

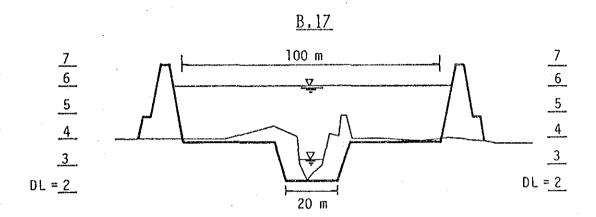
LEGEND Proposed River Bad (Longitudinal Profile) River Ցսոս 5 Seed (£1,m) Peopel HWL (Elm) Marence (m) Beerlen MA 0 0

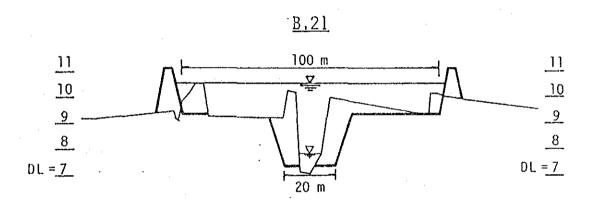
Proposed Long-Term Plan of Bunut River (2/3)

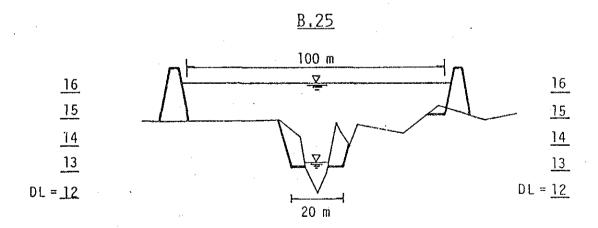
Fig.H-3

2H - 82

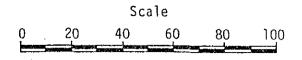
Fig.H-3 Proposed Long-Term Plan of Bunut River (3/3)
(Cross-section)

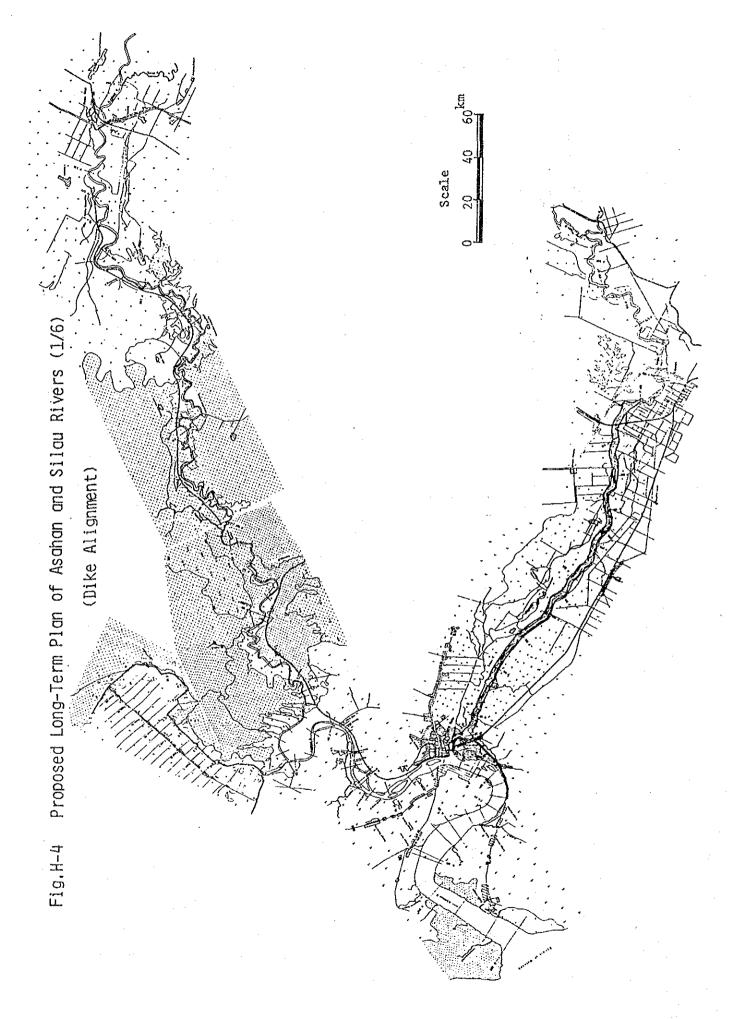






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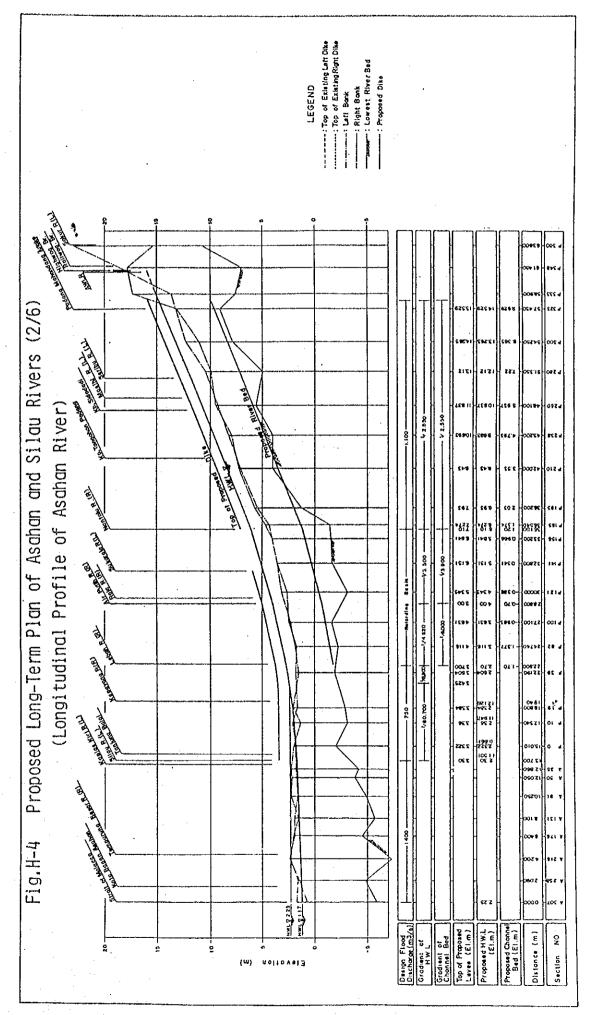
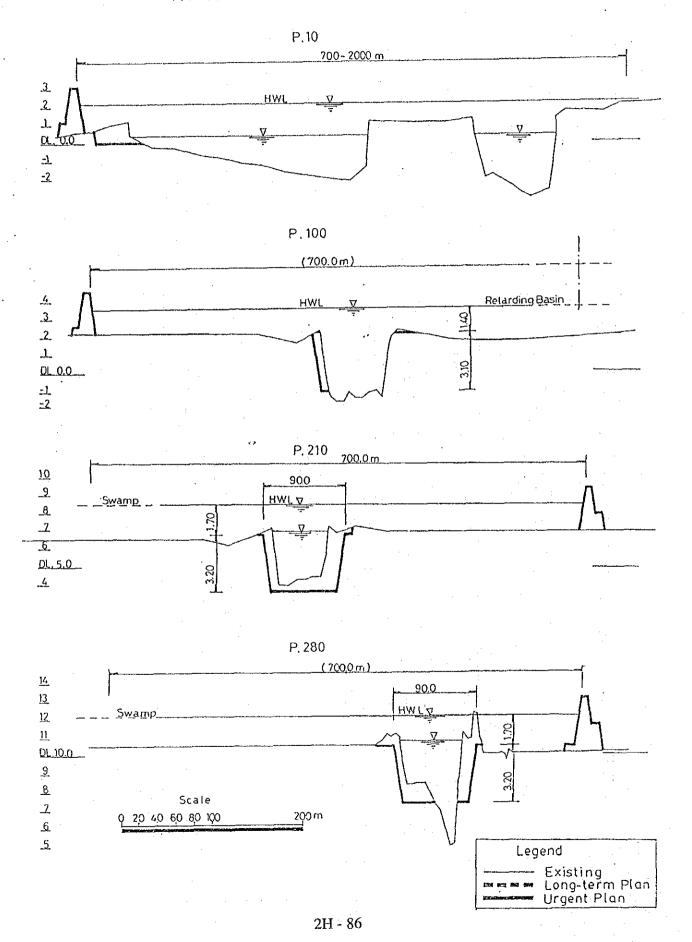
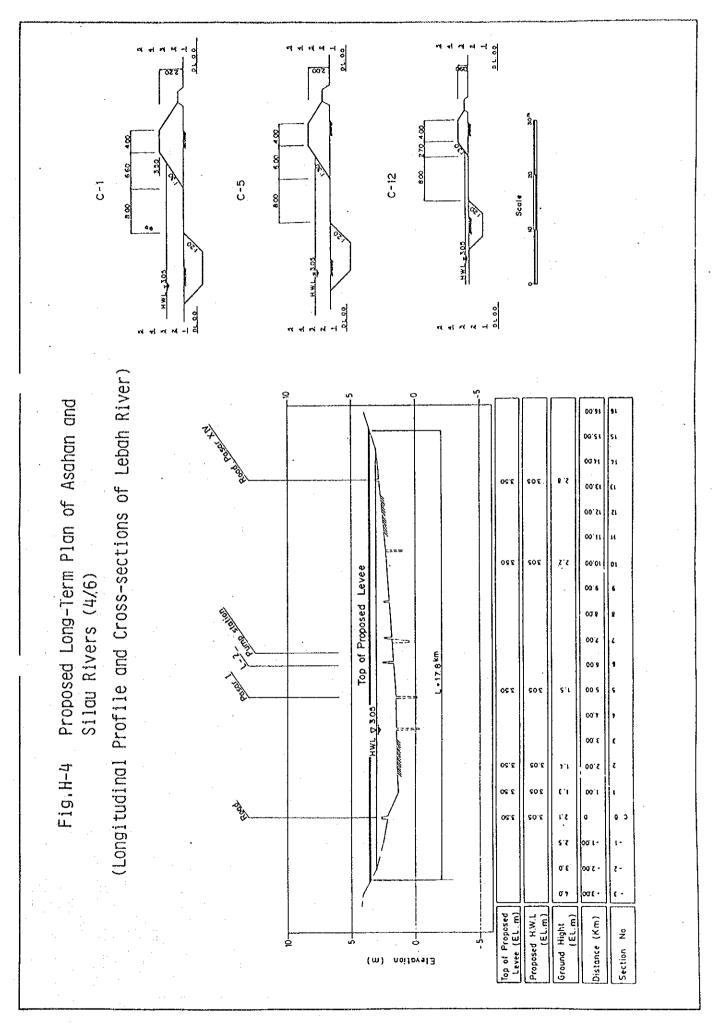


Fig.H-4 Proposed Long-Term Plan of Asahan and Silau Rivers (3/6)

(Cross-sections of Asahan River)





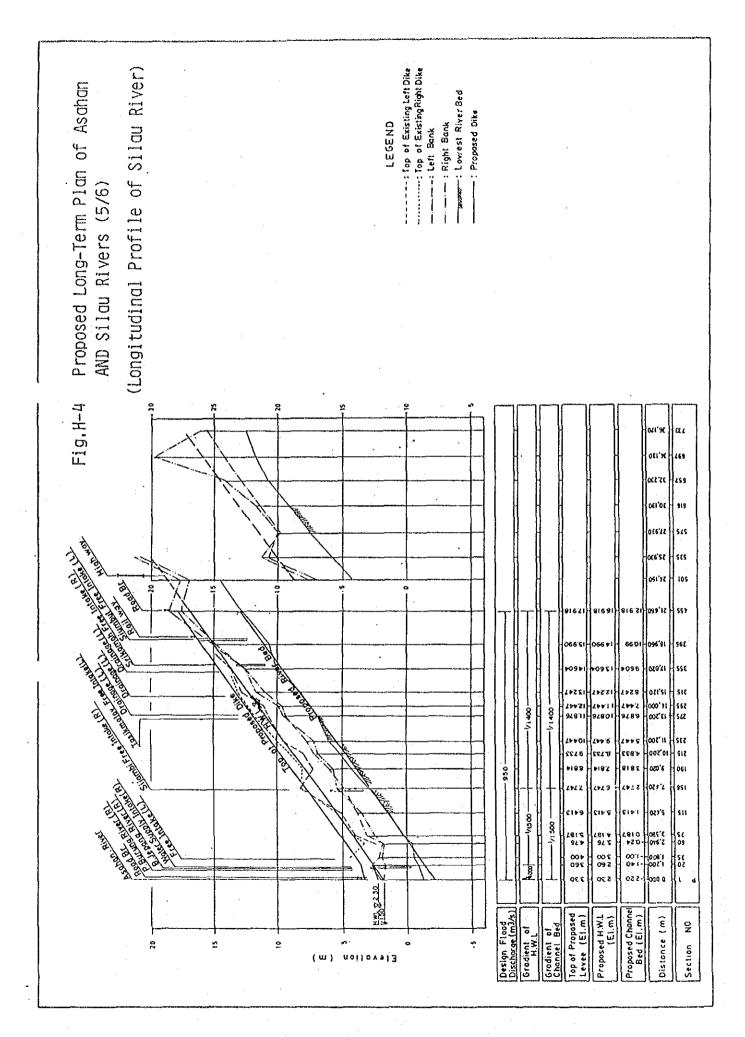
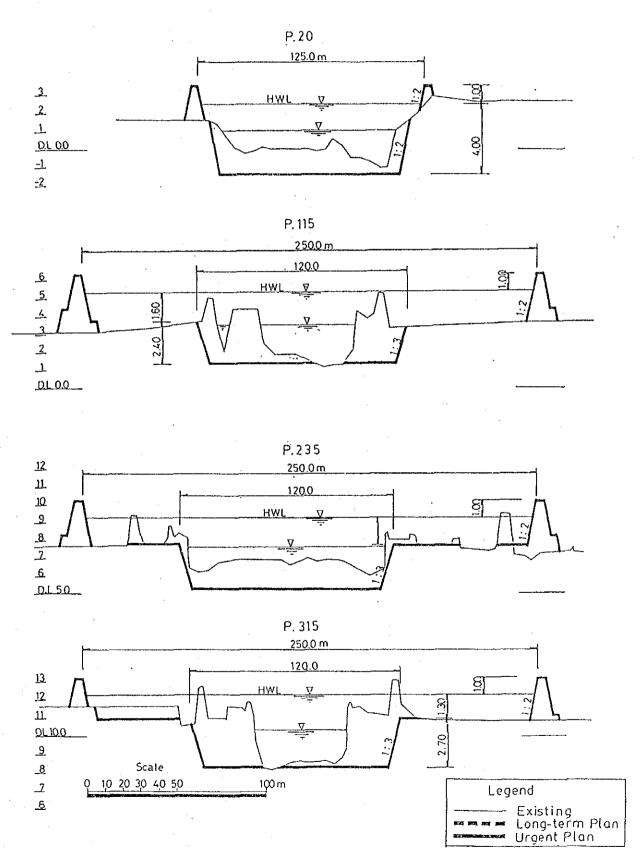


Fig.H-4 Proposed Long-Term Plan of Asahan and Silau Rivers (6/6)

(Cross-sections of Silau River)



2H - 90

Fig.H-5 Proposed Long-Term Plan of Kualuh River (2/3) (Longitudinal Profile)

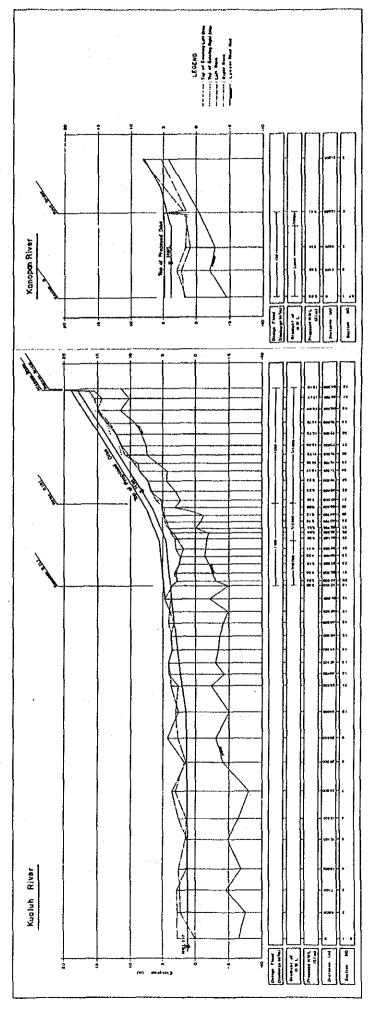
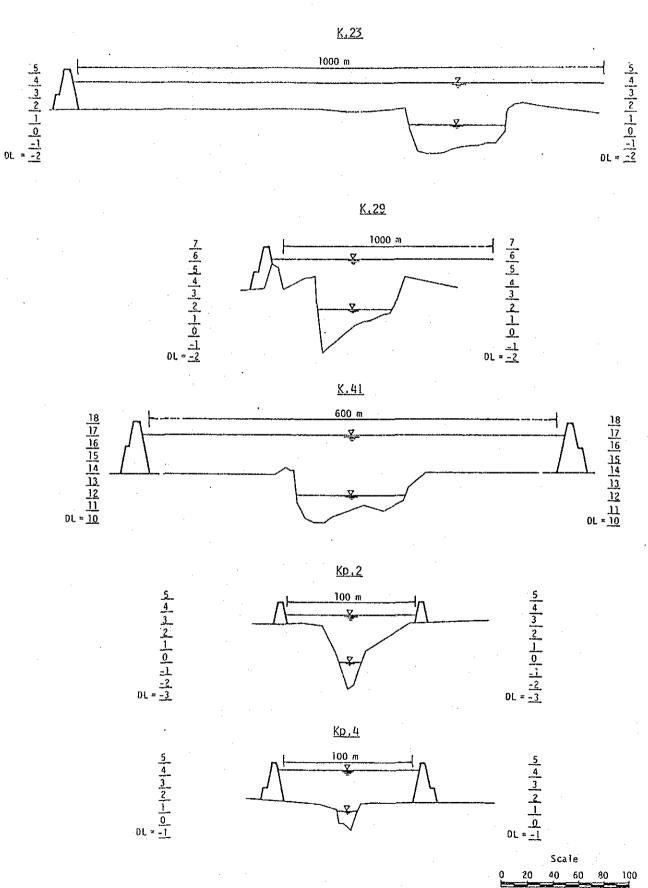
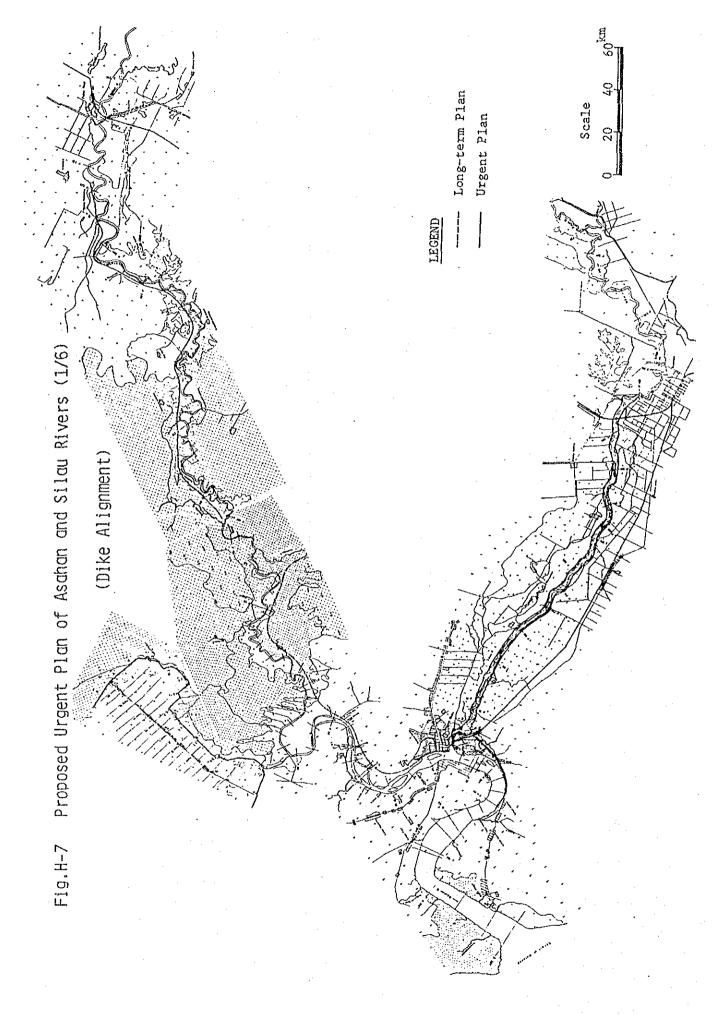


Fig.H-5 Proposed Long-Term Plan of Kualuh River (3/3) (Cross-section)



Design Flood Discharges for Proposed Fig.H-6 Urgent Plan (Unit:  $m^3/s$ ) Lake Toba Regulating Dam 400 Baturangin R. - 250 Parhi tean 810 220 Sakur R. Pulau Raja Masihi R. 150 -Retarding Basin W.L. : EL. 3.00 m Area: 92 km² 110 — Sukaraja R. Lebah R. 1,100 Vol.: 88 m cm 350 =750 15 Kepayang R. -Silau R. Road Br. Legend 750 ď Embankment 1,200 Dredging Railway Br. Kisaran

Strait of Malacca - H.96 -



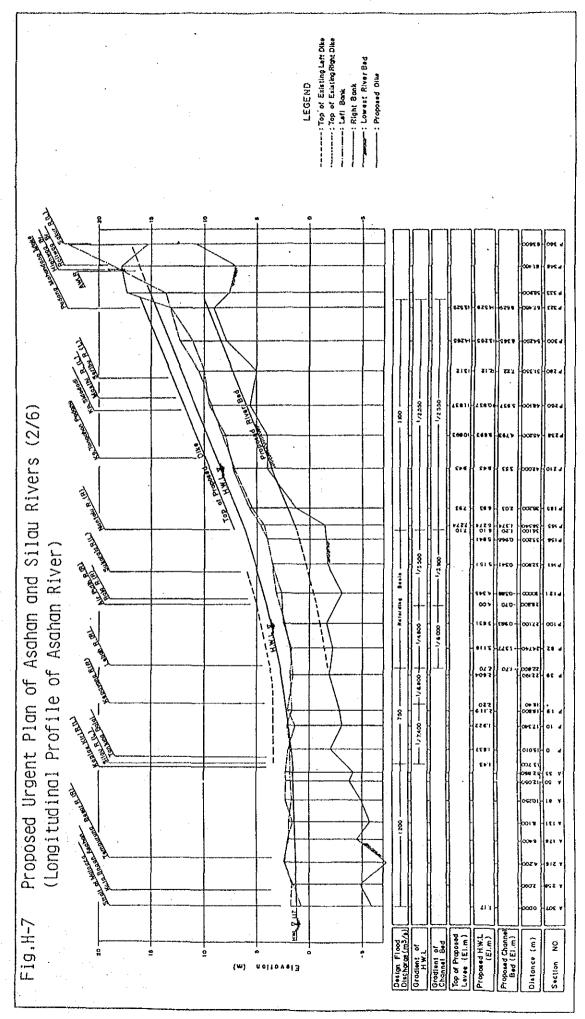
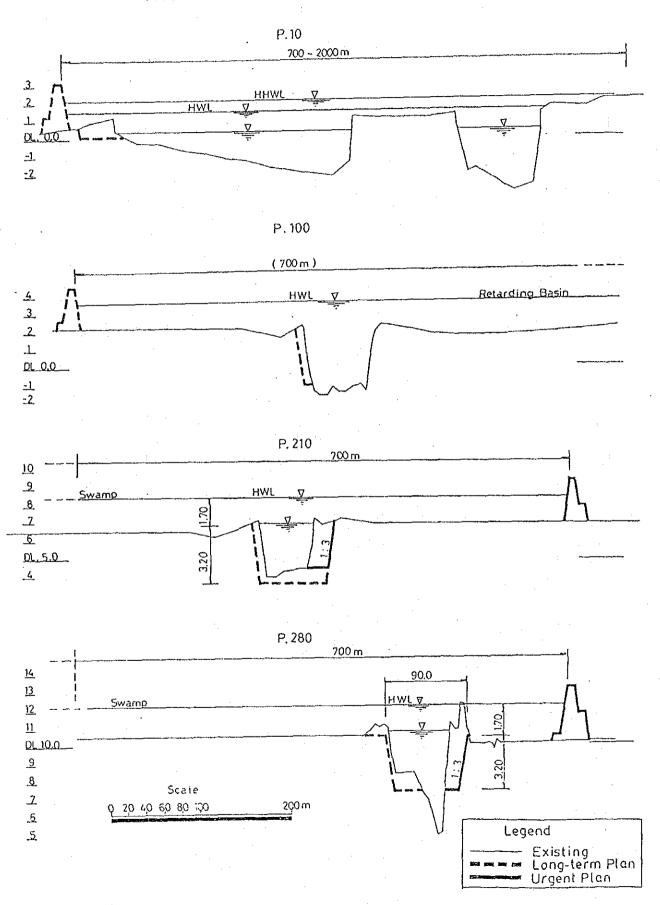
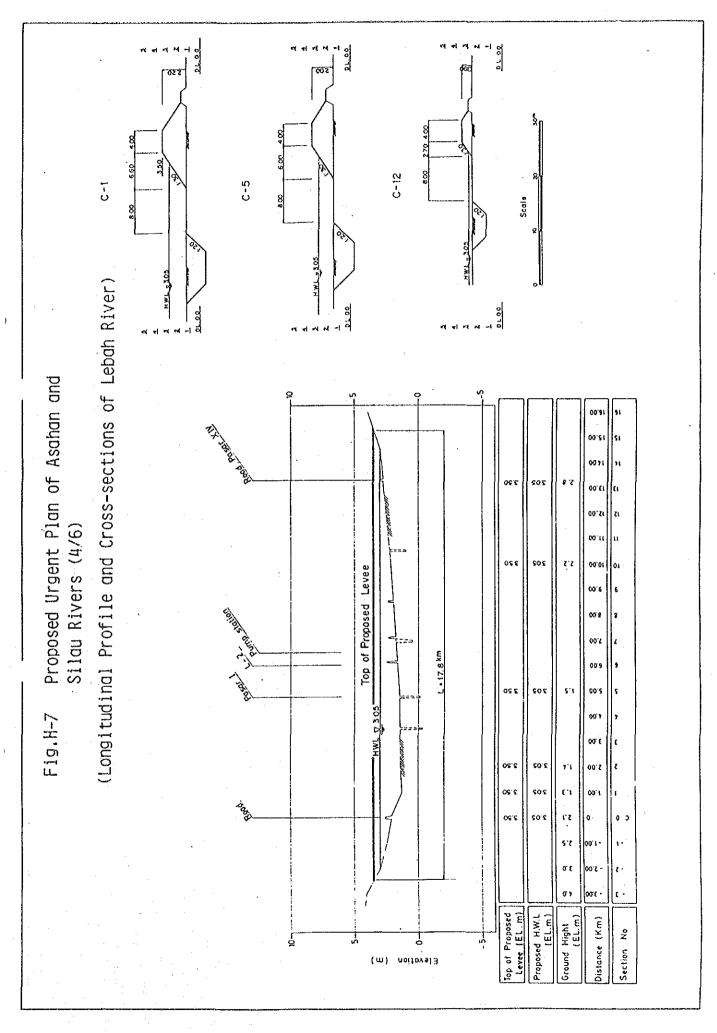


Fig.H-7 Proposed Urgent Plan of Asahan and Silau Rivers (3/6)

(Cross-sections of Asahan River)





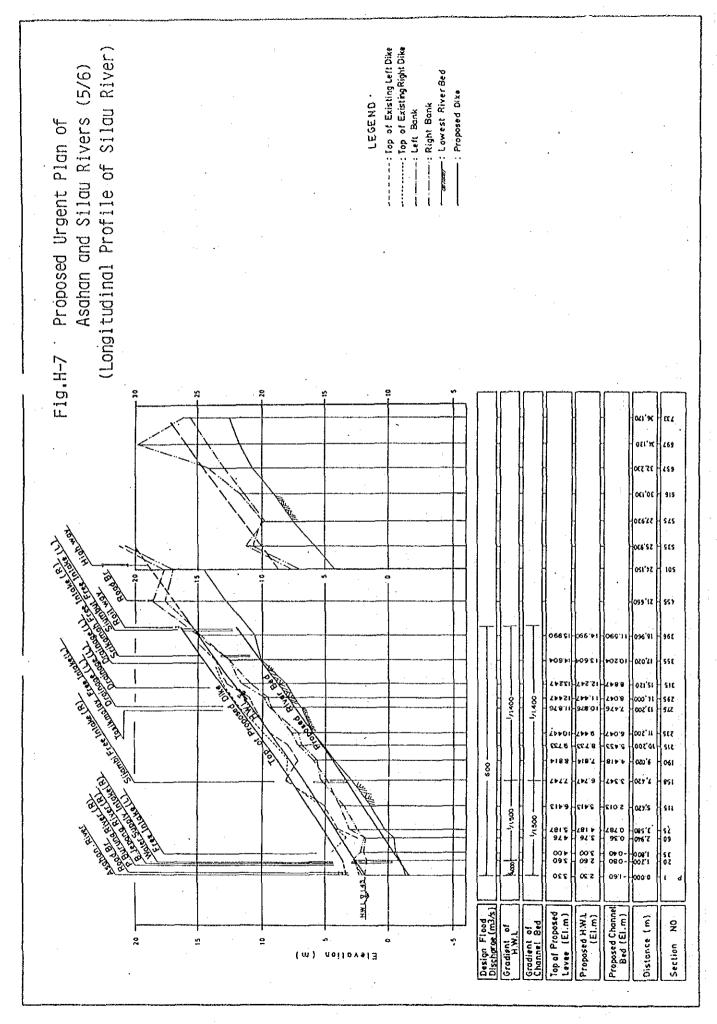
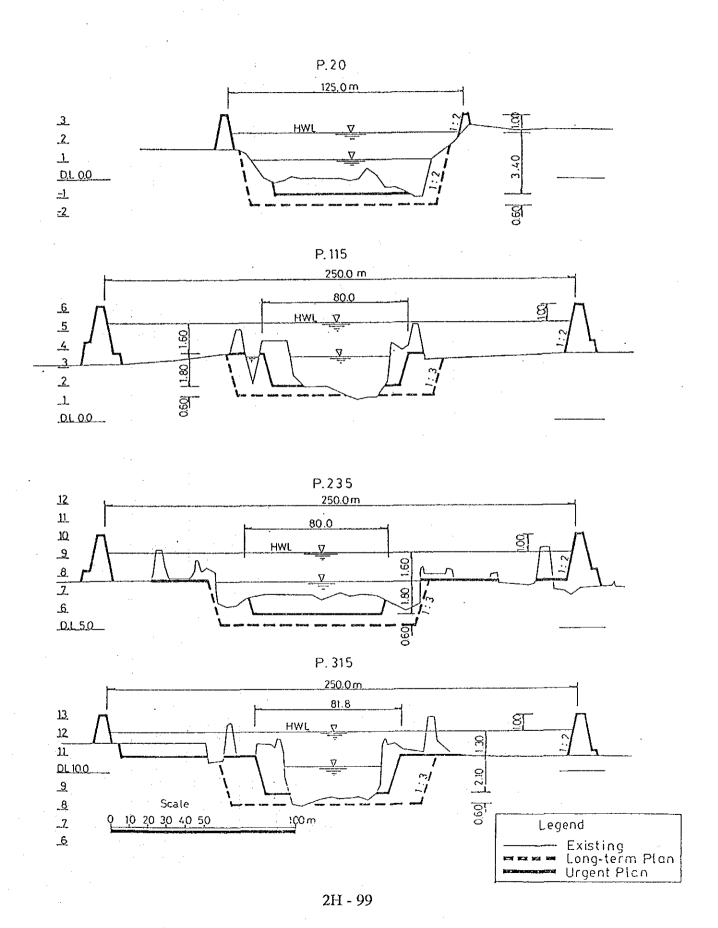


Fig.H-7 Proposed Urgent Plan of Asahan and Silau Rivers (6/6)

(Cross-sections of Silau River)



Construction Time Schedule for Urgent Flood Control Project Fig.H-8

		***************************************	***************************************				
Fiscal Year (Apr-Mar)	1987/88	1988/89	1989/90	1990/91	1991/92	1992/93	1993/94
Loan Process							
Land Acquisition							
Civil Works							
Preparatory							
Asahan River				-[]-			
Silau River		,		-U-			
Administration							
Consulting Services						·	
Detailed Design							
Supervision		:					

Fig.H-9 Present Organization for Flood Control Works

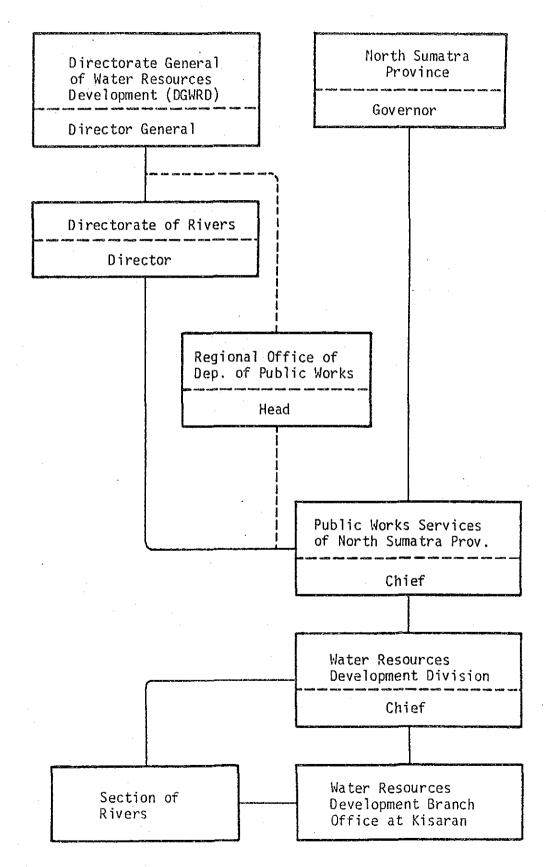


Fig.H-10 Organization for Project Implementation (1/2) (Detailed Design Stage)

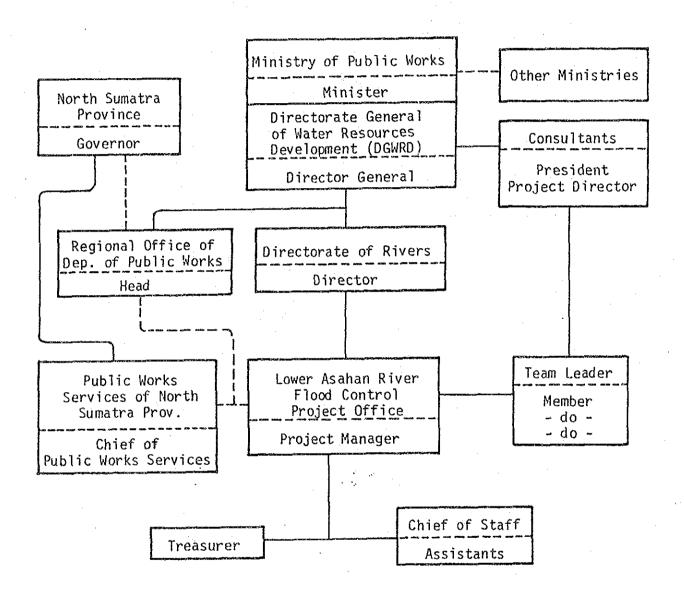


Fig.H-10 Organization for Project Implementation (2/2) (Construction Stage)

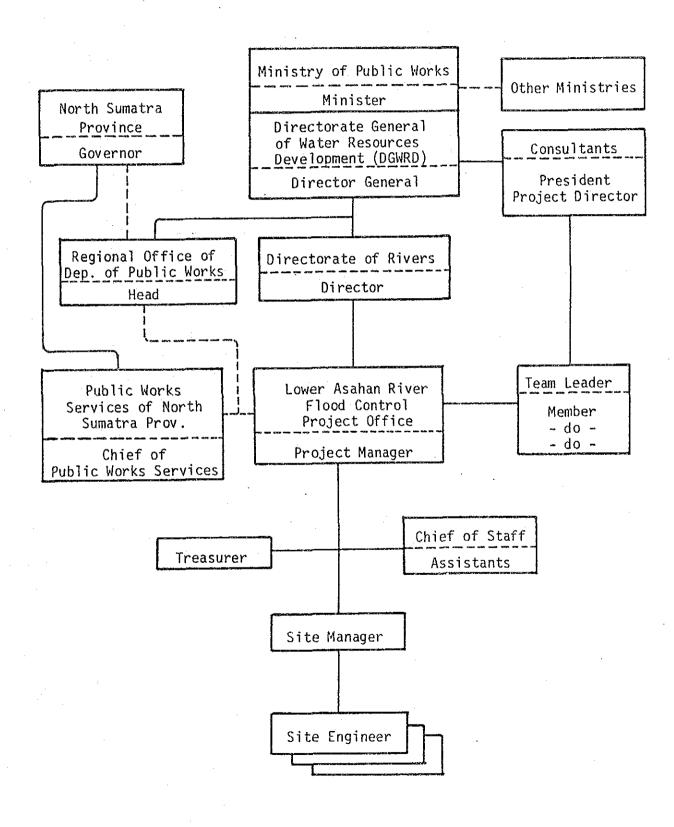
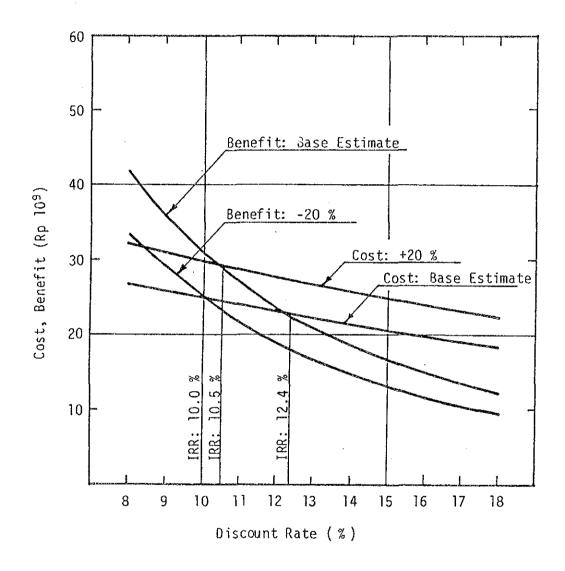


Fig.H-11 Sensitivity of IRR of Urgent Flood Control Project



## Appendix 2-I

# Regulation of Water Level of Lake Toba

#### Appendix 2-I

### REGULATION OF WATER LEVEL OF LAKE TOBA

#### LIST OF TABLES

Table	: I-1	Rainfall Data Available in and around Lake Toba	2I-1
	I-2	Monthly Rainfall of Lake Toba Basin	2I-2
	1-3	Monthly Mean Net Inflow into Lake Toba	2I-3
	I-4	Comparison of Lake Toba Operation Method	2I-4
	I-5	Major Flood Inflow (net) into Lake Toba	2I-5
	I-6	Probable Flood Inflow into Lake Toba	2I-5
	I-7	Net Inflow Volume into Lake Toba during the Flood Season	21-6
	I-8	Operation of Lake Toba: Case V (Tentative Operation Prior to Completion of the UrgentFlood Control Project)	2I-7
		LIST OF FIGURES	
Fig.	I-1	Location of Rain Gage Station in and around Lake Toba Basin	2I-8
	I-2	Rating Curve for Estimating Water Level of Lake Toba	21-9
	I-3	Case V Operation of Lake Toba for Flood Control and Water Utilization	2I-10

Table I-1 Rainfall Data Available in and around Lake Toba

Name of Station	Type of Data	Available Year
Sidi Kalang	Monthly	1913, 1914, 1916, 1919-1941, 1951-1964
Seribu Dolok	Daily	1910-1930, 1935-1941, 1953-1958
Pangururan	Monthly	1918-1940, 1953-1956
	Daily	1973-1984
Gorbus	Daily	1953-1958, 1973-Feb. 1985
Ambarita	Monthly	1919-1940
Prapat	Monthly	1918-1941, 1955-1958
	Daily	1973-1984
Palipi	Monthly	1922-1940
Onanrunggu	Monthly	1922-1940
Balige	Monthly	1918-1941, 1954-1960
	Daily	1961-1980
Dolok Sangul	Monthly	1936-1939, 1954-1956, 1958, 1959, 1963, 1964
Siborong Borong	Monthly	1936-1939, 1952, 1954-1956, 1958, 1959, 1964
Hataraja	Daily	1952-1954, 1958, 1976, 1978-1984
Simangkuk	Daily	1961-1980

												-	
1984	394	331	364	207	370	78	135	43	115	101	202	239	2575
1983	85	33	129	100	249	16	146	157	322	334	104	271	2018
1982	97	78	355	. 280	265	46	65	138	166	293	247	202	2230
1981	83	121	730	210	321	41	44	80	298	170	83	104	1691
1980	100	108	238	157	200	78	153	186	141	121	242	200	1921
1979	158	136	115	216	19	234	174	83	133	201	294	103	1905
1978	146	102	258	208	77	27	87	26	95	161	229	230	1672
1977	101	139	69	136	130	8	125	132	94	440	320	159	1916
1976	165	221	193	328	125	176	123	167	102	305	318	325	2544
1975	120	169	226	240	192	9	214	59	240	76	213	188	1941
1974	144	286	114	297	24I	200	164	28	247	128	151	185	2181
	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	oct.	Nov.	Dec.	Annual.

\*Gorbus alone

Jan.
Feb.
Mar.
Apr.
May
June
July
Aug.
Sept.
Oct.
Nov.

Table I-3 Monthly Mean Net Inflow into Lake Toba

unit : m3/s

	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Annual
1916 1917	105.0 95.4	10.5 227.1	141.1 71.4	89.5 152.8	109.8 102.5	45.3 33.9	84.1 69.9	87.6 127.7	-22.4 73.7	109.6 57.8	112.2 86.3	238.3 155.0	93.4 103.6
1918 1919 1920	222.2	125.4	93.6	.225.7	62.1	61.3	38.3 -25.0	9.6 19.2	153.7 54.2	101.0 41.6	174.5 147.5	234.3 36.5	88.1
1921 1922	100.7 223.2	110.0 84.2	135.3	119.0 36.1	149.9 157.8	1.5 11.0	19.6 -22.4	63.5 67.1	64.8 -12.7	172.2 171.3	80.2 76.2	112.0 190.0	94.2 100.1
1923 1924	144.3 136.4	89.3 117.7	136.8 296.9	100.9 152.0	70.6 87.9	-7.9 111.3	5.0 28.8	46.4	62.7 74.8	132.2 87.4	128.1 53.0	86.1 178.1	82.9 116.6
1925 1926	172.7	205.7 151.6	184.7 97.3	292.0 133.2	64.9 35.8	78.9 53.6	67.3 56.3	3.0 29.1	208.9	239.7	229.1 149.8	201.1	161.5
1927 1928	179.8	138.9	91.4 78.7	143.4	38.4	-6.5	-17.4 -4.6	26.9	175.7	174.4 116.7	149.4 187.2	189.3 168.3	106.6
1929	164.3 48.9	119.8	185.0 89.5	125.1 140.9	64.7 112.1 33.8	-13.6 27.0 70.6	-46.0 -24.3	19.3 11.6 79.8	80.7	93.8 273.9	192.6	155.7	91.8 123.2
1930 1931	97.9 363.6	38.0	124.5	235.2	129.1	13.2	201.9	-29.9	203.2	104.0	211.1	451.0 163.1	171.5 110.8
1932	53.7	166.5	164.1	193.0	142.8	40.1	-54.9	157.4	04.0	20.7	199.2	100.1	110.8
1956	102.9	47.6	179.5	236.3	271.8	-0.8	-10.3	-8.2	72.7	204.0	203.8	194.4 179.6	123.8
1957 1958	126.8	147.8	88.88	93.7	84.9	35.2	-84.8	-56.0	32.4	66.0	204.2	243.8	81.3
1959 1960	71.4 89.3	69.8 185.4	109.0 103.9	258.2 204.8	161.8 48.8	104.9 -54.1	-5.7 43.6	5.6 77.1	102.5 -26.0	286.0 220.1	246.6 188.4	110.3 215.3	126.6 108.0
1961 1962	79.8 114.3	103.9 39.1	35.9 185.8	173.6 185.1	-67.4 91.1	-10.7 97.6	13.3 -18.8	-43.8 86.9	112.1 30.8	100.7 94.5	145.4 132.0	237.0 148.5	72.7 99.3
1963 1964	73.1 43.3	85.5 59.6	95•7 97•1	-9.6 102.2	50.0 10.8	22.5 60.7	55.0 98.7	51.3 3.7	58.4 104.8	237.9 52.0	290.5 78.0	251.1 127.4	105.4 69.7
1965 1966	-0.9 154.8	89.1 103.9	127.3 167.0	155.2	96.5 38.8	11.2 102.6	0.9 88.7	73.4 82.0	115.5 96.8	203.3	98.2 184.5	175.4 149.2	95.5 123.5
1967 1968	133.0 251.7	121.0 121.4	113.6 76.2	194.9 121.6	165.6 99.3	25.4 103.5	3.4 54.3	16.8 -6.0	143.6 32.6	152.2 141.3	187.8 198.0	93.6 177.6	112.2 114.3
1969 1970	133.4 154.7	175.7 105.4	92.4	163.8 122.1	176.7 85.5	55.0 8.6	-0.0 55.8	124.8 33.9	51.0 122.2	189.8 82.9	191.7 120.1	356.8 97.5	142.6 92.7
1971 1972	189.9	144.1	162.6 84.4	101.5 167.9	52.2 181.7	38.1 61.4	-9.9 -24.7	94.4 42.8	126.7 89.1	30.1 143.3	79.0 252.7	169.1 109.2	97.9 100.3
1973 1974	78.1 91.8	44.4	163.2 73.8	159.8	103.5 126.5	77.4 91.8	24.2 90.6	48.1 -7.2	73.3 176.5	144.3	87.5 84.6	249.9 210.1	105.0 101.1
1975 1976	53.6 71.7	48.1 83.1	133.8 116.3	215.3 178.2	10.2	5.9 78.0	81.7 33.5	-28.1 52.7	89.9 30.9	28.2 111.4	88.4 220.7	100.9 203.1	68.8 104.8
1977	119.4	90.5	75.6 76.3	112.5	45.4 48.6	39.2 -20.8	-20.5 10.5	44.7	13.5	253.9 88.1	232.0	168.1 108.6	97.9 60.3
1978 1979	57.0 73.4	68.7	53.5	108.2	1.0	93.6	7.0 -7.1	13.3 37.9	76.8 16.4	101.8 49.7	234.3	118.6 113.7	78.7 73.6
1980 1981	_	88.9 113.3		118.7	193.0	-0.4		-15.8 31.8		107.8. 137.9	_	27.5 84.2	59.9 108.1
1982 1983	8.6 52.6	120.8	79.5	271.0 37.7	230.3 84.1	31.1 5.3	38.0	16.7	137.2	148.7	52.5 159.1	182.0 110.2	71.6
1984 1985	264.8 108.6	178.4	174.9	131.1	220.0	37.6	68.7	-5.0	39.0	ر ۱۵۰۰	177•1	11046	, , , , , , ,
	445 0	101 6	100.0	116 3	96.9	207.0	21.9	35 A	76.7	128 2	158.6	171 7	100.9
Average	117.4	104.0	122.0	140.7	70.7	21.7	£1.7	٠٠٠٠	1014	روندا	1,000		

Table I-4 Comparison of Lake Toba Operation Method

Case	O Current Ope. Rule	<b>.</b>	11	111	AI .	· >	
Seasonal Restricted WL (RWL)	None	None	July e. 5.00 Aug. c. 4.84 Sept. e. 4.52 Bov. e. 4.56 Bov. e. 4.76 Jan. e. 4.16 Feb. e. 5.00 Mar-July 5.00	Ditto	Ditto	Ditto	1
Flood release incid. power discharge	st. q >5.05 186 m <sup>3</sup> /a >5.10 242 >5.15 315 >5.20 400	VL Q 30 m <sup>3</sup> /s	<sup>3</sup> / <sub>9</sub> >5.00 m 300 m <sup>3</sup> /s >5.50 400	41. Q 3/8 > 5.00 m 300 m <sup>3</sup> /8	VL Q > 5.00 m 200 m <sup>3</sup> /s > 5.10 250 > 5.20 300 > 5.50 400	Ditto	
			HL_S.00 HL_S.WL_3/s SP 100 <sup>m3</sup> /s	41 <u>5</u> 5.00 41.> RHL 5P=75	HI.(5.00 HI.>RHI.SP+50 HI.>RHI+.2SP+75	WL _ 5.00 H WL > RWL SP ;	SP=50 SP=75
Discharge for power generation	WL Q 3/2.40 m 101 m <sup>3</sup> / < 2.40 0	Q HT Q 3/S 24.50 m 101 m <sup>3</sup> /S 24.50 m 101 m <sup>3</sup> /S 0 95 0 00 00 00 00 00 00 00 00 00 00 00 00	X 2 2 2 2	#L q 24.50 103 <4.50 98 <4.00 95 <3.75 92 <3.50 86 <3.00 80 <2.40 0	ML Q 24.50 101 4.50-4.25 101/98 4.25-4.00 98/95 4.00-3.75 95/92 3.75-3.50 92/86 3.50-3.25 86/80 3.25-2.40 80	wt. Q ≥4.50 101 4.50-4.25 101, 4.25-4.00 98, 4.00-3.75 95, 3.75-3.50 92, 3.50-3.25 86, 3.25-2.40 €	9 101 101/98 98/95 92/80 86/80 80
Operation results							
F 81	905.42	905.37	905.17	905.27	300	300	
Lowest WL. Mt. m  Duration of O dis. days for 43.08 year	902.33 443	902.41	902.58	902.35 52	902.38	902.44	
Ave. power dis. m <sup>3</sup> /s for 43.08 year		9.46	93.9		(95.6)	95.6	1

Table I-5 Major Flood Inflow (net) into Lake Toba

Duration	Volume
1 Sept. 1919 - 30 Apr. 19	$3,494 \times 10^6 \text{ m}^3$
11 Oct. 1924 - 10 May 19	3,219
1 Sept. 1925 - 30 Apr. 19	3,586
21 Oct. 1926 - 20 Apr. 19	927 2,636
1 Oct. 1930 - 31 May 19	931 4,743
21 Oct. 1931 - 20 May 19	3,990
11 Dec. 1956 - 31 May 19	2,687
21 Sept. 1957 - 20 May 19	3,162
11 Sept. 1959 - 20 May 19	3,608
1 Oct. 1963 - 31 Dec. 19	963 2,063
21 Sept. 1965 - 30 Apr. 19	966 2,895
21 Aug. 1966 - 20 May 19	3,614
1 Oct. 1968 - 31 May 19	3,295
1 Oct. 1969 - 31 May 19	970 3,511
21 Sept. 1977 - 20 Dec. 19	977 1,756
1 Feb. 1982 - 31 May 19	2,068
1 Sept. 1983 - 31 May 19	984 3,947

Table I-6 Probable Flood Inflow into Lake Toba

				Unit:	$10^6 \text{ m}^3$
Return Period	Hazen	Gumbel	Pearson III	Iwai	Adopted
100 year	4,527	4,917	4,548	4,428	4,500
50	4,253	4,546	4,278	4,186	4,300
30	4,049	4,270	4,068	4,000	4,100
10	3,569	3,667	3,595	3,560	3,600
5	3,252	3,268	3,256	3,240	3,300
2	2,697	2,665	2,693	2,693	2,700

## Table I-7 Net Inflow Volume into Lake Toba during Flood Season

(1 Oct. thru 31 May)

	·	
No.	Year	Volume
1	1930/31	$4,743 \times 10^6 \text{ m}^3$
2	31/32	3,917
3	83/84	3,592
4	69/70	3,511
5	59/60	3,344
6	68/69	3,295
7	19/20	3,262
8	24/25	3,234
9	66/67	3,228
10	25/26	3,141
:11	58/59	3,114
12	23/24	3,001
13	57/58	2,961
14	67/68	2,909
15	61/62	2,903
16	16/17	2,889
17	63/64	2,882
18	26/27	2,864
19	65/66	2,862
20	21/22	2,844
21	28/29	2,790
22	72/73	2,777
23	77/78	2,769
24	73/74	2,709
25	27/28	2,598
26	22/23	2,584
27	76/77	2,569
28	81/82	2,501
29	70/71	2,490
30	60/61	2,485
31	79/80	2,480
32	29/30	2,314
33	80/81	2,255
34	20/21	2,200
35	71/72	2,139
36	74 <u>/</u> 75	2,046
37	75/76	1,962
38	64/65	1,897
39	62/63	1,761
40	78/79	1,668
41	82/83	1,652

Table I-8 Operation of Lake Toba: Case V

# (Tentative Operation Prior to Completion of the UrgentFlood Control Project)

	Siruar Q	NWL	Net Inflow	Discharge	Spill	WL.	RWL		Siruar O	N WL	Net (nflow	Discharge	Spill	WL.	EML.
1931	(CMB)	(m)	(cas)	(cas)	(cas)	· (m)	(a)		(ens)	(m)	(cas)	(cms)	(cms)	(m)	(m)
Sept.	20					904,810	904.680	Nov.	130.0	5.61	2.69	101	75	4.721	4.524
Oct.	134.0	5.66	-120.62	101	50	4,789	4.675	2	129.0 129.0	5.40 5.59	1.69	101	50 50	4.71ů 4.690	4.532 4.532
2	133.0	5.64	-121.64	101	50	4.767	4.670	Ā	128.0	5,58	0,69	101	50	4.684	4.536
3 4	132.0	5.60	~122.63 2.69	101	50 50	4.746 4.754	4.665 4.660	5 6	127.0	5.57	870.87	101	50 75	4.744	4.540
5	129.0	5.59	1.69	101	50	4.722	4.655	7	146.0	5.63 5.71	1148.52 18.68	101	75	4.808	4.548
6	129.0	5.58	1.59	101	50 50	4.711 4.699	4.645	8	145.0	5.70	17.69	101	75	4.776	4.552
7 8	128.0	5.57 5.56	1.68 0.69	101	50 50	4.687	4.640	10	140.0 138.0	5. 69 5. 69	140.00 138.00	101	75 75	4.793 4.790	4,556 4,550
9	126.0	5.55	-1.32	101	50	4.675	4.635	•			235.05				
10	124.0	5.54	-3.32 -36.11	101	50	4.663	4.630	11	135.0	5.69	B. 6B	101	75	4,777	4.564
								12	135.0	5.48	7.69	101	75	4.764	4.568
1 t 1 2	124.0	5.53 5.52	~3.31 ~431.63	101 101	50 50	4.651	4.625 4.620	13	135.0 133.0	5.67 5.66	7.69 5.69	101 101	50 50	4.752 4.741	4,572 4,576
13	122.0	5.50	-5.31	101	50	4.616	4.615	is	131.0	5.65	3.69	101	50	4.729	4.580
14 15	122.0	5.49 5.49	-5.32	101		4.608	4.610	15 17	130.0 143.0	5.44 5.72	1148.52 143.00	101 101	50 75	4.898 4.603	4.584 4.588
16	122.0	5.48	-5.31 -7.32	101		4,591	4.600	18	140.0	5.72	12.68	101	75	4.792	4.592
17	117.0	5.46	-8.32	101		4.583 4.574	4.595 4.590	19	137.0	5.71	264.32	101	50	4.801	4.578
16 19	118.0 118.0	5.45 5.44	-9.31 -9.32	101 101		4.565	4.585	20	128.0	5.72	519.94 212.19	101	75	4.978	4.800
20	117.0	5.43	~10.31	101		4.557	4.580		2.2						
			-19,55	•				21 22	141.0	5.75 5.79	650.28 146.00	101	75 75	4.863 4.863	4.604 4.600
21	114.0	5,42	~11.32	101		4.548	4.575	23	145.0	5.79	272.32	101	75	4.871	4.612
23 23	115.0	5.41 5.41	115.00 241.32	101 201		4.549 4.560	4.570 4.585	24 25	148.0 149.0	5.80 5.81	275.31 403.43	101	75 75	4.870 4.874	4.616 4.620
24	119.0	5.42	-6.32	101		4.551	4.550	26	155.0	5.83	27.69	101	75	4.685	4.624
25	112.0	5.41 5.50	1257.84 377.63	101	50	4.642 4.660	4.555 4.550	27 28	149.0 146.0	5.82 5.81	21.69 18.69	101	75 · 75	4.873 4.860	4.628 4.652
76 27	125.0 127.0	5,52	1400.15	101	50	4.758	4.545	29	145.0	5.80	17.68	101	75	4.848	4.656
28 29	138.0	5.62	108.00	101	75 75	4.755 4.742	4.535 4.535	30	144.0	5.79	16.58 184.99	101	75	4.83\$	4.640
20	136.0 132.0	5.62 5.61	8.6B 132.00	101	75	4.739	4.550				184.44				
31	151.0	5.61	131.00	101	75	4,735	4.500								
			343.82												
									Sieure O	b1 /-21	Not leften	Discharge	Çaj 11	611	SU:
_	Siruar O	N ML	Net Inflow	Discharge	Spill	WL	RWL		Siruar Q	N ML	Net Inflow	Discharge	Spill	6R.	KUL
	Siruar 0	N ML	Net Inflow	Discharge 	Spill (cas)			1932	Siruar Q (cms)	N k/L (m)	Net Inflow	Discharge (cms)	Spill (cms)	68. (a)	
Dec.		(a) 5.78	(cms)	(cms)	(cas)	(m) 4,875	(m) 4.644	Jan.	(cms)	(a)	(cas)	(cas)	(cms)	(a)	(a)
Dec. ! 2	(cns) 143.0 150.0	(a) 5.78 5.82	(cms) 652.26 277.31	(cms) 101 101	(cas) 50 75	(m) 4.875 4.683	(m) 4.644 4.643						(cms)	(a) 5.459 5.449	(m) 4.764 4.769
Dec.	(cms)	(a) 5.78	(cms)	(cms) 101 101 101 101	(cas) 50 75 75 75	(m) 4,875 4,683 4,901 4,879	(m) 4.644 4.649 4.652 4.656	Jan. ! 2 3	(cms) 195.0 196.0 194.0	(m) 6.45 6.45 6.44	(cms) 195.00 66.59 -60.63	(cms) 101 101 101	(cms) 99 99 99	(a) 5.459 5.449 5.429	(m) 4.764 4.769 4.772
Dec. 1 2 3 4 5	(cms) 143.0 150.0 151.0 156.0 154.0	(a) 5.78 5.82 5.83 5.65 5.65	(cms) \$52.26 277.31 405.65 156.00 1427.15	(cms) 101 101 101 101 101	(cas) 50 75 75 75 75	(m) 4.875 4.683 4.901 4.899 4.997	4.644 4.649 4.652 4.656 4.660	Jan. 1 2 3 4	(cms) 195.0 196.0	(n) 6.45 6.45	(cms) 195.00 66.59	(cms)	(cms)	(a) 5.459 5.449	(a) 4.764 4.769 4.772 4.775 4.780
Dec. 1 2 3 4 5	(cns) 143.0 150.0 151.0 156.0 154.0 160.0	(a) 5.78 5.82 5.83 5.65 5.65 5.95	\$52.26 277.31 405.63 156.00 1427.15 2378.99	(cms) 101 101 101 101	(cas) 50 75 75 75	(m) 4.875 4.683 4.901 4.879 4.879 5.186 5.204	(m) 4.644 4.648 4.652 4.650 4.660 4.664 4.669	Jan. ! 2 3 4 5 6	195.0 196.0 194.0 194.0 192.0 159.0	(m) 6.45 6.45 6.44 6.42 6.40 6.38	(cms) 195.00 66.69 -60.63 -62.62 -55.63 60.68	(Cms)  101 101 101 101 101 101	(cms) 99 99 99 99 99	5.459 5.449 5.429 5.408 5.387 5.376	4.764 4.769 4.772 4.775 4.790 4.764
Dec. 1 2 3 4 5 6 7 8	(cms) 143.0 150.0 151.0 156.0 154.0 160.0 171.0 175.0	(a) 5.78 5.82 5.83 5.65 5.85 5.95 6.14 6.16	\$52.26 277.31 405.63 156.00 1427.15 2578.99 425.62 175.00	(cms) 101 101 101 101 101 101 101 101 101	(cms) 50 75 75 75 75 75 99	(m) 4.875 4.683 4.901 4.879 4.997 5.186 5.204 5.202	(m) 4.644 4.649 4.652 4.656 4.660 4.664 4.669 4.669	Jan. ! 2 3 4 5 6 7	(CMS) 195.0 196.0 194.0 192.0 198.0 168.0	6.45 6.45 6.44 6.42 6.40 6.38 6.37	(cms) 195.00 66.69 -60.64 -62.62 -65.63 60.68	(CMS)  101 101 101 101 101 101 101	(cms)  99 99 99 99 99 99	5.459 5.449 5.429 5.408 5.387 5.376 5.365	4.764 4.769 4.772 4.775 4.780 4.788
Dec. 1 2 3 4 5 6 7 8	(cms) 143.0 150.0 151.0 154.0 160.0 171.0 174.0	(a) 5.78 5.82 5.83 5.65 5.85 5.85 5.45 6.14 6.16	tcms)  \$52.26 277.31 405.63 156.00 1427.15 2378.99 425.62 175.00 46.67	(cms)  101 101 101 101 101 101 101 101	(cas) 50 75 75 75 75 75 75	(m) 4.875 4.683 4.901 4.879 4.879 5.186 5.204	(m) 4.644 4.648 4.652 4.650 4.660 4.664 4.669	Jan. ! 2 3 4 5 6 7 8	(cms) 195.0 196.0 194.0 192.0 189.0 168.0 189.0 188.0	6.45 6.45 6.44 6.42 6.38 6.37 6.38	(cns)  195.00  68.49  -60.64  -62.62  -65.63  60.68  -65.62  -68.63	(CMS)  101 101 101 101 101 101 101 101 101	(cms) 99 99 99 99 99 99 99 99	(a) 5.459 5.449 5.408 5.387 5.376 5.368 5.368 5.368	4.764 4.769 4.772 4.776 4.780 4.784 4.789 4.792 4.796
Dec. 1 2 3 4 5 6 7 8	(cms) 143.0 150.0 151.0 156.0 154.0 160.0 171.0 175.0	(a) 5.78 5.82 5.83 5.65 5.85 5.95 6.14 6.16	\$52.26 277.31 405.63 156.00 1427.15 2578.99 425.62 175.00	(cms)  101 101 101 101 101 101 101 101 101 1	(cas) 50 75 75 75 75 75 99 99	(m) 4.875 4.683 4.701 4.879 4.797 5.186 5.204 5.202 5.190	(m) 4.644 4.649 4.652 4.656 4.660 4.864 4.669 4.672 4.676	Jan. ! 2 3 4 5 6 7 8	195.0 196.0 196.0 194.0 192.0 159.0 168.0 189.0	6.45 6.45 6.44 6.42 6.38 6.37 6.35	(cns)  195.00 68.69 -60.64 -62.62 -45.63 60.68 60.68 65.62 -65.62 -66.63	(Cms)  101 101 101 101 101 101 101 101 101 1	(cms)  99 99 99 99 99 99	(a) 5.459 5.449 5.429 5.408 5.387 5.368 5.368	(n) 4.764 4.769 4.772 4.776 4.780 4.788 4.792
Dec. 1 2 3 4 5 6 7 8 9	(Cms)  143.0 150.0 151.0 156.0 154.0 160.0 171.0 175.0 174.0 172.0	(a) 5.78 5.82 5.85 5.85 5.85 5.95 6.14 6.16 6.15	\$52.26 277.31 \$05.63 \$156.00 \$127.15 2378.99 \$22.62 \$175.00 \$46.67 \$43.69	(cms) 101 101 101 101 101 101 101 101 101 10	(cas) 50 75 75 75 75 75 99 99	(m) 4.875 4.683 4.701 4.879 4.797 5.186 5.204 5.202 5.190	(m) 4.644 4.649 4.652 4.656 4.660 4.664 4.672 4.676 4.630	Jan. 1 2 3 4 5 6 7 8 9	(cms)  195.0 196.0 194.0 192.0 199.0 189.0 189.0 188.0 189.0	6. 45 6. 45 6. 42 6. 40 6. 38 6. 37 6. 35 6. 34 6. 32	(cns)  195.00 68.59 -60.64 -62.62 -65.63 -60.68 -65.62 -65.63 -65.62 -65.63 -65.62	(cms)  101 101 101 101 101 101 101 101 101 1	(cms)  99 99 99 99 99 99 99 99	5.459 5.449 5.429 5.408 5.376 5.376 5.344 5.323 5.312	4.764 4.759 4.772 4.775 4.780 4.784 4.784 4.792 4.792 4.600
Dec. 1 2 3 4 5 6 7 8	(cms) 143.0 150.0 151.0 154.0 160.0 171.0 174.0	(a) 5.78 5.82 5.85 5.85 5.85 5.95 6.14 6.16 6.15	4cms1 452,26 277,31 405,63 156,00 1427,15 2378,99 425,69 45,69 44,69 418,93	(cms) 101 101 101 101 101 101 101 101 101 10	(cms) 50 75 75 75 75 79 99 99	(m) 4, 875 4, 683 4, 901 4, 899 4, 997 5, 186 5, 204 5, 202 5, 190 5, 176	(m) 4.644 4.649 4.652 4.660 4.664 4.669 4.672 4.670 4.680	Jan. ! 23 4 5 6 7 8 9	(cms)  195.0 196.0 194.0 192.0 158.0 168.0 169.0 189.0	6.45 6.44 6.44 6.42 6.38 6.37 6.35 6.32	195.00 68.69 -60.61 -62.62 -65.63 60.68 -65.63 58.68 12.26	(cms)  101 101 101 101 101 101 101 101 101 1	(cms)  99 99 99 99 99 99 99	(a) 5, 459 5, 449 5, 429 5, 387 5, 376 5, 376 5, 323 5, 312 5, 301	4.764 4.769 4.772 4.774 4.780 4.784 4.792 4.792 4.792 4.600
Dec., 1 2 3 4 5 6 7 8 9 10 11 12 13	1000) 143.0 150.0 151.0 154.0 154.0 154.0 171.0 175.0 174.0 172.0	(m) 5.78 5.83 5.85 5.85 5.95 6.14 6.16 6.15 6.14 6.29 6.27	\$52.26 277.31 405.63 156.00 1427.15 2378.99 425.62 175.00 46.69 43.69 418.93	(cms) 101 101 101 101 101 101 101 101 101 10	(cms) 50 75 75 75 75 75 99 99 99	(m) 4.683 4.901 4.899 4.997 5.186 5.204 5.202 5.190 5.178 5.315 5.303	(m) 4.644 4.649 4.652 4.656 4.660 4.664 4.672 4.676 4.630	Jan. 1 2 3 4 5 6 7 8 9 10	(cms)  195.0 196.0 194.0 192.0 198.0 188.0 188.0 188.0 188.0	6.45 6.44 6.44 6.42 6.38 6.37 6.34 6.32 6.31 6.30 6.27	(cns)  195.00 68.69 -60.61 -62.62 -65.65 60.68 -65.65 53.68 12.26 56.47 54.68	(cms)  101 101 101 101 101 101 101 101 101 1	(cms)  99 99 99 99 99 99 99 99 99	(a) 5, 459 5, 449 5, 429 5, 429 5, 587 5, 576 5, 584 5, 523 5, 512 5, 501 5, 290 5, 268	4.764 4.769 4.775 4.780 4.780 4.788 4.792 4.796 4.600
Dec. 1 2 3 4 5 6 7 8 9 10	(ces)  143.0 150.0 151.0 154.0 154.0 160.0 171.0 172.0 171.0 185.0 185.0	(a) 5.78 5.82 5.85 5.85 5.85 5.95 6.14 6.16 6.15	4cms1 452,26 277,31 405,63 156,00 1427,15 2378,99 425,69 45,69 44,69 418,93	(cms) 101 101 101 101 101 101 101 101 101 10	(cms) 50 75 75 75 75 75 99 99 99 99	(m) 4.875 4.683 4.901 4.899 4.997 5.186 5.204 5.202 5.176 5.315 5.304 5.303 5.282 5.280	(n) 4.644 4.649 4.652 4.653 4.660 4.664 4.669 4.672 4.676 4.680	Jan. 12 33 45 56 77 89 10	(cms)  195.0 194.0 194.0 192.0 189.0 168.0 169.0 189.0 188.0	(6) 6.45 6.45 6.44 6.38 6.38 6.34 6.34 6.34 6.32 6.31 6.30 6.27	(cms)  195.00 68.69 -60.64 -62.62 -65.63 60.68 -65.62 -65.63 53.68 12,26	(cms)  101 101 101 101 101 101 101 101 101 1	(cms)  49 99 99 99 99 99 99 99 99 99 99	5. 459 5. 449 5. 408 5. 587 5. 376 5. 365 5. 365 5. 365 5. 323 5. 512 5. 301 5. 290 5. 290 5. 257	4.764 4.769 4.772 4.775 4.784 4.784 4.786 4.795 4.600 4.808 4.808 4.802 4.816
Dec. 1 2 3 4 5 6 7 8 9 10	(cms)  143.0 150.0 151.0 154.0 154.0 160.0 171.0 172.0 172.0 171.0 188.0 185.0 185.0 180.0	(a) 5.78 5.82 5.83 5.85 5.95 6.14 6.16 6.15 6.14 6.29 6.27 6.27 6.25	452.26 277.31 455.63 155.00 1427.15 2378.99 423.82 175.00 46.69 41.69 41.69 618.93 1953.40 60.49 185.00 185.00	(cms) 101 101 101 101 101 101 101 101 101 10	(cms) 50 75 75 75 75 79 99 99 99 99	(m) 4.693 4.693 4.991 4.897 5.186 5.204 5.204 5.176 5.315 5.304 5.282 5.280 5.279	(n) 4.614 4.649 4.652 4.660 4.664 4.664 4.669 4.672 4.676 4.684 4.688 4.692 4.692 4.700 4.700	Jan. 12 34 55 67 69 10	(cms)  195.0 196.0 194.0 192.0 198.0 188.0 188.0 188.0 188.0	6.45 6.45 6.44 6.44 6.37 6.34 6.37 6.34 6.37 6.34 6.37	(cns)  195.00 68.69 -60.61 -62.62 -65.65 60.68 -65.65 53.68 12.26 56.47 54.68	(cms)  101 101 101 101 101 101 101 101 101 1	(cms)  99 99 99 99 99 99 99 99 99 99 99 99	5.459 5.429 5.408 5.376 5.368 5.376 5.368 5.323 5.312 5.301 5.290 5.257 5.248 5.257 5.257	4.784 4.784 4.789 4.772 4.778 4.780 4.782 4.794 4.600 5.804 4.808 4.816 4.820 4.824
Dec. 1 2 3 4 5 6 7 8 9 10	(Cms)  143.0 150.0 151.0 154.0 154.0 160.0 171.0 172.0 174.0 171.0 185.0 185.0 180.0 180.0	(m) 5.78 5.82 5.83 5.85 5.85 5.95 6.14 6.15 6.13 6.28 6.27 6.25 6.25	\$52, 26 277.31 405.65 156.00 1427.15 2578.99 425.62 175.00 46.67 44.69 618.90 1953.40 60.69 185.00 -89.63 180.00	(cms) 101 101 101 101 101 101 101 101 101 10	(cms) 50 75 75 75 75 99 99 99 99 99	(m) 4. 875 4. 683 4. 701 4. 879 4. 879 4. 879 5. 186 5. 204 5. 202 5. 170 5. 176 5. 303 5. 282 5. 280 5. 279 5. 267 5. 267	(n) 4,614 4,619 4,652 4,656 4,660 4,664 4,677 4,676 4,680 4,681 4,682 4,692 4,700 4,700 4,700 4,712	Jan. 12 34 55 67 89 10 11 12 13 14 15 16	195.0 196.0 194.0 194.0 192.0 189.0 188.0 188.0 188.0 188.0 188.0 186.0	6.45 6.42 6.442 6.43 6.37 6.34 6.37 6.34 6.37 6.54 6.32 6.30 6.27 6.26 6.26	(cns)  195.00 68.69 -60.63 -62.62 -65.65 60.68 -65.62 -66.63 53.68 12.26 56.67 54.68 50.69 47.63	(Cons.)  101 101 101 101 101 101 101 101 101 1	(cms)  49 99 99 99 99 99 99 99 99 99 99 99 99	(a) 5.459 5.429 5.429 5.376 5.364 5.323 5.517 5.268 5.268 5.275 5.275 5.275 5.275 5.275 5.275 5.275 5.275 5.275 5.275	4.764 4.764 4.769 4.772 4.776 4.780 4.782 4.795 4.600 4.804 4.804 4.804 4.804 4.812 4.812 4.812 4.824 4.824
Dec. 1 2 3 4 4 5 6 7 8 9 10	(CAS) 147.0 150.0 150.0 151.0 156.0 174.0 177.0 177.0 177.0 177.0 185.0 185.0 185.0 180.0 180.0 180.0 179.0	(a) 5.78 5.82 5.83 5.85 5.85 5.44 6.14 6.15 6.12 6.27 6.27 6.25 6.25 6.24	452.26 277.31 405.65 125.00 1427.15 2378.99 423.62 175.00 46.69 44.69 41.69 60.69 185.00 -69.63 180.00 180.00 180.00 179.00	(cms) 101 101 101 101 101 101 101 101 101 10	(cms) 50 75 75 75 75 75 79 99 99 99 99 99 99	(m) 4.875 4.683 4.901 4.899 4.997 5.186 5.204 5.202 5.190 5.176 5.315 5.303 5.282 5.279 5.264 5.265	(n) 4,644 4,849 4,852 4,653 4,660 4,654 4,672 4,676 4,680 4,680 4,680 4,704 4,704 4,704 4,704 4,712	Jan. 12 33 4 55 6 7 8 9 10 11 12 13 14 15 16 17 18	195.0 196.0 196.0 194.0 192.0 189.0 188.0 189.0 188.0 188.0 186.0 182.0 182.0 180.0 177.0 175.0	6.45 6.45 6.45 6.42 6.37 6.37 6.37 6.32 6.32 6.32 6.32 6.32 6.32 6.32 6.32	(cms)  195.00 68.69 -60.64 -62.62 -65.63 60.68 -65.62 -66.63 53.69 12.26 55.67 54.68 -72.63 50.69	(Come)  101 101 101 101 101 101 101 101 101 1	(cms) 99 99 99 99 99 99 99 99 99 99 99 99 99	(a) 5.459 5.429 5.429 5.408 5.526 5.524 5.523 5.501 5.209 5.245 5.221 5.201 5.	4.764 4.759 4.772 4.775 4.786 4.786 4.792 4.795 4.795 4.800 4.812 4.812 4.812 4.813 4.820 4.813 4.823 4.823 4.823 4.834 4.834
Dec. 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18	(cms)  143.0 150.0 151.0 155.0 154.0 154.0 171.0 171.0 172.0 171.0 172.0 171.0 185.0 185.0 180.0 180.0 180.0	(a) 5.78 5.82 5.83 5.85 5.95 6.14 6.16 6.14 6.27 6.27 6.25 6.24	452.26 277.31 455.63 155.00 1427.15 2378.99 425.62 175.00 46.69 41.69 41.69 41.69 610.69 1953.40 1953.40 185.00 52.69 179.00	(cms)  101 101 101 101 101 101 101 101 101 1	(cms) 50 75 75 75 75 99 99 99 99 99	(m) 4. 875 4. 683 4. 701 4. 879 4. 879 4. 879 5. 186 5. 204 5. 202 5. 170 5. 176 5. 303 5. 282 5. 280 5. 279 5. 267 5. 267	(n) 4,614 4,619 4,652 4,656 4,660 4,664 4,677 4,676 4,680 4,681 4,682 4,692 4,700 4,700 4,700 4,712	Jan. 12 34 55 67 89 10 11 12 13 14 15 16	195.0 196.0 194.0 194.0 192.0 189.0 188.0 188.0 188.0 188.0 188.0 188.0 186.0	6.45 6.42 6.442 6.43 6.37 6.34 6.37 6.34 6.37 6.54 6.32 6.30 6.27 6.26 6.26	195.00 68.49 -60.64 -62.62 -65.63 60.68 -65.62 -65.63 53.69 12,26 55.69 -72.63 50.69 -72.63 50.69 -72.60 50.69	(Come)  101 101 101 101 101 101 101 101 101 1	(cms)  99 99 99 99 99 99 99 99 99 99 99	5.459 5.429 5.429 5.408 5.536 5.365 5.365 5.324 5.323 5.312 5.220 5.229 5.229 5.223 5.223 5.223 5.223	4.764 4.759 4.772 4.775 4.786 4.786 4.786 4.786 4.792 4.600 4.808 4.814 4.824 4.824 4.832 4.833
Dec. 1 2 3 4 4 5 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20	(Cas) 143.0 150.0 150.0 151.0 154.0 174.0 171.0 172.0 171.0 185.0 185.0 180.0 190.0 180.0 179.0	(a) 5.78 5.82 5.85 5.85 5.85 6.14 6.16 6.13 6.14 6.29 6.27 6.27 6.27 6.25 6.24 6.24	\$52.26 277.31 405.63 156.00 1477.15 2378.99 425.62 175.00 46.69 41.69 418.93 1953.40 60.69 185.00 52.69 179.00 179.00 179.00 305.31 320.53	(cms)  101 101 101 101 101 101 101 101 101 1	(cms) 50 75 75 75 75 75 77 79 99 99 99 99 99 99	(m) 4,875 4,683 4,901 4,879 4,997 5,186 5,204 5,202 5,190 5,176 5,303 5,282 5,290 5,272 5,264 5,272	(n) 4.614 4.849 4.852 4.653 4.660 4.664 4.672 4.676 4.680 4.680 4.700 4.700 4.700 4.716 4.720 4.720	Jan. 1 2 3 3 4 5 6 7 7 8 9 9 10 11 12 13 14 15 16 17 18 19 20	195.0 194.0 194.0 194.0 192.0 189.0 188.0 188.0 188.0 188.0 188.0 184.0 182.0 180.0 177.0 174.0 174.0	6.45 6.45 6.44 6.42 6.38 6.37 6.34 6.32 6.32 6.27 6.25 6.27 6.25 6.22 6.22 6.22	195.00 68.49 -60.64 -62.62 -65.63 60.68 -65.63 -68.63 -53.68 12,26 54.69 -74.68 -72.63 52.66 50.69 -78.63 175.00 301.31	(Come)  101 101 101 101 101 101 101 101 101 1	(cms)  99 99 99 99 99 99 99 99 99 99 99 99 9	5. 459 5. 429 5. 429 5. 409 5. 509 5. 509 5. 504 5. 523 5. 501 5. 290 5. 257 5. 227 5. 225 5. 221 5. 221 5. 227 5. 227 5. 227 5. 227 5. 227 5. 227 5. 227 5. 227 5. 227	4.764 4.769 4.772 4.773 4.780 4.780 4.784 4.782 4.800 4.809 4.808
Dec. 1 1 2 5 6 6 7 8 9 10 11 12 13 14 15 15 15 17 20 21 22	(Cas)  143.0 150.0 150.0 151.0 154.0 154.0 174.0 175.0 174.0 178.0 185.0 180.0 180.0 179.0 179.0 179.0	(a) 5.78 5.82 5.85 5.85 5.85 6.14 6.16 6.15 6.14 6.27 6.27 6.27 6.27 6.25 6.24 6.24 6.24	\$6ms1 \$52.26 277.31 \$65.63 155.00 1427.15 2378.99 \$25.62 175.00 46.69 41.69 418.93 1953.40 60.69 185.00 52.69 179.00 179.00 179.00 205.31 320.55	(cms)	(cas) 50 75 75 75 75 75 79 99 99 99 99 99 99 99 99 99 99 99 99	(m) 4,875 4,683 4,901 4,979 4,979 1,186 5,204 5,204 5,190 5,303 5,303 5,303 5,267 5,264 5,264 5,264 5,275	(n) 4,614 4,649 4,652 4,656 4,660 4,664 4,672 4,672 4,680 4,688 4,698 4,700 4,704	Jan. 1 2 3 3 4 5 5 6 7 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 21	195.0 196.0 194.0 194.0 192.0 189.0 189.0 189.0 183.0 183.0 183.0 184.0 182.0 182.0 187.0 177.0 177.0 177.0 178.0	6.45 6.45 6.44 6.49 6.37 6.54 6.37 6.54 6.32 6.32 6.32 6.32 6.24 6.22 6.23	(cns)  193.00 68.69 -60.64 -62.62 -65.65 60.68 -65.62 -66.63 53.66 12.26 55.69 -72.63 52.68 50.69 49.69 -78.63 173.00 301.31 76.75	(Cms)  101 101 101 101 101 101 101 101 101 1	(cms) 99 99 99 99 99 99 99 99 99 99 99 99 99	(a) 5.459 5.449 5.429 5.408 5.587 5.376 5.323 5.312 5.312 5.312 5.225 5.225 5.225 5.215 5.215	(m) 4.764 4.759 4.772 4.776 4.789 4.788 4.788 4.796 4.800 4.804 4.804 4.814 4.814
Dec. 1 2 3 4 5 6 7 7 8 9 10 11 12 15 16 17 18 17 18 17 18 17 18 17 18 17 18 17 18 17 18 17 18 17 18 17 18 17 18 17 18 17 18 18 17 18 18 18 18 18 18 18 18 18 18 18 18 18	(Cas)  142.0 150.0 151.0 151.0 153.0 153.0 153.0 153.0 171.0 175.0 177.0 177.0 185.0 180.0 180.0 179.0 179.0 179.0 179.0 179.0 179.0 177.0	(a) 5.78 5.82 5.85 5.85 5.85 6.14 6.14 6.15 6.12 6.27 6.25 6.25 6.24 6.24 6.24	452.26 277.31 405.65 156.00 1427.15 2578.99 423.69 46.69 48.99 1953.40 60.69 185.00 -69.63 180.00 180.00 197.00 205.31 200.55	(cms)  101 101 101 101 101 101 101 101 101 1	(cas) 50 75 75 75 75 75 77 99 99 99 99 99 99 99 99 99 99 99 99	(m) 4,875 4,683 4,701 4,879 4,997 5,186 5,204 5,202 5,190 5,176 5,305 5,203 5,	(n) 4.614 4.849 4.852 4.653 4.660 4.664 4.672 4.676 4.680 4.680 4.700 4.700 4.700 4.716 4.720 4.720	Jan. 1 1 2 3 4 4 5 5 6 7 7 6 9 10 11 12 13 14 14 15 14 15 12 12 22 22 23 3	195.0 196.0 194.0 194.0 194.0 199.0 189.0 189.0 189.0 189.0 189.0 180.0 182.0 180.0 170.0 177.0 177.0 178.0 178.0	6.45 6.45 6.44 6.49 6.37 6.54 6.37 6.54 6.37 6.54 6.32 6.32 6.22 6.23 6.23 6.23	(cns)  193.00 68.69 -60.64 -62.62 -65.65 60.68 -65.62 -66.63 53.68 12.26 55.69 -72.63 52.68 50.69 49.69 -78.63 173.00 301.31 78.00 50.69 50.69 50.69 50.69	(Cms)  101 101 101 101 101 101 101 101 101 1	(cms)  99 99 99 99 99 99 99 99 99 99 99 99 9	(a) 5.459 5.449 5.409 5.108 5.108 5.305 5.375 5.375 5.312 5.312 5.323 5.312 5.245 5.245 5.245 5.215 5.215	(m) 4.764 4.759 4.772 4.776 4.780 4.780 4.780 4.780 4.780 4.780 4.804 4.804 4.804 4.804 4.804 4.804 4.804 4.804 4.804 4.804 4.804 4.804 4.804
Dec. 1 2 3 4 5 5 6 7 8 9 9 10 11 12 13 14 15 11 14 15 11 15	(Cas)  142.0 150.0 151.0 151.0 154.0 154.0 154.0 171.0 175.0 177.0 177.0 177.0 177.0 177.0 177.0	(a) 5.78 5.82 5.85 5.85 5.85 5.85 6.14 6.16 6.16 6.12 6.27 6.25 6.25 6.24 6.24 6.24 6.24	\$52.26 277.31 405.65 156.00 1427.15 2378.99 423.62 175.00 46.69 618.90 1953.40 60.69 185.00 187.00 187.00 197.00 197.00 197.00 177.00 177.00 177.00 177.00 177.00 177.00	(cms)  101 101 101 101 101 101 101 101 101 1	(cas) 50 75 75 75 75 77 77 77 77 77 77 77 77 77	(m) 4,875 4,683 4,701 4,879 4,977 5,196 5,204 5,204 5,303 5,303 5,303 5,202 5,290 5,267 5,264 5,272 5,264 5,272 5,257 5,275 5,275 5,275 5,275	(n) 4.644 4.649 4.652 4.656 4.660 4.664 4.672 4.676 4.688 4.692 4.700 4.700 4.700 4.710 4.720 4.712 4.720 4.724 4.720 4.724 4.722 4.735 4.736	Jan. 1 2 3 4 4 5 6 6 7 7 8 8 9 9 10 111 122 133 144 155 166 17 188 19 20 21 22 23 24	195.0 194.0 194.0 194.0 194.0 194.0 195.0 188.0 188.0 188.0 188.0 188.0 184.0 182.0 180.0 177.0 174.0 175.0 174.0 174.0 175.0	6.45 6.45 6.44 6.42 6.38 6.38 6.34 6.35 6.34 6.32 6.26 6.27 6.25 6.22 6.22 6.22 6.22 6.22 6.22	(cms)  195.00 68.49 -60.64 -62.62 -65.63 60.68 -65.63 53.68 -12.26 55.69 -72.63 52.68 30.69 -78.63 175.00 301.31 178.00 76.75 50.68 48.68 47.69	(Care)  101 101 101 101 101 101 101 101 101 1	(cms)  99 99 99 99 99 99 99 99 99 99 99 99 9	5.459 5.429 5.429 5.429 5.429 5.368 5.344 5.323 5.512 5.301 5.290 5.225 5.225 5.215 5.209 5.215 5.209 5.215 5.209 5.215	4.764 4.759 4.772 4.778 4.786 4.786 4.786 4.786 4.786 4.800 4.804
Dec. 1 1 2 3 4 5 6 6 7 8 8 9 10 11 12 13 14 15 15 16 17 20 22 23 4 22 5 24 22 5 26	(Cas) 143.0 150.0 150.0 151.0 154.0 154.0 171.0 175.0 174.0 175.0 174.0 185.0 180.0 180.0 180.0 179.0 179.0 179.0 177.0 177.0 177.0 177.0	(a) 5.78 5.82 5.85 5.85 5.95 6.14 6.16 6.15 6.27 6.22 6.27 6.25 6.24 6	\$cms1 \$52.26 277.31 \$05.63 155.00 1477.15 2378.99 \$127.00 46.69 418.92 195.00 50.63 180.00 52.69 179.00 179.00 179.00 177.00 45.62 177.00 177.00 45.63	(cms)	(cas) 50 75 75 75 75 75 79 99 99 99 99 99 99 99 99 99 99 99 99	(m) 4,875 4,683 4,901 4,899 4,999 4,999 5,186 5,202 5,190 5,202 5,202 5,203 5,204 5,203 5,204 5,203 5,204 5,205 5,204 5,205 5,204 5,205 5,205 5,207 5,	(n) 4,614 4,649 4,652 4,656 4,669 4,672 4,672 4,680 4,688 4,692 4,690 4,700 4,704	Jan. 1 2 3 3 4 4 5 6 6 7 7 8 9 9 10 111 112 113 114 115 116 117 118 119 220 23 244 242 25 264	195.0 194.0 194.0 194.0 194.0 194.0 195.0 188.0 188.0 188.0 188.0 188.0 188.0 189.0 189.0 179.0 179.0 174.0 174.0 178.0 178.0 178.0 178.0 178.0 178.0 174.0	6.45 6.45 6.44 6.42 6.38 6.38 6.35 6.35 6.35 6.32 6.25 6.25 6.25 6.25 6.22 6.22 6.22 6.2	(cns)  195.00 68.49 -60.64 -62.62 -65.63 60.68 -65.63 53.68 -12.26 55.69 -72.63 -52.68 50.69 -79.63 175.00 301.31 178.00 -76.75 -50.69 48.68 48.68 47.69 48.68 48.68	(Care)  101 101 101 101 101 101 101 101 101 1	(cms)  99 99 99 99 99 99 99 99 99 99 99 99 9	5.459 5.429 5.429 5.408 5.368 5.376 5.376 5.376 5.523 5.512 5.521 5.209 5.225	4.764 4.759 4.772 4.778 4.786 4.786 4.786 4.782 4.800 4.800 4.804 4.805 4.804
Dec. 1 2 3 4 5 5 6 7 8 9 9 10 11 12 13 14 15 11 14 15 11 15	(Cas)  142.0 150.0 151.0 151.0 154.0 154.0 154.0 171.0 175.0 177.0 177.0 177.0 177.0 177.0 177.0	(a) 5.78 5.82 5.85 5.85 5.85 5.85 6.14 6.16 6.16 6.12 6.27 6.25 6.25 6.24 6.24 6.24 6.24	\$6ms1 \$52,26 277.31 \$05.63 155.00 1477.15 2378.99 \$125.00 46.69 \$418.92 175.00 46.69 \$618.92 179.00 180.00 52.69 179.00 177.00 177.00 431.62 183.00	(cms)	(cas) 50 75 75 75 75 79 99 99 99 99 99 99 99 99 99 99 99 99	(m) 4,875 4,683 4,791 4,899 4,999 4,999 5,186 5,202 5,198 5,203 5,	(n) 4,614 4,649 4,652 4,656 4,660 4,669 4,672 4,672 4,680 4,680 4,680 4,690 4,680 4,700 4,700 4,716 4,720 4,	Jan. 1 2 3 4 5 5 6 9 10 11 12 13 14 15 16 16 17 18 19 20 21 22 23 24 25 26 27	195.0 196.0 194.0 194.0 192.0 199.0 189.0 189.0 189.0 189.0 189.0 180.0 180.0 180.0 180.0 180.0 180.0 170.0	6.45 6.45 6.44 6.44 6.37 6.34 6.37 6.34 6.37 6.32 6.32 6.32 6.22 6.23 6.22 6.23 6.23	(cms)  195.00 48.67 -60.64 -62.62 -45.63 60.68 -65.62 -66.63 53.68 12.26 54.69 -72.65 50.69 49.69 -78.63 175.00 301.31 76.75 50.69 48.66 47.69 48.66 47.69 48.66 47.69 45.68	(Cms)  101 101 101 101 101 101 101 101 101 1	(cms)  99 99 99 99 99 99 99 99 99 99 99 99 9	(a) 5.459 5.429 5.408 5.507 5.365 5.375 5.365 5.312 5.301 5.225 5.225 5.227 5.215 5.21	(m) 4.764 4.759 4.772 4.776 4.780 4.788 4.796 4.796 4.807
Dec. 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 6 17 8 19 20 21 22 32 45 26 7 28 9	(CAS)  142.0 150.0 151.0 151.0 151.0 160.0 171.0 160.0 171.0 180.0 180.0 180.0 180.0 179.0 179.0 177.0 177.0 177.0 177.0 177.0 188.0	(a) 5.78 5.82 5.85 5.85 5.85 5.85 6.14 6.14 6.14 6.27 6.25 6.25 6.24 6.24 6.24 6.24 6.24 6.25 6.33	\$6.83 \$52.26 277.31 405.63 156.00 1427.15 2378.99 423.89 175.00 46.59 618.93 1953.40 60.69 185.00 185.00 180.00 52.59 179.00 305.31 320.53 51.69 177.00 177.	(cms)  101 101 101 101 101 101 101 101 101 1	50 75 75 75 75 75 75 75 77 77 77 77 77 97 99 99 99 99 99 99 99	(m) 4, 875 4, 683 4, 701 4, 897 4, 997 4, 997 5, 176 5, 176 5, 176 5, 204 5, 203 5, 20	(n) 4.644 4.649 4.652 4.653 4.660 4.664 4.677 4.676 4.688 4.692 4.704 4.708 4.718 4.720 4.724 4.724 4.725 4.735 4.735	Jan. 1	195.0 196.0 194.0 194.0 194.0 192.0 189.0 189.0 189.0 189.0 189.0 180.0 182.0 182.0 182.0 182.0 179.0 177.0 176.0 177.0 178.0	6.45 6.45 6.44 6.42 6.38 6.38 6.36 6.37 6.36 6.32 6.32 6.25 6.25 6.25 6.25 6.25 6.25 6.25 6.2	(cns)  195.00 48.67 -60.64 -62.62 -65.63 60.68 -65.62 -66.63 53.68 -72.65 50.69 -72.65 50.69 49.69 -78.63 175.00 301.31 76.75 50.69 50.68 48.68 47.69 45.68 47.69 45.68 47.69 45.68 47.69 45.68	(Care)  101 101 101 101 101 101 101 101 101 1	(cms)  99 99 99 99 99 99 99 99 99 99 99 99 9	(a) 5.459 5.429 5.429 5.429 5.507 5.375 5.375 5.371 5.200 5.225 5.215 5.207 5.215 5.209 5.215 5.209 5.215 5.204 5.125 5.215 5.204 5.125 5.215	(m) 4.764 4.759 4.772 4.776 4.780 4.788 4.790 4.788 4.794 4.800 4.801 4.802 4.813 4.823 4.824 4.823 4.824 4.835 4.835 4.835 4.854 4.852 4.854 4.858
Dec. 1 1 2 3 4 5 6 6 7 8 9 10 11 12 3 14 4 15 6 17 20 22 22 4 25 6 27 28	(Cas) 143.0 150.0 150.0 151.0 154.0 154.0 171.0 172.0 174.0 185.0 185.0 185.0 180.0 180.0 179.0 179.0 179.0 179.0 179.0 179.0 179.0 179.0 179.0 179.0 179.0 179.0 179.0	(a) 5.78 5.82 5.85 5.85 5.95 6.14 6.15 6.14 6.22 6.27 6.25 6.24 6.24 6.24 6.24 6.24 6.24 6.25 6.33 6.33	\$6 ms1 \$52, 26 277. 31 \$405.65 \$156.00 \$1427.15 2378.99 \$423.62 \$175.00 \$46.69 \$41.69 \$60.69 \$185.00 \$185.00 \$197.00 \$177.00 \$177.00 \$177.00 \$177.00 \$177.00 \$177.00 \$177.00 \$177.00 \$177.00 \$177.00 \$177.00 \$178.62 \$124.84 \$66.69 \$188.04	(cas)	(cas) 50 75 75 75 75 79 99 99 99 99 99 99 99 99 99 99 99 99	(m) 4,875 4,683 4,791 4,899 4,999 4,999 5,186 5,202 5,198 5,203 5,	(n) 4,614 4,649 4,652 4,656 4,660 4,669 4,672 4,672 4,680 4,680 4,680 4,690 4,680 4,700 4,700 4,716 4,720 4,	Jan. 1 2 3 4 4 5 6 6 7 7 8 8 9 9 10 11 12 13 14 15 16 17 18 19 20 21 22 22 23 24 22 27 26 27 28	195.0 194.0 194.0 194.0 192.0 189.0 188.0 188.0 188.0 188.0 182.0 182.0 182.0 174.0 177.0 176.0 177.0 178.0	6.45 6.45 6.46 6.46 6.37 6.37 6.37 6.30 6.32 6.32 6.22 6.22 6.22 6.22 6.22 6.21 6.16 6.17 6.17 6.17 6.17 6.25	195.00 68.49 -60.64 -62.62 -65.63 60.68 -65.63 58.68 12,26 55.67 54.68 50.69 49.69 49.69 175.00 301.31 178.00 76.75 50.68 48.66 47.69 48.66 49.69 47.69 46.68	(Cms)  (Cms)  (Cms)  (01  101  101  101  101  101  101  10	(cms)  99 99 99 99 99 99 99 99 99 99 99 99 9	5. 459 5. 429 5. 429 5. 429 5. 429 5. 368 5. 384 5. 322 5. 301 5. 226 5. 225 5. 221 5. 209 5. 215 5. 215	(m) 4.764 4.759 4.772 4.778 4.778 4.788 4.789 4.786 4.800  4.804 4.803
Bec. 1 123 4 5 6 7 8 9 10 11 123 134 156 17 20 22 234 22 5 6 27 8 27 9 27 9 27 9 27 9 27 9 27 9 27 9	(Cas) 143.0 150.0 150.0 151.0 154.0 154.0 171.0 172.0 174.0 185.0 180.0 180.0 180.0 179.0 179.0 179.0 179.0 179.0 179.0 179.0 179.0 179.0 179.0 188.0 188.0 188.0 188.0 188.0 188.0 188.0	(a) 5.78 5.82 5.85 5.85 5.95 6.16 6.16 6.17 6.28 6.27 6.25 6.27 6.25 6.24 6.24 6.24 6.24 6.24 6.24 6.25 6.35 6	\$6ms1 \$52,26 277.31 \$65,63 155,00 1477.15 2378.99 \$125,00 46.69 \$418.92 175.00 46.69 \$618.92 179.00 179.00 179.00 179.00 177.00 177.00 431.62 188.40 188.90	(cas)	(cas) 50 75 75 75 75 75 79 99 99 99 99 99 99 99 99 99 99 99 99	(m) 4,875 4,683 4,901 4,899 4,999 4,999 5,190 5,190 5,190 5,202 5,190 5,202 5,200 5,203 5,	(n) 4,614 4,649 4,652 4,656 4,660 4,669 4,672 4,672 4,678 4,688 4,698 4,704 4,	Jan. 1 2 3 4 4 5 6 7 7 7 9 10 11 12 13 14 15 16 17 18 19 20 21 22 25 24 25 26 27 28	195.0 196.0 194.0 194.0 194.0 192.0 189.0 189.0 189.0 189.0 189.0 180.0 182.0 182.0 182.0 182.0 179.0 177.0 176.0 177.0 178.0	6.45 6.45 6.44 6.44 6.37 6.34 6.37 6.32 6.31 6.32 6.32 6.22 6.23 6.22 6.23 6.22 6.23 6.23	(cns)  195.00 48.67 -60.64 -62.62 -65.63 60.68 -65.62 -66.63 53.68 -72.65 50.69 -72.65 50.69 49.69 -78.63 175.00 301.31 76.75 50.69 50.68 48.68 47.69 45.68 47.69 45.68 47.69 45.68 47.69 45.68	(Cms)  101 101 101 101 101 101 101 101 101 1	(cms)  99 99 99 99 99 99 99 99 99 99 99 99 9	(a) 5.459 5.429 5.429 5.429 5.507 5.375 5.375 5.371 5.200 5.225 5.215 5.207 5.215 5.209 5.215 5.209 5.215 5.204 5.125 5.215 5.204 5.125 5.215	(m) 4.764 4.759 4.772 4.776 4.780 4.788 4.790 4.788 4.794 4.800 4.801 4.802 4.813 4.823 4.824 4.823 4.824 4.835 4.835 4.835 4.854 4.852 4.854 4.858

```
230 Operation of Lake Toba
231
232 IF YR=1931 THEN
232 IF YR=1931 THEN
IF WL>=5 THEN R=101: SP=20
235 IF WL>=5.5 THEN R=101: SP=40
240 IF WL< 5.5 THEN R=101: SP=20
244 IF WL< 5.2 THEN SP=20
246 IF WL< 5.1 THEN SP=20
250 IF WL< 5 THEN SP=75 ELSE
IF WL>RWL+2 THEN SP=75 ELSE
THEN SP=50 FLSE
                               THEN R=101:SP=200-R:GOTO 250
                               THEN R=101:SP=400-R
THEN R=101:SP=300-R
                                                   SP≈250~R
265 RETURN
```

2I - 7

Fig. I-1 Location of Rain Gage Station in and around Lake Toba Basin

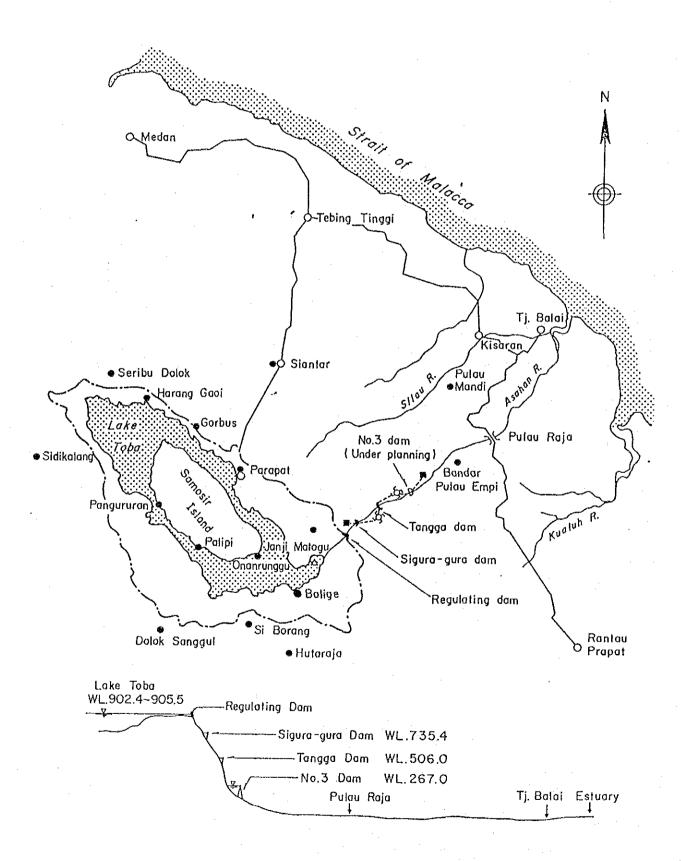


Fig. I-2 Rating Curve for Estimating Water Level of Lake Toba

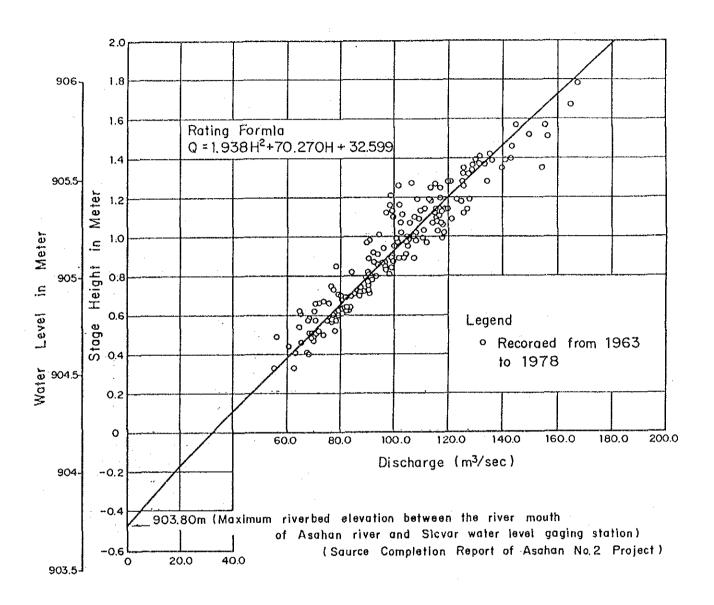
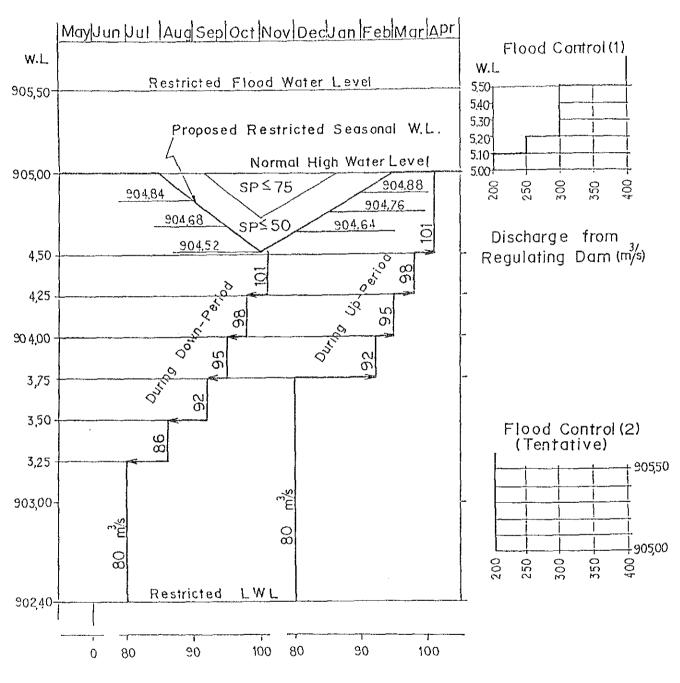


Fig. I-3 Case V Operation of Lake Toba for Flood Control and Water Utilization



Discharge for Power Generation (m³/sec)

## Appendix 2-J

# Drawings of Urgent Flood Control Project

### Appendix 2-J

#### DRAWINGS OF URGENT FLOOD CONTROL PROJECT

#### TABLE OF CONTENTS

Ι.	RIVER	RIVER CHANNEL IMPROVEMENT					
				<u>Page</u>			
	I-1	Plan of Project	Asahan River	2J-1			
•	I-2	Proposed Profile	Asahan River	2J-6			
	I-3	Proposed Cross Section	Asahan River	2J-7			
	I-4	Proposed Profile and Cross Section	Asahan Retarding Basin	2J-10			
	I-5	Plan of Project	Silau River	2J-11			
	I-6	Proposed Profile	Silau River	2J-13			
	1-7	Proposed Cross Section	Silau River	2J-14			
П.	DRAIN	AGE FACILITIES					
	11-1	Drainage Culvert		2J-16			

