15.924	0.0000	0.000	0.000	0.0000	15.924	0.159
1960	0	14	1	4.433	0.3830	-0.0006	16.114	0.0000	0.000	0.000	0.0000	16.114	0.159
1960	0	15	1	3.957	0.3419	-0.0006	16.263	0.0000	0.000	0.000	0.0000	16.263	0.159
1960	0	16	1	3.957	0.3419	-0.0006	16.412	0.0000	0.000	0.000	0.0000	16.412	0.159
1960	0	17	1	3.233	0.2794	-0.0006	16.499	0.0000	0.000	0.000	0.0000	16.499	0.159
1960	0	18	1	2.944	0.2544	-0.0006	16.560	0.0000	0.000	0.000	0.0000	16.560	0.159
1960	0	19	1	2.799	0.2419	-0.0006	16.609	0.0000	0.000	0.000	0.0000	16.609	0.159
1960	0	20	1	3.378	0.2919	-0.0006	16.708	0.0000	0.000	0.000	0.0000	16.708	0.159
1960	0	21	1	3.523	0.3044	-0.0006	16.820	0.0000	0.000	0.000	0.0000	16.820	0.159
1960	0	22	1	3.089	0.2669	-0.0006	16.894	0.0000	0.000	0.000	0.0000	16.894	0.159
1960	0	23	1	3.089	0.2669	-0.0006	16.968	0.0000	0.000	0.000	0.0000	16.968	0.159
1960	0	24	1	3.233	0.2794	-0.0006	17.054	0.0000	0.000	0.000	0.0000	17.054	0.159
1960	0	25	1	2.944	0.2544	-0.0006	17.116	0.0000	0.000	0.000	0.0000	17.116	0.159
1960	0	26	1	2.655	0.2294	-0.0006	17.153	0.0000	0.000	0.000	0.0000	17.153	0.159
1960	0	27	1	2.532	0.2188	-0.0006	17.179	0.0000	0.000	0.000	0.0000	17.179	0.159
1960	0	28	1	2.410	0.2082	-0.0006	17.194	0.0000	0.000	0.000	0.0000	17.194	0.159
1960	0	29	1	2.288	0.1977	-0.0006	17.199	0.0000	0.000	0.000	0.0000	17.199	0.159
1960	0	30	1	2.043	0.1765	-0.0006	17.183	0.0000	0.000	0.000	0.0000	17.183	0.159
1960	0	31	1	2.532	0.2188	-0.0006	17.209	0.0000	0.000	0.000	0.0000	17.209	0.159
1960	Aug	1	1	2.655	0.2294	0.0004	17.246	0.0000	0.000	0.000	0.0000	17.246	0.159
1960	0	2	1	2.410	0.2082	0.0004	17.262	0.0000	0.000	0.000	0.0000	17.262	0.159
1960	0	3	1	2.166	0.1871	0.0004	17.258	0.0000	0.000	0.000	0.0000	17.258	0.159
1960	0	4	1	2.532	0.2188	0.0004	17.284	0.0000	0.000	0.000	0.0000	17.284	0.159
1960	0	5	1	2.532	0.2188	0.0004	17.311	0.0000	0.000	0.000	0.0000	17.311	0.159
1960	0	6	1	6.273	0.5420	0.0004	17.661	0.0000	0.000	0.000	0.0000	17.661	0.159
1960	0	7	1	1.921	0.1660	0.0004	17.636	0.0000	0.000	0.000	0.0000	17.636	0.159
1960	0	8	1	5.426	0.4688	0.0004	17.912	0.0000	0.000	0.000	0.0000	17.912	0.159
1960	0	9	1	5.591	0.4831	0.0004	18.204	0.0000	0.000	0.000	0.0000	18.204	0.159
1960	0	10	1	8.510	0.7353	0.0004	18.747	0.0000	0.000	0.000	0.0000	18.747	0.159
1960	0	11	1	8.717	0.7532	0.0004	19.308	0.0000	0.000	0.000	0.0000	19.308	0.159
1960	0	12	1	137.957	3.2795	0.0004	22.396	0.0000	0.000	0.000	0.0000	22.396	0.159

Table 4.4-1 Calculation Sheet of Guare Dam Reservoir Operation Simulation (1960)

Year	Month	Date	Days	Inflow m ³ /s	Inflow mcm	Rain-avg mcm	Reserve 40,000	Spill	Defloit	Final V	outflow	
1960	0	13		117.360	1.4999	0.0004	23.704	0.0000	0.000	0.0000	23.704	0.159
1960	0	14		110.231	0.8840	0.0004	24.396	0.0000	0.000	0.0000	24.396	0.159
1960	0	15		8.116	0.7013	0.0004	24.905	0.0000	0.000	0.0000	24.905	0.159
1960	0	16		6.882	0.5946	0.0004	25.308	0.0000	0.000	0.0000	25.308	0.159
1960	0	17		6.882	0.5946	0.0004	25.711	0.0000	0.000	0.0000	25.711	0.159
1960	0	18		6.264	0.5412	0.0004	26.060	0.0000	0.000	0.0000	26.060	0.159
1960	0	19		12.266	1.0597	0.0004	26.928	0.0000	0.000	0.0000	26.928	0.159
1960	0	20		7.705	0.6657	0.0004	27.402	0.0000	0.000	0.0000	27.402	0.159
1960	0	21		5.906	0.5103	0.0004	27.720	0.0000	0.000	0.0000	27.720	0.159
1960	0	22		4.832	0.4175	0.0004	27.946	0.0000	0.000	0.0000	27.946	0.159
1960	0	23		4.474	0.3866	0.0004	28.140	0.0000	0.000	0.0000	28.140	0.159
1960	0	24		5.369	0.4639	0.0004	28.412	0.0000	0.000	0.0000	28.412	0.159
1960	0	25		5.369	0.4639	0.0004	28.684	0.0000	0.000	0.0000	28.684	0.159
1960	0	26		5.727	0.4948	0.0004	28.987	0.0000	0.000	0.0000	28.987	0.159
1960	0	27		5.727	0.4948	0.0004	29.290	0.0000	0.000	0.0000	29.290	0.159
1960	0	28		5.727	0.4948	0.0004	29.593	0.0000	0.000	0.0000	29.593	0.159
1960	0	29		5.727	0.4948	0.0004	29.896	0.0000	0.000	0.0000	29.896	0.159
1960	0	30		5.548	0.4794	0.0004	30.183	0.0000	0.000	0.0000	30.183	0.159
1960	0	31		5.369	0.4639	0.0004	30.455	0.0000	0.000	0.0000	30.455	0.159
1960	Sep	1		6.470	0.5590	-0.0025	30.820	0.0000	0.000	0.0000	30.820	0.159
1960	0	2		7.087	0.6123	-0.0025	31.237	0.0000	0.000	0.0000	31.237	0.159
1960	0	3		6.264	0.5412	-0.0025	31.584	0.0000	0.000	0.0000	31.584	0.159
1960	0	4		5.548	0.4794	-0.0025	31.868	0.0000	0.000	0.0000	31.868	0.159
1960	0	5		5.369	0.4639	-0.0025	32.137	0.0000	0.000	0.0000	32.137	0.159
1960	0	6		5.548	0.4794	-0.0025	32.422	0.0000	0.000	0.0000	32.422	0.159
1960	0	7		5.369	0.4639	-0.0025	32.691	0.0000	0.000	0.0000	32.691	0.159
1960	0	8		5.369	0.4639	-0.0025	32.960	0.0000	0.000	0.0000	32.960	0.159
1960	0	9		4.330	0.3741	-0.0025	33.140	0.0000	0.000	0.0000	33.140	0.159
1960	0	10		4.040	0.3491	-0.0025	33.294	0.0000	0.000	0.0000	33.294	0.159
1960	0	11		4.330	0.3741	-0.0025	33.473	0.0000	0.000	0.0000	33.473	0.159
1960	0	12		6.291	0.5435	-0.0025	33.822	0.0000	0.000	0.0000	33.822	0.159
1960	0	13		4.330	0.3741	-0.0025	34.002	0.0000	0.000	0.0000	34.002	0.159
1960	0	14		3.896	0.3366	-0.0025	34.143	0.0000	0.000	0.0000	34.143	0.159
1960	0	15		4.474	0.3866	-0.0025	34.335	0.0000	0.000	0.0000	34.335	0.159
1960	0	16		3.896	0.3366	-0.0025	34.477	0.0000	0.000	0.0000	34.477	0.159
1960	0	17		3.896	0.3366	-0.0025	34.619	0.0000	0.000	0.0000	34.619	0.159
1960	0	18		3.606	0.3116	-0.0025	34.736	0.0000	0.000	0.0000	34.736	0.159
1960	0	19		3.462	0.2991	-0.0025	34.840	0.0000	0.000	0.0000	34.840	0.159
1960	0	20		3.462	0.2991	-0.0025	34.945	0.0000	0.000	0.0000	34.945	0.159
1960	0	21		3.317	0.2866	-0.0025	35.036	0.0000	0.000	0.0000	35.036	0.159
1960	0	22		3.172	0.2741	-0.0025	35.116	0.0000	0.000	0.0000	35.116	0.159
1960	0	23		3.028	0.2616	-0.0025	35.183	0.0000	0.000	0.0000	35.183	0.159
1960	0	24		2.904	0.2509	-0.0025	35.239	0.0000	0.000	0.0000	35.239	0.159
1960	0	25		2.656	0.2295	-0.0025	35.274	0.0000	0.000	0.0000	35.274	0.159
1960	0	26		2.656	0.2295	-0.0025	35.308	0.0000	0.000	0.0000	35.308	0.159
1960	0	27		2.656	0.2295	-0.0025	35.343	0.0000	0.000	0.0000	35.343	0.159
1960	0	28		2.656	0.2295	-0.0025	35.378	0.0000	0.000	0.0000	35.378	0.159
1960	0	29		2.656	0.2295	-0.0025	35.413	0.0000	0.000	0.0000	35.413	0.159
1960	0	30		2.532	0.2188	-0.0025	35.437	0.0000	0.000	0.0000	35.437	0.159
1960	Oct	1		2.656	0.2295	-0.0041	35.470	0.0000	0.000	0.0000	35.470	0.159
1960	0	2		3.028	0.2616	-0.0041	35.535	0.0000	0.000	0.0000	35.535	0.159
1960	0	3		2.656	0.2295	-0.0041	35.568	0.0000	0.000	0.0000	35.568	0.159
1960	0	4		2.656	0.2295	-0.0041	35.601	0.0000	0.000	0.0000	35.601	0.159
1960	0	5		2.656	0.2295	-0.0041	35.634	0.0000	0.000	0.0000	35.634	0.159
1960	0	6		2.532	0.2188	-0.0041	35.657	0.0000	0.000	0.0000	35.657	0.159
1960	0	7		2.409	0.2081	-0.0041	35.669	0.0000	0.000	0.0000	35.669	0.159
1960	0	8		2.285	0.1974	-0.0041	35.670	0.0000	0.000	0.0000	35.670	0.159
1960	0	9		2.285	0.1974	-0.0041	35.671	0.0000	0.000	0.0000	35.671	0.159
1960	0	10		2.037	0.1760	-0.0041	35.650	0.0000	0.000	0.0000	35.650	0.159
1960	0	11		2.409	0.2081	-0.0041	35.662	0.0000	0.000	0.0000	35.662	0.159
1960	0	12		2.409	0.2081	-0.0041	35.674	0.0000	0.000	0.0000	35.674	0.159
1960	0	13		2.285	0.1974	-0.0041	35.675	0.0000	0.000	0.0000	35.675	0.159
1960	0	14		1.914	0.1653	-0.0041	35.644	0.0000	0.000	0.0000	35.644	0.159
1960	0	15		1.993	0.1722	-0.0041	35.620	0.0000	0.000	0.0000	35.620	0.159
1960	0	16		1.790	0.1546	-0.0041	35.578	0.0000	0.000	0.0000	35.578	0.159
1960	0	17		1.914	0.1653	-0.0041	35.547	0.0000	0.000	0.0000	35.547	0.159
1960	0	18		2.037	0.1760	-0.0041	35.526	0.0000	0.000	0.0000	35.526	0.159
1960	0	19		1.790	0.1546	-0.0041	35.485	0.0000	0.000	0.0000	35.485	0.159
1960	0	20		1.790	0.1546	-0.0041	35.443	0.0000	0.000	0.0000	35.443	0.159
1960	0	21		1.790	0.1546	-0.0041	35.401	0.0000	0.000	0.0000	35.401	0.159
1960	0	22		1.790	0.1546	-0.0041	35.360	0.0000	0.000	0.0000	35.360	0.159
1960	0	23		1.790	0.1546	-0.0041	35.318	0.0000	0.000	0.0000	35.318	0.159
1960	0	24		2.161	0.1867	-0.0041	35.308	0.0000	0.000	0.0000	35.308	0.159
1960	0	25		2.161	0.1867	-0.0041	35.298	0.0000	0.000	0.0000	35.298	0.159
1960	0	26		2.161	0.1867	-0.0041	35.289	0.0000	0.000	0.0000	35.289	0.159

Table 4.4-1 Calculation Sheet of Cuare Dam Reservoir Operation Simulation (1950)

Year	Month	Date	Days	Inflow m3/s	Rain-erp mcm	Reserve 40.000	Spill		Deficit	Final V	outflow
1960	0	27	1	2.161	0.1867	-0.0041	35.279	0.0000	0.000	0.000	0.159
1960	0	28	1	2.161	0.1867	-0.0041	35.270	0.0000	0.000	0.000	0.159
1960	0	29	1	1.914	0.1653	-0.0041	35.238	0.0000	0.000	0.000	0.159
1960	0	30	1	2.037	0.1760	-0.0041	35.218	0.0000	0.000	0.000	0.159
1960	0	31	1	2.285	0.1974	-0.0041	35.219	0.0000	0.000	0.000	0.159
1960	Nov	1	1	2.656	0.2295	-0.0035	35.253	0.0000	0.000	0.000	0.159
1960	0	2	1	2.409	0.2081	-0.0035	35.265	0.0000	0.000	0.000	0.159
1960	0	3	1	2.161	0.1867	-0.0035	35.256	0.0000	0.000	0.000	0.159
1960	0	4	1	2.037	0.1760	-0.0035	35.236	0.0000	0.000	0.000	0.159
1960	0	5	1	1.690	0.1460	-0.0035	35.186	0.0000	0.000	0.000	0.159
1960	0	6	1	1.590	0.1374	-0.0035	35.128	0.0000	0.000	0.000	0.159
1960	0	7	1	1.590	0.1374	-0.0035	35.070	0.0000	0.000	0.000	0.159
1960	0	8	1	1.590	0.1374	-0.0035	35.011	0.0000	0.000	0.000	0.159
1960	0	9	1	1.390	0.1201	-0.0035	34.935	0.0000	0.000	0.000	0.159
1960	0	10	1	1.190	0.1028	-0.0035	34.842	0.0000	0.000	0.000	0.159
1960	0	11	1	1.190	0.1028	-0.0035	34.750	0.0000	0.000	0.000	0.159
1960	0	12	1	1.190	0.1028	-0.0035	34.657	0.0000	0.000	0.000	0.159
1960	0	13	1	1.090	0.0942	-0.0035	34.555	0.0000	0.000	0.000	0.159
1960	0	14	1	1.190	0.1028	-0.0035	34.462	0.0000	0.000	0.000	0.159
1960	0	15	1	1.190	0.1028	-0.0035	34.369	0.0000	0.000	0.000	0.159
1960	0	16	1	1.190	0.1028	-0.0035	34.276	0.0000	0.000	0.000	0.159
1960	0	17	1	1.090	0.0942	-0.0035	34.174	0.0000	0.000	0.000	0.159
1960	0	18	1	1.090	0.0942	-0.0035	34.073	0.0000	0.000	0.000	0.159
1960	0	19	1	1.190	0.1028	-0.0035	33.980	0.0000	0.000	0.000	0.159
1960	0	20	1	17.495	1.5115	-0.0035	35.296	0.0000	0.000	0.000	0.159
1960	0	21	1	3.527	0.3048	-0.0035	35.405	0.0000	0.000	0.000	0.159
1960	0	22	1	2.799	0.2419	-0.0035	35.451	0.0000	0.000	0.000	0.159
1960	0	23	1	2.532	0.2183	-0.0035	35.474	0.0000	0.000	0.000	0.159
1960	0	24	1	2.410	0.2082	-0.0035	35.486	0.0000	0.000	0.000	0.159
1960	0	25	1	2.410	0.2082	-0.0035	35.498	0.0000	0.000	0.000	0.159
1960	0	26	1	2.043	0.1765	-0.0035	35.479	0.0000	0.000	0.000	0.159
1960	0	27	1	1.799	0.1554	-0.0035	35.439	0.0000	0.000	0.000	0.159
1960	0	28	1	2.043	0.1765	-0.0035	35.420	0.0000	0.000	0.000	0.159
1960	0	29	1	1.799	0.1554	-0.0035	35.379	0.0000	0.000	0.000	0.159
1960	0	30	1	1.554	0.1343	-0.0035	35.318	0.0000	0.000	0.000	0.159
1960	Dec	1	1	1.351	0.1167	-0.0053	35.237	0.0000	0.000	0.000	0.159
1960	0	2	1	1.432	0.1237	-0.0053	35.163	0.0000	0.000	0.000	0.159
1960	0	3	1	1.554	0.1343	-0.0053	35.100	0.0000	0.000	0.000	0.159
1960	0	4	1	1.351	0.1167	-0.0053	35.019	0.0000	0.000	0.000	0.159
1960	0	5	1	1.921	0.1660	-0.0053	34.987	0.0000	0.000	0.000	0.159
1960	0	6	1	1.676	0.1448	-0.0053	34.935	0.0000	0.000	0.000	0.159
1960	0	7	1	1.799	0.1554	-0.0053	34.892	0.0000	0.000	0.000	0.159
1960	0	8	1	1.799	0.1554	-0.0053	34.850	0.0000	0.000	0.000	0.159
1960	0	9	1	1.799	0.1554	-0.0053	34.808	0.0000	0.000	0.000	0.159
1960	0	10	1	1.799	0.1554	-0.0053	34.766	0.0000	0.000	0.000	0.159
1960	0	11	1	2.410	0.2082	-0.0053	34.777	0.0000	0.000	0.000	0.159
1960	0	12	1	3.233	0.2794	-0.0053	34.858	0.0000	0.000	0.000	0.159
1960	0	13	1	2.655	0.2294	-0.0053	34.890	0.0000	0.000	0.000	0.159
1960	0	14	1	2.410	0.2082	-0.0053	34.901	0.0000	0.000	0.000	0.159
1960	0	15	1	2.166	0.1871	-0.0053	34.891	0.0000	0.000	0.000	0.159
1960	0	16	1	2.166	0.1871	-0.0053	34.880	0.0000	0.000	0.000	0.159
1960	0	17	1	2.043	0.1765	-0.0053	34.859	0.0000	0.000	0.000	0.159
1960	0	18	1	2.043	0.1765	-0.0053	34.838	0.0000	0.000	0.000	0.159
1960	0	19	1	1.799	0.1554	-0.0053	34.796	0.0000	0.000	0.000	0.159
1960	0	20	1	1.799	0.1554	-0.0053	34.754	0.0000	0.000	0.000	0.159
1960	0	21	1	1.676	0.1448	-0.0053	34.701	0.0000	0.000	0.000	0.159
1960	0	22	1	1.554	0.1343	-0.0053	34.638	0.0000	0.000	0.000	0.159
1960	0	23	1	1.676	0.1448	-0.0053	34.585	0.0000	0.000	0.000	0.159
1960	0	24	1	1.554	0.1343	-0.0053	34.522	0.0000	0.000	0.000	0.159
1960	0	25	1	1.554	0.1343	-0.0053	34.459	0.0000	0.000	0.000	0.159
1960	0	26	1	1.432	0.1237	-0.0053	34.385	0.0000	0.000	0.000	0.159
1960	0	27	1	1.432	0.1237	-0.0053	34.311	0.0000	0.000	0.000	0.159
1960	0	28	1	1.432	0.1237	-0.0053	34.237	0.0000	0.000	0.000	0.159
1960	0	29	1	1.432	0.1237	-0.0053	34.163	0.0000	0.000	0.000	0.159
1960	0	30	1	0.868	0.0750	-0.0053	34.041	0.0000	0.000	0.000	0.159
1960	0	31	1	0.868	0.0750	-0.0053	33.918	0.0000	0.000	0.000	0.159

Table 4.4-2 Cost Estimate for Guare Dam

	Unit	Quantity	Unit price US\$	Cost US\$
1. Land acquisition and relocation				
Crop land (flat)	ha	100	11,000	1,100,000
Crop land (hilly)	ha	126	5,000	630,000
Road Relocation	km	5	17,000	85,000
2. Dike				
Clearing	ha	226	600	135,600
Foundation excavation				
Soil	m ³	88,000	4	352,000
Rock	m ³	66,000	15	990,000
Embankment				
Core	m ³	330,000	12	3,960,000
Toe	m ³	780,000	13	10,140,000
Grouting	m ³	1,300	85	110,500
Drilling	m	25,000	111	2,775,000
3. Bank protection				
	m ²	10,000	100	1,000,000
4. Spillway and intake				
Intake tower with siphon, concrete	m ³	3,600	234	842,400
8 m diameter tunnel	m	215	13,000	2,795,000
Access bridge concrete	m ³	155	234	36,270
Gates, valves, pipes, etc.	l.s.	1	230,000	230,000
TOTAL				25,181,770