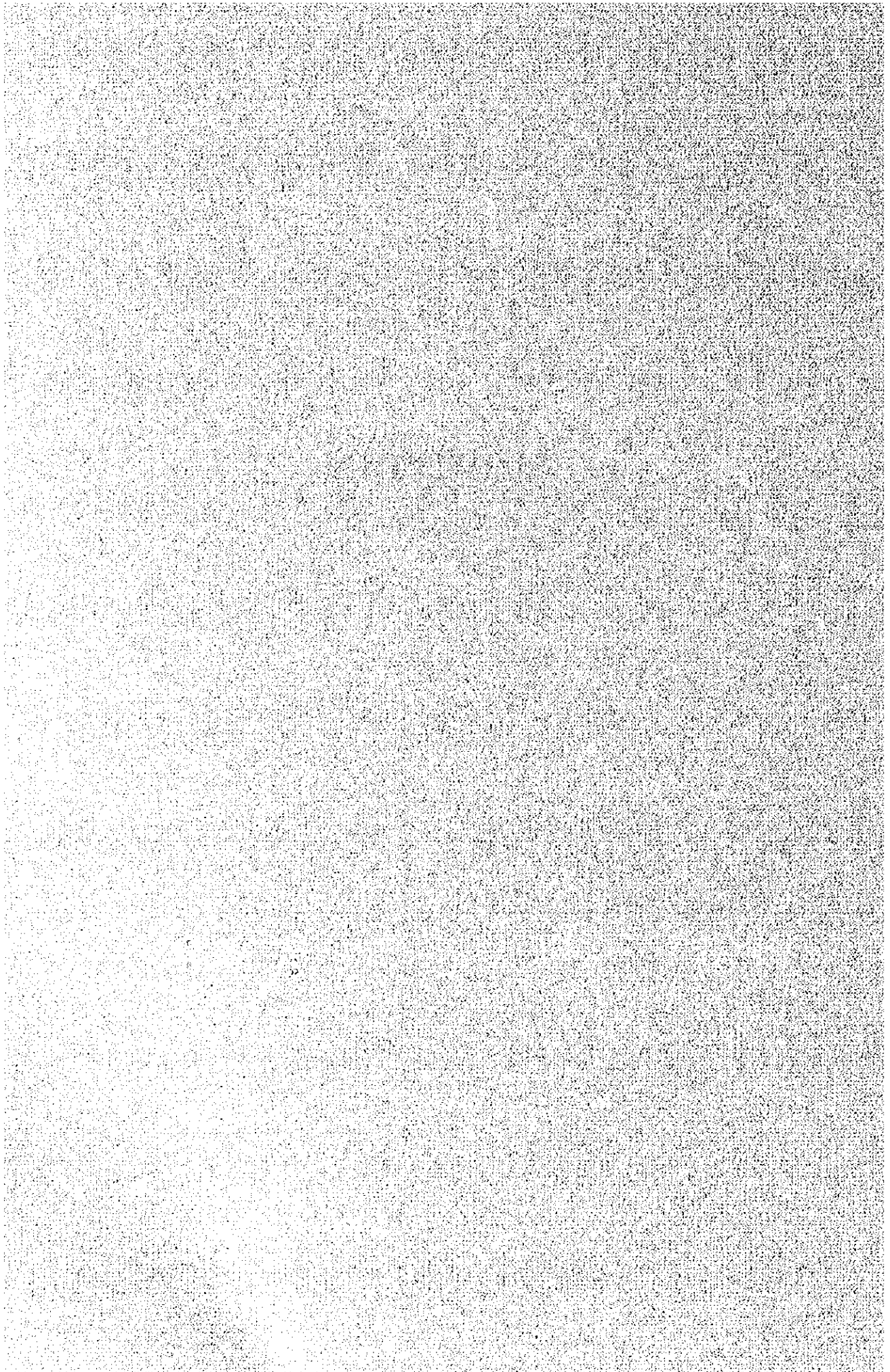


APPENDIX

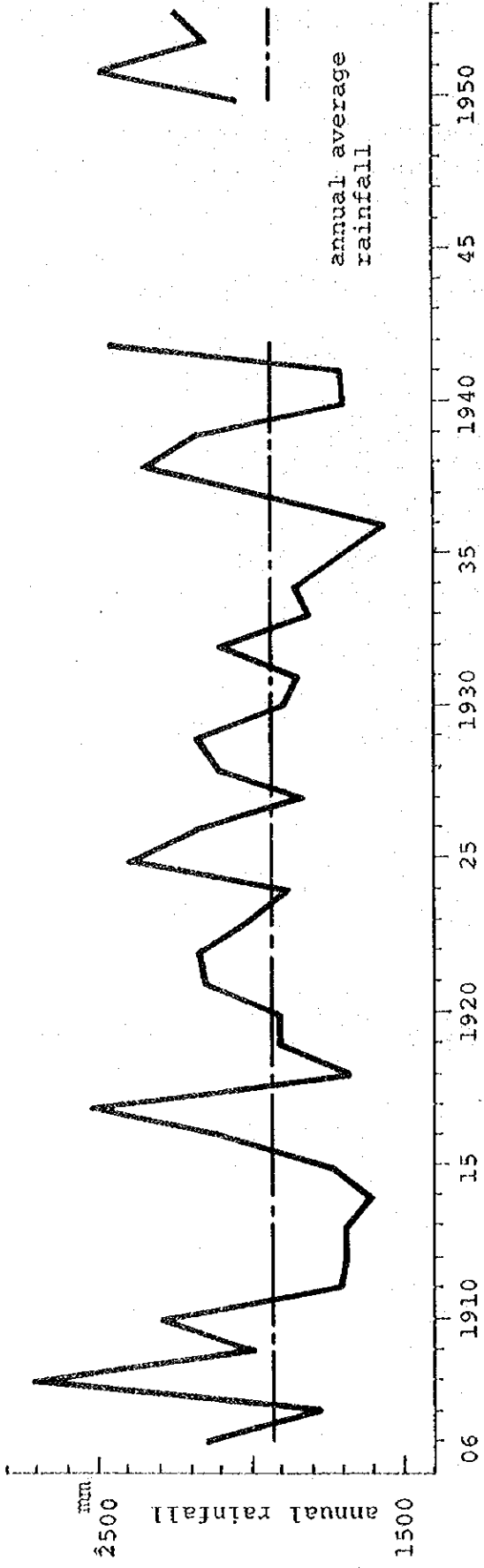


APPENDIX A RAIN FALL

The rainfall for the year 1969 was the smallest in recent 20 years regarding meteorological data in Saigon and Hiep Hoa. On the other hand, the minimum flow of the Dong Nai River was about 90 cum/sec at Tan Uyen that is located about 15 km upstream from Bien Hoa where the drainage area of the river is about 22,600 sqkm.

From above two numbers, 90 cum/sec and 22,600 sqkm, the specific discharge is obtained as 4 l/sec/sqkm.

This figure can be applicable in roughly estimating the dry season flow of the Saigon River although topographical and meteorological conditions are more or less different each other. Hence, 16 cum/sec of discharge is obtained multiplying the drainage area of the Saigon river, 4,300 sqkm, by the above specific discharge.



A-4

maximum 2,720 mm (1908)
 minimum 1,555 mm (1936)
 average 1,940 mm (for 55 years)

NOTE: Unknown from 1943 to 1949

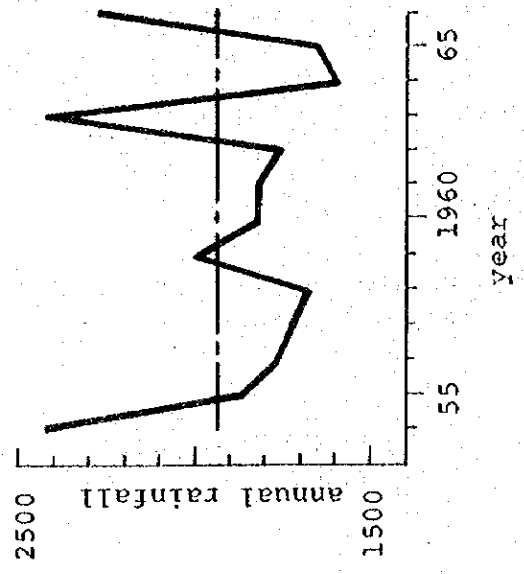


Fig. PRECIPITATION AT SAIGON

Table App. 1.a Precipitation

Location	Year	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Total
Saigon	1906	40mm	0	0	190	280	300	230	340	410	260	80	30	2160
	1907	0	10	5	5	250	240	220	270	250	255	130	150	1775
	1908	40	10	15	70	300	420	390	500	340	345	170	120	2720
	1909	30	10	20	25	190	260	590	170	290	70	50	170	1975
	1910	10	0	30	110	250	420	280	310	280	500	50	50	2290
	1911	15	5	0	180	210	280	220	180	300	230	40	30	1690
	1912	40	0	0	0	60	210	380	320	350	200	50	70	1680
	1913	20	10	0	5	260	210	300	280	250	200	40	110	1685
	1914	25	10	5	5	150	320	360	200	240	80	170	40	1605
	1915	5	5	10	20	230	460	110	130	250	370	20	120	1730
	1916	5	5	35	5	170	280	300	310	460	410	60	50	2090
	1917	110	5	5	5	250	220	280	280	310	600	280	25	2530
	1918	10	5	5	30	160	330	250	200	450	160	30	30	1660
	1919	5	5	10	20	170	470	100	190	410	320	140	60	1900
	1920	10	10	5	10	210	360	320	240	240	220	55	120	1900
	1921	10	0	45	20	220	220	310	135	465	450	245	15	2135
	1922	15	0	130	140	80	290	380	290	470	260	85	25	2165
	1923	15	0	5	30	360	205	290	315	365	225	170	15	1995
	1924	0	0	15	40	90	520	275	170	250	330	110	70	1870

UNIT: millimeters

Table App. 1.b Precipitation

Location	Year	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Total	
Saigon	1925	10	0	60	105	170	415	565	300	295	300	150	15	2385	
	1926	0	0	0	0	115	325	385	390	290	340	270	65	2180	
	1927	0	0	5	25	220	350	320	230	340	175	145	5	1815	
	1928	0	0	5	65	215	390	260	340	505	285	5	20	2090	
	1929	25	5	0	50	230	325	350	465	325	200	150	45	2170	
	1930	5	5	0	80	375	250	320	210	205	190	180	70	1890	
	1931	30	0	0	5	270	180	340	160	335	415	80	25	1840	
	1932	0	5	10	20	335	420	310	225	280	280	180	30	2095	
	1933	30	0	0	20	50	405	245	300	300	295	110	60	1805	
	1934	0	5	15	140	385	275	215	220	220	375	115	80	25	1850
	1935	5	0	0	50	205	280	340	120	120	370	185	105	30	1690
	1936	15	0	10	25	70	255	330	330	230	255	60	50	1555	
	1937	30	10	0	30	165	335	420	420	370	275	150	150	20	1955
	1938	5	10	0	15	310	405	430	430	240	395	360	125	25	2320
	1939	5	0	15	105	460	325	235	235	330	350	120	205	5	2155
	1940	0	0	0	15	220	415	230	230	255	295	175	40	40	1685
1941	0	5	5	15	120	150	220	220	325	330	300	170	60	1700	
1942	90	5	10	145	205	260	280	280	263.3	682.5	364.8	130.0	15.1	2453.5	

UNIT: millimeters

Table App. 1-c Precipitation

Unknown from 1943 to 1949

Location	Year	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Total
Saigon	1950	38.5	42.7	4.3	65.0	248.8	304.0	284.1	224.7	487.4	212.0	89.2	33.2	2033.9
	1951	2.4	18.5	3.5	77.6	311.7	454.5	288.4	293.0	409.9	351.4	255.2	13.8	2479.9
	1952	0.3	0.2	4.4	31.8	344.5	506.2	229.8	276.6	204.4	374.5	105.5	58.6	2136.8
	1953	4.5	11.7	11.7	104.6	420.0	269.7	216.8	217.6	384.7	214.8	245.2	132.9	2234.2
	1954	26.7	0	38.9	121.4	277.6	297.0	387.7	504.7	451.7	262.1	54.4	6.1	2428.3
	1955	0.5	0.2	0	35.0	207.9	345.2	188.3	225.6	232.3	364.6	237.9	25.6	1863.1
	1956	nil	nil	nil	94.8	198.0	101.2	296.0	241.1	451.7	204.8	90.2	83.0	1760.8
	1957	1.0	nil	37.7	18.9	47.6	293.3	230.5	172.5	566.2	256.9	36.8	54.1	1715.3
	1958	nil	5.6	7.6	16.2	159.2	246.9	286.4	283.6	276.1	362.1	13.3	17.4	1674.4
	1959	-do-	nil	0.4	119.5	145.0	209.2	338.6	501.3	200.0	318.4	138.8	18.0	1989.2
	1960	11.5	14.4	nil	70.7	290.4	478.4	182.3	236.9	241.7	189.5	74.2	32.3	1822.3
	1961	2.6	0.4	6.6	58.1	172.8	241.4	289.7	282.6	439.3	184.5	82.4	40.2	1815.6
	1962	27.7	nil	28.8	36.8	260.3	257.5	372.2	246.5	256.0	204.6	42.4	28.5	1761.3
	1963	25.5	-do-	1.6	nil	320.1	449.1	534.4	315.7	470.0	232.6	44.4	26.7	2420.1
	1964	nil	-do-	nil	-do-	137.1	271.0	298.5	309.9	156.1	194.3	197.4	26.8	1591.1
	1965	-do-	-do-	-do-	27.9	167.4	214.1	221.9	330.3	335.-	137.0	154.7	52.0	1640.6
	1966	19.4	Traces	32.7	47.6	510.2	269.4	251.3	209.9	331.2	308.7	204.2	96.7	2281.3
1967	27.7	nil	nil	4.7	244.3	140.8	351.7	150.4						

UNIT: millimeters

Table App. 1.d Precipitation

Location	Year	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Total
Hiep Hoa	1967	5.0	0	0	88.0	177.0	168.0	290.0	247.0	262.0	330.0	176.0	0	1,743.0
	1968	0	0	0	84.0	262.8	456.3	152.1	209.0	403.2	273.6	30.0	15.0	1,886.0
	1969	78.0	42.0	0	81.0	58.0	262.0	126.7	210.2	313.5	147.1	48.8	2.5	1,369.8
	1970	13.5	5.6	0	10.0	246.0	291.2	105.9	241.3	133.7	355.3	113.7	150.3	1,666.5
	1971	0	1.0	34.0	27.0	137.6	247.5	121.2	241.4	306.3	327.9	165.9	139.6	1,749.4
	1972	16.0	0	25.0	59.5	62.1	184.9	127.8	80.7	469.6	262.0	160.1	25.9	1,473.6
Phu Cuong	1967	20.4	0	0.2	40.4	178.4	262.0	323.7	250.5	259.6	176.5	162.9	4.2	1,678.8
	1968	0	0	0	83.3	176.9	104.8	175.7	299.9	230.6	168.0	31.0	10.0	1,280.2
	1969	0	5.0	17.0	0	0	97.0	50.0	332.9	312.3	283.3	220.0	285.0	1,560.5
	1970	32.0	0	40.0	35.0	127.0	135.0	162.0	181.0	181.0	160.0	30.0	201.8	1,268.0
	1971	0	0	0.3	3.5	214.9	437.0	146.0	358.7	28.4	362.7	17.0	100.5	1,669.0
1972	0	0	0	171.8	148.3	53.8	20.5	65.0	560.3	413.4	0	0	1,433.1	
Hoc Mon	1972	-	-	-	-	118.6	248.0	165.0	32.0	782.0	230.0	280.0	-	-

UNIT: millimeters

APPENDIX B OPERATING COST

Design Capacities

Proposed daily maximum production	200,000 cum
Proposed daily average production (80% of the above)	160,000 "
Annual production	58.4 million cum.
Amount of sold water (70% of annual production)	40.9 "

Operating expenses

1) Labor cost

The results of operation by SMWO

	1968	1969	1970	1971	1972
Total water production, million cum	81.9	105.5	127.4	134.6	143.1
Labor cost, million plasters	63.1	70.1	111.0	135.8	150.3
Labor cost per cum, plasters	.77	.66	.87	1.01	1.05

Taking the unit cost 1.05 in 1972, labor cost for the increased production of 200,000 cmd as day maximum or 160,000 cmd as day average will be 54.8 million cmd x 1.05 plasters per cum = 57.5 million plasters per year. However, it is very reasonable to consider that number of personnel will not increase directly in proportion to the increase ratio of production but less than that. It is found by a statistical operation that the pertinent increase number of personnel shall be 320 as the number of personnel was 980 in 1972. Hence,

Labor cost for 980 persons	150.3 million plasters
Labor cost for 320 persons increased for production expansion	49.0 million plasters

2) Chemicals

Average dosage: Lime 15 ppm
Chlorine 3 ppm

Annual chemical consumption

Lime 15 x 58.4 = 876 tons
Chlorine 3 x 58.4 = 17 "

Cost of chemicals

Lime 876 tons x 22,000 piasters/ton = 19.2
million
piasters

Chlorine 175 tons x 121,000 piasters/ton = 21.2
million
piasters

Total 40.5
million piasters

3) Power

Power facilities	Power rating	Q'ty	Standby unit	Total power	Commission ratio ¹⁾	Actual power
Intake pump	26 KW	70 ¹⁾	6	1890 ²⁾	.83 ³⁾	1512 ⁴⁾
Relay pump	110	2	1	220	.8	176
"	90	2	1	180	.8	144
"	110	2	1	220	.8	176
"	75	2	1	150	.8	120
"	80	2	1	160	.8	128
(Relay pump total)				(930)		(744)
Backwash pump	280	1	1	280	.042 ⁵⁾	126 ⁶⁾
Surfacewash pump	180	1	1	125	.042	8
Lighting	75	-	-	75	.5	38
Airconditioning	22	-	-	22	.75	17
Instrumentation	15	-	-	15	1	15
(Plant total)				(517)		(90)
Service pump	820	4	1	3,280	.57 ⁷⁾	1,640
(Service pump total)				(3,280)		(1,640)
Power Total				(6,617)		(3,986)

Power cost⁸⁾

$$4,000 \text{ KW} \times 24 \times 365 = 35 \text{ million KWH}$$

$$35 \text{ million KWH} \times 10 \text{ piasters/KWH} = 350 \text{ million piasters}$$

- NOTE: 1) Stand-by unit not included
 2) Stand-by unit not included
 3) Average annual power demand/Actual maximum power demand
 4) Total power x commission ratio
 5) Number of filters (excluding stand-by unit) : 11
 Average length of filter run : 48 hours

Frequency of backwash .5/day x 11 = 5.5 say, 6.0 times/day
 Total washing time per day 10 minutes/cycle x 6.0 times
 = 60 minutes

$$\text{Commission ratio} = \frac{60}{1,440} = .042$$

- 6) Rounded
- 7) Roughly, Average daily water demand/hourly peak demand
- 8) Power cost, i.e., running cost, will almost be the same when power is supplied by a diesel power system in the water supply plants.

4) Supplies, materials, maintenance, repairs and transport

	1968	1969	1970	1971	1972
Total water production, million cum	81.9	105.5	127.4	134.6	143.1
Supplies etc.	114.3	39.9	91.6	24.2	177.0
Cost per cum, piasters	1.40	.38	.72	.18	1.24

Taking the unit cost, 1.24, expenses for supplies, materials, maintenance and transport will be:

$$58.4 \text{ million cum} \times 1.24 = 72.4 \text{ million piasters}$$

5) Billing, collection and accounting

	1968	1969	1970	1971	1972
Total water production, million cum	81.9	105.5	127.4	134.6	143.1
Billing etc.	24.3	28.0	42.7	52.2	60.1
Cost per cum	.30	.27	.34	.39	.42

Applying .42 piasters per cum,
 Cost of billing, collection and accounting for the proposed expansion quantity,

$$.42 \times 58.4 \text{ million cum} = 24.5 \text{ million piasters}$$

6) Administrative and general

Administrative and general costs shall be proportional to the number of personnel. Therefore, additional cost for the increased personnel in accordance to the increase of the production will be (refer to the article 1) Labor cost):

$$24 \text{ million piasters} \times \frac{320}{980} = 7.8 \text{ million piasters}$$

(Administrative cost in 1972)

Total Operating Expenses 544.3 million piasters

Likewise, operating expenses in other cases will be estimated in accordance with the size of the production and the individual operating condition.

Table App.2 SAIGON WATER DISTRIBUTION PROJECT

COMPARATIVE INCOME STATEMENT (1968-1972) BY SMWO

	1968	1969	1970	1971	1972
AVERAGE NUMBER OF CONNECTIONS	52,093	69,130	90,280	106,951	121,606
Total water produced, million cum	81.9	105.5	127.4	134.6	143.1
Total water consumed, million cum	55.6	72.9	65.3	90.9	99.0
Percent not billed	32	31	33	31	31
	(millions of piasters)				
<u>Operating Revenues</u>					
Water sales	446.7	758.1	1,091.6	1,487.5	2,128.5
Other	62.6	45.8	70.3	78.8	241.8
Total revenue	509.3	803.9	1,161.9	1,566.3	2,370.3
<u>Operating Expenses</u>					
Labor	63.1	70.1	111.0	135.7	156.3
Chemicals	27.0	43.9	73.9	103.3	117.4
Power	70.0	104.8	199.2	269.8	355.1
Supplies, materials, maintenance, repairs and transport	114.3	49.9	91.6	24.2	177.0
Billing, collection and accounting	24.3	27.0	42.7	52.2	60.1
Administrative and general	9.7	10.7	17.1	20.9	24.0
Total operating expenses	308.4	306.4	535.5	606.1	889.9
<u>Other expenses</u>					
Provision or bad debts	15.5	14.5	15.3	13.1	11.5
Depreciation	196.6	215.8	227.0	418.9	540.8
Interest	79.7	87.8	148.7	173.6	206.6
Taxes	1.2	36.6	15.5	18.4	61.7
Miscellaneous	1.6	2.2	4.2	5.7	12.8
Total other expenses	294.6	356.9	410.7	629.7	833.4
Total all expenses	603.0	663.3	946.2	1,235.6	1,723.3
Net operating income (loss)	(93.7)	140.6	215.7	330.5	647.0
Other income	9.2	69.3	59.7	48.8	97.1
Net income (loss)	(84.5)	209.9	275.4	379.3	744.1
Extraordinary adjustments to income (expenses)	139.0	(239.2)	(245.7)	(316.3)	(494.4)
Adjusted net income (loss)	54.5	(29.3)	29.7	63.0	249.7

Table App.3 Case Study on Cost of Water Excluding Distribution System (for ref.)

Case	Loan Condition*	Capital Cost	Interest	Operating Cost (US\$1,000)	Total	Sold Water Million cum	Cost of Water US\$	VN\$**
Alternative 1	a/30/2/2	24,600	9,632	30,753	64,985	1,186.1	5.5	28
	b/25/3/3	24,600	11,574	25,310	61,484	981.6	6.3	32
	c/15/6/15	24,600	20,746	14,424	59,770	572.6	10.5	53
Alternative 2	a/30/2/2	22,800	8,929	31,025	65,485	1,186.1	5.5	28
	b/25/3/3	22,800	10,111	25,582	58,493	981.6	6.0	30
	c/15/6/15	22,800	19,212	14,696	56,708	572.6	9.9	50

* Loan condition/Repayment period/Interest of foreign currency/Interest of local currency

** US\$1 = VN\$500

Table App.4 Case Study on Cost of Water including Distribution System (for ref.)

Case	Loan Condition*	Capital Cost	Interest	Operating Cost	Total	Sold Water Million cum	Cost of Water	
							US\$	VN\$**
Alternative 1	a/30/2/2	36,440	14,486	30,753	81,679	1,186.1	6.9	35
	b/25/3/3	36,440	22,222	25,310	83,972	981.6	8.6	43
	c/15/6/15	36,440	31,038	14,424	81,902	572.6	14.3	72
Alternative 2	a/30/2/2	34,640	13,783	31,025	79,448	1,186.1	6.7	34
	b/25/3/3	34,640	20,759	25,582	80,981	981.6	8.3	42
	c/15/6/15	34,640	29,504	14,696	78,840	572.6	13.8	69

* Loan condition/Repayment period/Interest of foreign currency/Local currency

** US\$1 = VN\$500

APPENDIX C DISTRIBUTION PIPE REQUIREMENT

In proportion to the increase of supplied water, new mains should be added to the existing distribution network. According to the report "Saigon Water Distribution Project", some 400,000 m of distribution pipe will be required for an increased supply of about 500,000 cmd by 1980 excluding pipe length for replacements. Hence, distribution pipe requirements for the production added by the groundwater project, namely, 200,000 cmd, will be some 160,000 m. And the average pipe laying cost will be roughly 74 dollars per meter including engineering. Therefore, pipe laying cost for the 200,000 cmd will be:

$$\text{US\$74 @ 160,000 m} = \text{US\$11,840,000}$$

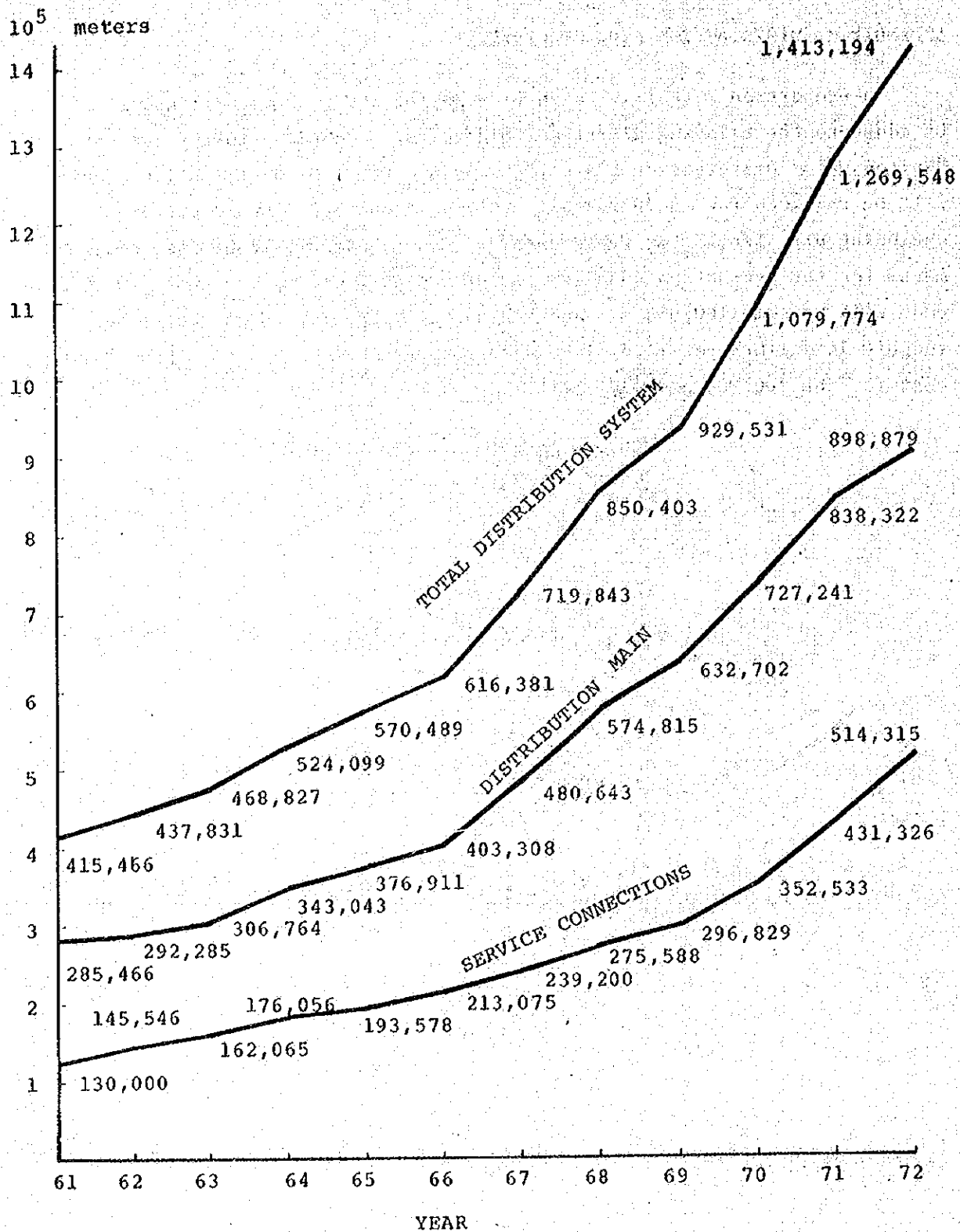


Fig. WATER DISTRIBUTION SYSTEM IN SAIGON

by SMWO

APPENDIX D DONG NAI WATER SUPPLY SYSTEM

Intake Pumping Station

Location	Dong Nai River, just upstream of Bien Hoa bridge
Intake Pumps	6 units
Design Capacity	450,000 cmd (actual 400,000 cmd)

Raw Water Transmission Main

Material, Diameter and Length	PS-Concrete Pipe, $\phi 72"$, 11 km
Capacity	505,000 cmd

Water Purification Plant

Capacity	480,000 cmd
Rectangular Sedimentation Basins	5
Rapid Sand Filters	20 (filtration rate 150 m/day)
Filtered Water Reservoirs	2 x 40,000 cum = 80,000 cum 2 x 95,000 cum = 190,000 cum Total 270,000 cum
Treated Water Pumps	5 units, 680,000 cmd

Treated Water Main

Material, Diameter and Length	PS-Concrete Pipe, $\phi 78"$, 11.5 km
Capacity	Ultimate not known. Supposedly 750,000 cmd

Elevated Storage Tanks

8 major tanks with capacity of 49,000 cmd in total

APPENDIX E ALTERNATIVE LAYOUT OF GROUNDWATER SUPPLY SYSTEM

Shown herewith is an alternative plan of groundwater supply system in which wells are distributed also in the military zone. Diameters of some parts of raw water mains would be reduced if this plan is executed. (See Fig. LAYOUT OF GROUNDWATER SUPPLY SYSTEM on next page.)

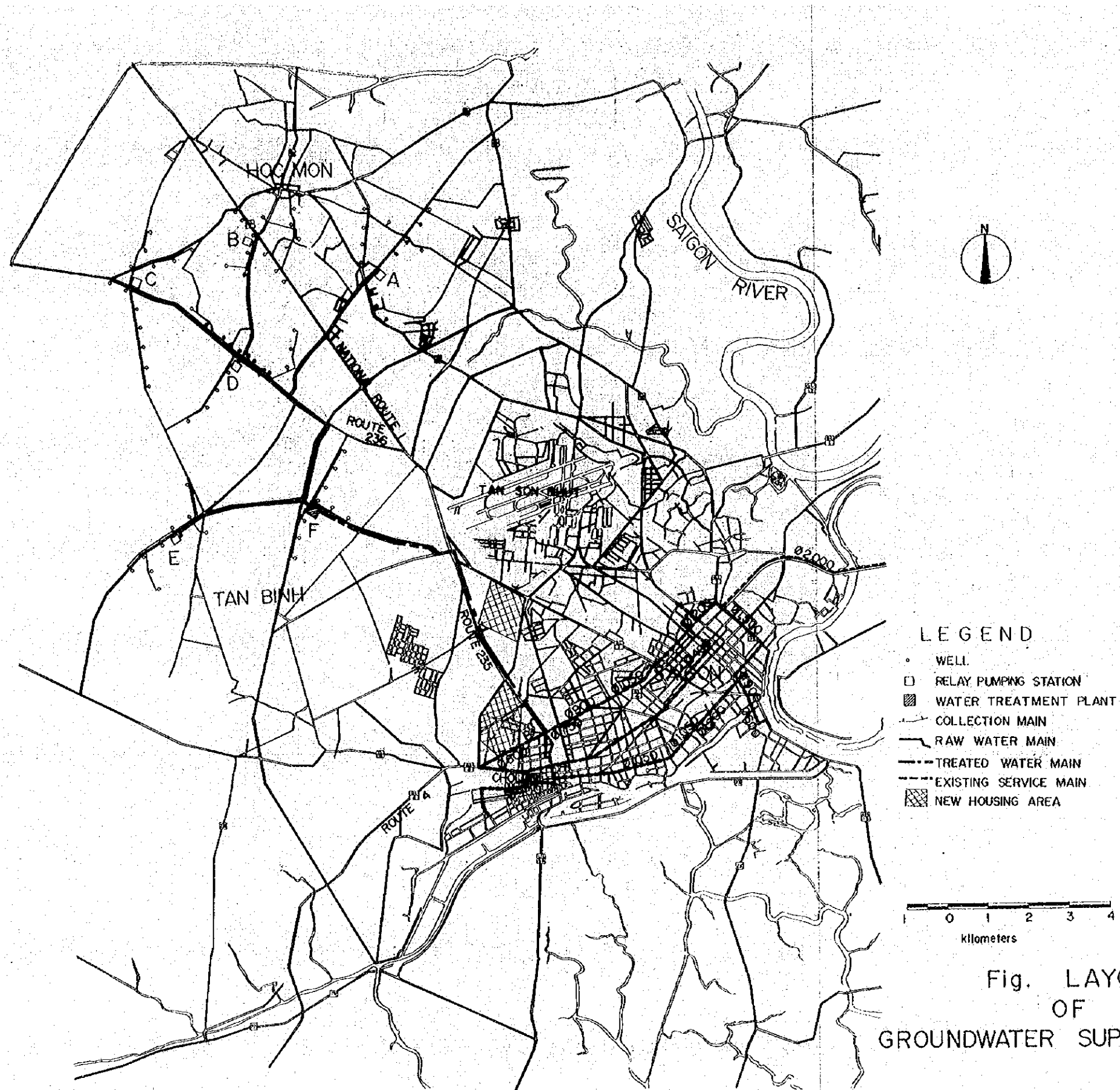


Fig. LAYOUT
OF
GROUNDWATER SUPPLY SYSTEM

Table App. 5.a CHEMICAL ANALYSIS OF SAIGON RIVER WATER SAMPLES at Phu Cuong in 1971 by SSMO

Date	*	pH	Turbidity SiO ₂ ppm	Color unit	Total Alkalinity CaCO ₃ ppm	Total Hardness	Total Iron ppm	Chloride NaCl ppm
8 August	L	6.6	22	110	12	12	0.1	3.5
	H	7.0	25	120	15	11	0.1	3.5
9	L	6.4	22	100	10	9	0.1	3.0
	H	6.4	22	100	10	9	0.1	3.0
10	L	6.5	25	80	11	12	0.1	3.0
	H	6.2	20	120	8	10	0.1	3.0
11	L	6.5	25	100	11	10	0.1	3.0
	H	6.5	24	120	11	10	0.1	3.0
12	L	6.6	32	80	11	11	0.1	3.5
	H	6.2	30	80	9	9	0.1	2.5
13	L	6.4	25	60	10	9	0.1	3.5
	H	6.4	25	80	10	9	0.1	3.5
14	L	7.1	21	80	10	9	0.1	2.5
	H	7.1	20	80	10	9	0.1	2.5
15	L	7.0	30	80	13	12	0.1	3.5
	H	6.4	25	80	10	11	0.1	3.0
16	L	6.9	24	80	10	10	0.1	3.0
	H	7.1	24	80	10	10	0.1	3.0
17	L	6.4	22	80	9	11	0.1	3.0
	H	6.4	23	60	9	11	0.1	3.0
18	L	6.6	21	80	10	12	0.1	3.5
	H	6.3	20	70	8	10	0.1	3.5
19	L	6.2	28	100	9	9	0.1	4.0
	H	6.5	27	100	10	10	0.1	3.5
20	L	6.2	28	100	8	8	0.1	2.0
	H	6.3	27	100	8	8	0.1	2.0
21	L	6.3	20	80	9	8	0.1	3.0
	H	6.3	22	80	9	8	0.1	3.0
22	L	6.5	18	100	10	12	0.1	3.0
	H	6.5	18	100	10	12	0.1	3.0
23	L	6.9	18	80	13	12	0.1	3.5
	H	6.4	20	80	9	10	0.1	3.3
24	L	6.5	18	70	10	10	0.1	3.5
	H	6.5	18	80	10	10	0.1	3.5
25	L	6.4	15	80	10	9	0.1	2.5
	H	6.2	15	80	9	9	0.1	2.5
26	L	6.2	22	100	9	10	0.1	3.5
	H	6.4	23	100	10	10	0.1	3.5

Table App.5.b CHEMICAL ANALYSIS OF SAIGON RIVER WATER SAMPLES

at Phu Chuong in 1971 by SMWO

Date	*	Color	Turbidity	Cl ⁻	Date	*	Color	Turbidity	Cl ⁻
27 Aug.	H	100	23	5.0	21 Sept.	H	30	7	3.3
	L	120	24	2.5		L	45	7	4.1
28	H	100	18	5.8	22	H	30	10	3.3
	L	100	18	5.0		L	35	9	3.3
29	L	120	22	2.5	23	L	45	10	2.5
30	H	100	23	2.5	24	H	45	7	24.9
	L	100	25	2.5		L	45	8	3.3
31	H	100	20	2.5	25	H	45	7	3.3
	L	100	20	2.5		L	50	7	3.3
1 Sept.	H	30	20	2.5	26	H	45	6	4.1
	L	100	25	3.3		L	50	6	3.3
2	H	60	25	2.5	27	H	50	14	3.3
	L	100	20	2.5		L	55	14	3.3
3	H	80	17	5.8	28	H	70	11	2.5
	L	100	17	5.8		L	65	10	3.3
4	H	100	25	2.5	29	H	65	10	3.3
	L	100	20	3.3		L	70	10	3.3
5	H	110	20	1.7	30	H	65	9	4.1
	L	110	20	2.5		L	40	7	5.0
6	H	80	20	2.5	1 Oct.	H	70	12	3.3
	L	100	20	4.2		B	55	12	3.3
7	H	80	25	2.5	2	R	55	11	3.3
	L	80	17	2.5		L	55	10	3.3
8	H	80	15	1.7	3	H	40	10	4.1
	L	100	15	1.7		L	55	10	4.1
9	H	80	15	1.7	4	H	50	10	2.5
	L	80	15	1.7		L	55	10	3.3
10	H	80	15	1.7	5	H	55	10	3.3
	L	80	15	1.7		L	55	10	2.5
11	H	80	15	1.7	21	L	50	11	3.3
	L	60	10	1.7		H	35	11	3.3
12	H	100	16	1.7	22	L	45	15	1.7
	L	80	16	1.7		H	35	10	1.7
13	H	80	17	3.3	23	L	35	10	1.7
	L	80	17	3.3		H	30	9	1.7
14	H	80	17	3.3	24	L	40	10	1.7
	L	80	15	3.3		H	40	12	1.7
15	H	20	10	5.8	25	L	40	15	1.7
	L	70	15	5.0		H	40	11	2.4
16	H	60	10	3.3	26	L	60	8	1.7
	L	120	25	3.3		H	50	8	1.7
17	H	80	10	3.3	27	L	40	11	1.7
	L	80	10	4.1		H	20	10	2.4
18	H	70	16	4.1	28	L	45	11	3.3
	L	70	12	3.3		H	20	10	2.4
19	H	80	18	2.5	29	L	35	6	3.3
	L	80	12	3.3		H	35	6	3.3
20	H	50	10	2.5	30	L	40	10	2.4
	L	60	10	2.5		H	20	9	2.4
					31	L	35	10	3.3
						H	40	10	3.3

unit as SiO₂ as NaCl
ppm ppm

Table App.5.c CHEMICAL ANALYSIS OF SAIGON RIVER WATER SAMPLES

at Phu Cuong in 1971 by SMWO

Date	*	Color	Turbidity	Cl ⁻	Date	*	Color	Turbidity	Cl ⁻		
1	Nov.	L	55	15	2.4	26	Nov.	L	30	13	3.3
		H	55	10	2.4			H	30	13	4.1
2		L	50	10	3.3	27		L	40	14	4.1
		H	55	10	1.7			H	40	14	4.1
3		L	45	7	1.7	28		L	40	12	4.1
		H	45	6	1.7			H	35	12	2.4
4		L	45	15	1.7	29		L	45	11	2.4
		H	50	10	1.7			H	40	10	2.4
5		L	50	11	1.7	30		L	50	11	3.3
		H	50	10	1.7			H	35	10	1.7
6		L	40	6	3.3	1 Dec.		L	40	10	3.3
		H	45	6	2.4			H	35	10	1.7
7		L	50	10	1.7	2		L	30	9	2.4
		H	50	9	1.7			H	35	10	1.7
8		L	50	10	2.4	3		L	40	11	1.7
		H	50	10	2.4			H	40	10	1.7
9		L	55	11	2.4	4		L	60	12	1.7
		H	60	10	2.4			H	45	11	2.4
10		L	40	13	4.1	5		L	35	10	3.3
		H	40	10	2.4			H	30	9	1.7
11		L	45	10	4.9	6		L	40	10	2.4
		H	40	12	4.1			H	45	10	2.4
12		L	40	10	4.1	7		L	50	11	2.4
		H	40	10	3.3			H	40	11	1.7
13		L	60	13	4.9	8		L	35	10	3.3
		H	50	10	4.9			H	35	10	2.4
14		L	40	11	4.1	9		L	35	9	1.7
		H	30	9	2.4			H	45	11	1.7
15		L	50	10	2.4	10		L	45	10	1.7
		H	50	10	1.7			H	35	10	2.4
16		L	30	9	4.1	11		L	40	10	2.4
		H	30	8	4.9			H	40	8	1.7
17		L	40	10	3.3	12		L	55	11	2.4
		H	30	6	3.3			H	50	10	2.4
18		L	35	10	3.3	13		L	35	8	1.7
		H	35	10	3.3			H	30	9	1.7
19		L	40	15	2.4	14		L	45	10	1.7
		H	30	11	3.3			H	50	10	2.4
20		L	35	10	3.3	15		L	55	11	3.3
		H	35	11	2.4			H	50	10	3.3
21		L	40	10	3.3	16		L	50	10	2.4
		H	35	10	3.3			H	45	11	1.7
22		L	40	7	2.4	17		L	30	10	1.7
		H	30	9	4.1			H	35	9	1.7
23		L	40	10	3.3	18		L	40	11	2.4
		H	40	10	3.3			H	40	10	1.7
24		L	30	10	4.1						
		H	25	11	4.1						
25		L	25	11	3.3						
		H	25	11	4.1						

unit FTU NaCl ppm

Table App.5,d CHEMICAL ANALYSIS OF SAIGON RIVER WATER SAMPLES

at Phu Cuong in 1972 by SMWO

Date	*	Color	Turbidity	Cl ⁻	Date	*	Color	Turbidity	Cl ⁻
4 Jan.	L	55	15	4.9	1 Feb.	L	55	15	4.9
	H	55	15	5.8		H	55	10	4.9
5	L	60	17	5.0	2	L	55	10	4.1
	H	60	15	5.8		H	15	5	4.1
6	L	35	16	5.0	3	L	55	10	4.1
	H	55	16	5.8		H	45	12	4.1
7	L	60	35	5.8	4	L	55	15	4.1
	H	55	17	5.0		H	55	13	4.1
8	L	60	17	5.0	5	L	50	13	4.1
	H	35	15	5.8		H	55	14	4.1
9	L	50	18	5.8	6	L	55	15	4.9
	H	30	15	6.6		H	50	15	4.9
10	L	45	10	5.8	7	L	55	12	4.1
	H	10	10	5.8		H	50	13	4.1
11	L	30	10	5.8	8	L	55	13	4.1
	H	35	10	5.8		H	35	10	4.1
12	L	35	15	5.8	9	L	30	10	4.9
	H	40	15	6.6		H	35	14	4.9
13	L	35	10	6.6	10	L	55	13	4.9
	H	40	11	6.6		H	50	13	4.9
14	L	50	10	5.8	11	L	65	13	6.6
	H	20	80	6.6		H	50	14	4.9
15	L	45	15	5.0	12	L	60	15	6.6
	H	40	10	5.0		H	55	15	4.9
16	L	40	15	5.8	13	L	65	15	6.6
	H	55	19	5.8		H	65	15	4.1
17	L	80	35	5.8	25	L	40	12	8.3
	H	55	25	6.6		H	40	11	6.6
18	L	55	15	6.6	26	L	40	14	6.6
	H	55	15	6.6		H	40	12	9.1
19	L	80	15	6.6	27	L	60	11	6.6
	H	55	15	6.6		H	70	14	6.6
20	L	55	15	5.0	28	L	20	12	10.7
	H	55	15	5.0		H	90	15	6.6
21	L	70	15	5.0	29	L	80	15	6.6
	H	55	15	5.0		H	80	12	12.3
22	L	55	15	5.0	1 Mar.	L	80	15	16.5
	H	45	15	5.0		H	60	19	6.6
25	L	40	20	4.9	2	L	60	14	8.3
	H	30	15	4.9		H	60	15	6.6
26	L	50	14	4.9	3	L	60	14	9.9
	H	30	10	5.8		H	40	16	5.0
27	L	40	9	4.9	4	L	40	15	5.0
	H	30	9	4.9		H	40	12	6.6
28	L	40	14	4.9	5	L	20	14	1.7
	H	55	13	4.9		H	10	11	8.3
29	L	65	19	5.8	6	L	40	15	5.7
	H	30	10	5.8		H	40	15	4.9
30	L	55	17	5.8	7	L	40	17	5.7
	H	35	10	5.8		H	45	12	5.0
31	L	55	13	4.9	8	L	40	15	5.0
	H	55	17	5.8		H	40	15	5.0

unit FTU NaCl ppm

Table App.5.e CHEMICAL ANALYSIS OF SAIGON RIVER WATER SAMPLES

at Phu Cuong in 1972 by SMWO

Date	*	Color	Turbidity	Cl ⁻	Date	*	Color	Turbidity	Cl ⁻
9 Mar.	L	20	15	5.7	1 Apr.	L	10	50	69.3
	H	20	15	5.7		H	14	60	9.9
10	L	40	15	2.4	2	L	15	60	21.5
	H	30	15	4.3		H	12	40	14.8
11	L	40	15	4.9	3	L	15	50	53.6
	H	40	16	4.2		H	15	50	8.2
12	L	60	16	6.6	4	L	15	55	37.3
	H	80	16	6.6		H	15	55	9.9
13	L	80	16	3.3	5	L	10	55	30.5
	H	60	16	8.3		H	12	60	9.1
14	L	70	16	8.3					
	H	100	17	18.1	9	L	80	14	6.6
15	L	60	15	13.2		H	40	15	12.4
	H	100	18	16.5	10	L	60	15	7.4
						H	80	18	14.8
17	L	20	50	29.7	11	L	75	16	20.6
	H	19	50	5.8		H	60	15	15.6
18	L	15	50	36.3	12	L	100	20	9.9
	H	15	50	5.8		H	80	16	14.0
19	L	17	70	31.4	13	L	60	15	33.0
	H	16	70	9.1		H	70	15	16.5
20	L	15	60	19.8	14	L	40	14	37.3
	H	15	60	9.9		H	50	15	12.3
21	L	15	40	18.2	15	L	40	12	41.2
	H	16	60	8.3		H	40	15	9.0
22	L	10	55	8.3	16	L	20	12	49.5
	H	10	55	6.6		H	90	15	12.4
23	L	15	55	4.1	17	L	50	16	33.0
	H	17	70	11.5		H	70	14	12.4
24	L	15	60	3.3	18	L	20	14	41.2
	H	16	55	9.9		H	40	14	20.6
25	L	15	40	5.8	19	L	30	12	20.6
	H	14	50	11.5		H	30	14	12.4
26	L	15	55	8.2	20	L	30	12	8.2
	H	15	55	4.1		H	30	14	12.4
27	L	17	50	15.6	21	L	50	15	5.0
	H	15	50	18.2		H	60	15	14.8
28	L	15	50	18.2	22	L	80	16	9.9
	H	14	50	18.2		H	70	14	20.6
29	L	10	40	14.8	23	L	80	20	4.1
	H	12	40	9.9		H	70	11	19.8
30	L	12	40	24.8	24	L	70	16	4.1
	H	14	40	10.7		H	80	16	8.2
31	L	12	50	52.8	25	L	60	15	12.4
	H	10	50	10.7		H	40	16	12.4
					26	L	70	16	20.6
						H	70	18	12.4
					27	L	80	19	20.6
						H	60	16	12.4
					28	L	60	14	28.9
						H	60	17	12.4

unit FTU NaCl ppm

Table App.5.f CHEMICAL ANALYSIS OF SAIGON RIVER WATER SAMPLES

at Phu Cuong in 1972 by SMWO

Date	*	Color	Turbidity	Cl ⁻	Date	*	Color	Turbidity	Cl ⁻
2 May	L	50	15	18.9	6 Jun.	L	60	14	3.8
	H	50	15	10.7		H	40	13	8.2
3	L	50	13	20.6	7	L	70	15	4.1
	H	60	11	4.1		H	50	15	6.6
4	L	55	14	16.5	8	L	40	11	6.6
	H	50	15	6.6		H	30	11	3.3
5	L	50	17	14.1	9	L	30	10	5.8
	H	50	18	5.7		H	40	10	5.8
6	L	55	17	3.3	10	L	30	10	5.0
	H	100	18	9.8		H	50	10	5.8
7	L	100	45	4.9	11	L	30	10	6.6
	H	55	20	5.7		H	40	10	4.9
8	L	75	18	3.3	12	L	50	12	8.2
	H	55	17	8.2		H	20	10	3.3
9	L	90	18	4.9	13	L	30	14	9.1
	H	90	20	6.6		H	40	11	3.3
10	L	100	20	5.7	14	L	50	12	7.4
	H	90	20	8.2		H	50	12	3.3
11	L	100	35	10.7	15	L	50	10	6.6
	H	85	18	8.2		H	40	11	6.6
12	L	85	14	28.8	16	L	50	22	8.2
	H	100	14	20.6		H	55	15	4.1
13	L	100	32	16.5	17	L			
	H	100	20	39.4		H	55	18	6.6
14	L	100	35	6.6	18	L	70	25	3.3
	H	100	16	12.3		H	40	15	6.6
15	L	75	20	7.4	25	L	30	18	10.7
	H	75	19	35.6		H	40	10	9.1
16	L	65	18	8.2	26	L	40	15	7.4
	H	70	18	37.3		H	55	16	4.1
17	L	65	17	17.3	27	L	50	16	9.1
	H	70	15	4.1		H	30	16	9.9
18	L	55	15	13.2	28	L	30	19	9.9
	H	75	16	4.9		H	35	15	7.4
19	L	65	18	18.9	29	L	35	17	6.6
	H	70	22	4.9		H	35	15	7.4
20	L	65	15	12.3	30	L	35	15	8.2
	H	65	15	20.6		H	50	15	5.8
21	L	65	14	4.1	1 Jul.	L	50	15	6.6
	H	60	15	11.5		H	55	15	5.8
30	L	30	20	45.5	2	L	60	16	5.0
	H	55	15	41.1		H	40	14	8.2
31	L	55	15	28.9	3	L	55	15	8.2
	H	55	14	41.1		H	30	14	5.0
1 Jun.	L	30	15	18.2	4	L	60	20	5.8
	H	60	16	33.0		H	40	16	8.2
2	L	60	14	37.8	5	L	60	15	5.0
	H	60	14	27.2		H	55	14	7.4
3	L	30	15	4.1	6	L	14	14	5.0
	H	55	14	8.2		H	40	10	4.1
4	L	50	15	3.3	7	L	30	30	8.2
	H	70	15	5.8		H	50	14	7.4
5	L	60	15	3.3	8	L	30	14	8.2
	H	70	13	8.2		H	65	15	8.2

Table App.5,g CHEMICAL ANALYSIS OF SAIGON RIVER WATER SAMPLES

at Phu Cuong in 1972 by SMWO

Date	*	Color	Turbidity	Cl ⁻	Date	*	Color	Turbidity	Cl ⁻
9 Jul.	L	10	9	6.6	10 Aug.	L	60	17	9.9
	H	15	10	9.1		H	60	17	7.4
10	L	5	9	5.8	11	L	70	15	8.2
	H	9	9	9.1		H	60	15	8.2
11	L	30	10	6.6	12	L	50	14	7.4
	H	50	12	5.0		H	60	15	8.2
12	L	15	14	5.6	13	L	60	11	9.1
	H	50	15	5.0		H	70	15	4.1
13	L	30	14	6.6	14	L	60	10	6.6
	H	50	13	8.2		H	70	14	6.6
14	L	30	14	6.6	15	L	50	12	8.2
	H	50	11	5.0		H	60	13	5.8
19	L	10	12	9.9	16	L	70	12	5.0
	H	50	20	7.4		H	70	12	5.8
20	L	60	35	6.6	17	L	70	15	5.8
	H	60	30	8.2		H	70	11	5.8
21	L	30	15	6.6	18	L	70	17	5.8
	H	35	15	8.2		H	50	12	5.0
22	L	10	14	6.6	19	L	60	16	5.0
	H	20	15	8.2		H	50	15	6.6
23	L	20	15	8.2	20	L	60	15	7.4
	H	30	15	9.9		H	50	13	8.2
24	L	10	10	9.1	21	L	50	11	8.2
	H	35	10	9.9		H	50	10	8.2
25	L	10	10	9.1	22	L	70	11	8.2
	H	25	10	9.9		H	60	10	8.2
26	L	20	15	9.9	23	L	60	12	8.2
	H	50	16	8.2		H	60	11	6.6
27	L				24	L	60	14	5.8
	H	25	12	8.2		H	50	12	6.6
28	L	10	15	9.1	25	L	50	10	5.8
	H	50	20	7.4		H	60	11	6.6
29	L	20	15	9.1	26	L	60	14	7.4
	H	50	15	8.2		H	60	14	5.8
30	L	30	20	9.9	27	L	60	16	6.6
	H	50	21	7.4		H	60	14	7.4
31	L	50	20	9.1	28	L	60	15	8.2
	H	50	15	6.6		H	70	15	6.6
1 Aug.	L	50	15	9.1	29	L	70	15	8.2
	H	55	15	6.6		H	70	15	5.8
2	L	100	30	8.2	2 Sept.	L	70	25	4.1
	H	50	15	6.6		H	80	25	5.0
3	L	100	20	8.2	3	L	80	28	5.0
	H	70	15	9.1		H	20	20	5.0
4	L	50	15	8.2	4	L	100	20	5.8
	H	55	20	6.6		H	90	20	5.0
5	L	50	15	7.4	5	L	60	20	5.8
	H	70	14	6.6		H	100	20	5.0
6	L	80	15	9.1	6	L	60	18	5.0
	H	90	15	8.2		H	80	18	5.0
7	L	40	10	9.1	7	L	100	20	5.8
	H	50	15	9.9		H	80	20	5.8

unit FTU NaCl ppm

Table App.5.h CHEMICAL ANALYSIS OF SAIGON RIVER WATER SAMPLES

at Phu Cuong in 1973 by SMWO

Date	*	Color	Turbidity	Cl ⁻	Conductivity	Date	*	Color	Turbidity	Cl ⁻	Conductivity
30 Jan.	L	60	28	5.0	25	26 Jan.	L	20	18	5.0	35
	H	50	17	5.8	25		H	40	10	5.0	35
31	L	15	7	6.6	30	27	L	40	30	5.0	30
	H	15	88	6.6	40		H	60	27	5.0	65
1 Feb.	L	80	38	6.6	30	28	L	40	20	5.0	30
	H	60	22	9.9	30		H	30	17	5.0	35
2	L	20	8	5.0	35	1 Mar.	L	60	30	5.0	35
	H	60	21	6.6	35		H	50	28	5.0	35
3	L	40	21	6.6	35	2	L	80	32	4.1	35
	H	60	22	6.6	35		H	60	32	5.8	35
4	L	50	22	5.0	30	3	L	80	35	7.4	30
	H	55	22	5.0	30		H	70	35	6.6	35
5	L	60	27	6.6	30	4	L	70	35	7.4	30
	H	45	17	5.0	30		H	90	37	6.6	35
6	L	50	20	6.6	30	5	L	80	40	6.6	35
	H	45	18	5.8	30		H	100	42	8.2	35
7	L	40	18	6.6	30	6	L	100	40	9.9	45
	H	40	18	6.6	35		H	100	40	6.6	35
8	L	60	23	6.6	55	7	L	120	40	6.6	80
	H	55	27	6.6	30		H	100	37	6.6	35
9	L	50	18	6.6	35	8	L	120	47	20.6	70
	H	55	18	5.0	35		H	100	37	21.5	40
10	L	60	22	7.4	40	9	L	80	30	12.3	80
	H	50	18	5.8	30		H	100	36	8.2	50
11	L	65	23	6.6	30	10	L	80	30	7.4	35
	H	55	18	7.4	30		H	100	30	7.4	35
12	L	50	22	7.4	35	11	L	80	37	9.9	40
	H	50	18	8.2	30		H	70	42	10.7	45
13	L	50	22	8.2	35	12	L	40	33	8.2	40
	H	60	25	9.1	40		H	70	27	7.4	55
14	L	60	27	14.1	35	13	L	70	42	18.2	55
	H	60	27	16.5	35		H	70	42	5.0	35
15	L	55	22	8.2	45	14	L	70	32	9.9	35
	H	70	27	14.1	70		H	60	32	9.9	40
16	L	65	25	8.2	35	21	L	40	22	74.2	180
	H	65	25	11.5	45		H	80	32	36.5	120
17	L	80	40	8.2	30	22	L	30	28	115.2	280
	H	60	25	9.9	45		H	60	20	41.0	95
18	L	65	20	8.2	30	23	L	40	20	82.4	70
	H	65	22	9.9	30		H	60	25	21.5	180
23	L	50	20	5.8	30	24	L	60	20	59.4	150
	H	50	30	6.6	35		H	60	25	28.9	80
24	L	60	22	5.0	40	25	L	50	20	71.0	170
	H	50	22	6.6	30		H	60	25	26.4	70
25	L	45	22	5.0	30	26	L	40	17	8.9	100
	H	40	22	5.8	35		H	60	22	29.7	70

unit

FTU

NaCl
ppm

10⁻⁶ Ω/cm

unit

FTU

NaCl
ppm

10⁻⁶ Ω/cm

Table App.5.1 CHEMICAL ANALYSIS OF SAIGON RIVER WATER SAMPLES

at Phu Cuong in 1973 by SMWO

Date	*	Color	Turbid-ity	Cl ⁻	Conduct-ivity	Date	*	Color	Turbid-ity	Cl ⁻	Conduct-ivity
27 Mar.	L	60	22	40.2	105	15 Apr.	L	20	10	192.1	420
	H	70	27	21.5	75		H	25	10	132.0	300
28	L	60	17	36.9	100	16	L	30	15	231.0	520
	H	60	22	16.5	75		H	30	15	92.4	230
29	L	70	30	12.3	55	17	L	10	10	264.0	590
	H	60	27	36.5	100		H	15	12	94.7	190
30	L	80	32	11.5	40	18	L	50	10	453.0	990
	H	60	23	42.7	115		H	30	15	132.0	780
31	L	80	22	37.2	100	19	L	20	12	154.0	310
	H	80	35	27.2	75		H	25	15	474.4	1000
1 Apr.	L	40	17	36.5	160	20	L	10	8	154.3	340
	H	40	22	49.5	120		H	10	8	305.3	890
2	L	40	20	51.1	140	21	L	20	12	123.4	300
	H	50	25	52.8	145		H	30	10	281.5	600
3	L	40	18	69.3	195	22	L	30	8	165.0	400
	H	60	22	45.5	110		H	10	12	123.4	300
4	L	60	20	99.0	245	23	L	30	12	254.8	720
	H	30	18	82.4	220		H	20	12	99.8	210
5	L	40	20	90.6	240	24	L	40	12	123.4	160
	H	60	20	57.7	160		H	20	10	165.0	350
6	L	40	20	189.8	410	25	L	40	12	115.2	90
	H	40	20	104.8	240		H	20	8	41.2	230
7	L	40	15	78.3	205	26	L	50	12	41.2	50
	H	30	18	99.0	155		H	20	10	132.0	290
8	L	40	16	119.3	290	27	L	60	15	41.2	40
	H	60	18	57.7	150		H	25	10	208.0	350
9	L	30	23	148.5	390	28	L	20	10	288.4	450
	H	40	28	165	220		H	30	10	112.1	230
						29	L	40	10	82.4	190
							H	30	10	236.8	440
						30	L	20	10	289.2	600
							H	25	10	206.2	440

unit FTU NaCl 10^{-6} cm ppm

Table App.5.j WATER QUALITY DATA OF SAIGON RIVER in 1973 at Phu Cuong

Date	Sampling Depth meters	PH	Alkalinity as CaCO ₃ ppm	Hardness	Turbidity FTU	Colour UNIT	Chloride as NaCl ppm	Iron ppm	Conductivity x 10 ⁻⁶ Ω/cm
5 April	2	5.4	3.0	31.0	25.0	45.0	136.9	0.1	310.0
	8	5.5	4.0	29.0	30.0	50.0	140.2	0.1	330.0
11	2	6.1	6.0	6.0	32.0	70.0	8.3	0.1	35.0
	8	6.5	9.0	7.0	38.0	80.0	12.4	0.1	35.0
18	2	5.6	4.0	72.0	32.0	50.0	495.0	0.2	980.0
	6	5.8	5.0	83.0	27.0	40.0	578.0	0.1	1,000.0
25	2	6.0	5.0	12.0	25.0	55.0	53.6	0.1	160.0
	6	5.9	5.0	13.0	38.0	70.0	56.1	0.1	120.0
28	2	6.3	4.0	8.0	25.0	60.0	7.4	0.1	40.0
	8	6.4	5.0	8.0	22.0	50.0	10.7	0.1	45.0
9 May	2	5.7	5.0	20.0	40.0	60.0	78.4	0.1	180.0
	8	5.9	5.0	20.0	42.0	60.0	82.5	0.1	200.0
12	2	6.0	5.0	9.0	42.0	60.0	23.1	0.1	70.0
	5	6.0	6.0	9.0	60.0	100.0	25.8	0.1	70.0
16	2	5.5	5.0	30.0	25.0	55.0	127.0	0.1	310.0
	8	5.4	5.0	35.0	27.0	45.0	128.7	0.1	280.0
19	2	4.8	5.0	52.0	18.0	25.0	288.7	0.1	600.0
	4	5.2	5.0	46.0	15.0	20.0	222.7	0.1	450.0
24	2	5.5	5.0	21.0	32.0	60.0	74.3	0.1	180.0
	2	5.2	5.0	20.0	35.0	70.0	74.3	0.1	180.0
29	2	5.0	4.0	47.0	38.0	55.0	208.5	0.1	400.0
	4	5.0	4.0	46.0	28.0	55.0	214.5	0.1	420.0

by SMWO

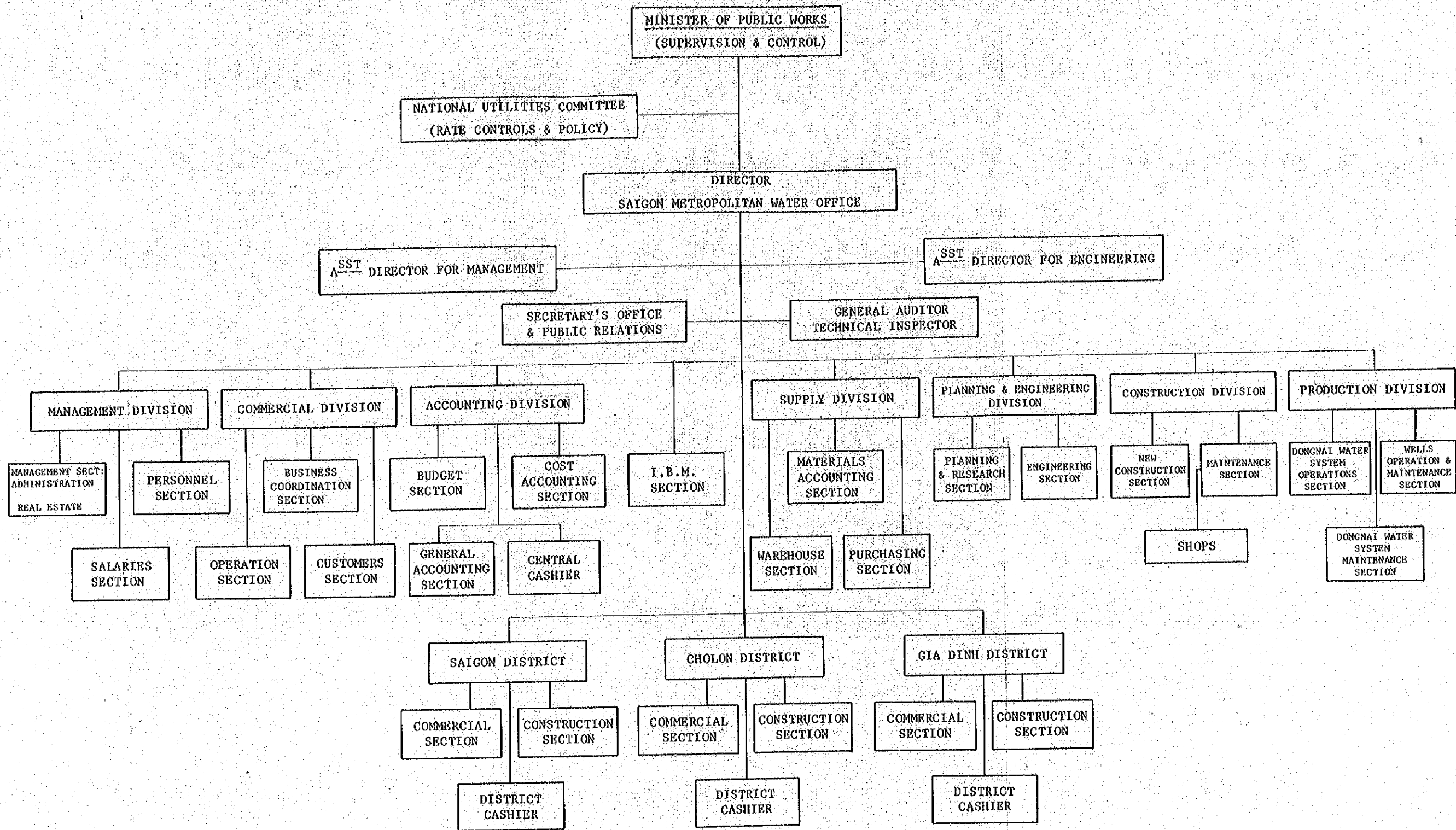


Fig. SAIGON METROPOLITAN WATER OFFICE ORGANIZATION CHART

