ESTIMATION OF AVAILABLE WATER FOR THE EL SALAM CANAL PROJECT

REUSE OF DRAINAGE WATER PROJECT

REPORT 3

ESTIMATION OF AVAILABLE WATER FOR THE EL SALAM CANAL PROJECT

PROJECT TEAM

1985

DRAINAGE RESEARCH INSTITUTE (DRI), GIZA, EGYPT

INSTITUTE FOR LAND AND WATER MANAGEMENT RESEARCH (ICW)

WAGENINGEN, THE NETHERLANDS

CONTENTS

1. PREFACE

The 'Reuse of Drainage Water Project' is a joint activity of the technical agencies:

Drainage Research Institute (DRI), Giza/Cairo-Egypt and

Institute for Land and Water Management Research (ICW) Wageningen, The Netherlands.

The Project is funded bu the Ministry of Irrigation of Egypt and by the Ministry of Foreign Affairs of the Netherlands in the framework of the joint programme of Technical co-operation between Egypt and the Netherlands.

The Advisory Panel for Land Drainage in Egypt acts as steering committee.

The results of studies, carried out in the 'Reuse of Drainage Water Project', will be presented in preliminary reports and in a final report. As such the contents of preliminary reports can vary strongly, from a simple presentation of data to a discussion of research results with tentative conclusions.

All opinions, conclusions and recommendations in these reports are those of the co-operating Institutes and not of the Ministry of Irrigation of Egypt or the Ministry of Foreign Affairs of the Netherlands.

2. SUMMARY AND CONCLUSIONS

Since 1980 the Drainage Research Institute conducts a programme to measure the discharges of drainage canals at different locations, in order to establish the relationship between lifting head and discharge for the drainage pumping stations. To determine its suitability for mixing with fresh water the chemical composition of the drainage water is also measured.

This report presents data concerning water quality, discharge measurements and calibration results of pumping stations in the Bahr Hadous catchment and at the Lower Serw pumping station. For the Bahr Hadous drain a water - and salt balance is calculated for the years 1980-1982. Assuming that drainage pumping stations (except Saft P.S.) are the only feeders of the Bahr Hadous Drain, a more or less closed water balance is ontained, but the salt balance did not fit that assumption. Reuse of drainage water was assumed after the delivering pumping stations but inside the catchment of another pumping station and with a closed salt balance a yearly reuse of 535 million cubic meter in the Bahr Hadous catchment could be calculated.

Further calculations revealed a yearly discharge of 500 million cubic meter water from the area drained by the Saft El-Qibly drain into the Bahr Hadous drain. Adding to this amount the average yearly quantity of drainage water deliverd to the Bahr Moius irrigation canal through the Hanut pumping station, resulted in an average drainage rate of 2,4 $mm.day^{-1}$ in the catchment area of the Saft El-Qibly drain. A drainage rate varying from 1,6 to 2,5 $mm.day^{-1}$ is obtained in measurements which is in the same order of magnitude. This leads to the conclusion that the measured discharge at the end of the Bahr Hadous drain is reliable within some limits.

The extent of the contribution of the Saft pumping station to the Bahr Hadous discharge is not clear. The discharge of this pumping station is partly diverted to the catchment of the Main Kassaby pumping station, partly to the navigational Ramsis drain and partly to an unknown destination, most probably for reuse practices, fish farms and to the Bahr Hadous drain.

For these reasons any contribution from the Saft pumping station is neglected in the calculation of available water for the El Salam canal.

The total amount of water, available for the El Salam canal has been calculated for a number of alternatives. It is assumed that 90% of the average yearly discharge of the Lower Serw pumping station

in the period 1980-1982 and 80% of the average yearly discharge of the Bahr Hadous drain during the period 1980-1984 is available.

It is assumed that the salinity of the drainage water from the Bahr Hadous when it becomes available for the El Salam Canal equals the measured salinity st the outfall.

If the amount of water available at the Farasquor Barrage does not exceed the quantity planned in 1979, the maximum amount of water, available for the El Salam Canal is 4070 million cubic meter per year, with an average salinity of less than 810 ppm. In some months the salinity will be up tp 1060 ppm. Setting the upper limit of salinity at 900 ppm, the yearly amount available is about 3900 million cubic meter. With an upper salinity limit of 800 ppm an amount of 3500-3700 million cubic meter is available.

If the originally required amount of 4450 million cubic meter has to to realized, an additional quality of 400-700 million cubic meter has to be made available at the Farasqour Barrage. The lowest amount concerns the situation when no upper limits are set to the salinity (average 830 ppm) the highest amount is for an upper salinity limit of 800 ppm and a salinity of 370 at the Farasqour Barrage. The calculated quantities do not include conveyance losses. It should be stressed that the calculations are based on the actual available data. Additional measurements are carried out now to increase the number of data to establish the water - and salt balances. Continuous records have to be made of discharge and salinities of the Bahr Hadous drain and the Saft El-Qibly drain.

When these data have become available more accurate calculations can be made of the amounts of available water for the El Salam Canal.

3. SCOPE OF THIS REPORT

The scope of this report is to present measurements of the Drainage Research Institute (DRI) until 1984 and to indicate the consequences of measured data for the availability of drainage water for the El Salam Canal project.

The sources of the El Salam Canal are at the Farasqour Barrage, the Lower Serw pumping station and the Bahr Hadous drain.

On a yearly base the available water from the Farasqour Barrage is more or less a fixed amount. It contains 250 and 370 ppm salt.

Water available at the Lower Serw pumping station is determined from measured discherges by the Ministry of Irrigation, corrected for the pump-efficiency and adapted to uncertain variations in the monthly discharges. The quality is set to the average (monthly) value. The amount of water originating from the Bahr Hadous drain is derived from the measured discharge at the Bahr Hadous Bridge. Since many areas drain to the Bahr Hadous drain, either by gravity or by pumping stations, a water - and salt balance is made of the drainage system. These balances will be used to control the reliability of the measured discharges at the Bahr Hadous Bridge location.

For a number of alternatives the total amount and the quality of the water, available for the El Salam Canal project will be calculated.

4. THE EL SALAM CANAL PROJECT

The El Salam Canal project is planned to collect the excess of irrigation water from the Damietta Branch of the River Nile at the Farasqour Barrage, the drainage water from the Lower Serw pumping station and the drainage water from the Bahr Hadous Drain. The water thus collected will be used to irrigate newly reclaimed areas. One area is located at the Western side of the Suez Canal with an acreage of about 200,000 feddan (84,000 ha) and one area of about 400,000 feddan (168,000 ha) is located East of the Suez Canal in the North Western part of Sinai.

Starting at the Farasqour Barrage at km 20.4, the Canal moves in South-Eastern direction, passing the Harna Drain, until the delivery side of the Lower Serw pumping station. Nile water and drainage water will be mixed by gravity. At km 17.5 of the canal a pumping station will lift the water from 0.5 m to 2.25 m. After this pumping station the canal moves to the Eastern direction parallel to the Tawil Drain. At km 36.65 the Tawil Drain will be crossed. Then the canal moves in Southern direction till it crosses the Bahr Hadous Drain at km 48.0. This point is situated between the measurement locations of DRI at Bahr Hadous Bridge and Bahr Hadous Outfall. A pumping station at that location will lift the water from 0.5 m till 3.0 m. The canal moves South and then to the East until it faces the Suez canal at km 27.8 (at Suez Canal).

The total length of the canal till this location is 82 km (Report of Ministry for Irrigation, Sept. 1979).

5. THE BAHR HADOUS DRAINAGE SYSTEM

5.1. INTRODUCTION

A schematic diagram of the Bahr Hadous drainage canal system is presented in fig. 1. Drainage water coming from the Bahr Saft El Qibly drain is partly discharged to the Bahr Moius Irrigation canal through the Hanut pumping station. After this substraction point the Bahr Saft El Qibly drain continues as the Bahr Hadous drain.

A small canal connects the Bahr Moius with the Bahr Saft El Qibly drain, as spillway for high water levels in the Bakr Moius. Since the construction of the High Dam it is not active anymore.

The Bahr Hadous outfall location is affected by back water, so at that location no stage discharge relation can be established. The water levels there are more or less equal to the Mansala lake level.

The discharge of the Saft pumping station is distributed over some canals. One of them is the Ramsis drain, a navigational canal. Another branch of the canal called Saft drain from Saft P.S. is supposed to discharge into the Bahr Hadous drain between the Bahr Hadous Bridge and Bahr Hadous Outfall.

Just after the Saft pumping station a water level regulator is present. Before this regulator the drainage water is partly diverted to the irrigation system in the catchment area of the Main Kassaby pumping station, following a rotational scheme.

From the Bahr Hadous an area of about 5,000 feddan is irrigated in the Manzala district. Moreover in that district about 4,000 feddan fish farms refresh the fish ponds with water from the Bahr Hadous Drain.

5.2. DRAINAGE RATES

The discharge of each pumping station is calculated as a mean monthly discharge expressed in $mm.day^{-1}$.

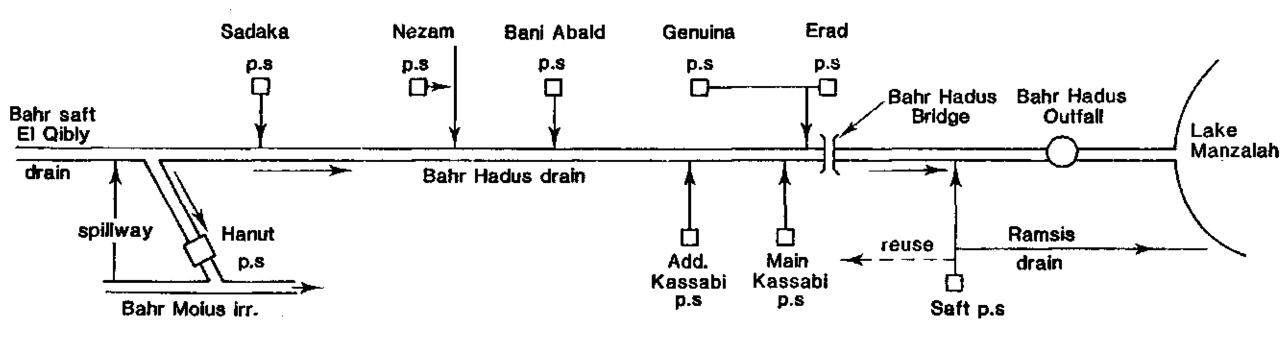

Fig. 1. Schematic diagram Bahr Hadous drainage canal system

The results are shown in tabel 1. About 1/3 of the area of the Nezam pumping station is under rice, 2/3 of the Main Kassaby area is occupied by rice. Due to the need for refreshing the standing water in the rice fields during the early stages of growth to prevent too high temperatures, and due to continuously high water tables, the drainage rates in rice areas will be higher than in non-rice areas.

The drainage rates in the Main Kassaby catchment area are extremely high. This is problably due to the use of the saline drainage water from the Saft pumping station. Much leaching is required when this saline water is used for irrigation.

The drainage rate of Erad is high. It is observed that during some periods the discharge from the Genuina pumping station is reused completely in the area belonging to the Erad catchment. However, quantitative data about this reuse are not available.

5.3. EFFICIENCY OF PUMPING STATIONS

Pumping stations are calibrated during steady state situations. This means that during the discharge measurements the lifting head does not change significantly.

The discharge of each pump operation is measured with a current meter. This meter is regularly calibrated by the Hydraulics and Sediment Research Institute at Delta Barrage.

The velocity at the nodal points of an imaginary grid system(grids 0.5 x 0.5 m) at the suction side of the pump is measured. The velocity is taken representative for an area of 0.5 x 0.5 m^2,with the nodal point as its centre.

When high water tables at the suction side occur the flow velocity is measured in a cross - section of the canal with the same technique.

From the measured discharge and lifting head a curve is composed, giving the relation between both. If the originally designed static head discharge curve is available, the capacity pertaining to the measured lifting heads is determined. The actual measured capacity is divided by this capacity and the actual pump efficiency is obtained. In other cases the ratio of measured and designed capacity is determined and all ratios are averaged, yielding the efficiency.

The efficiency of each pumping station is determined in 1981 - 1982 and revised in 1984. The measurements are presented in fig. 2. From this figure it can be concluded that, except for the Genuina pumping station, the efficiencies did not change significantly since 1981.

Table 2 presents the efficiency of each pumping station, derived from the calibration measurements.

Table 2. Efficiency of Pumping Stations in the Bahr Hadous catchment area

Pumping station	(code)	Average 1981/1982	Efficiency 1984
Sadaka	(EH03)	0.95	0.99
Nezam	(EH05)	1.02	1.00
Beni Abaid	(EH06)	0.89	0.89
Main Kassabi	(EH08)	1.15	1.15
Add. Kassabi	(EH07)	0.68	0.68
Genuina	(EH09)	0.96	1.08
Erad	(EH10)	0.83	0.83
Saft	(EH12)	0.84	0.84

Table 1. Drainage rates, $mm.day^{-1}$, in different areas served by pumping stations

Month	Sadaka	Nezam	Beni Abayd	Main Kassaby	Add.Kassaby	Genuina	Erad
	43,000 feddan	45,000 feddan	53,000 feddan	28,000 feddan	60,000 feddan	38,000 feddan	57,000 feddan
Jan.	1.4	1.3	2.3	5.9	2,2	2.1	4.2
Febr.	0.9	1.0	1.2	3.1	1.3	1.7	2.73
March	1.4	1.6	2.5	5.7	1.7	2.5	4.2
April	1.5	1.9	2.5	6.1	2.1	2.4	4.4
May	1.5	1.6	2.3	6.0	2.1	2.2	3.8
June	1.7	2.2	2.8	8.2	2.8	3.8	5.8
July	2.1	2.5	3.6	10.1	4.1	5.1	7.4
Aug.	2.5	2.9	4.2	10.0	4.4	4.8	8.1
Sept.	3.0	2.8	4.2	10.2	4.5	4.4	8.1
Oct.	2.4	2.5	3.8	9.6	4.0	3.0	6.1
Nov.	1.8	2.3	3.1	6.5	2.4	2.7	5.6
Dec.	1.8	2.1	3.0	5.5	2.4	2.4	4.7

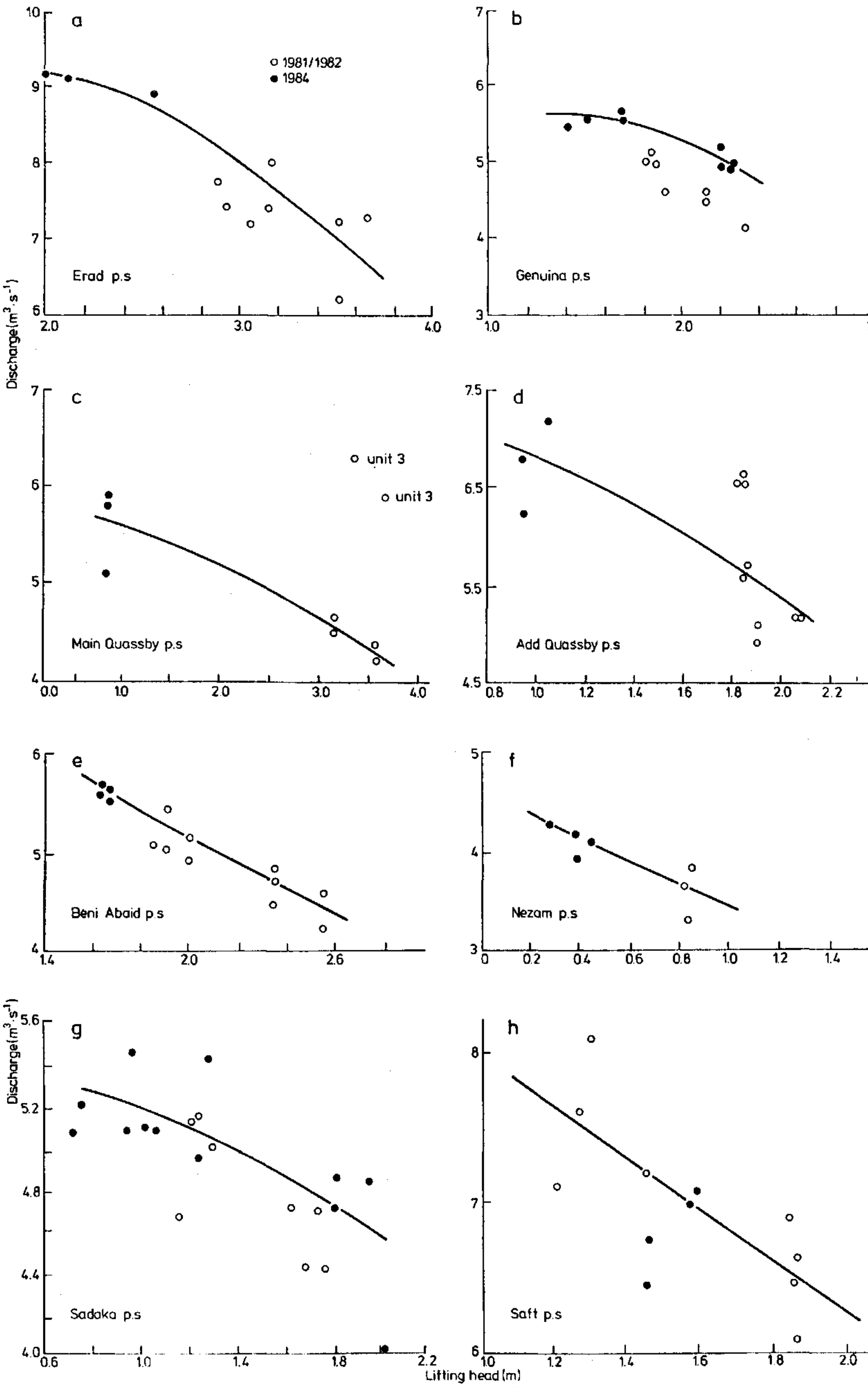

Fig. 2. A - H. Results of calibrations of pumping stations in the Eastern Delta

The results presented in table 2 will be used to correct the discharges obtained from the Ministry of Irrigation.

5.4. DISCHARGE AND SALINITY AT THE BAHR HADOUS BRIDGE

At the Bahr Hadous Bridge location the water level in the drain has been measured regularly referring to a fixed point.

At the same location the discharge is measured by the current meter for different water levels.

In a cross-section the velocity is measured at distances of 2 m and depth intervals of 0.5 m. The duration of the measurements is 30 seconds in each position.

With these measurements a stage - discharge relationship is established. Using a curve fitting technique a water level is determined at which the discharge is just zero. Through the points the power curve shown in Fig. 3 is obtained.

With the curve in Fig. 3 the discharge is determined at the dates on which the water level is measured. The results are shown in table 3.
The discharge per month is determined as the arithmetic mean per month of the available data over some years. In January and February the duration of the closure period is taken into account to determine the periods for which the measurements are representative. The closure period starts about Jan. 20 and ends about Febr. 10.

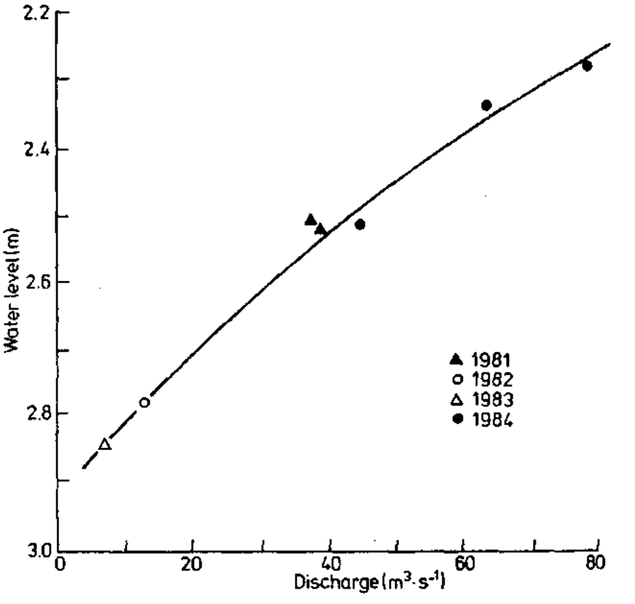

Fig. 3. Results of stage discharge measurements at the Bahr Hadous Bridge Location

The average discharge per month is given in table 4 in 10^6 m^3. Salinities are obtained from fortnightly sampling.

Table 3. Discharge at Bahr Hadous Bridge (m^3S^{-1}) (from stage-discharge curve)

1980		1981		1982		1983		1984	
date	disch.	date	disch.	date	disch.	date	disch.	date	disch.
8- 1	42.1	7- 1	14.6	10- 1	116,1?				
28- 1	14.6	20- 1	-					23- 1	39.6
11- 2	15.5	9- 2	8.6	16- 2	2.1				
26- 2	60.9	17-2	31.2						
10- 3	47.2	10- 3	44.6	2- 3	89.5			6- 3	60.9
24- 3	25.6	28- 3	49.9	16- 3	71.1			19- 3	42.1
14- 4	43.4	14- 4	32.4	6- 4	66.6			3- 4	37.1
21- 4	42.1			21- 4	32.4	26- 4	14.6		
5- 5	28.9	4- 5	26.7	8- 5	34.7	3- 5	30.1		
27- 5	40.8	22- 5	30.0			17- 5	55.4		
4- 6	31.2			5- 6	69.6				
16- 6	45.9	14- 6	26.7						
30- 6	24.5			29- 6	30.0	26- 6	44.7		
17- 7	65.2	4- 7	27.8	13- 7	55.3	28- 7	72.7		
1- 8	72.5								
19- 8	68.1	18- 8	53.9	23- 8	84.8	16- 8	59.6		
23- 9	97.6	3- 9	81.7	14- 9	68.1	7- 9	81.9		
5-10	4.4?					5-10	107.8		
28-10	49.9	16-10	86.4	16-10	84.8				
12-11	63.7	3-11	45.9	12-11	83.2				
25-11	72.5			20-11	71.1				
7-12	53.9					13-12	63.9		
26-12	65.2	29-12	91.1			26-12	84.9		

Table 4. Average monthly discharge at Bahr Hadous Bridge ($10^6 m^3$) and the average salinity (ppm)

Month	Discharge 1980-1982	Discharge 1980-1983/84	Salinity 1980-1982
Jan.	125	121	1939 (1680)*
Febr.	57	57	2230 (2570)
March	146	140	1006 (1410)
April	112	99	1287 (1500)
May	86	94	1221 (1490)
June	112	101	1474 (1440)
July	132	148	1568 (1740)
Aug.	180	182	1553 (1690)
Sept.	213	213	1366 (1640)
Oct.	197	220	1071 (1170)
Nov.	174	174	1293 (1460)
Dec.	187	192	1603 (1700)
Total	1721	1740	1420

* average Bahr Hadous Outfall

5.5. PRELIMINARY WATER - AND SALT BALANCE OF BAHR HADOUS

Drainage water is deliverd to the Bahr Hadous drainage canal from several sources. Most of them are the drainage pumping stations. The discharge of some areas is drained by gravity into the Hadous drain. A part of this amount is reused through the Hanut pumping station and through approximately 50 officially approved small pumps along the Hadous drain. Unofficial reuse is observed locally in periods with shortage of irrigation water.

It will be assumed that all the water from areas drained by gravity is reused and that the non-used part of the reused water will be drained into an area, served by a pumping station. Salts present in the irrigation water will then be discharged through the pumping stations. A salt and water balance of the Bahr Hadous drain can be made under this assumption. Data concerning discharges of the pumping stations are provided by the Ministry of Irrigation, and corrected for the pump efficiency as determined by DRI.

The discharges of all the pumping stations are added together and compared with the discharges at the end of the Bahr Hadous drain at the Bahr Hadous Bridge Location. This results in the water balance. Instead of making a balance for the complete system the balance for this part of the Bahr Hadous drainage system is made since the former would require information on that part of the discharge from the Saft pumping station that is delivered to the Bahr Hadous drain. Further more sufficient data on the Bahr Hadous Outfall are required. In preceding chapters it is pointed out that the information concerning the routing of the Saft-discharge is not very well known. Moreover, not enough data on discharges at the Bahr Hadous Outfall are available. However, some evidence is present that the discharge at the Bahr Hadous Outfall is of the same order of magnitude as that at the Bahr Hadous Bridge, as is shown in Fig. 4.

As a first approach it could be assumed that the discharge at the Bahr Hadous Bridge Location is one of the sources for feeding the El Salam Canal

A water - and salt balance is made under the following assumptions:

- the complete discharge of the Saft El Qibly drain is delivered to the Bahr Moius;
- there is no return flow from Bahr Moius to Bahr Hadous drain;
- discharge from areas, drained by gravity is reused completely;
- drainage water, including salts coming from the areas irrigated with drainage water, is completely discharged to the Bahr Hadous drain through the pumping stations;
- the concentration of the total dissolved salts (TDS in parts per million) is a good parameter for salinity and no precipitation of salts occur;
- correcting discharges of pumping stations via the determined efficiency gives the actual discharge.

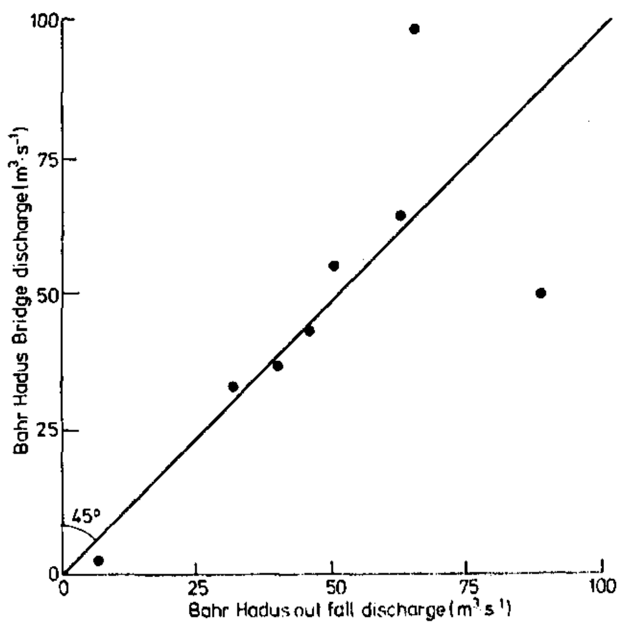

Fig. 4. Relationship between discharge at Bahr Hadous Bridge and Bahr Hadous Outfall

Table 5A. Discharge ($Q \times 10^6 m^3$) and salinity (TDS in ppm) at pumping stations and Bahr Hadous Bridge, 1980

Month	Sadaka		Nezam		Beni Abaid		Main Kassabi		Add. Kassabi		Genuina		Erad		Bahr Hadous Bridge	
	+		+		+		+		+		+		+		−	
	Q	TDS	Q	TDS	Q	TDS	Q	TDS	Q	TDS	Q	TDS	Q	TDS	Q	TDS
Jan.	6.0	2830	5.0	1195	14.1	1765	19.0	3095	17.1	1825	9.8	1815	31.0	2605	103.2	1920
Febr.	3.9	2510	4.5	805	8.5	1440	11.0	3900	11.6	3175	8.4	3145	18.8	4420	85.9	1705
March	7.5	1655	8.0	925	14.9	1215	18.3	2120	17.3	1440	12.4	820	32.4	1477	97.5	1330
April	8.1	1245	10.3	700	14.8	1430	19.2	3170	15.1	1450	12.0	630	35.0	1660	110.7	1480
May	7.4	1505	7.0	630	13.9	1190	16.4	1890	16.0	1345	11.4	575	30.4	1660	93.4	1295
June	7.6	1560	8.0	830	13.4	1243	23.7	2976	26.0	1576	20.2	573	43.6	1730	87.8	1453
July	10.4	1470	13.4	870	20.1	1460	33.7	3428	32.6	1970	25.3	660	55.9	1730	174.6	1630
Aug.	13.7	1670	18.0	865	22.6	1360	34.5	2785	33.3	1580	24.8	680	62.1	1760	188.3	1635
Sept.	16.2	1410	14.9	850	22.1	640	34.4	1630	34.4	1640	21.5	540	64.7	1660	252.9	1560
Oct.	13.4	1615	11.6	775	19.8	1310	30.4	1805	32.0	1535	14.3	890	48.6	1320	133.6	1405
Nov.	10.3	1910	11.0	1150	16.6	1650	19.8	2720	21.0	1655	12.5	1080	41.3	2025	174.0	1625
Dec.	10.9	1910	10.8	1140	17.6	1680	20.6	2980	20.1	1870	11.0	1155	36.2	2070	144.4	1640
Total	115.6		122.5		198.3		280.9		276.6		183.6		499.9		1646.3	

Table 5B: 1981

Jan.	7.3	2330	7.7	1145	13.8	1570	21.4	2130	18.4	1550	10.0	965	29.4	1835		1255
Febr.	6.3	1290	6.2	825	7.4	2705	8.7	2460	9.5	1470	8.7	2765	21.2	1560	42.3	3190
March	8.4	1270	10.7	745	18.6	1630	22.1	2170	19.7	1290	13.5	950	31.4	1425	126.6	1065
April	6.9	1960	9.4	1170	17.3	1105	23.9	2560	17.8	1580	11.1	10.60	30.1	1960	83.7	1380
May	9.0	1070	8.6	690	17.6	1105	25.9	2120	15.7	1185	10.4	895	26.6	1600	76.0	1120
June	7.2	620	7.5	1070	16.8	1350	34.5	3560	11.0	1610	17.2	750	40.2	1790	69.2	1740
July	11.3	2110	12.0	460	20.3	2010	40.9	2070	36.0	900	24.1	970	53.0	1080	74.4	1550
Aug.	14.4	1350	13.3	760	19.1	1110	37.1	1880	37.9	1620	23.1	790	60.7	1870	144.4	1490
Sept.	16.2	1540	13.3	810	25.7	1070	38.4	2560	35.3	1400	19.8	760	55.5	1660	211.7	750
Oct.	13.4	1170	13.1	790	24.9	1110	39.4	1840	33.4	1320	14.3	970	41.7	1520	231.3	770
Nov.	9.0	1595	11.2	1010	18.4	1185	25.0	2225	15.0	1275	11.0	1115	37.8	1680	119.0	1265
Dec.	9.3	1570	9.8	1100	18.0	1370	22.9	2520	15.0	1540	10.7	1240	33.4	2370	244.1	1590
Total	118.8		122.8		218.0		340.3		264.7		174.0		461.1			

Table 5C: 1982

Jan.	10.4	2860	10.9	1460	20.6	1425	24.6	2515	16.9	2130	10.9	2240	32.0	2625	311.1	1945
Febr.	3.1	5390	4.6	2260	6.9	3340	11.3	5180	5.6	5890	6.2	5170	14.9	4590	5.1	3120
March	7.4	1405	9.3	810	18.0	1045	22.1	1955	1.8	1290	11.9	870	28.9	1385	215.0	825
April	9.6	1125	13.1	810	18.5	1200	21.3	2450	13.8	1310	11.9	1065	30.6	1645	128.0	1060
May	9.3	1690	12.1	860	16.4	1320	22.9	2750	13.5	1990	11.2	960	28.5	1380	93.0	1230
June	12.3	1390	17.1	695	25.8	1395	28.4	2615	17.1	1355	17.2	710	41.4	1760	129.1	1345
July	13.5	1260	18.6	1080	34.2	1190	36.3	2750	26.9	1540	26.1	810	56.2	1710	148.1	1530
Aug.	14.4	1620	19.2		38.4	1300	37.4	2690	32.0	1630	23.4	1050	56.9	2030	227.1	1540
Sept.	15.7	1680	19.5		37.2	1490	34.8	3100	32.11820		21.7	1130	55.1	1880	176.0	1830
Oct.	12.7	1400	18.4	800	33.0	900	31.5	2201	27.1	1150	15.6	830	44.9	1470	227.0	1180
Nov.	10.3	1660	16.5	740	28.0	980	24.3	1820	18.5	1270	14.9	800	41.9	1325	200.0	1020
Dec.	10.4		16.9		26.6		16.6		20.3	1090	13.2		35.5			
Total	129.0		176.2		303.7		311.5		225.6		184.2		466.9			

The basic data to establish the water and salt balance are presented in the tables 4 and 5 A through 5 C.

For each month the average discharge and amount of salts released from all the pumping stations are calculated. The same is done for the Bahr Hadous Bridge Location. Table 6 shows the results.

The average salinity is calculated as a weighted mean from data given in tables 5 A through 5 C.

From the water balance it can be seen that discharges at the bridge exceeds the total discharge of the pumping station during the first five months of the year, indicating that an additional source must exist.

Table 6. Average cummulative discharge and salt release through all pumping stations and the Bahr Hadous Bridge Location (1980-1982)

Month	Cummulative discharge ($10^6 m^3$)		Cummulative salt release (10^6 tons)	
	pumping stations	B.H. Bridge	pumping stations	B.H. Bridge
Jan.	112	125	0,234	0,243
Febr.	175	182	0.429	0.369
March	290	328	0.592	0.517
April	407	440	0,781	0,661
May	518	526	0.944	0.766
June	643	638	1.192	0.931
July	844	770	1.509	1.138
Aug.	1107	950	1.916	1.418
Sept.	1317	1163	2.241	1.708
Oct.	1494	1360	2.542	1.919
Nov.	1633	1534	2.755	2.144
Dec.	1761	1721	2.871	2.444

In the months June through September the discharge at the Bridge Location is much less than the total discharge of the pumping stations. As the same holds for the salt releases, it seems reasonable that part of the drainage water is reused after the pumping stations in catchment area's of other stations.

It can be assumed that part of the discharge of the pumping stations is reused and that the salinity of that water equals the average salinity at all the pumping stations. A further assumption is that the discharge of the areas, drained by gravity (roughly 200,000 feddan) to the Bahr Hadous area, have an average salinity as is measured at the Nezam Bridge Location (900 ppm). With these assumptions an estimate can be made of the total reuse and the total discharge of the area's drained by gravity.

The amount of reuse is calculated with:

$$Q_r = \frac{C_b - C_n}{C_n - C_p} \cdot Q_b + Q_p$$

where:

Q_p - total yearly discharge of all pumping stations (= 1761 $10^6 m^3$);

C_p - average salinity of the discharged drainage water by the pumping stations (= 1630 ppm);

Q_b - total yearly discharge at Bahr Hadous Bridge (= 1721 10^6 m^3);

C_b - average salinity ar Bahr Hadous Bridge (1420 ppm);

Q_r - total amount of reused drainage water

C_r - salinity of reused water (= C_p);

C_n - salinity of water, drained by gravity (= 900 ppm)

The amount drained by gravity (excluding reuse through Hanut P.S (Q_n) is calculated with:

$$Q_n = Q_b + Q_r - Q_p$$

The amount of reuse is now 535 million m^3 per year and the amount of water drained by gravity is 495 million m^3 per year.

So the percentage of reused drainage water is about 24%. Volker (1980)* estimated the total reuse in the Nile-Delta at 13% and from Rijtema and Roest (1984)** a percentage of 27 can be derived.

The area, drained by gravity is roughly 200,000 feddan. Part of the drainage water from this area is reused through the Hanut pumping station.

* VOLKER, A. 1980. Reuse of drainage water; a pre-panel meeting Report of a Mission to Egypt, Rep. 4080 VII.01. Advisory Panel for Land Drainage in Egypt

** RIJTEMA P.E. and C.W.J. ROEST, 1984. Water and Salt balance approach. Proceedings Workshop on Reuse of Drainage Water. Cairo, 3 March 1984

The average yearly discharge of this pimping station in the period 1980-1982 is 286 million m^3. According to calibration measurement of DRI, the pump efficiency is 80%, so the effective yearly discharge is 236 million m^3. The total drainage from this area is about 731 million m^3, per year, or 2.4 mnd^{-1}. Recent measurement at the Gemeza bridge (Sept, Oct , 1984) give discharges of 11.5 - 17.5 $m^3 s.^{-1}$ for an area served of about 150,000 feddan (1.6-2.4 mmd^{-1}). At the Nezam Bridge, measurements in Sept, Oct and Nov , 1984 yielded discharges, ranging from 1.7 till 3.0 mm per day.

The calculated drainage from areas drained by gravity is of the same order of magnitude as the incidentally measured ones. However the accuracy of the derived data has to be increased, so additional measurements are inevitable.

At this stage, the conclusion can be drawn that the accuracy of the measured discharge at the Bahr Hadous Bridge is sufficient to give some preliminary figures about the availability of drainage water from the Bahr Hadous drain.

6. DISCHARGES AND WATER QUALITY AT THE LOWER SERW PUMPING STATION

6.1. INTRODUCTION

The Lower Serw pumping station serves an area of 66,000 feddan (27,720 ha). The pumping station is equipped with four pumps, having a gaarantee capacity of 8 m^3/sec each. This pumping station is calibrated in 1982 and in 1984. The latter was performed with high water tables in the canals.

Discharges of this pumping station are obtained from the Ministry of Irrigation. The monthly discharges and the average monthly head were available.

6.2. RESULTS CALIBRATION MEASUREMENTS

The calibration measurements are performed with a current meter, using the procedure described before.

The results are shown in fig. 5. Due to high water tables in 1984 the individual pumps could not be calibrated. The given data represent the average for all the pump units. Assuming that the results of 1982 are still valid, a smooth stage discharge curve for the pumping station could be derived.

This pumping station operates at lifting heads, ranging from 1.95 m to 2.65 m. Within this range the measured capacity varies from 8.85 m^3/sec till 8.0 m^3/sec. This means that the realized capacity always exceeds the guarantee capacity. From the obtained lifting heads the average efficiency during 1980-1982 is derived and amounts to 102%.

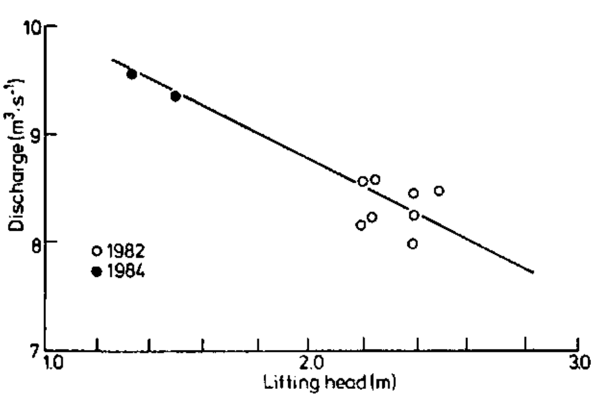

Fig. 5. Results of calibrations of the Lower Serw pumping station

6.3. DISCHARGES AND SALINITY

The discharges obtained from the Ministry of Irrigation, are corrected based on the ratio between the capacity of the pumps derived from the average monthly lifting head and the guarantee capacity.

The results, including the salinity determined by DRI-laboratory, are shown in table 7.

Table 7. Discharge (Q x $10^6 m^3$) and Water quality (TDS in ppm) of the Lower Serw pumping station

Month	1980		1981		1982		Average	
	Q	TDS	Q	TDS	Q	TDS	Q	TDS
Jan.	33	2435	40	1170	38	1610	37	1697
Febr.	24	1480	17	2525	16	2620	19	2154
March	42	1125	47	955	42	950	44	1008
April	49	915	47	1050	47	950	48	971
May	47	1050	50	855	58	980	52	961
June	66	1010	64	960	72	1040	67	1005
July	72	960	72	2200	75	1020	73	1389
Aug.	71	915	62	900	77	1240	70	1030
Sept.	72	880	65	860	72	1220	70	991
Oct.	52	960	60	860	57	860	56	891
Nov.	51	1350	52	835	49	945	51	1043
Dec.	44	1320	47	1070	41	-	45	1191

7. ESTIMATION OF AVAILABLE WATER FOR THE EL SALAM CANAL PROJECT

7.1. INTRODUCTION

From three sources water is available for the El Salam Canal Project. The first source is Nile water, delivered at the Farasqour Barrage From this source an amount of 2,110 million cubic meter per year is expected. As this amount comes from Lake Nasser, the discharge can be controlled at any time.

The second source is the discharge of the Lower Serw drainage pumping station, which delivers about 600 million cubic meter per year with an average salinity of 1120 ppm to Lake Manzala. This source cannot be controlled.

The third source is the discharge of the Bahr Hadous drain. The average yearly discharge is 1700 million cubic meter. The amount available from this source is less than the expected amount in 1977 of 2831 million cubic meter with an average salinity of 1337 ppm. The discharge from this source cannot be controlled.

The salinity of the Nile water at Farasqour Barrage will be 250 ppm, based on the El Salam Canal document.

Recent meassurements in the vicinity of this location show an average of 377 ppm.* This salinity may be due to pior actual flushing of the Damietta reach.

For the estimation of the amounts of available water for the El Salam Canal, the following assumptions are made:

- the discharge at the Farasqour Barrage can be controlled;
- to account for uncertainties and future increase in irrigation efficiency 90% of the discharge of the Lower Serw pumping station is available and will be completely used;
- to account for uncertainties, future increase in irrigation efficiency and actual reuse of drainage water, 80% of the discharge at the Bahr Hadous Bridge with a salinity similar to the measured one at the Bahr Hadous Outfall will be maximum available;
- conveyance losses are not accounted for. The available amount from the Lower Serw pumping station is derived from the average discharge during 1980 - 1982 and for the Bahr Hadous drain from the average discharge in the period 1980-1984.

Table 8 shows the available amounts from different sources: the planned total amount in 1979, the needed discharge from the Farasqour Barrage to be mixed with drainage water to obtain irrigation water with a salinity less than 800 ppm and the actual available amounts and salinities, based on recent measurements of the DRI.

7.2. CALCULATED AMOUNTS OF AVAILABLE WATER AT DIFFERENT ALTERNATIVE CONDITIONS

For a number of alternatives the available amounts of water will be calculated.

Table 8. Available Resources for El Salam Canal Project ($10^6 m^3$)

	Planned in 1979			Max available according to DRI			
	Total	From Farasqour Barrage	Salinity (ppm)	Bahr Hadous total	Bahr Hadous salinity	Lower Serw total	Lower Serw salinity
Jan.	240	120	802	97	1680	33	1697
Febr.	300	230	730	46	2570	17	2154
March	305	125	780	112	1410	40	1008
April	310	155	720	80	1500	46	961
May	305	75	725	75	1490	46	948
June	570	285	769	80	1440	60	1005
July	570	285	732	118	1740	65	1388
Aug.	540	255	697	145	1690	63	1030
Sept.	420	225	782	170	1640	63	991
Oct.	160	50	743	176	1170	50	891
Nov.	340	155	807	139	1460	46	1043
Dec.	390	150	824	153	1700	40	1191
Total	4450	2110		1391		569	

* Dr. SAMIA EL GUINDY, 1984. Report on water quality of irrigation water. Drainage Research Institute. Giza.

7.2.1. Alternative A

Discharge from Lower Serw is completely used, discharge from Bahr Hadous completely used and the planned amount at the Farraqour Barrage is completely used. Calculated is the total amount available for the El Salam Canal when the salinity at Faraqour Barrage is 250 or 370 ppm. The resulting salinity of the mixture is also calculated.

The results are shown in table 9. From this table it can be seen that the total amount available is about 400 million less than was planned in 1979. The average salinity is almost the same as was planned in 1979. The difference in salinity at the Farasqour Barrage does not affect the salinity of the mixture significantly. In some months the salinity is somewhat high.

This, however, will not cause much trouble when an adequate drainage is realized in the reclaimed areas.

Table 9. Calculated available water for El Salam Canal ($10^6 m^3$) and salinity of mixture (ppm) according to alternative A, with a salinity at Faraqour Barrage of 250 and 370 ppm respectively

Month	Planned 1979		According to DRI measurements		
	amount ($10^6 m^3$)	salinity (ppm)	amount ($10^6 m^3$)	salinity of mixture	
				250	370
Jan.	240	802	250	996	1053
Febr.	300	730	293	725	819
March	305	780	277	828	883
April	310	720	281	722	788
May	305	725	196	888	934
June	570	769	425	581	661
July	570	732	468	784	857
Aug.	540	697	463	807	873
Sept.	420	782	458	868	927
Oct.	160	743	276	953	975
Nov.	340	807	340	852	907
Dec.	390	824	343	1007	1059
Total	4450		4070	753	810

7.2.2. Alternative B

The discharge from Lower Serw will be completely used, the planned discharge at Farraqour Barrage is completely used, the salinity at this location is 250 and 370 ppm respectievely, such an amount of Bahr Hadous will be used to

salinity does not exceed 800 and 900 ppm respectively. The total available amount for the El Salam Canal is calculated under these conditions.

From table 10 it can be seen that the total available amount of water for El Salam Canal is hardly

Table 10. Available water for El Salam Canal with alternative B: salinity of mixture less than 800 and 900 ppm respectively, salinity at Farasqour Barrage 250 and 370 ppm

Month	≤ 800 ppm						≤ 900 ppm					
	250			370			250			370		
	Total available	From Hadous	Salinity mixture	Total available	From Hadous	Salinity mixture	Total available	From Hadous	Salinity mixture	Total available	From Hadous	Salinity mixture
	$10^6 m^3$	$10^6 m^3$	ppm	$10^6 m^3$	$10^6 m^3$	ppm	$10^6 m^3$	$10^6 m^3$	ppm	$10^6 m^3$	$10^6 m^3$	ppm
Jan.	194	41	800	178	25	800	219	66	900	201	48	900
Febr.	305	58	800	290	43	800	293	46	725	307	60	900
March	264	99	800	239	74	800	277	112	828	277	112	883
April	281	80	722	281	80	788	281	80	722	281	80	788
May	171	50	800	158	37	800	196	75	888	185	64	900
June	425	80	581	425	80	661	425	80	581	425	80	661
July	468	118	784	440	90	800	468	118	784	468	118	857
Aug.	459	141	800	425	107	800	463	145	807	463	145	873
Sept.	421	133	800	389	101	800	458	170	868	441	153	900
Oct.	162	62	800	146	46	800	222	122	900	200	100	900
Nov.	313	112	800	285	84	800	340	139	852	336	135	900
Dec.	264	74	800	244	54	800	297	107	900	275	85	900
Total	3729	1050	767	3500	821	782	3940	1261	802	3859	1180	856

affected by the salinity at Farasqour Barrage when the salinity of the mixture is less han 900 ppm. Lowering the maximum salinity to 800 ppm, has a significant effect on the amount available.

7.2.3. Alternative C

Discharge from Lower Serw completely used and the planned total amount in 1979 will be realized. Such an amount from the Bahr Hadous and the Farasqour Barrage will be required, that the salinity of the mixture is less than 800 and 900 ppm respectievely. The salinity at Farasqour will be 250 and 370 ppm respectievely.

To meet the demands as was foreseen in 1979 for the El Salam Canal significantly more water has to be released at the Farasqour Barrage. If the salinity of the mixture should not exceed 800 ppm roughly 600-700 million cubic meter is needed additional to the planned 2110 million cubic meter per year. Increasing the limit to 900 ppm, this additional amount is roughly 500 million cubic meter per year.

7.2.4. Alternative D

Discharge of Lower Serw and Bahr Hadous completely used. Such an amount from Farasqour Barrage is required to meet the demands for El Salam Canal as was foreseen in 1979. Calculated is the amount of water to be released from Farasqour Barrage and the salinity of the mixture when the salinity at Farasqour Barrage is 250 and 370 ppm respectively.

From table 12 it can be seen that the required amount from the Farasqour Barrage is roughly 400 million cubic meter per year more than was foreseen in 1979. The average salinity is than not much higher.

Table 12. Required discharge from Farasqour Barrage and salinity of mixture when the total discharge from Lower Serw pumping station and Bahr Hadous drain is used and the planned total demand for El Salam Canal is met. Salinity at Farasqour is 250 and 370 ppm respectievely

Month	Total required	Required from Farasqour		Salinity mixture	
		planned 1979	acc. DRI	250 at Farasqour	370 at Farasqour
	(10^6m^3)	(10^6m^3)	(10^6m^3)	(10^6m^3)	(10^6m^3)
Jan.	240	120	110	1027	1082
Febr.	300	230	237	714	808
March	305	125	153	775	836
April	310	155	184	678	749
May	305	75	184	660	733
June	570	285	430	496	587
July	570	285	387	688	770
Aug.	540	255	332	728	801
Sept.	420	225	187	924	977
Oct.	160	50	0	1083	1083
Nov.	340	155	155	852	907
Dec.	390	150	197	915	976
Total	4450	2110	2556	761	830

7.2.5. Summary of alternatives A - D

A summary of all the alternatives is given in table 13. This table gives the total amounts available for the El Salam Canal and the contribution of each source. Besides that the average yearly salinity is mentioned for different salinities at the Farasqour Barrage.

Table 11. Required amounts from Bahr Hadous and Farasqour Barrage to meet the total required demand for El Salam Canal under the condition that salinity of mixture is less than 800 and 900 ppm, while salinity at Farasqour is 250 and 370 ppm respectively

Month	Total required	≤ 800 ppm				≤ 900 ppm			
		250		370		250		370	
		from Hadous	from Farasqour	from Hadous	from Farasqour	from Hadous	from Farasqour	from Hadous	from Farasqour
	(10^6m^3)	(10^6m^3)	(10^6m^3)	(10^6m^3)	(10^6m^3)	(10^6m^3)	(10^6m^3)	(10^6m^3)	(10^6m^3)
Jan.	240	59	148	45	162	76	131	64	143
Febr.	300	57	226	45	238	46	237	46	237
March	305	112	153	102	163	112	153	112	153
April	310	80	184	80	184	80	184	80	184
May	305	75	184	75	184	75	185	75	184
June	570	80	430	80	430	80	430	80	430
July	570	118	387	118	387	118	387	118	387
Aug.	540	145	332	144	333	145	332	145	332
Sept.	420	133	224	111	246	163	194	144	212
Oct.	160	61	49	53	57	78	32	73	37
Nov.	340	124	170	106	188	139	155	137	157
Dec.	390	122	228	101	249	149	201	131	219
Total	4450	1166	2715	1061	2820	1261	2620	1205	2676

Table 13. Yearly available water and salinities for El Salam Canal and the contribution of different sources, when the salinity at Farasqour Barrage is 250 and 370 ppm respectievely

	Total amount available ($10^6 m^3$)		From Farasqour ($10^6 m^3$)		From Bahr Hadous ($10^6 m^3$)		From Lower Serw ($10^6 m^3$)	Salinity of mixture (ppm)	
	250	370	250	370	250	370		250	370
A	4070	4070	2110	2110	1391	1391	569	753	810
B (≤ 800)	3729	3500	2110	2110	1050	821	569	767	782
B (≤ 900)	3940	3859	2110	2110	1261	1180	569	802	856
C (≤ 800)	4450	4450	2715	2820	1166	1061	569	800	800
C (≤ 900)	4450	4450	2620	2676	1261	1205	569	900	900
D	4450	4450	2556	2556	1391	1391	569	761	830

From table 13 it can be seen that the planned amount for the El Salam Canal is only available when the discharges at the Farasqour Barrage are higher than originally was calculated. Depending upon the maximum allowed salinity during some period this additional amount is about 400-700 million cubic meter. However, the available amount at the Farasqour Barrage is not allowed to rank higher than 2110 million cubic meter as was foreseen in 1979, the maximum amount available for the El Salam Canal is yearly 4070 million cubic meter. In some months the salinity will than be up to 1060 ppm. Limiting the maximum salinity to 900 ppm, the amount available will be about 3900 million cubic meter.

Setting the maximum allowed salinity at 800 ppm results an available amount of 3500 - 3700 million cubic meter for the El Salam Canal.

الملخص والاستنتاجات

منذ عام ١٩٨٠ قام معهد بحوث الصرف بوضع برنامج لقياس معدل تصريف المصارف في اماكن مختلفه بهدف معرفه العلاقه بين ارتفاع الماء ومعدل التصريف في محطات رفع مياه الصرف. كذلك يهدف البرنامج الى معرفه امكانيه خلط هذه المياه مع مياه الرى بمعرفه التحليل الكيميائى لمياه الصرف.

يشمل هذا التقرير نتائج تتعلق بنوعيه المياه وقياسات معدلات التصريف وكذلك النتائج القياسيه المقدره في محطات الرفع في منطقه بحر حادوس ومحطه السرو الاسفل.

تم حساب الاتزان المائى والملحى في الفتره ١٩٨٠-١٩٨٤ لمنطقه مصرف بحر حادوس مع الاخذ في الاعتبار ان جميع محطات رفع مياه الصرف في المنطقه ماعدا محطه الصفط هى المصدر الوحيد للمياه في مصرف بحر حادوس وبهذا حسب الميزان المائى للمنطقه بدقه مع العلم بان هذا الاعتبار غير صالح لحساب الميزان الملحى بدقه كافيه. وقد وجد ان منطقه بحر حادوس تستهلك ٥٢٥ مليون متر مكعب من مياه الصرف اذا اخذ في الاعتبار ان هناك اعاده لاستخدام مياه الصرف في منطقه نهايه المصرف وان الميزان الملحى مغلق.

بينت الحسابات ان هناك ٥٠٠ مليون متر مكعب من المياه تاتى من منطقه مصرف الصفط القبلى الى مصرف بحر حادوس فاذا اضفنا الى هذه الكميه المتوسط السنوى لمياه الصرف الاتيه من ترعه بحر مواس الى محطه حانوت فان معدل الصرف في المتوسط يكون ٢٫٤ م/يوم في منطقه مصرف الصفط القبلى وهذه النتيجه مقارنه للقياسات الفعليه التى توضح ان معدل الصرف يتراوح بين ١٫٦ـ ٢٫٥م/يوم.

ومن جهه اخرى فان مدى مساهمه محطه الصفط في كميه المياه في مصرف بحر حادوس غير واضحه ويرجع ذلك الى ان التصريف في هذه المحطه يرجع جزئيا الى منطقه محطه القصابى الرئيسيه وجزئيا الى مصرف رمسيس ثم الى مصدر غير معروف حاليا وهو غالبا من اعاده استخدام مياه الصرف والمزارع السمكيه وكذلك مصرف بحر حادوس نفسه. ولهذه الاسباب فقد اهمل مدى مساهمه محطه الصفط في كميه المياه المتاحه لشروع ترعه السلام.

تم حساب كميه المياه المتاحه لترعه السلام على اعتبار انها تتكون من ٩٠٪ من متوسط التصريف السنوى لمحطه السرو الاسفل ، ٨٠٪ من متوسط التصريف السنوى لمصرف بحر حادوس خلال الفتره ١٩٨٠ـ١٩٨٢/١٩٨٤.

وضع ايضا في الاعتبار ان ملوحه مياه مصرف بحر حادوس في منطقه اتصاله مع ترعه السلام مساويه للملوحه المقاسه في نهايه المصرف.

وعلى اعتبار ان كميه المياه المتوفره عند قناطر فارسكور لا تتعدى الكميه المخطط لها في عام ١٩٧٩ ،فان اقصى كميه مياه متاحه لترعه السلام هى ٤٠٧٠ مليون متر مكعب في العام مع متوسط ملوحه اقل من ٨١٠ جزء في المليون مع الاخذ في الاعتبار ان الملوحه قد تصل في بعض الشهور الى ١٠٦٠ جزء في المليون. واذا كان الحد الاعلى المسموح به هو ٩٠٠ جزء في المليون فان كميه المياه المتاحه تصل الى ٣٩٠٠ مليون متر مكعب وتنخفض هذه الكميه الى ٢٥٠٠-٢٧٠٠ مليون متر مكعب اذا اعتبر حد الملوحه الاقصى المسموح به هو ٨٠٠ جزء في المليون.

ونظرا لان كميه المياه المطلوبه هى ٤٤٥٠ مليون متر مكعب فان ذلك يعنى الاحتياج الى ٤٠٠-٧٠٠ مليون متر مكعب اضافيه تؤخذ من مياه نهر النيل ويجب ان تكون متوفره عند قناطر فارسكور. والحد الادنى السابق مقدر على اساس حد اعلى للملوحه مقداره ٨٢٠ جزء في المليون والحد الاخر (٧٠٠) مقدر على اساس حد اعلى للملوحه مقداره ٨٠٠ جزء في المليون مع الاخذ في الاعتبار ان ملوحه مياه النهر عند منطقه قناطر فارسكور هى ٢٧٠ جزء في المليون وان الكميات السابقه لا تاخذ في الاعتبار الفاقد خلال النقل.

ونود ان نؤكد ان الحسابات السابقه مقدره على اساس كميه الماء المتاح فعلا وان هناك قياسات اخرى تجرى حاليا للحصول على مزيد من النتائج يمكن من خلالها حساب الميزان المائى والملحى بدقه اكبر الا ان هذا يستلزم ان تكون هناك قياسات مستمره لمعدل التصريف والملوحه في مصرفي بحر حادوس والصفط القبلى وانه بمجرد توفر هذه المعلومات فانه يمكن حساب كميه المياه المتاحه لمشروع ترعه السلام بدقه اكبر.

مشروع اعادة استخدام مياة الصرف

تقرير رقم ٣

حسابات مبدئيه للماء المتاح لمشروع ترعه السلام

الفريق البحثى

١٩٨٥

معهد بحوث الصرف مركز البحوث المائية ج.م.ع.

معهد بحوث ادارة الاراضى والمياة
واخننجن، هولندا

مشروع اعاده آستخدام ميـاه الصرف نشاط مشترك بيـن :-

معهد بحوث الصـرف - الجيزه - جمهوريه مصر العربيـة

ومعهد بحوث اداره الاراضى والميـاة - فاجننجن - هولنـدا

وتعتبر الجهه المموله للمشروع وزاره الرى بجهوريه مصر العربيـة ووزاره العلاقات الخارجيه بهولندا فى آطار البرنامج المشترك للتعاون الفنـى بين مصر وهولنـدا ٠

ويعمل المجلس الاستشارى المصرى الهولندى كهيئه مشرفة ٠

نتائج الدراسات التى تمت خلال هذا المشروع ستعرض اما فى تقارير مبدئيـة او تقارير نهائيـه ٠ حيث ان محتويات التقارير المبدئيه ممكن تختلف بشـدة من تقديم مبسط للبيانات او مناقشات لنتائج وخلاصات بحثيـه ٠

الاراء والتوصيات الموجوده فى التقارير السابقه تعتبر اراء الموءلف فقـط وليس لها علاقه بالمعاهـد اوالوزارات المعنيـة ٠

بسم الله الرحمن الرحيـم

"وجعلنـا من المـاء كل شـى حـى"

صدق الله العظيـــم