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Republic of Cyprus
Ministry of Agriculture and
Natural Resources

WATER DEVELOPMENT DEPARTMENT

ANNUAL REPORT 1978

Nicosia, November 1979

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C A C Konteatis B Sc (Eng.) FICE FIWE FGS — Director

Nicosia, November 1979

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for the
Water Development Department
Ministry of Agriculture and Natural Resources.

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Abbreviations

m	metre
mm	millimetre
MCM	Million Cubic Metres
m^3	cubic metres
ha	hectare
WDD	Water Development Dept.
£	Cyprus pound*

Conversion factors

Donum	=	0.134	Hectares
	=	0.3306	Acres
	=	14,400	Sq. feet
	=	1,340	sq. metres
Hectare	=	7.46	Donums
Acre	=	3.25	Donums

* The Cyprus pound was on par with £ sterling up to July, 1972. In 1978 the value of the Cyprus pound on average (daily basis) was:–

$	2.6788
£ st. ...	1.3954
DM ...	5.3602
Drachma	97.3226

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I GENERAL

Introduction

During 1978 and for the fourth year running, the hydrometeorological as well as other work of the Department was confined to the southern part of Cyprus due to the continued occupation of northern Cyprus by the invading Turkish troops, allowing no contact whatever by any Government Agency with the occupied half. Although it is believed that limited data are collected in the north it is by no means certain whether such data will one day suffice for a complete hydrometeorological picture of Cyprus.

Regarding the groundwater situation in the free areas, there was a marked improvement in the Akrotiri aquifer whereas the situation in the southeastern part of Cyprus has deteriorated due to over extraction especially in the Kokkinokhoria area.

Work on the feasibility study of the Southern Conveyor Project was well under way in 1978 as well as preparations for such a study for the Khrysokhou Watershed Irrigation Project.

Design work was concentrated on the requirements of the Pitsilia Integrated Rural Development Project and a British Consulting Firm was assigned in mid 1978 for the design of the first phase of the Nicosia water supply component of Vasilikos–Pendaskinos Project.

A record expenditure was again reached this year on construction works amounting to more than £5.25 million, the Paphos Irrigation Project being by far the biggest Project under construction.

The Water Development Department

The Department of Water Development, Ministry of Agriculture and Natural Resources, is responsible for the Government's overall policy on water resources, planning, design and construction on the Island. It also cooperates in the management of water resources and water development projects together with other Departments and Ministries.

Water development projects include domestic water supplies, irrigation and drainage projects, flood protection works, protection works against pollution of water resources, groundwater recharge works and other relevant works.

The Government institutional set up for water resources conservation and development and the role of the Department of Water Development is shown on page 4.

DEPARTMENTAL ORGANIZATION

The Departmental Organization is shown on page 6 and is made up of: **The Division of Water Resources** which groups together all services required for the collection, study and interpretation of hydrological and

hydrogeological data both for ground and surface water, control of groundwater extraction and engineering geology problems as connected with the planning and execution of works projects.

The **Division of Planning** which deals with the preparation of reconnaissance and feasibility studies prior to the detailed design of major projects. The works for planning include field investigations for hydraulic structures, laboratory testing for these structures, water use studies, hydrological evaluations, evaluation of benefits, techno–economic studies, as well as engineering geology problems.

Systems analysis and mathematical modelling techniques with the help of electronic computers are widely used in these studies.

The **Division of Design** which deals with the detailed design and specification works required for major projects after feasibility stage. In this Division the drawing and topographic functions of the Department are incorporated.

The **Division of Construction** which is responsible for all construction work whether carried out by direct labour or by contract.

The **Division of Operation and Maintenance** which assists in the operation and maintenance of the major projects such as dams and town water supplies. For every major irrigation project there is a Project Water Board for its management. In the case of town water supplies, Town Water Boards have been established to which we are a member, whilst in the case of rural water supplies, Village Water Commissions are set up according to relevant legislation.

The **Division of Small Projects Planning** deals with the planning and designing of small irrigation and domestic water supply projects which are of a rather routine nature and do not need elaborate planning and design procedure.

The **Regional Offices** after the 1974 Turkish invasion are confined to **Larnaca, Limassol** and **Paphos.**

In these Regional Offices the main works carried out are:

Hydrological measurements, collection of engineering data, operation and maintenance of projects, investigations and planning for small projects and control of construction work.

The **Office Management** Division is responsible for the office services, accounts, labour, personnel and stores. Also a financial control and co–ordination branch is included which deals with financial aspects and control of expenditure.

Legal Matters

The Legal Adviser performs Legal and other relevant duties concerning the activities of the Department of Water Development or more generally the Ministry of Agriculture and Natural Resources.

All matters cropping up from time to time in the working of the Department which involve legal questions are referred to be resolved by the Legal Adviser. The Legal Adviser expresses his opinion either orally or he prepares written opinion.

FOREIGN TECHNICAL ASSISTANCE

The following sections of work were dealt with during the year.

United Nations

Technical Assistance received from United Nations during 1978 was:

Experts

B Milinusic, FAO Senior Irrigation Engineer continued his services with us throughout the year as the Project Manager of the Paphos Irrigation Project.

R C Bloemers, FAO Expert continued his services with us throughout the year on Paphos Irrigation Project.

T J Sytsema FAO Associate Expert was assigned to Paphos Irrigation Project as from August 1979.

British Technical Assistance

Southern Conveyor Project

Four experts, from the Ministry of Overseas Development arrived in Cyprus between April and May 1978 and took up their posts with the Water Development Department to work together with Cypriot staff on the

preparation of a feasibility study for the Southern Conveyor Project.
They are:

J.F. Laurence ..... Project Manager
M.J. Makin ..... Agriculturist
Dr. R.J. Grimble ... Agr. Economist
T. Kingham ..... Civil Engineer

A detailed description of the work carried out during 1978 is given in chapter III of this report.

high as 125% of normal.

Regarding the monthly distribution of precipitation during this hydrometeorological year the months between December 1977 and April 1978 were above normal.

The maximum amount of rainfall reported in a 24 hour period was 96.4 mm by Kanaviou station on the 8th December 1977. The first snowfall occured on mount Olympus the highest peak of the Troodos mountain

TECHNICAL STAFF OF W.D.D. ON 31.12.1978

DRG. No. BM/6/46

	MONTHLY AND DAILY PAID TECHNICAL STAFF		D	AD	SWE	EH	EE	ME	Geo	H	Ch	QS	EM	TIE	SW	SIW	EDR	IW	CF	ACF	TA	Sur	DR	F	TOTAL Nos.
1	Permanent staff		1	2	1	1	18	1	2	3					4	6	1	18	4	8	53		5	40	168
2	Temporary staff				3		6			1				3		3		12	1	7	24		6	20	86
3	Daily paid staff						9				1	2	1	2							40	4	2		61
	TOTAL NUMBERS		1	2	4	1	33	1	2	4	1	2	1	5	4	9	1	30	5	15	117	4	13	60	315
	DISTRIBUTION OF STAFF																								
4	Divisions	i Water Resources				1			1							1		5			16			3	27
		iii Planning					2											2		1	7			1	13
		ii Design			1		8							3		1	1	2		1	12		9		38
		iv Construction			1		2	1							1	3		9	2	8	4			16	47
		v Small Projects Planning			1		1								1	1		5			2				11
		vi Operation & Maintenance					1				1				1	3		1	1		2			5	15
		vii Paphos Irrig. Project					6														26	2	3		37
		viii Southern Conveyor Project			1		4		1	2				1				3			11				23
5	Administration (Head Office)		1	2																					3
6	Regional Offices (Limassol, L/ca & Paphos)						4											3		5	21		1	30	64
7	Turkish Officers absent from duty						1																		1
8	On Scholarship									1											1				2
9	Vacancies						4			1		2	1	1	1				2		15	2		5	34
	TOTAL NUMBERS		1	2	4	1	33	1	2	4	1	2	1	5	4	9	1	30	5	15	117	4	13	60	315

REFERENCE

D Director
AD Assistant Director
SWE Senior Water Engineer
EH Engineer Hydrologist
EE Executive Engineer
ME Mechanical Engineer
Geo Geologist
H Hydrologist
Ch. Chemist
QS Quantity Surveyor
EM Electromechanical Engineer
TIE Topographer Irrigation Eng.
SW Superintendent of Works
SIW Senior Inspector of Works
EDR Engineering Draughtsman
IW Inspector of Works
CF Chief Foreman
ACF Assistant Chief Foreman
TA Technical Assistant
Sur Surveyor
DR Draughtsman
F Foreman

SUMMARY OF ACTIVITIES

Water Resources

The hydrometeorological situation, given here, refers only to the southern part of the Island, as the northern part, is still under the occupation of the Turkish troops and no such data are available to us.

The precipitation for the hydrometeorological year 1977–1978 averaged 549 mm which is 103% of normal. The distribution of rainfall was uneven, the lowest ranging between 70–90% of normal in the Mesaoria plain, whilst in other areas rainfall was as

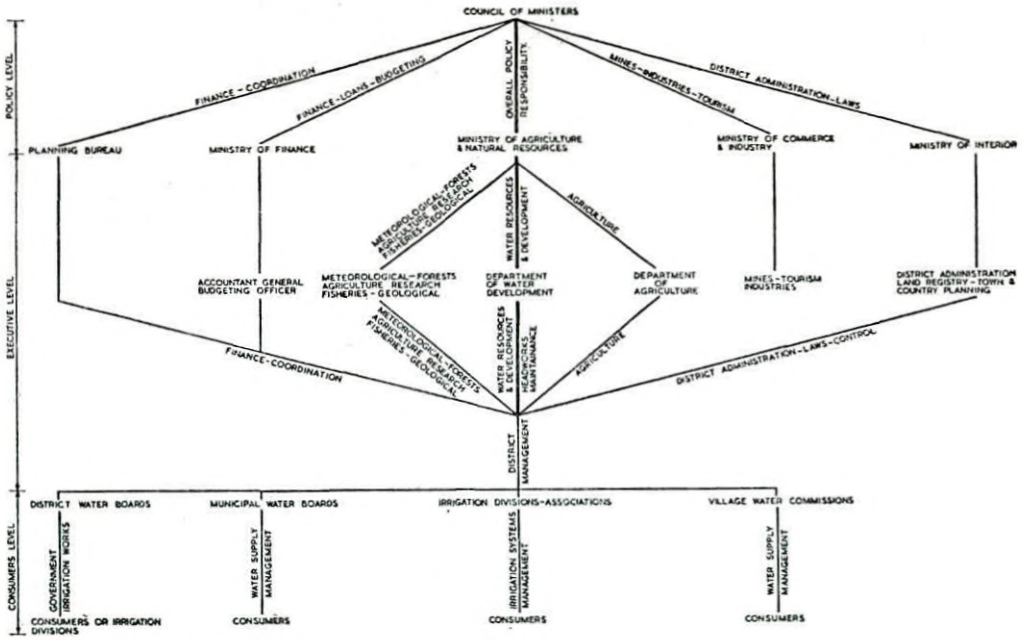
range on the 3rd December 1977 which is the median date for the first snowfall in Cyprus. The last occured on the 22nd of April 1978, which comes to be at about 10 days later than the median date of snowfall in Cyprus. The air temperature was as a whole slightly above normal in most areas. In particular the monthly mean was below normal in October, December, April, August and September but it was above normal in all other months.

The extreme maximum temperature has been reported from Nicosia to be 43.5°C on the 8th of July and the extreme minimum from

Prodhromos with—4.0°C on 24th of December.

The measured evaporation from a USWB class A evaporation pan was 1.897 mm in Nicosia and 1.457 in Prodhromos.

the situation being continuously worsened, both because of the water table decline and sea intrusion advancement. In the Akrotiri aquifer there was a marked improvement with a water table rise. In the other aquifers the



WATER DEVELOPMENT - ORGANIZATION CHART

Surface flows have been recorded in the southern part of Cyprus at 51 automatic river gauging stations. Most of the flows were around normal and no exceptional floods have been reported.

Out of the 30 dams under regular observations 21 dams overflowed in January. The maximum volume of water accumulated in all these dams was 30.7 MCM or 74% of their total capacity of 41.65 MCM.

The groundwater situation, as observed in the most important aquifers of the Island still under Government control, was different in different parts of the Island. In the south-eastern part the extraction was again this year much more than the recharge particularly in the Kokkinokhoria area, with situation remained about the same as last year.

Planning and Design of Projects

The study of the **Southern Conveyor Project** will be executed in two stages. During 1978 the Project teams were mainly occupied with the preparation of the pre-feasibility report (Stage 1) with the aim of identifying different development options and the appraising of their respective economic viability. This has involved the compilation and detailed analysis of a great volume of data concerning hydrology, hydrogeology, engineering, agriculture and economics. It is expected that the Stage 1 will be completed by February 1980.

DAMS CONSTRUCTED UP TO 1960

No	DAM	TYPE	HT	1000m³	YEAR
1	Kouklia	Earth	6	4,545	1900
2	Lymbia *	Gravity	5	18	1945
3	Lythrodhonda	Gravity	11	32	1945
4	Kalokhorio (K1)	Gravity	9	82	1947
5	Akrounda	Gravity	7	23	1947
6	Galini	Gravity	11	23	1947
7	Petra	Gravity	9	32	1948
8	Petra	Gravity	9	23	1951
9	Lythrodhonda	Gravity	10	32	1952
10	Kafizes	Gravity	23	113	1953
11	Ayios Loucas	Earth	3	455	1955
12	Gypsos	Earth	3	100	1955
13	Kandou	Gravity	15	34	1956
14	Perapedhi	Gravity	22	55	1956
15	Pyrgos	Gravity	22	285	1957
16	Trimiklini	Gravity	33	340	1958

Total Storage Capacity 6.174 $m^3 \times 10^6$

MINOR RECHARGE DAMS FROM 1960-70

No	DAM	TYPE	HT	1000m³	YEAR
47	Sotira	Earth	8	45	1962
48	Panayia (F)	Earth	7	45	1962
49	Paralimni (45)	Earth	5	115	1963
50	Ayia Napa (7)	Earth	8	55	1963
51	F'sta Recharge	Earth	5	50	1963
52	Phrenaros (6)	Earth	5	115	1964
53	Dherynia	Earth	6	23	1964
54	Phrenaros (3)	Earth	7	45	1966
55	Avgorou (7)	Earth	3	68	1966
56	Kondea (2)	Earth	5	82	1966
57	Xylophaghou (4)	Earth	7	86	1966
58	Sotira (4)	Earth	5	32	1966
59	Lysi	Earth	7	77	1967
60	Ay. Yearyios (9)	Earth	3	68	1967
61	Ay. Epiktitos (6)	Earth	6	34	1968
62	Akanthou (6)	Earth	6	45	1968
63	Akhna (3)	Earth	4	40	1968
64	Xylotymbou (5)	Earth	5	50	1969

Total Storage Capacity 1,075 $m^3 \times 10^6$

MAJOR DAM PROJECTS FROM 1960-70

No	DAM	TYPE	HT	1000m³	YEAR
17	Prodhromos	Earth	10	122	1962
18	Morphou	Earth	13	1,879	1962
19	Lefka	Gravity	35	368	1962
20	Geunyeli	Earth	15	1,045	1962
21	Athalassa	Earth	18	791	1962
22	Kanli Kevy	Earth	19	1,113	1963
23	Argaka	Rockfill	41	1,150	1964
24	Mia Milia	Earth	22	355	1964
25	Ovgos	Earth	16	845	1964
26	Kiti	Earth	22	1,614	1964
27	Agros	Earth	26	99	1964
28	Liopetri	Earth	18	340	1964
29	Polemidhia	Earth	45	3,864	1965
30	Ayia Marina	Rockfill	33	311	1965
31	Kalopanayiotis	Earth	40	391	1966
32	Mavrokolymbos	Earth	45	2,180	1966
33	Pomos	Rockfill	38	859	1966
34	Yermasoyia	Earth	49	13,600	1968
35	Syngrasis	Earth	7	1 115	1968

Total Storage Capacity 32.041 $m^3 \times 10^6$

MAJOR RECHARGE DAMS FROM 1960-70

No	DAM	TYPE	HT	1000m³	YEAR
36	Ayios Yeoryios	Earth	6	90	1962
37	F'sta Antiflood	Earth	8	165	1963
38	Ayios Nikolaos	Earth	2	1,365	1964
39	Paralimni Lake	Earth	1	1,365	1964
40	Fresh Water Lake	Earth	3	4,545	1964
41	Makrasyka	Earth	8	195	1966
42	Akhna (Mesania)	Earth	4	90	1967
43	Morphou spreading grounds	Earth	5	130	1969
44	Ormidhia	Earth	5	100	1968
45	Vrysoules	Earth	7	140	1969
46	Protopapas	Earth	6	90	1970

Total Storage Capacity 8,275 $m^3 \times 10^6$

MAJOR DAM PROJECTS FROM 1971-77

No	DAM	TYPE	HT	1000m³	YEAR
65	Lefkara	Earth Rockfill	71	13,850	1973
66	Massari Recharge dam	Earth	15	2,273	1973
67	Palekhori-Kambi	Gravity	33	620	1973
68	Arakapas	Gravity	23	130	1975
69	New Lymbia	Gravity	12	220	1977

Total Storage Capacity 17,093 $m^3 \times 10^6$

GRAND TOTAL UP TO END OF 1977: 64,7 $m^3 \times 10^6$

(1) Dams constructed up to 1960

(12) Major dam projects from 1960-70

(69) Major dam projects from 1971-75

(36) Major recharge dams from 1960-70

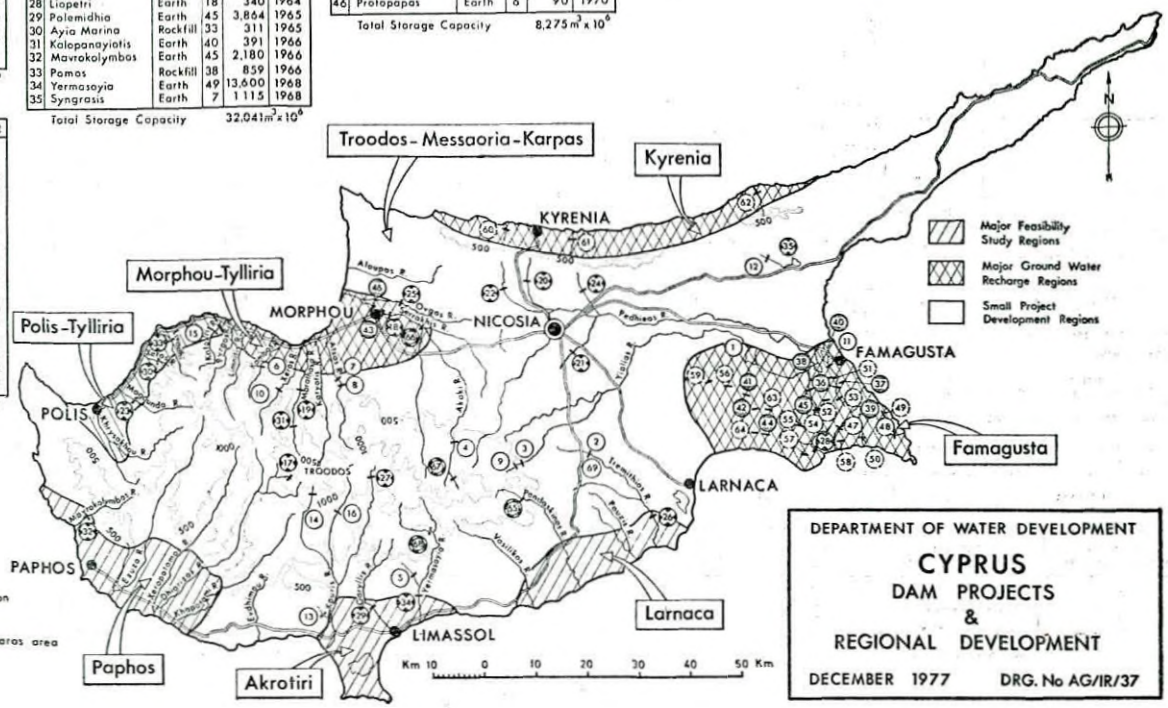
(47) Minor recharge dams from 1960-70

HT refers to height in meters from foundation

YEAR is the year of completion

Phrenaros (6) means six small dams in Phrenaros area

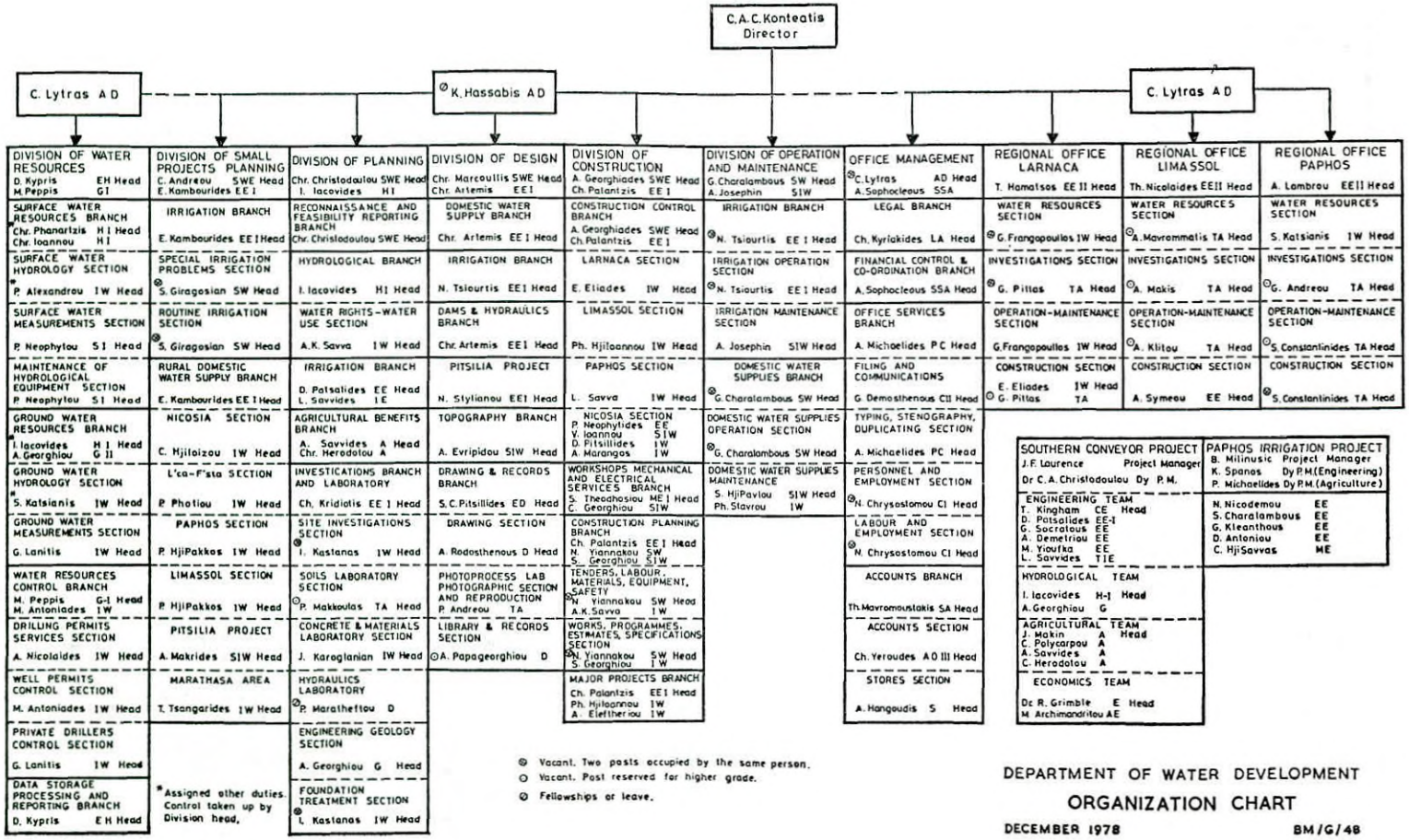
*Demolished 1976



DEPARTMENT OF WATER DEVELOPMENT

CYPRUS
DAM PROJECTS & REGIONAL DEVELOPMENT

DECEMBER 1977 DRG. No AG/IR/37



DEPARTMENT OF WATER DEVELOPMENT

ORGANIZATION CHART

DECEMBER 1978 BM/G/48

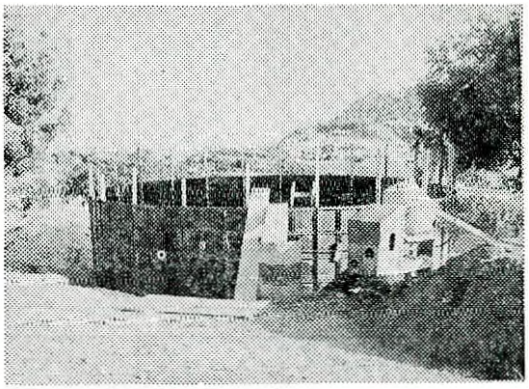
Preparations were under way during 1978 for the initiation in 1979 of the Feasibility Study of the **Khrysokhou Watershed Irrigation Project** which is a Government of Cyprus project with technical assistance from FAO under a UNDP/Government of Cyprus agreement. To this effect an FAO representative visited Cyprus in the summer of 1978.

The Feasibility Study of the **Vasilikos-Pendaskinos Project** was completed by the middle of 1977. During 1978 all work done for this project was connected with the efforts to secure foreign financing to cover the foreign exchange component of the cost of the project which is estimated at about £18 million.

Various financing possibilities were investigated and the project was appraised by the World Bank passing successfully the test of feasibility. The negotiations for a loan by the World Bank of 11 million US dollars were successfully concluded in December 1978. Efforts will be made during next year to secure another loan in addition to the above one to cover the whole of the foreign exchange component of the project.

At the same time offers were invited for the appointment of a consulting firm to prepare the detailed designs and contract documents of the Nicosia Water Supply component of the Vasilikos–Pendaskinos Project. The purpose of expediting this component of the project which provides mainly for the laying of the conveyance pipeline from the project area to Nicosia, is to take advantage and deliver to the capital all water surpluses of the Larnaca–Famagusta Water Supply System, until the completion of the whole project, which among others provides for the delivery of about 5 MCM of water to Nicosia. A British consulting firm was assigned in 1978 and the design was almost completed by the end of the year.

In the field of designs of major projects the Department was almost fully employed with the requirements of the **Pitsilia Integrated Rural Development Project.** The design of the Xyliatos dam which constitutes the basis of the main irrigation scheme project, which will irrigate an area of about 2,300 donums was at its full by the end of the year, whereas the designs of numerous off–stream ponds continued throughout the year. By the end of the year, another scheme associated with the **Nicosia water supply** was undertaken in an effort to ameliorate as much as possible the acute problem of the capital. This emergency scheme is based on boreholes which were drilled in the area between Peristerona, Akaki and Orounda. By the end of the year several successful boreholes were drilled in this area which merited the immediate commencement of design work to expedite as much as possible the laying of a conveyance pipeline to deliver the water to Nicosia.



Steel formwork being erected for a storage tank for Amathus Improvement Board water supply scheme.

Construction of Projects

The expenditure incurred on all construction projects during 1978 *reached the amount of* £5,259,425 *which is a record figure for water works executed in a single year in the history of the Department.*

The main construction activities may be summarised as follows:

Paphos Irrigation Project

During 1978 the three Contract Works concerning the Main Canal, the Well Pumps and the Central Offices were completed. The Wellfield Conveyance System was taken over in May by Water Development Department and reached 60% completion by the end of the year. Some of the biggest Contracts of the Project were also put in hand during this year, like the Asprokremmos Dam, the Irrigation Network and Reservoirs of the

REGISTRE DES BARRAGES EN CHYPRE — *REGISTER OF DAMS IN* CYPRUS

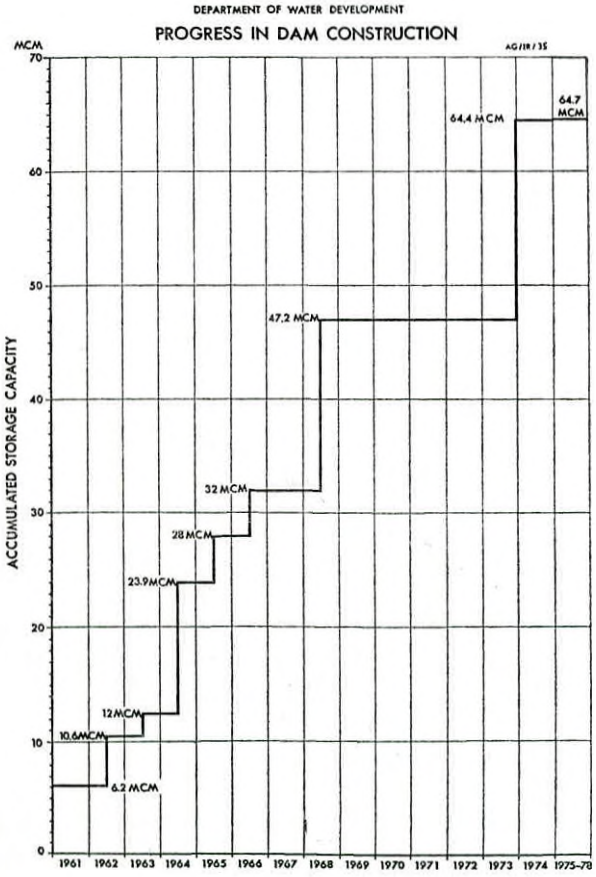
DRG. No. AG/IR/39

LIGNE / LINE No.	NOM DU BARRAGE / NAME OF DAM	ANNEE D'ACHEVEMENT / YEAR OF COMPLETION	SITUATION / LOCATION: COURS D'EAU / RIVER	VILLE LA PLUS PROCHE / NEAREST CITY	ETAT PROVINCE OU DEPARTEMENT / STATE PROVINCE OR COUNTY	TYPE	HAUTEUR AU DESSUS DE LA PLUS BASSE FONDATION / HEIGHT ABOVE LOWEST FOUNDATION (m)	LONGUEUR DE CRETE / LENGTH OF CREST (m)	VOLUME DU BARRAGE / VOLUME CONTENT OF DAM (10³ m³)	CAPACITE TOTALE DU RESERVOIR / GROSS CAPACITY OF RESERVOIR (10³ m³)	DESTINATION DES EAUX / PURPOSE	CAPACITE MAXIMALE DES EVACUATEURS / MAXIMUM DISCHARGE CAPACITY OF SPILLWAYS (m³/s)	TYPE DES EVACUATEURS / TYPE OF SPILL WAYS	PROPRIETAIRE / OWNER	BUREAU D'ETUDES / ENGINEERING BY	CONSTRUCTEUR / CONSTRUCTION BY	LIGNE / LINE No.
1	KAFIZES	1953	Xeros (Morphou)	Nicosia	Nicosia	PG	23	27	4	113	I	54	L	Lefka Irrigation Division	Department of Water Development	Department of Water Development	1
2	KANDOU	1956	Kouris	Limassol	Limassol	PG	15	53	2	34	I	59	L	Kandou Irrigation Division	Department of Water Development	Department of Water Development	2
3	PERAPEDHI	1956	Kouris	Limassol	Limassol	PG	22	62	4	55	I	107	L	Perapedhi Irrigation Division	Department of Water Development	Department of Water Development	3
4	PYRGOS	1957	Katouris	Nicosia	Nicosia	PG	22	66	5	285	I	125	L	Pyrgos Irrigation Division	Department of Water Development	Department of Water Development	4
5	TRIMIKLINI	1958	Kouris	Limassol	Limassol	PG	33	76	6	340	I	59	L	Trimiklini Irrigation Division	Department of Water Development	Department of Water Development	5
6	ATHALASSA	1962	Pedhieos	Nicosia	Nicosia	TE	18	447	103	791	I	48	L	Government	Department of Water Development	Department of Water Development	6
7	GEUNYELI	1962	Pedhieos	Nicosia	Nicosia	TE	15	254	50	1 045	I	173	L	Geunyeli Irrigation Division	Department of Water Development	Department of Water Development	7
8	LEFKA	1962	Marathasa	Nicosia	Nicosia	PG	35	149	11	368	I	246	L	Lefka Irrigation Division	Department of Water Development	Department of Water Development	8
9	MORPHOU	1962	Serakhis	Nicosia	Nicosia	TE	13	1 436	206	1 879	I	764	L	Morphou Irrigation Division	Department of Water Development	Department of Water Development	9
10	PRODHROMOS	1962	off stream	Limassol	Limassol	TE	10	756	73	122	I	-	L	Prodromos Irrigation Division	Department of Water Development	Department of Water Development	10
11	KANLI KEUY	1963	Pedhieos	Nicosia	Nicosia	TE	19	311	47	1 113	I	116	L	Kanli Keuy Irrigation Division	Department of Water Development	Department of Water Development	11
12	AGROS	1964	Kouris	Limassol	Limassol	TE	26	180	61	99	I	6	L	Agros Irrigation Division	Department of Water Development	Department of Water Development	12
13	ARGAKA	1964	Magounda	Paphos	Paphos	ER	41	173	138	1 150	I	0,3	L	Government	Howard Humphreys & Sons of U.K.	Department of Water Development	13
14	KITI	1964	Tremithos	Larnaca	Larnaca	TE	22	990	183	1 614	I	602	L	Government	Il Nuovo Castoro of Italy	Department of Water Development	14
15	LIOPETRI	1964	Potamos	Famagusta	Famagusta	TE	18	579	50	340	R	150	L	Liopetri Irrigation Division	Department of Water Development	Department of Water Development	15
16	MIA MILEA	1964	Pedhieos	Nicosia	Nicosia	TE	22	140	54	355	I	24	L	Mia Milea Irrigation Division	Department of Water Development	Department of Water Development	16
17	OVGOS	1964	Serakhis	Nicosia	Nicosia	TE	16	745	130	845	I	786	L	Morphou Irrigation Division	Department of Water Development	Department of Water Development	17
18	AYIA MARINA	1965	Xeros (Tyllirias)	Paphos	Paphos	ER	33	142	61	311	I	161	L	Ayia Marina Irrigation Division	Energoprojekt of Yugoslavia	Mediterranean Constructors Greece - G.P.Zachariades Cyprus	18
19	POLEMIDHIA	1965	Garyllis	Limassol	Limassol	TE	45	196	215	3 864	I	581	L	Government	Energoprojekt of Yugoslavia	Howlem & Ridgway of U.K.	19
20	KALOPANAYIOTIS	1966	Marathasa	Nicosia	Nicosia	TE	40	137	156	391	I	207	L	Government	Howard Humphreys & Sons of U.K.	Department of Water Development	20
21	MAVROKOLYMBOS	1966	Mavrokolym-bos	Paphos	Paphos	TE	45	528	267	2 180	I	340	L	Government	Energoprojekt of Yugoslavia	Cybarco of Cyprus	21
22	POMOS	1966	Livadhi	Paphos	Paphos	ER	38	302	153	859	I	300	L	Pomos Irrigation Division	Energoprojekt of Yugoslavia	Mediterranean Constructors Greece - G.P.Zachariades Cyprus	22
23	YERMASOYIA	1968	Yermasoyia	Limassol	Limassol	TE	49	409	539	13 600	I	850	V	Government	Energoprojekt of Yugoslavia	Cybarco of Cyprus	23
24	LEFKARA	1973	Pendaskinos	Larnaca	Larnaca	TE/ ER	74	240	820	13 850	S/I	316	L	Famagusta Water Board & Lefkara Irrigation Division	Howard Humphreys & Sons of U.K.	L. Fairclough & Medcon Construction Ltd.	24
25	NASARI	1973	Serakhis	Nicosia	Nicosia	TE	15	929	245	2 273	I	622	V	Government	Department of Water Development	Department of Water Development	25
26	PALEKHORI-KAMBI	1973	Akaki	Nicosia	Nicosia	PG	33	131	27	620	I	65	L	Government & Palekhori Irrigation Division	Department of Water Development	Department of Water Development	26
27	ARAKAPAS	1975	Yermasoyia	Limassol	Limassol	PG	23	97	10	129	I	205	L	Arakapas Irrigation Division	Department of Water Development	Department of Water Development	27

Eastern Area and the 14 Pumping Stations with the Western Main Conveyor of a total value more than £12.5 million. The total expenditure on the Project during the year was £3,294,337 whilst up to date expenditure reached £4,616,686.

Other Major Irrigation Works

The construction programme of the year included 26 different schemes on which the expenditure reached the amount of £817,460. Most of these schemes were extensions and minor works and the most important ones were the *Yermasoyia–Polemidhia* Project, Trakhoni and Ayios Nikolaos distribution systems, the *Pissouri* irrigation scheme and the *Pakhyammos* project.



Rural Domestic Water Supplies

The construction programme of the year included 68 such schemes and the expenditure incurred on all schemes was £370,491. The most important schemes were the *Paralimni–Ayia Napa* Water Supply with an expenditure of £60,322 and the *Amathus* area water supply project with an expenditure of £32,213.

For the *housing of Refugees* 99 water supply schemes were undertaken in 1978 with an expenditure of £269,993.

Several rural domestic water supply schemes for maintenance purposes paid through village deposits were also executed at a total cost of £27,223.

In addition 200 small schemes mainly in the form of distribution pipes for private developers were also carried out at a cost of £96,426.

Town Water Supplies

During 1978 11 town water supply schemes were undertaken at an expenditure of £256,750. The most important, were the continuation of the extensions and improvements on the *Nicosia distribution systems*, the completion of the new water supply system of the within the walls city and the commencement of the new *Lakatamia Reservoir*.

Minor Irrigation Works

77 routine irrigation schemes at an expenditure of £164,665 and 23 small schemes from village deposits at £8,447 were executed during the year. The most important of these schemes were those of *Akaki–Meniko, Peristerona and Astromeritis* for the lining of irrigation channels.

Works Undertaken for Other Government Departments

76 various schemes at an expenditure of £164,226 were carried out during the year. Such schemes included the construction of water supply projects for the Agricultural Department for *Stock Farms*, for the Forest Department, for *new Industrial areas* and for Turkish Cypriot villages or properties.

Domestic Water Supply Projects

Water sold by the Department is in the case of Nicosia (Greater Nicosia Scheme) and in

the case of the Famagusta Water Sypply Project.

In Nicosia 3.7 MCM were provided through the Greater Nicosia Scheme giving a revenue of £345,000 at £233,000 corresponding expenses.

The revenue would have been much larger but the Turkish population of Nicosia was supplied free of charge. The cost of supply of water from the Turkish occupied Morphou sources is 97% electricity which is also supplied free.

Also 4 MCM were provided by the Water Board supply areas and 0.73 MCM by the Nicosia Water Commission area.

Efforts to unify the three Administrations as above and which started 11 years ago are still pending.

The Famagusta Domestic Water Supply Scheme supplies water to the Turkish occupied town of Famagusta, free of charge to Larnaca and to a number of villages. The total revenue from the sale of the water reached £108,000.

Regional Offices

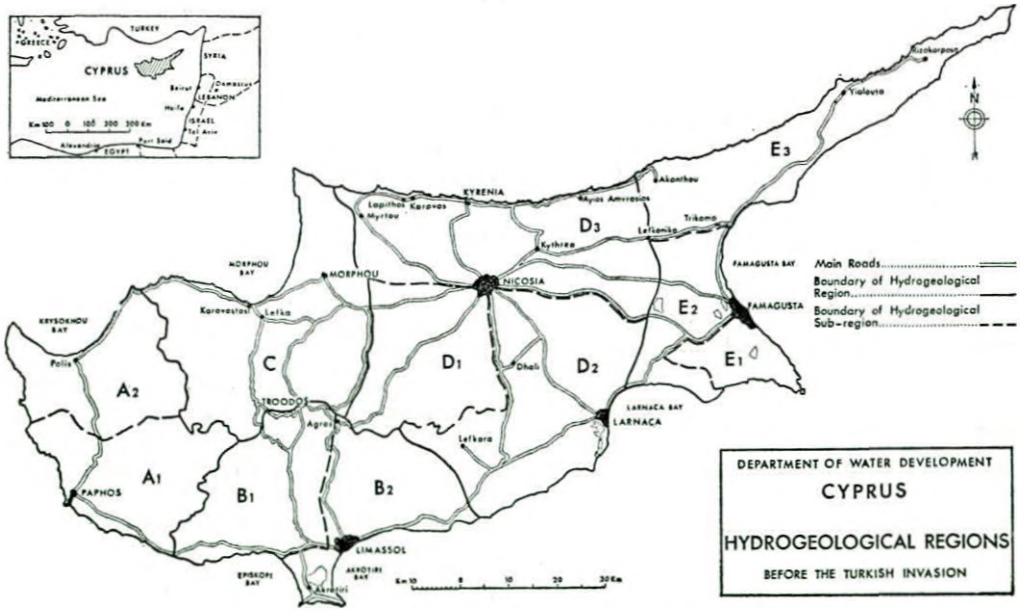
Due to the occupation of northern Cyprus by Turkish troops, there are only three regional offices, Famagusta/Larnaca, Limassol and Paphos. The responsibility of the regional offices is largely on water resources and routine project planning and supervision of construction.

Operation and Maintenance of Projects

The management of major irrigation works is done jointly with the District Administration, whilst small irrigation and village water supply schemes is done by the District Administration and local committees. For town water supplies, there are Water Board set up.

In the year under review the total water available in all dams in Cyprus, in the Government controlled areas, amounted to 35.77 MCM. From this quantity 11.00 MCM was used for irrigation of 17,851 donums, 2.85 MCM was used for domestic water supplies, 5.44 MCM was used for recharge or seeped under the dam and 2.86 MCM was lost as evaporation. The rest i.e. 13.62 MCM remained in the dam for overyear storage.

Water available for utilization from Government projects reached the figure of 27.83 MCM. Out of this only 14.28 MCM was utilized, 9.45 MCM for irrigation, 2.85 MCM for domestic water supply and 1.98 MCM for recharge. The irrigation



water was utilized to irrigate 14,855 donums of land planted with citrus, bananas, vines, diciduous, vegetables, potatoes, cereals and olives. The gross income from the sale of water amounted to £101,367 whereas the operational expenses amounted to £33,592. The maintenance expenses amounted to £8,165. Net income to Government projects for the year was £59,610.

Water available for utilization from contributory schemes was 2.02 MCM out of which 1.88 MCM was used for the irrigation of 2,955 donums.

Recharge works in the Government controlled areas represent only 11.5% of the total recharge capacity available in Cyprus and collected a total quantity of 0.10 MCM out of which 0.09 MCM was used for recharge whereas the rest was lost in the form of evaporation.

Legal Adviser

The legal matters may have inter alia to deal with existing Contracts entered into between the Government of the Republic and Contractors.

Similarly with new contracts to be negotiated and signed, torts committed by the employees of the Department who are deemed to be the servants or agents of the Government during and in the course of their official duties in their official capacity, such as negligence at work, negligence whilst driving, nuissance, trespass to property, etc.

Regretably, some of these matters have lead to legal suits before the Cyprus Courts, whereupon the adviser entered appearance, filed defence and tried to negotiate the difference on the issue raised or tried the case before appropriate Courts.

The Legal Adviser entered appearances in the Supreme Court of Cyprus as well as in recourses filed against the Government.

Apart from the legal matters dealt with, the Legal Adviser performed a number of other duties relevant to his professional duties both for the Department and for the Ministry of Agriculture and Natural Resources.

He has been appointed to a number of Committees which he attended regularly such as the Advisory Committee for the application of permits to sink or construct a well and to make use of the underground or surface water. The Committee fixed to review the existing water legislation and recommend modernization and unification of same.

He also performs the duties of the secretary for the Committee duly appointed for the fixing of new rates and prices which arise from time to time in the Contracts for the Paphos Irrigation Project.

In October 1978 the Legal Adviser attended a Seminar organized by the National Water Council of Great Britain which had been sponsored by F A O. Availing of this opportunity he applied for a membership at the International Association for Water Law which has the Headquarters of its Secretariat in Valencia, Spain and in March 1979 he had been made full member of this private international organization. He has prepared a report on the National Water Law Inventory of Cyprus which he submitted for approval by the Legislation Branch of FAO and is earnestly hoped that his work will be published in the second volume of "Water Law in selected European Countries" to be published by FAO.

CYPRUS NATIONAL, INTERDEPARTMENTAL AND DEPARTMENTAL COMMITTEES

International Hydrological Programme

The Cyprus National Committee for the IHP consists of the following:

Chairman
C A C Konteatis, Director,

Secretary
I Iacovides, Hydrologist,

Members
Dr V Krentos, Director, Agricultural Research Institute

A Louca, Director, Department of Agriculture

E Michaelides, Director, Department of Forests

Dr Th Pandazis, Ag. Director, Geological

Survey Department
Cl Philaniotis, Head, Meteorological Office

The IHP is sponsored by UNESCO and its purpose is to implement and carry on the findings and activities of *International Hydrologic Decade* which ended in 1975. The IHP officially started being operational in 1976 with the establishment of National Committees to act as focal points for IHP activities.

Several scientific and educational IHP projects have already been decided upon and questionnaires regarding local practice have been answered. Data from the Cyprus Decade stations were continued to be provided. The computer storage of hydrologic data initiated during the IHD is continuing.

International Commission on Large Dams

The International Commission on Large Dams (ICOLD) is a non-profit seeking organization with 71 member countries. As set out in its constitution: "The objects of the Commission are to encourage improvement in the design, construction, maintenance and operation of large dams by bringing together information thereon, and by studying questions relating thereto".

The Cyprus National Committee on Large Dams (CYNCOLD) was elected to full membership of the International Commission in 1969. During 1978 the National Committee was composed of the following:

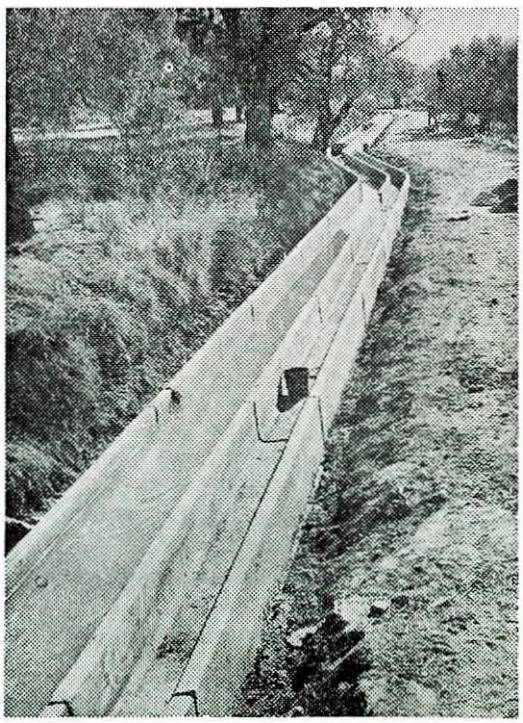
Chairman
C A C Konteatis, Director, WDD
Secretary
C C Artemis, Executive Engineer I, WDD
Members
K C Hassabis, Assistant Director, WDD
A Papadopoulos, Representative of the Association of Civil Engineers and Architects
P Christophorou, Representative of the Association of Building Contractors

The 46th Executive Meeting of the Commission was held in Cape Town, South Africa on October 11th and 12th, 1978. CYNCOLD was not represented at the meeting.

The 47th Executive Meeting and Thirteenth Congress on Large Dams are scheduled to take place in New Delhi, India between October 24th and November 2nd 1979. The Congress will be followed by organized Study Tours to large dams in India. The subjects to be dealt with by the Congress are:

—Interface Problems of Dams
—Deterioration or Failure of Dams
—Large Capacity Outlets and Spillways, and
—Seismicity and Aseismic Design of Dams

During the year under review CYNCOLD has continued the exhange of correspondence with the Central Office of the Commission in Paris and its Technical Committee and has both received and supplied technical information on dams and related subjects.



The lining of earth channels in reinforced cement concrete is a continuous process all over Cyprus. In the photograph a twin channel belonging to Akaki and Meniko villages was lined in 1978. Twin channels were necessary to secure complex water rights in the area.

International Commission on Irrigation and Drainage

The International Commission on Irrigation and Drainage is a non-profit organization whose objectives are to stimulate and promote the development and application of the science and techniques of irrigation, drainage, flood control and rive. training in the engineering, economic and social aspects. The ICID was set up in 1950 with central office in New Delhi, India.

Membership to the ICID has risen to 73 National Committees from an equal number of member countries.

Cyprus is a member country of the International Commission on Irrigation and Drainage since 1954. The Cyprus Committee on Irrigation and Drainage was formed in 1964 and it is now composed of the following:

Chairman:
C A C Konteatis, Director,

N. Tsiourtis, Executive Engineer I, W D D.
Ex-officio Members:
Director, Department of Forests
Director, Department of Agriculture
Director, Agricultural Research Institute

During the year 1978 the Cyprus National Committee continued its correspondence and exchange of information with the Central Office of the ICID and other National Committees. All publications such as six monthly bulletins, annual reports and other documents which were received from the Central Office of the ICID were distributed to all members of the CNCID.

During 1978 the following activities of the ICID took place:

—Tenth congress on Irrigation and Drainage Athens May-June 1978

The congress in which more than 50 member countries participated has dealt with the following:

Question 33: Economic evaluation of Irrigation Projects—Studies developed and case studies of economic and envioronmental impacts. For this question forty six reports were presented and discussed.

Question 34: Latest sub-surface drainage techniques and Drainage construction methods. For this question fifty two reports were presented and discussed.

Question 35: Operation and Maintenance of Irrigation and Drainage Systems: Fifty five reports were presented and discussed for this question.

Special Session: Mass transfer of water over long distances for regional development and its effects on human environment: A total of eleven reports were presented and discussed during the meeting.

Symposium: Development of techniques to recharge subterranean aquifers to conserve surplus river flows. This subject was presented in thirteen reports.

Other activities of the congress included the election of President and number of Vice Presidents.

—Second Afro-Asian Regional Conference of ICID.

This took place at the Philippine International Convention Centre, Manilla from 4–13 December 1978. The theme of the Conference was "Rice Production in Afroasian Countries"

The Cyprus National Committee was represented at the Athens Congress by a delegation of two officers from the Ministry of Agriculture and Natural Resources.

C. Andreou, Senior Water Engineer, W D D
S. Himonides, Agricultural Officer, Head of the Water Used Section Department of Agriculture.

International Water Supply Association

The Department of Water Development was an associate member of the IWSA until 1969. Late in 1969 a National Committee was established, made by:

Chairman
C A C Konteatis, Director,

Secretary
G Charalambous, Superintendent of Works, WDD, and the representatives of the Ministry of Interior and Water Boards of Nicosia, Limassol, Famagusta and Larnaca as members.

The Cyprus National Committee of the International Water Supply Association exchanged regular correspondence with the Head Office of the Association relative to the activities of his Organization.

FINANCE, EXPENDITURE AND REVENUE

During the year 1978, the total expenditure by the Department was £6,404,229 from budgeted and non-budgeted votes amounting to £7,566,734.

This is by far the highest expenditure made since the creation of this Department. The general picture is as follows:

TABLE I-1a
GENERAL BUDGET-EXPENDITURE FIGURES

Description	Budget £	Expenditure £
WDD Development Estimates including Loans ...	5 861 853	5 119 220
WDD Ordinary Estimates ...	782 841	718 694
Non Budgeted Votes for Refugee Housing estates, works for other Government Departments and private developers and village deposits	922 040	566 315
Totals	£7 566 734	£6 404 229

The level of construction works carried out during 1978 was a record £5,259,424 from WDD and other votes. See Table V-1 under CONSTRUCTION DIVISION.

The largest item of expenditure was for the Paphos Irrigation Project for which the sum of £3,294,336 was spent. During the year 1978 nine contracts were in progress for the Paphos Project of a total value of £14,334,464.

Revenue

The sum of £521,557 was collected during the year (1977 was £405,486) as revenue mainly from the sale of water for the Greater Nicosia and Famagusta Water Supply Schemes.

Loan Proceeds

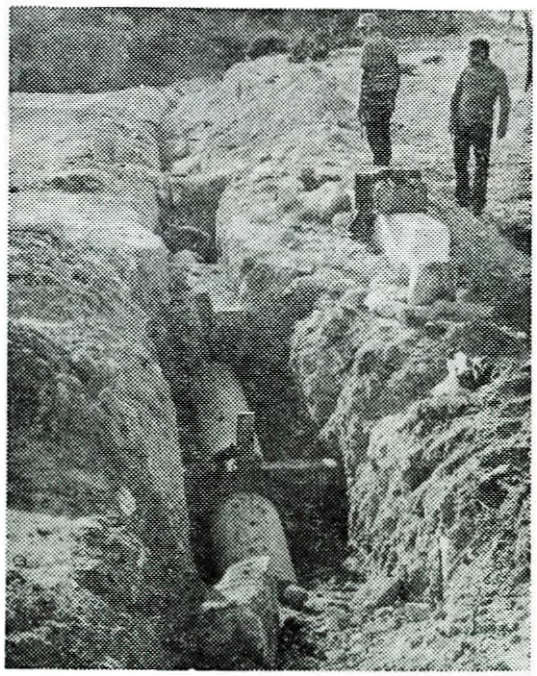
(a) Three loans from the *Federal Republic of Germany* for the sum of £3,210,000 (approx.) were approved for the construction of irrigation schemes in rural areas.

During the period 6th December 1976–6th June 1978 the sum of £1,990,254 was withdrawn from the loan.

(b) Loan from the *International Bank of Reconstruction and Development* for the Paphos Irrigation Project ($ 14,000,000).

During the period 22.1.76–20.6.78 the sum of £1,972,022 was withdrawn from the loan.

Tables I-1 to I-8 which follow refer to WDD budgeted votes only.



700 mm dia steel pumping main internally and externally coated being laid from Trakhoni pumping station to Trakhoni concrete lined reservoir, both belonging to the Yermasoyia-Polemidhia Project.

TABLE I–1

EXPENDITURE-WATER DEVELOPMENT DEPARTMENT VOTES

Ser. No.	Details	Expenditure Govt £	Village £	Total £
1	Administration			
	Ordinary 355 892	637 557	—	637 577
	Development 281 665			
2	Greater Nicosia Scheme Running Expenses	233 152	—	233 152
3	Famagusta Water Supply Running Expenses	91 128	—	91 128
4	Regional Village Water Supply Running Expenses	10 671	—	10 671
5	Irrigation, Drainage & Dams	3 978 921	111 237	4 090 158
6	Water Control	—	—	—
7	Town Water Supplies	116 036	150 493	266 529
8	Village Water Supplies	206 764	154 490	361 254
9	Drilling and Prospecting	12 680	—	12 680
10	Hydrology	62 709	—	62 709
11	Surveys and Investigations	43 759	—	43 759
12	Purchase and Maintenance of Machinery and Equipment	11 716	—	11 716
13	Stores	9 195	—	9 195
14	Others	7 406	—	7 406
	Total	£5 421 694	£416 220	£5 837 914

Breakdown of Administration

		£
1	Personal Emoluments	490 882
2	Technical Assistance	84 283
3	Travelling	39 494
4	Operation of Motor Transport	6 906
5	Office Expenses	6 609
6	Leave Pay to Regular Employees	4 985
7	Govt. Water Supply	4 398
	Total	£637 557

Breakdown of "Irrigation Drainage & Dams"

		£
1	Paphos Irrigation Project	3 294 336
2	Major Irrigation Works	577 460
3	Minor Irrigation Works.....	166 784
4	Major Project Investigations	30 712
5	Consultant's Fees, Dam M/ce and Distribution Systems	9 547
	Total	£4 090 158

TABLE I–2

MONTHLY STATEMENT OF ORDINARY EXPENDITURE FOR THE YEAR 1978

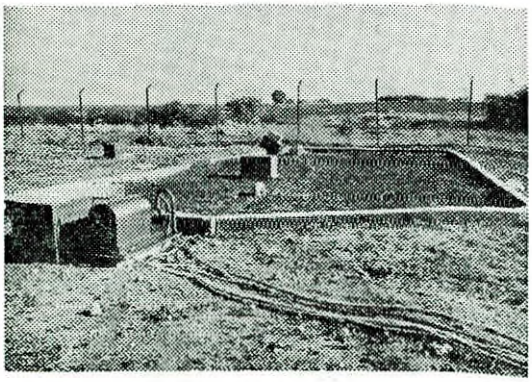
Head 17A-Water Development

1978 Approved	£733 131
Add special warrants	49 710
Total	£782 841

Month	Monthly Expend. £	Expend. to date £	%
January	31 303	31 303	3.99
February	44 250	75 553	9.65
March	39 465	115 018	14.69
April	50 691	165 709	21.16
May	46 798	212 507	27.14
June	61 001	273 508	34.93
July.....	61 361	334 869	42.77
August	74 575	409 444	52.30
September ...	64 937	474 381	60.59
October	61 005	535 386	68.39
November ...	61 396	596 782	76.23
December	121 912	718 694	91.80

Summary

Amount approved ...	£782 841	100%
Less actual expend ...	£718 694	91.80%
Balance	£64 147	8.20%



Lysimeter site of Paralimni.

TABLE I–3

MONTHLY STATEMENT OF DEVELOPMENT EXPENDITURE FOR THE YEAR 1978

1978 Approved	4 898 671
Add special warrants	573 460
Total	£5 472 131

Month	Monthly Expend. £	Expend. to date £	%
January	30 009	30 009	0.54
February ...	71 650	101 659	1.85
March	157 113	258 772	4.72
April	229 102	487 874	8.91
May	122 712	610 586	11.15
June	1 136 514	1 747 100	31.92
July.....	383 979	2 131 079	38.94
August	152 621	2 283 700	41.73
September	200 208	2 483 908	45.39
October	562 487	3 046 395	55.67
November	409 791	3 456 186	63.15
December ...	1 246 814	4 703 000	85.95

Summary

Amount approved ...	£5 472 131	100%
Less actual expend	£4 703 000	85.95%
Balance	£ 769 131	14.05%

TABLE I–4

STATEMENT OF REVENUE COLLECTED DURING THE YEAR 1978

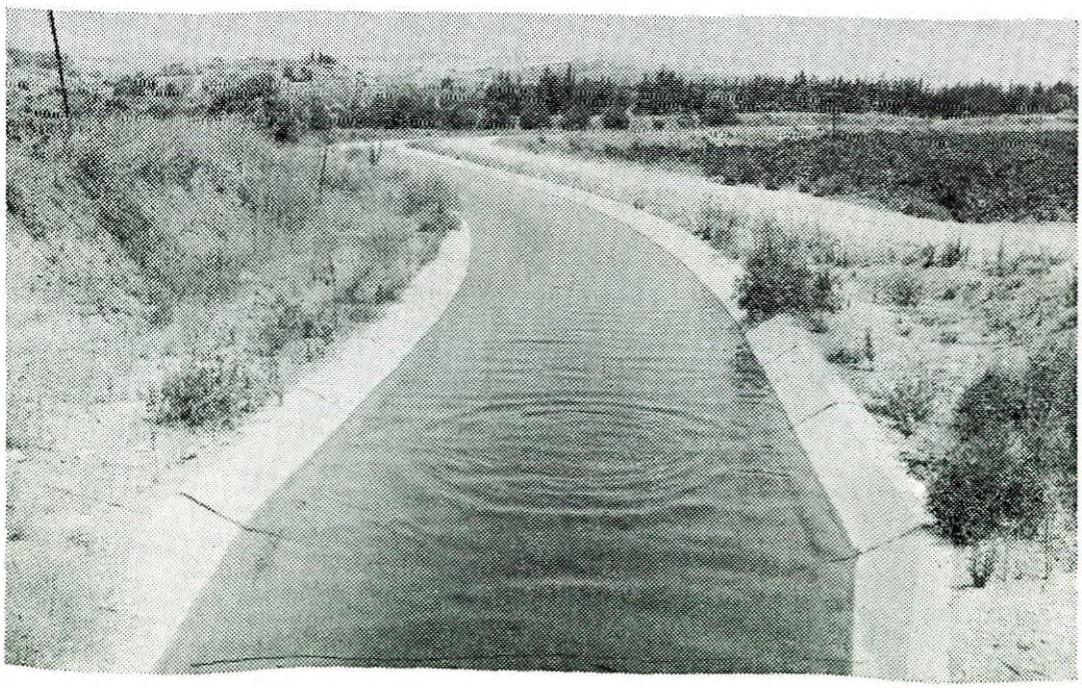
Description	£
Drilling Charges	23
Greater Nicosia Scheme	354 571
Famagusta WS Scheme	105 130
Village Water Supplies	14 482
Other Fees	47 351
Total	£521 557

TABLE 1-5 **PAPHOS IRRIGATION PROJECT EXPENDITURE-YEAR 1978**

Ser. No.	Description	Amount Dedaggered £ mils	Expenditure in 1978 £ mils
1	**Well Pumps**–Caramondani Bros Ltd	81 405 000	**81 401 666**
2	**Construction of main canal**		
	Laboratory work–soil mechanics	4 460 000	**4 458 236**
	General Construction Co.–Main Contractor	278 869 000	**278 863 269**
	Alkali activity tests abroad	936 000	**757 612**
3	**Wellfield Conveyance System**		
	Aspem Construction Ltd.	4 324 000	**4 323 443**
	WDD Construction Lot 4C1	129 900 000	**89 190 373**
	" " Lot 4C2	—	**20 006 784**
	Isasbest (Supply of pipes & valves)	134 535 000	**134 533 556**
	J & P (Supply of canaletti)	—	**17 938 000**
4	**Electricity**		
	Electricity	198 000	**198 000**
	Metering units	7 000 000	—
5	**Irrigation Network–Eastern Area**		
	Survey works	5 100 000	**5 031 004**
	Topographical survey	1 800 000	**1 399 603**
	Socea–France	399 891 000	**399 890 677**
	Pipes and fittings	19 540 000	**15 884 963**
	Supply of asbestos cement pipes and fittings (*CPI*)	333 775 000	**333 772 249**
6	**Main Contract**-Pumping Stations and Western Conveyor.		
	Costain Civil Eng. Contractors	260 660 000	**260 660 000**
7	**Construction of Asprokremmos Dam**		
	Model testing	3 200 000	**693 078**
	Investigations	3 490 000	**3 488 063**
	Laboratory (Triaxial tests abroad)	800 000	—
	Contractors for the Construction of the Dam		
	J & P and Medcon	1 380 073 000	**1 380 071 339**
	Diversion services	1 500 000	**1 008 797**
	Redesign of spillway	10 000 000	—
8	**Purchase of equipment**	3 255 000	**2 399 667**
9	**Erection of buildings**		
	Buildings (Timi etc)	890 000	**876 004**
	Yeroskipos central offices	22 365 000	**22 360 351**
10	**Land Acquisition Etc**	280 000	244 450
11	**Management**		
	Training programme	4 847 000	1 792 435
	Furniture & fittings	1 419 000	1 215 499
	Advertisements	500 000	494 000
	Wages of drivers	17 440 000	17 435 017
	Travelling	6 060 000	5 938 587
	Purchases of tools	1 440 000	—
	Operation of motor transport	6 787 000	6 786 168
	M'ce of project vehicles	3 450 000	3 218 473

TABLE I–5
PAPHOS IRRIGATION PROJECT EXPENDITURE–YEAR 1978 (continued)

	£ mils	£ mils
Office requirements	6 070 000	6 062 114
Agriculture research activities	22 290 000	20 707 423
Overtime fees	10 100 000	10 074 996
Poster for Paphos Project	300 000	295 969
Installation of rain guages	4 000 000	3 435 401
Expenses for central offices	1 070 000	145 256
Inspection of cast iron fittings	316 000	315 600
Computer services	300 000	291 000
Akhelia unit	4 954 000	—
Inspection of pipes (Hellenit—Greece)	102 000	95 350
Consultants—SOGREAH	129 180 000	121 559 516
Consultants—Sir M McDonald and Partners	30 760 000	22 963 107
G Post (Expert)	600 000	570 608
Extension services experts		
Dr PROVIDENTI	7 200 000	6 989 881
Dr HANAN	4 239 000	4 065 616
Inspection of the factory in India for valves	435 000	433 000
Totals in £ and mils	3 352 105 000	3 294 336 200



The 11.8 km long canal of the Paphos Irrigation Project was completed in 1978.

TABLE I–6 **MAJOR WATER WORKS 1978**

	Scheme	Amount Dedaggered £ mils	Expenditure Govt. £ mils	Village £ mils	Total £ mils	Govt. £ mils	Village £ mils	**Total £ mils**	Remarks
1	Mavrokolymbos Dam	376 000	376 000	—	376 000	245 950	—	**245 950**	Govt only
2	Yermasoyia Dam Supervision ...	1 196 000	1 196 000	—	1 196 000	—	—	—	" "
3	Masari Dam	788 000	788 000	—	788 000	218 000	—	**218 000**	" "
4	Lefkara Dam	6 108 000	6 108 000	—	6 108 000	55 250	—	**55 250**	" "
5	Khirokitia Pipeline.....	707 000	707 000	—	707 000	—	—	—	" "
6	Khirokitia Treatment Plant	923 000	923 000	—	923 000	—	—	—	" "
7	Kiti Leakages	2 641 000	2 641 000	—	2 641 000	96 000	—	**96 000**	" "
8	Argaka Dam	3 200 000	3 200 000	—	3 200 000	2 987 126	—	**2 987 126**	" "
9	Mavrokolymbos Distr.	16 067 000	16 067 000	—	16 067 000	511 608	—	**511 608**	" "
10	**Yermasoyia-Polemidhia Project**								
	(i) Yermasoyia Main Conveyor	1 643 000	1 643 000	—	1 643 000	236 800	—	**236 800**	" "
	(ii) Akrounda—Phinikaria Scheme	2 013 000	2 013 000	—	2 013 000	—	—	—	" "
	(iii) Zakaki Extensions	538 000	538 000	—	538 000	—	—	—	" "
	(iv) Phasouri Extension	3 099 000	3 099 000	—	3 099 000	2 356 988	—	**2 356 988**	" "
	(v) Trakhoni Extension	195 894 000	195 984 000	—	195 894 000	191 970 518	—	**191 970 518**	" "
	(vi) Ayios Nikolaos Extension ...	120 000 000	120 000 000	—	120 000 000	108 215 595	—	**108 215 595**	" "
11	Southern Conveyor Project	6 000 000	6 000 000	—	6 000 000	1 373 682	—	**1 373 682**	" "
12	Vasilikos Pendaskinos Project ...	56 480 000	56 480 000	—	56 480 000	7 586 150	—	**7 586 150**	" "
13	Pissouri "Khapotami" Irrigation Scheme	99 000 000	99 000 000	—	99 000 000	87 289 052	—	**87 289 052**	" "
14	Ayia Marina Dam	3 720 000	3 720 000	—	3 720 000	3 687 366	—	**3 687 366**	" "
15	Pomos Distribution	45 000	45 000	—	45 000	— —	—	—	" "
16	Lefkara Distribution	12 861 000	12 861 000	—	12 861 000	3 700 419	—	**3 700 419**	" "
17	Kiti	205 000	205 000	—	205 000	—	—	—	" "
	CONTRIBUTORY SCHEMES								
1	Palekhori–Kambi Dam	3 082 000	3 082 000	1 028 000	4 110 000	62 325	20 775	**83 100**	P.L.F. 1/4
2	Lymbia Dam	7 660 000	7 660 000	3 830 000	11 490 000	5 120 542	2 560 271	**7 680 813**	" 1/3
3	Arakapas Dam	493 000	493 000	165 000	658 000	4 500	1 500	**6 000**	" 1/4
4	Palekhori Distribution	130 000	130 000	44 000	174 000	—	—	—	" 1/4
5	Pakhyammos Irrigation.....	40 545 000	40 545 000	22 273 000	62 818 000	40 074 447	20 037 223	**60 111 670**	" 1/3
6	Polemidhia Irrigation	36 432 000	36 432 000	18 216 000	54 648 000	24 468 318	12 234 157	**36 702 475**	" 1/3
7	Yermasoyia Irrigation	41 003 000	41 003 000	20 502 000	61 505 000	40 536 473	20 268 235	**60 804 708**	" 1/3
8	Palekhori "Sklydros".....	3 547 000	3 547 000	1 183 000	4 730 000	1 155 186	385 061	**1 540 247**	" 1/4
	TOTALS	666 396 000	666 396 000	67 241 000	733 637 000	521 952 295	55 507 222	**577 459 517**	

P.L.F.—Public Loan Fund.

TABLE I-7 **MINOR IRRIGATION SCHEMES—1978**

Scheme	Budjet			Actual Expenditure			Balance			
	Govt. £ mils	Village £ mils	Total £ mils	Govt. £ mils	Village £ mils	**Total** £ mils	Govt. £ mils	Village £ mils	Total £ mils	Village Contr.
Ayios Dhimitrios "Kaloyiros"	252 347	125 672	378 019	252 347	125 672	**378 019**	—	—	—	1/3
Ayios Dhimitrios "Kryo Nero"	642 359	321 180	963 539	643 525	322 263	**965 788**	CR 1 166	CR 1 083	CR 2 249	1/3
Arsos Irrigation	560 000	280 000	840 000	444 695	280 000	**724 695**	115 305	—	115 305	Exec. by Irr. D.
Anayia	6 666 000	3 334 000	10 000 000	2 066 576	1 033 288	**3 099 864**	4 599 424	2 300 712	6 900 136	1/3
Agros "Vournes"	666 000	334 000	1 000 000	666 000	334 000	**1 000 000**	—	—	—	1/3
Agros "Anastasia"	386 509	193 253	579 762	30 932	14 465	**45 397**	355 577	178 788	534 365	1/3
Akaki	8 533 000	3 414 000	12 800 000	7 872 954	3 149 182	**11 809 432**	660 046	264 818	990 568	1/3 80%
Meniko		853 000			787 296			65 704		20%
Akaki	633 673	210 890	949 509	600 587	200 195	**900 878**	33 086	10 695	48 631	1/3 2/3
Meniko		104 946			100 096			4 850		1/3
Ayios Ioannis (Agros) "Teratsia"	685 775	343 387	1 029 162	310 363	155 181	**465 544**	375 412	188 206	563 618	1/3
Amargeti	1 199 765	599 881	1 799 646	149 290	74 646	**223 936**	1 050 475	525 235	1 575 710	1/3
Astromeritis	5 000 000	5 000 000	10 000 000	3 500 297	3 500 296	**7 000 593**	1 499 703	1 499 704	2 999 407	1/2
Dhali "Yialias River"	3 471 624	—	3 471 624	3 064 399	—	**3 064 399**	407 225	—	407 225	Govt. only
Dhymes "Kato Livadhia"	793 000	677 000	1 470 000	650 714	555 428	**1 206 142**	142 286	121 572	263 858	46.05%
Dhymes "Sykameri"	264 670	132 330	397 000	106 930	53 465	**160 395**	157 740	78 865	236 605	1/3
Evrykhou	12 666 000	6 334 000	19 000 000	12 416 343	6 208 171	**18 624 514**	249 657	125 829	375 486	1/3
Ergates	4 230 080	2 115 539	6 345 619	3 730 871	1 865 436	**5 596 307**	499 209	250 103	749 312	1/3
Episkopi	1 406 895	703 448	2 110 343	370 007	185 002	**555 009**	1 036 888	518 446	1 555 334	1/3
Kato Platres	879 034	439 016	1 318 050	688 771	344 384	**1 033 155**	190 263	94 632	284 895	1/3
Khirokitia "Anefantis"	8 500 000	2 500 000	11 000 000	4 976 461	1 463 892	**6 440 353**	3 523 539	1 036 108	4 559 647	22.73%
Yialias Recharge	5 400 000	—	5 400 000	3 059 963	—	**3 059 963**	2 340 037	—	2 340 037	Govt. only
Khoulou 181/63	475 198	237 598	712 796	4 000	2 000	**6 000**	471 198	235 598	706 796	1/3
Khoulou 195/63	869 534	435 267	1 304 801	46 554	23 278	**69 832**	822 980	411 989	1 234 969	1/3
Kolossi	340 375	171 187	511 562	15 018	7 508	**22 526**	325 357	163 679	489 036	1/3
Kyperounda "Pano Stremmata"	1 080 000	720 000	1 800 000	965 987	643 991	**1 609 978**	114 013	76 009	190 000	40%
Kaliana	2 800 000	1 400 000	4 200 000	1 064 599	532 300	**1 596 899**	1 735 401	867 700	2 603 101	1/3
Kyperounda "Arkappis"	691 355	346 178	1 037 533	175 428	87 213	**262 641**	515 927	258 965	774 892	1/3
Khandria "Avlakou"	400 000	400 000	800 000	400 000	409 239	**809 239**	—	CR 9 239	CR 9 239	50%
Kyperounda "Kardama"	80 123	40 561	120 684	80 123	40 561	**120 684**	—	—	—	1/3
Khandria "Arkadji"	1 166 000	584 000	1 750 000	1 157 548	579 730	**1 737 278**	8 452	4 270	12 722	33.37%
Kambos	500 000	250 000	750 000	350 110	175 055	**525 165**	149 890	74 945	224 835	1/3
Kakopetria	3 200 000	1 600 000	4 800 000	2 498 358	1 249 179	**3 747 537**	701 642	350 821	1 052 463	1/3
Linou "Linopsas"	5 849 093	2 924 546	8 773 639	6 676 333	2 924 546	**9 600 879**	CR 827 240	—	CR 827 240	1/3
Louvaras "P. Pervolia"	224 711	177 232	401 943	242 172	190 897	**433 069**	CR 17 461	CR 13 665	CR 31 126	44.08%
Mosphili	6 000 000	—	6 000 000	3 825 869	—	**3 825 869**	2 174 131	—	2 174 131	Govt. only

TABLE I–7 MINOR IRRIGATION SCHEMES—1978 (Continued)

Scheme	Budjet			Actual Expenditure			Balance			
	Govt. £ mils	Village £ mils	Total £ mils	Govt. £ mils	Village £ mils	Total £ mils	Govt. £ mils	Village £ mils	Total £ mils	Village Contr.
Meniko "Lytharkes"	507 465	254 232	761 697	424 253	212 124	**636 377**	83 212	42 108	125 320	1/3
Mandria "Mylouris"	400 000	200 000	600 000	13 333	6 667	**20 000**	386 667	193 333	580 000	1/3
Moutoullas	3 200 000	1 600 000	4 800 000	2 709 143	1 354 572	**4 063 715**	490 857	245 428	736 285	1/3
Orounda "Maoutsoa"	7 315 000	5 985 000	13 300 000	1 828 237	1 495 831	**3 324 068**	5 486 763	4 489 169	9 975 932	1/3
Orounda "Ornitharis"	3 124 000	1 563 000	4 687 000	3 116 162	1 558 081	**4 674 243**	7 838	4 919	12 757	1/3
Pano Platres	3 142 604	1 571 302	4 713 906	CR 182 659	CR 91 330	**CR 273 989**	3 325 263	1 662 632	4 987 895	1/3
Peristerona	5 000 000	5 000 000	10 000 000	5 000 000	5 059 185	**10 059 185**	—	CR 59 185	CR 59 185	1/2
Potamitissa "Vizakia"	1 740 000	1 160 000	2 900 000	1 740 000	1 203 764	**2 943 764**	—	CR 43 764	CR 43 764	40%
Pera–Politiko	3 000 000	1 500 000	4 500 000	2 909 868	1 454 935	**4 364 803**	90 132	45 065	135 197	1/3
Phini	8 266 000	4 134 000	12 400 000	7 280 129	3 640 064	**10 920 193**	985 871	493 936	1 479 807	1/3
Pedhieos	15 000 000	—	15 000 000	9 000	—	**9 000**	14 991 000	—	14 991 000	Govt. only
Palekhori "Milouri"	425 778	336 824	762 602	386 575	306 087	**692 662**	39 203	30 737	69 940	44.19%
Polis (Khrysokhou)	2 446 155	1 223 578	3 669 733	1 314 627	657 315	**1 971 942**	1 131 528	566 263	1 697 791	1/3
Pera "Vizakia"	3 949 151	1 974 575	5 923 726	3 849 285	1 924 642	**5 773 927**	99 866	49 933	149 799	1/3
Pelendria "Kato Englisis"	1 200 000	600 000	1 800 000	1 122 094	561 048	**1 683 142**	77 906	38 952	116 858	1/3
Palekhori "Maroullena"	260 667	130 333	391 000	44 800	35 200	**80 000**	215 867	95 133	311 000	1/3
Prodhromos "Sklydros"	333 000	167 000	500 000	264 842	132 422	**397 264**	68 158	34 578	102 736	1/3
Perapedhi	5 733 000	2 867 000	8 600 000	4 602 829	2 301 414	**6 904 243**	1 130 171	565 586	1 695 757	1/3
Prodhromos "Kyparissi"	2 046 000	1 254 000	3 300 000	1 033 837	633 641	**1 667 478**	1 012 163	620 359	1 632 522	38%
Paleomylos "Hardji"	410 671	206 334	617 005	176 286	88 144	**264 430**	234 385	118 190	352 575	1/3
Prodhromos "Platania–Antonidhes"	267 479	134 239	401 718	265 903	132 950	**398 853**	1 576	1 289	2 865	1/3
Polemi	1 573 423	787 711	2 361 134	111 469	55 734	**167 203**	1 461 954	731 977	2 193 931	1/3
Pedhoulas	9 930 000	4 970 000	14 900 000	8 837 727	4 420 184	**13 257 911**	1 092 273	549 816	1 642 089	1/3
Skoulli	1 056 747	528 872	1 585 619	41 790	20 894	**62 684**	1 014 957	507 978	1 522 935	1/3
Steni	1 266 276	633 639	1 899 915	CR 47 478	CR 23 739	**CR 71 217**	1 313 754	657 378	1 971 132	1/3
Xyliatos	1 451 062	726 030	2 177 092	1 420 456	710 226	**2 130 682**	30 606	15 804	46 410	1/3
Total	169 557 598	76 809 780	246 367 378	111 376 632	55 467 910	**166 844 542**	58 180 966	21 341 870	79 522 836	

TABLE I-8 IMPROVEMENT OF VILLAGE WATER SUPPLY—1978

SCHEME	Budjet			Actual Expenditure			Balance			Village Contribution
	Govt. £ mils	Village £ mils	Total £ mils	Govt. £ mils	Village £ mils	**Total** £ mils	Govt. £ mils	Village £ mils	Total £ mils	
Philousa, Arminou	—	85 373	—	—	19 064	—	—	66 309	—	3.16%
Pretori, Regional	13 319 980	1 039 412	16 022 415	2 972 720	232 018	**3 575 990**	10 347 260	807 394	12 446 425	16.87% 38.46%
Kedhares, Scheme		1 577 650			352 188			1 225 462		58.38%
Akhyritou "Vrysoulles"	9 375 000	4 025 000	13 400 000	6 704 860	2 878 988	**9 583 848**	2 670 140	1 146 012	3 816 152	30.04%
Amathus	60 000 000	—	60 000 000	32 212 790	—	**32 212 790**	27 787 210	—	27 787 210	Govt. only
Ayia Napa	1 754 212	1 754 213	3 508 425	20 000	20 000	**40 000**	1 734 212	1 734 213	3 468 425	50%
Astromeritis	3 750 000	3 750 000	7 500 000	3 274 470	3 274 470	**6 548 940**	475 530	475 530	951 060	50%
Athienou	3 500 000	3 500 000	7 000 000	1 561 243	1 561 240	**3 122 483**	1 938 757	1 938 760	3 877 517	50%
Ay. Yeoryios (Alamanou)	640 000	160 000	800 000	442 411	110 602	**553 013**	197 589	49 398	246 987	20%
Ayia Marinoudha	1 200 000	1 395 000	2 595 000	1 181 224	1 372 773	**2 553 997**	18 776	22 227	41 003	53.76%
Anayia	360 360	180 180	540 540	316 254	158 126	**474 380**	44 106	22 054	66 160	33.33%
Ayia Marina (Xyliatos)	488 415	290 271	778 686	CR 53 878	CR 31 914	**CR 85 792**	542 293	322 185	864 478	37.20%
Armou	788 079	922 738	1 710 817	5 988	7 012	**13 000**	782 091	915 726	1 697 817	53.94%
Dherinia	14 000 000	7 000 000	21 000 000	10 219 990	5 109 995	**15 329 985**	3 780 010	1 890 005	5 670 015	33.33%
Dhali	5 115 226	5 115 229	10 230 455	2 185 060	2 185 060	**4 370 120**	2 930 166	2 930 169	5 860 335	50%
Episkopi	10 402 003	10 402 003	20 804 006	10 117 997	10 117 994	**20 235 991**	284 006	284 009	568 015	50%
Eledhiou	2 000 000	2 585 000	4 585 000	1 303 523	1 684 834	**2 988 357**	696 477	900 166	1 596 643	56.38%
Galata	695 035	695 038	1 390 073	CR 75 750	CR 75 750	**CR 151 500**	770 785	770 788	1 541 573	50%
Galataria	737 568	1 090 325	1 827 893	74 953	110 838	**185 791**	662 615	979 487	1 642 102	59.64%
Kiti		7 000 000						2 492 305		
Meneou, Regional...		—						—		
Dhromolaxia, Scheme ...	7 000 000	—	14 000 000	4 507 694	4 507 695	**9 015 389**	2 492 306	—	4 984 611	50%
Pervolia		—						—		
Tersephanou		—						—		
Kambia		125 355			28 206			97 149		15%
Analiondas, Regional Scheme ...	835 701	83 570	1 671 402	188 046	18 805	**376 094**	647 655	64 765	1 295 308	10%
Episkopio		125 357			28 206			97 151		15%
Ergates		501 419			112 831			388 588		60%
Kholi.....	3 500 000	3 950 000	7 450 000	2 961 280	3 341 998	**6 303 278**	538 720	608 002	1 146 722	53.02%
Kilinia	722 937	1 048 651	1 771 588	302 988	439 266	**742 254**	419 949	609 385	1 029 334	59.18%
Kivisil, Mazotos, Combined Scheme	209 250	209 250	418 500	85 885	85 883	**171 768**	123 365	123 367	246 732	50%
Klirou	941 112	941 113	1 882 225	594 493	594 492	**1 188 985**	346 619	346 621	693 240	50%
Kakopetria	10 310 610	16 531 164	26 841 774	10 309 591	14 576 442	**24 886 033**	1 019	1 954 722	1 955 741	50%
Kalokhorio (Limassol) ...	748 862	748 863	1 497 725	527 890	527 888	**1 055 778**	220 972	220 975	441 947	50%
Lefkara Regional Scheme	3 011 000	—	3 011 000	2 625	—	**2 625**	3 008 375	—	3 008 375	+Govt. only
Lymbia Regional Scheme	422 420	210 210	632 630	328 063	164 030	**492 093**	94 357	46 180	140 537	33.33%
Laxia, Yeri, Combined Scheme	1 073 048	557 985	2 146 096	870 940	452 890	**1 741 879**	202 108	105 095	404 217	50 52% 48%
		515 063			418 049			97 014		
Lefka Area	427 000	—	427 000	426 036	—	**426 036**	0,964	—	0,964	Govt. only
Meniko	2 400 000	2 400 000	4 800 000	1 860 056	1 860 057	**3 720 113**	539 944	539 943	1 079 887	50%

TABLE I–8 **IMPROVEMENT OF VILLAGE WATER SUPPLY—1978 (continued)**

SCHEME	Budjet Govt. £ mils	Budjet Village £ mils	Budjet Total £ mils	Actual Exdenditure Govt. £ mils	Actual Exdenditure Village £ mils	Actual Exdenditure **Total** £ mils	Balance Govt. £ mils	Balance Village £ mils	Balance Total £ mils	Village Contr.
Malounda	93 482	187 779	281 261	93 482	233 351	**326 833**	—	CR 45 572	CR 45 572	66.75%
Mennoyia }		6 450 000			4 794 665			1 655 335		
Aplanda } **Regional**	5 800 000	4 950 000	23 000 000	4 312 465	3 679 787	**17 099 379**	1 487 535	1 270 213	5 900 621	
Anaphotia } **Scheme**		3 825 000			2 843 628			981 372		
" }		1 975 000			1 468 834			506 166		
Ayios Tykhonas }		1 639			1 639			—		
Ayios Athanasios }		511 993			295 721			216 272		
Monagroulli }		2 850			2 850			—		
Ayia Phyla **Moutayiaka**	1 951 444	1 413 952	3 904 866	1 129 438	808 218	**2 260 854**	822 006	605 734	1 644 012	
Paramytha **Regional** }		6 301			6 301			—		
Palodhia **Scheme** }		7 117			7 117			—		
Spitali }		6 363			6 363			—		
Parekklisha }		3 207			3 207			—		
Odhou	1 632 246	2 023 716	3 655 962	773 978	959 844	**1 733 822**	858 268	1 063 872	1 922 140	55.36%
Phterikoudhi	231 576	223 132	454 708	213 829	205 938	**419 767**	17 747	17 194	34 941	49.06%
Paleomethokho	6 500 000	6 500 000	13 000 000	4 527 533	4 527 531	**9 055 064**	1 972 467	1 972 469	3 944 936	50%
Paralimni **Combined**	16 344 861	13 566 234	32 689 722	9 686 340	8 039 681	**19 372 678**	6 658 521	5 526 553	13 317 044	50% 83%
Ayia Napa **Scheme**		2 778 627			1 646 657			1 131 970		17%
Paralimni **Combined**	36 000 000	21 996 000	72 000 000	30 161 065	18 428 411	**60 322 130**	5 838 935	3 567 589	11 677 870	50% 61.10%
Ayia Napa **Scheme**		14 004 000			11 732 654			2 271 346		38.90%
Pano Arkhimandrita	964 610	1 366 587	2 331 197	904 074	1 280 736	**2 184 810**	60 536	85 851	146 387	58.62%
Pedhoulas	2 850 000	2 850 000	5 700 000	2 535 920	2 535 919	**5 071 839**	314 080	314 081	628 161	50%
Perakhorio	2 012 076	2 012 077	4 024 153	1 786 123	1 786 122	**3 572 245**	225 053	225 955	451 908	50%
Pano Platres	6 088 505	6 088 506	12 177 011	5 304 063	5 304 062	**10 608 125**	784 442	784 444	1 568 886	50%
Psomolophou	12 750 000	12 750 000	25 500 000	12 488 838	12 488 834	**24 977 672**	261 162	261 166	522 328	50%
Paphos Lower Villages	12 051 623	—	12 051 623	9 502 480	—	**9 502 480**	2 549 143	—	2 549 143	Govt. only
Pissouri	1 450 000	1 450 000	2 900 000	1 450 000	1 450 000	**2 900 000**	—	—	—	50%
Pitsilia B2	1 125 702	562 812	1 688 514	2 975	1 275	**4 250**	1 122 727	561 537	1 684 264	30%
Peristerona	1 750 000	1 750 000	3 500 000	1 374 246	1 374 246	**2 748 492**	375 754	375 754	751 508	50%
Sotira (Limassol)	1 305 420	1 305 420	2 610 840	1 129 111	1 129 110	**2 258 221**	176 309	176 310	352 619	50%
Sotira (Famagusta)	1 898 305	1 898 306	3 796 611	1 006 799	1 006 799	**2 013 598**	891 506	891 507	1 783 013	50%
Statos–Ayios Photios	20 500 000	—	20 500 000	6 813 409	—	**6 813 409**	13 686 591	—	13 686 591	Govt. only
Souni–Zanatzia	1 840 393	2 127 185	3 967 578	235 152	271 752	**506 904**	1 605 241	1 855 433	3 460 674	53.61%
Sykopetra	497 808	621 253	1 119 061	12 223	15 248	**27 471**	485 585	606 005	1 091 590	55.51%
Vasa (Kilani)	1 765 174	2 465 174	4 230 348	1 872 251	1 872 248	**3 744 499**	CR 107 077	592 926	485 849	50%
Voroklini	408 388	408 387	816 775	401 266	401 265	**802 531**	7 122	7 122	14 244	50%
Tseri	7 666 000	3 834 000	11 500 000	4 162 555	2 081 278	**6 243 833**	3 503 445	1 752 722	5 256 167	33.33%
Troulli	24 000 000	8 000 000	40 000 000	8 330 809	2 776 937	**113 884 682**	15 669 191	5 223 063	26 115 318	20% Deposit
Kellia		8 000 000			2 776 936			5 223 064		20% Relief fund
Xylophaghou				1 123 825						
Total	329 205 431	218 438 049	547 643 480	206 763 691	154 489 440	**360 129 306**	123 565 565	63 948 609	187 514 174	

STAFF MATTERS

Appointments

On a Monthly (Unestablished or Temporary) Basis

During the period under review the following persons have been appointed to the posts as indicated:

George Socratous, Executive Engineer, Class II, with effect from 15.2.78.

Constantinos Katsavras, Executive Engineer, Class II, with effect from 15.2.78.

Nicodemos Nicodemou, Executive Engineer, Class II, with effect from 15.2.78.

Soteris Charalambous, Executive Engineer, Class II, with effect from 15.2.78.

Michalakis Ioannou, Executive Engineer, Class II, with effect from 17.12.78.

Niki Michael, Topographer/Irrigation Engineer, with effect from 1.3.78.

Sofoclis Aletraris, Topographer/Irrigation Engineer, with effect from 1.3.78.

Andreas Christodoulides, Hydrologist, Class II, with effect from 20.11.78.

Anastasia Papageorghiou, Draughtsman, with effect from 2.5.78.

Elpida Antoniadou, Draughtsman, with effect from 2.5.78.

Eleni Nicolaou, Draughtsman, with effect from 2.5.78.

Fereniki Michaelidou, Draughtman, with effect from 2.5.78.

Adreas Theodosiou, Administrative Officer 3rd Grade, with effect from 2.5.78.

Andreas Riris, Foreman 2nd Grade, with effect from 1.6.78.

Andreas Eleftheriou, Foreman 2nd Grade, with effect from 1.6.78.

Georghios Mamantos, Foreman 2nd Grade, with effect from 1.6.78.

Savvas Papapanteli, Foreman 2nd Grade, with effect from 1.6.78.

Christodoulos Stephanou, Foreman 2nd Grade, with effect from 1.6.78.

Costas Avlonitis, Foreman 2nd Grade, with effect from 1.6.78.

Chrysanthos Kommatos, Foreman 2nd Grade, with effect from 1.6.78.

Ioannis Papadopoullos, Foreman 2nd Grade, with effect from 1.6.78.

Michael Petrides, Foreman 2nd Grade, with effect from 1.6.78.

Aristotedis Constantinou, Foreman 2nd Grade, with effect from 1.6.78.

Georghios Socratous, Foreman 2nd Grade, with effect from 1.6.78.

Sofoclis Christou, Foreman 2nd Grade, with effect from 1.6.78.

Andreas Koutsoullis, Foreman 2nd Grade, with effect from 1.6.78.

Nicolas Christou, Foreman 2nd Grade, with effect from 1.6.78.

Charalambos Hji Christodoulou, Foreman 2nd Grade, with effect from 1.6.78.

Panayiotis Eracleous, Foreman 2nd Grade, with effect from 1.6.78.

Georghios Poullos, Foreman 2nd Grade, with effect from 1.6.78.

Savvas Avgousti, Foreman 2nd Grade, with effect from 1.6.78.

Charilaos Charalambous, Foreman 2nd Grade, with effect from 1.6.78.

Savvas Kyriacou, Foreman 2nd Grade, with effect from 1.6.78.

Iacovos Tsimittis, Technical Assistant, with effect from 15.8.78.

Constantinos Stavrou, Technical Assistant, with effect from 15.8.78.

Loucas Loizou, Technical Assistant, with effect from 15.8.78.

Panos Andreou, Technical Assistant, with effect from 15.8.78.

Andreas Panayides, Technical Assistant, with effect from 15.8.78.

Stelios Constantinides, Technical Assistant, with effect from 15.8.78.

Elias Despotis, Technical Assistant, with effect from 15.8.78.

Andriani Nicolaou, Technical Assistant, with effect from 15.8.78.

Andreas Phylactou, Technical Assistant, with effect from 16.10.78

Charalambos Kountoureshis, Technical Assistant, with effect from 16.10.78.

Nearchos Onisiforou, Technical Assistant, with effect from 16.10.78.

Loizos Nicolaou, Technical Assistant, with effect from 16.10.78.

Yiannakis Achilleos, Technical Assistant, with effect from 16.10.78.

Adamos Neophytou, Technical Assistant, with effect from 16.10.78.

Christos Constantinides, Technical Assistant, with effect from 16.10.78.

Andreas Papasavvas, Technical Assistant, with effect from 16.10.78.

Nicos Philippides, Technical Assistant, with effect from 16.10.78.

Georghios Zachariou, Technical Assistant, with effect from 16.10.78.

Charalambos Anastasiou, Technical Assistant, with effect from 16.10.78.

Charalambos Anastasiou, Technical Assistant, with effect from 16.10.78.

Christodoulos Loizides, Technical Assistant, with effect from 16.10.78.

Iacovos Iacovou, Technical Assistant, with effect from 16.10.78.

Anastasios Aristotelous, Technical Assistant, with effect from 16.10.78.

Thrasyvoulos Kallasides, Technical Assistant, with effect from 16.10.78.

Omeros Georghiou, Technical Assistant, with effect from 16.10.78.

Andreas Demetriades, Technical Assistant, with effect from 16.10.78.

Stylianos Theodorou, Technical Assistant, with effect from 16.10.78.

Charalambos Constantinou, Technical Assistant, with effect from 16.10.78.

Michael Michaelides, Technical Assistant, with effect from 16.10.78.
Zacharias Yiasoumi, Technical Assistant, with effect from 16.10.78.
Christakis Theodorou, Technical Assistant, with effect from 16.10.78.
Polyxeni Neophytou, Technical Assistant, with effect from 16.10.78.
Ioanna Kaskiri, Technical Assistant, with effect from 16.10.78.
Athinoulla Andreou, Technical Assistant, with effect from 16.10.78.

On a Permanent Basis

Elias Kambourides, Executive Engineer, Class I, with effect from 1.2.78.
Kyriacos Spanos, Executive Engineer, Class II, with effect from 15.2.78.
Nicodemos Nicodemou, Executive Engineer, Class II, with effect from 1.11.78.
Georghios Socratous, Executive Engineer, Class II, with effect from 1.11.78.
Maria Zachariou, Executive Engineer, Class II, with effect from 1.11.78.
Andreas Artemis, Executive Engineer, Class II, with effect from 1.11.78.
Andreas Florides, Foreman 2nd Grade, with effect from 15.5.78.
Charalambos Themistocleous, Foreman 2nd Grade, with effect from 15.5.78.
Andreas Kyriadides, Foreman 2nd Grade, with effect from 15.5.78.
Costas Constantinides, Foreman 2nd Grade, with effect from 15.5.78.
Kyriacos Sfikouris, Foreman 2nd Grade, with effect from 1.6.78.
Nicos Mavrommatis, Technical Assistant with effect from 1.8.78.
Charalambos Hji Stavrou, Technical Assistant, with effect from 15.8.78.
Antonakis HjiIoannou, Technical Assistant, with effect from 15.8.78.
Andreas HjiPakkos, Technical Assistant, with effect from 15.8.78.
Stavroulla Selipa, Draughstman, with effect from 1.12.78.
Georghia Markitsi, Draughstman, with effect from 1.12.78.
Paraskevoulla Maratheftou, Draughstman, with effect from 1.12.78.

On Contract

The contract of **Charalambos Kyriakides,** Legal Adviser, was renewed for one more year, with effect from 1.7.78.
Georghios HjiIoannou, was appointed Technical Assistant, with effect from 20.3.78.
Christoforos Georghiades, was appointed Administrative Officer for the Southern Conveyor Project, with effect from 25.9.78.

Promotions, Secondments

A number of Officers were promoted or seconded to the posts appearing opposite their names.

Promotions

Nicos Tsiourtis, from Executive Engineer, Class II, to the permanent post of Executive Engineer, Class I, with effect from 1.1.78.
Neophytos Yiannakou, from Senior Inspector of Works, to the permanent post of Superintendent of Works, with effect from 15.1.78.
Samuel Giragosian, from Inspector of Works to the permanent post of Superintendent of Works, with effect from 15.1.78.
Andreas Evripidou, from Senior Inspector of Works (on secondment) to the permanent post of Senior Inspector of Works, with effect from 1.2.78.
Savvas HjiPavlou, from Senior Inspector of Works (on secondment) to the permanent post of Senior Inspector of Works, with effect from 1.2.78.
Joseph Karoglanian, from the permanent (Development) post of Inspector of Works to the permanent (Ordinary) post of Inspector of Works, with effect from 1.2.78.
Pantelis Alexandrou, from the permanent post of Inspector of Works (on secondment) to the permanent (Ordinary) post of Inspector of Works with effect from 1.2.78.
Andreas Eleftheriou, from the permanent (Ordinary) post of Inspector of Works (on secondment) to the permanent (Development) post of Inspector of Works, with effect from 1.2.78.
Costas Charalambous, from the Temporary (Development) post of Assistant Chief Foreman (on secondment) to the permanent (Ordinary) post of Assistant Chief Foreman, with effect from 1.2.78.
Gavriel Demosthenous, from Clerk 2nd Grade, to the permanent post of Clerk 1st Grade, G.C.S., with effect from 1.3.78.
Ioannis Efstathiou, from Clerical Assistant, to the permanent post of Clerk 2nd Grade, G.C.S., with effect from 1.4.78.
Xenia Voskou, from Clerical Assistant, to the permanent post of Clerk 2nd Grade G.C.S., with effect from 1.4.78.
Ioannis Serghides, from Senior Inspector of Works to the permanent post of Superintendent of Works, with effect from 1.4.78.
Elias Kambourides, from Executive Engineer Class II to the permanent post of Executive Engineer, Class I, with effect from 1.5.78.
Demosthenis Patsalides, from Executive Engineer Class II to the permanent post of Executive Engineer Class I, with effect from 1.5.78.
Kyriacos Yiannakou, from the Temporary (Development) post of Chief Foreman (on secondment) to the permanent post of Chief Foreman, with effect from 15.7.78.
Andreas Christodoulou, from the permanent (Ordinary) post of Assistant Chief Foreman (on secondment) to the permanent post of Assistant Chief Foreman, with effect from 1.10.78.
Tassos Hamatsos, from the permanent post of Executive Engineer, Class II (on secondment) to the permanent (Ordinary) post of Executive Engineer Class II, with effect from 15.10.78.
Costas Constantinides, from Foreman 2nd Grade, to

the permanent post of Foreman 1st Grade, with effect from 15.11.78.

Andreas Marangos, from the permanent (Ordinary) post of Inspector of Works (on secondment) to the permanent (Development) post of Inspector of Works with effect from 1.12.78.

Tefkros Tsangarides, from the permanent (Ordinary) post of Inspector of Works (on secondment) to the permanent (Ordinary) post of Inspector of Works with effect from 1.12.78.

Andreas Eleftheriou, from the permanent (Development post of Inspector of Works to the permanent (Ordinary) post of Inspector of Works, with effect from 15.11.78.

Panayiotis Kazamias, from the Temporary (Development) post of Senior Inspector of Works (on secondment) to the permanent (Ordinary) post of Senior Inspector of Works, with effect from 15.11.78.

Panayiotis Neophytou, from the Temporary (Development) post of Senior Inspector of Works (on secondment) to the permanent (Ordinary) post of Senior Inspector of Works, with effect from 15.11.78.

Charalambos Themistocleous, from Foreman 2nd Grade to the permanent post of Foreman 1st Grade, with effect from 1.12.78.

Andreas Kyriakides, from Foreman 2nd Grade to the permanent post of Foreman 1st Grade, with effect from 1.12.78.

Secondments

Panayiotis Neophytou, from the post of Inspector of Works, was seconded to the Temporary (Development) post of Senior Inspector of Works with effect from 1.2.78.

Panayiotis Kazamias, from the post of Inspector of Works, was seconded to the Temporary (Development) post of Senior Inspector of Works, with effect from 1.2.78.

Kyriacos Yiannakou, from the post of Assistant Chief Foreman, seconded to the Temporary (Development) post of Chief Foreman, with effect from 1.1.78.

Andreas Marangos, from the Temporary (Development) post of Inspector of Works (on secondment) was seconded to the Permanent (Ordinary) post of Inspector of Works, with effect from 1.2.78.

Tefkros Tsangarides, from the Temporary (Development) post of Inspector of Works (on secondment) was seconded to the permanent (Ordinary) post of Inspector of Works, with effect from 1.2.78.

Sofoclis Nicolaou, from the permanent post of Technical Assistant, was seconded to the Temporary (Development) post of Inspector of Works, with effect from 1.2.78.

Andreas Theodorou, from the permanent post of Technical Assistant, was seconded to the Temporary (Development) post of Inspector of Works, with effect from 1.2.78.

Ioannis Mintzides, from the permanent post of Technical Assistant, was seconded to the Temporary (Development) post of Inspector of Works, with effect from 1.2.78.

Savvas Katsianis, from the permanent post of Technical Assistant, was seconded to the Temporary (Development) post of Inspector of Works, with effect from 1.2.78.

Andreas Christodoulou, from the Temporary (Development) post of Assistant Chief Foreman (on secondment) was seconded to the permanent (Ordinary) post of Assistant Chief Foreman, with effect from 1.2.78.

Takis Olymbios, from the permanent post of Foreman 1st Grade, was seconded to the Temporary (Development) post of Assistant Chief Foreman, with effect from 1.2.78.

Antonios Zakheos, from the permanent post of Foreman 1st Grade, was seconded to the Temporary (Development) post of Assistant Chief Foreman, with effect from 1.2.78.

Neoclis Ioannou, from the permanent post of Foreman 1st Grade, was seconded to the Temporary (Development) post of Assistant Chief Foreman, with effect from 1.2.78.

Anastasis Nicola, from the permanent post of Foreman 1st Grade, was seconded to the Temporary (Development) post of Assistant Chief Foreman, with effect from 1.2.78.

Tassos Hamatsos, from Temporary (Development) post of Executive Engineer, Class II (on secondment) was seconded to the permanent post of Executive Engineer, Class II, with effect from 15.2.78.

Michael HjiConstantinou, from the permanent post of Assistant Chief Foreman, was seconded to the Temporary (Development) post of Chief Foreman, with effect from 1.10.78.

Costas Hji Stavrou, from the Temporary post of Assistant Chief Foreman (on secondment) was seconded to the permanent post of Assistant Chief Foreman, with effect from 1.10.78.

Andreas Kyprianou, from the permanent post of Foreman 1st Grade, was seconded to the Temporary (Development) post of Assistant Chief Foreman, with effect from 1.10.78.

Costas Mavropetrou, from the permanent post of Foreman 1st Grade, was seconded to the Temporary (Development) post of Assistant Chief Foreman, with effect from 1.10.78.

Chrysanthos Metaxas, from the permanent post of Foreman 1st Grade, was seconded to the Temporary (Development) post of Assistant Chief Foreman, with effect from 1.10.78.

Costakis Andreou, from the permanent post of Executive Engineer Class I, was seconded to the Temporary (Development) post of Senior Water Engineer, with effect from 15.11.78.

Andreas Georghiades, from the permanent post of Executive Engineer, Class I was seconded to the Temporary (Development) post of Senior Water Engineer, with effect from 15.11.78.

Symeon Georghiou, from the permanent post of Inspector of Works was seconded to the Temporary (Development) post of Senior Inspector of Works with effect from 15.11.78.

Vrahimis Ioannou, from the permanent post of Inspector of Works was seconded to the Temporary (Development) post of Senior Inspector of Works, with effect from 15.11.78.

Andreas Makrides, from the permanent post of Inspector of Works was seconded to the Temporary (Development) post of Senior Inspector of Works, with effect from 15.11.78.
Phaedon Stavrou, from the Temporary (Development) post of Inspector of Works (on secondment) was seconded to the Permanent (Ordinary) post of Inspector of Works, with effect from 1.12.78.
Andreas Nicolaides, from the Temporary (Development) post of Inspector of Works (on secondment) was seconded to the Permanent (Ordinary) post of Inspector of Works, with effect from 1.12.78.
Costas Hji Loizou, from the Temporary (Development) post of Inspector of Works (on secondment) was seconded to the Permanent (Ordinary) post of Inspector of Works, with effect from 1.12.78.
Andreas Kourtellas, from the permanent post of Technical Assistant, was seconded to the Temporary (Development) post of Inspector of Works, with effect from 1.12.78.
Andreas Pengeros, from the permanent post of Technical Assistant, was seconded to the Temporary (Development) post of Inspector of Works, with effect from 1.12.78.
Andreas Makis, from the permanent post of Technical Assistant, was seconded to the Temporary (Development) post of Inspector of Works, with effect from 1.12.78.
Christos Georghiades, from the permanent post of Technical Assistant, was sedonded to the Temporary (Development) post of Inspector of Works, with effect from 1.12.78.
Panayiotis Photiou, from the permanent post of Technical Assistant, was seconded to the Temporary (Development) post of Inspector of Works, with effect from 1.12.78.
Glafkos Stavrakis, from the permanent post of Technical Assistant was seconded to the Temporary (Development) post of Inspector of Works, with effect from 1.12.78.
Christodoulos Kyriacou, from the permanent post of Technical Assistant, was seconded to the Temporary (Development) post of Inspector of Works, with effect from 1.12.78.
Polynikis Constantinides, from the permanent post of Technical Assistant was seconded to the Temporary (Development) post of Inspector of Works, with effect from 1.12.78.

RESIGNATIONS, TRANSFERS, RETIREMENTS

Resignations

The following Officers their posts during the year:
Georghios Hji Ioannou, Technical Assistant, tendered his resignation with effect from 1.1.78.
Anthoullis Kokkinides, Technical Assistant, tendered his resignation with effect from 1.4.78.
Christos Phanartzis, Hydrologist, Class I tendered his resignation with effect from 1.8.78.

Transfers

George Michael, Chief Foreman, was transferred from Limassol to Nicosia, with effect from 16.1.78.
Frosoulla Demetriou, Clerical Assistant, G.C.S., was transferred from this Department to the Department of Land Transportation with effect from 6.4.78.
Nicos Zavros, Clerical Assistant, G.C.S. was transferred from this Department to the Ministry of Finance, with effect from 17.4.78.
Panayiotis Costi, Accounting Officer 2nd Grade, was transferred to this Department (for the Paphos Irrigation Project) from the Office of the Accountant-General, with effect from 15.5.78.
Savvas Katsianis, Inspector of Works, was transferred from Paphos to Nicosia, with effect from 15.7.78.
Christos Georghiades, Technical Assistant, was transferred from Nicosia to Limassol, with effect from 1.11.78.

Retirements

Loizos Christou, Messenger 2nd Grade, retired from the Government Service, with effect from 1.3.78.
Philippos Ioannou, Assistant Chief Foreman, retired from the Government Service, with effect from 1.3.78.
Ioannis Serghides, Superintendent of Works, retired from the Government Service, with effect from 1.5.78.
George Constantinides, Senior Inspector of Works, retired from the Government Service, with effect from 1.5.78.
Nicos Philippou, Foreman 1st Grade, retired from the Government Service, with effect from 1.5.78.
Xenophon Antoniades, Technical Assistant, retired from the Government Service, with effect from 1.8.78.
George Michael, Chief Foreman, retired from the Government Service with effect from 1.9.78.
Kyriacos Yiannakou, Chief Foreman, retired from the Government Service, with effect from 1.10.78.
Kyriacos Nicolaides, Foreman 1st Grade, retired from the Government Service, with effect from 1.12.78.

SCHOLARSHIPS, STUDY LEAVE, DUTY ABROAD

Scholarships

Christos Ioannou, Hydrologist Class I, who has been granted a scholarship by the Fulbright Programme in Cyprus, in Water Resources management at the University of Idaho, U.S.A., to obtaining the M.Sc., his scholarship extended one more year.
Andreas Tziakouris, Technical Assistant, was awarded a scholarship by J & P Ltd., through the Government of Cyprus at the University of London to obtaining the B.Sc. in Civil Engineering. He left the Cyprus on the 22nd September 1978 and the duration of his scholarship is two years.

Study Leave

Panayiotis Scordis, Technical Assistant, who has been granted a two year study leave without pay, at the University of "Dundee" London, for the purpose to obtain the B.Sc. degree in Civil Engineering, completed his studies and was awarded the B.Sc., in Civil Engineering. He resumed his duties on the 1st August, 1978.

Conferences and Duty Abroad

C.A.C. Konteatis, Director of Water Development and Chr. Marcoullis, Senior Water Engineer, participated in the Government team which negotiated a Loan Agreement for the financing by IBRD of the Vasilikos-Pendaskinos Project, in Washington, between 9-16.12.78.

Christos Marcoullis, Senior Water Engineer, attended the Near-East Workshop on Agricultural Investment Project, FAO, Rome between 9.1.78—11.2.78.

Costas Andreou, Executive Engineer, Class I, participated at the 10th International Congress on Irrigation and Drainage held in Athens, Greece, between 24.1.78-9.6.78.

Michalakis Peppis, Geologist Class I, attended the Seminar on Water Resources Management, held in Cannes, France between 24-29 April 1978.

Dedalos Kypris, Engineer Hydrologist, participated at the seminar on selected water problems in Islands and coastal areas with special regard to desalination and groundwater, held in Malta between 5-10 June 1978.

Nicos Stylianou, Executive Engineer, Class I, participated at the Study Tour on Irrigation Drainage and Water Management, held in China, between 8.6.78-7.7.78.

Andreas Georghiades, Executive Engineer Class I, participated in a course of Project Management offered by the Economic Development Institute of the World Bank at Washington D.C. between 14th August to the 29th September, 1978.

Iacovos Iacovides, Hydrologist Class I, attended the Symposium on Radioisotopes in Hydrology held at Munich, Federal Republic of Germany, from the 19th to the 24th June 1978.

Iacovos Iacovides, Hydrologist Class I, attended the Interregional Meeting for the IHP in Rome, Italy, from the 8th to the 15th October, 1978.

Charalambos Palantzis, Executive Engineer Class I, between 29.8.78-6.9.78, traveled on duty to Greece, Yugoslavia, England. The purpose of his visit was to inspect the production of Cast Iron fittings to be used in the Paphos Irrigation Project.

Savvas Theodosiou, Mechanical Engineer, Class I, participated at the International Symposium on fresh water from the sea, held in Las Palmas, Canary Islands, from the 17th to the 24th September 1978.

Kyriacos Spanos, Executive Engineer, Class I, visited the "UPADHAYA" factory in India which produces cast iron sluice valves from 8-14.5.78 in connection with supplies to Paphos Irr. Project.

Nicodemos Nicodemou, Executive Engineer, Class II, participated at the "Israqua 78, Exhibition and International Conference on Water System and Application" held in Israel, between 4—8.6.78.

Charalambos Kyriakides, Legal Adviser, participated in the International Seminar on Water Law and Administration for Developing Countries, held at Taaley Court, Itampshire, England, 9-20 October 1978.

Kyriacos Spanos, Executive Engineer, Class II, visited the "HELLENIT" factory in Greece, which produces Asbestos Cement Pipes, from 10-14 October, 1978, in connection with supplies to Paphos Irrigation Project.

Grant of Leave, without Pay, to Government Employees who have Secured Temporary Employment Overseas

Kyprianos C Hassabis, Assistant Director of the Department, has been granted another six-months leave without pay, not on ground of public policy, with effect from 19.12.78.

MEETINGS OF THE DIRECTOR WITH THE STAFF

Several meetings were held during the year under the Chairmanship of the Director with the Heads of the various Divisions, Regional Engineers as well as with other members of the staff to discuss various aspects of works and personal matters.

Interdepartmental meetings with the Departments of Agriculture, Forests, ARI, the Geological Survey Department, Meteorological Office, Fisheries Department and the District Administration were also held during the year.

II DIVISION OF WATER RESOURCES

by
D C Kypris
Engineer Hydrologist
Head of Division

General

For five years now no hydrological data could be collected by this Department in the northern part of Cyprus, because this area amounting to 40% of the Cyprus land is still under the occupation of the Turkish troops. So the behaviour of both surface runoff and groundwater bodies could not be followed or recorded there during the year under examination.

During the year, besides the reconstruction of our hydrogeological archives, destroyed during the events of July, 1974, or lost in the occupied area by the Turkish troops, new areas have been also covered. A number of 2,912 wells/boreholes and springs were plotted or replotted in an area of 278 sq kilometers, with their relative information recorded.

INTRODUCTION

The main tasks assigned to the Division of Water Resources are the collection and interpretation of Hydrological and Hydrogeological data, regarding both ground and surface water, to deal with engineering geology problems, as connected with the planning and execution of water works projects, to carry out ancillary drilling operations and to control groundwater extraction and use.

Cyprus has been divided into eleven hydrogeological regions based on both hydrogeological and administrative criteria, which were followed for reasons of better control on the collection of hydrogeological data and thorough hydrogeological studies, until July 1974 when the Turkish invasion occurred. For the year under examination since the Turkish troops are still occupying part of Cyprus, a new arrangement is followed as on map page 37.

During 1978, D C Kypris, Engineer Hydrologist, acted as the Head of Division, M Peppis, Geologist, Class I, was the Assistant Head. He was also Head of the Drilling Permits and Water Control Branch. M Peppis acted also as the president of the specially formed advisory committee for the issue of well permits.

DRILLING OPERATIONS

Drilling operation for water continued this year on a small scale. One drilling rig Ruston Bucyrus 22W was engaged, with which the following operations were carried out:

- ★ Cleaning of 17 existing boreholes out of which three were also lined with casings.
- ★ Drilling of five boreholes for domestic water supply and irrigation purposes. Two of them were later completed, by a Rotary rig. Penetrated depth 211 m.
- ★ Removing pumps stuck or broken in boreholes.

★ Enlarging, deepening and casing of three boreholes drilled for irrigation purposes. Penetrated depth 97 m.

TEST PUMPINGS

In order that the Department will be in a position to express views on the water supply sources proposed to be used for the division of land into building plots or the erection of hotels, industries or other establishments, it undertakes to carry out pumping tests the results of which are communicated to the appropriate authorities.

Pumping tests are also carried out for Government works.

During 1978, 45 Government and private test pumpings were carried out as follows:-

★ 18 for division of land with total hours pumped 569
★ 21 for building permits with total hours pumped 164
★ 3 for irrigation divisions with total hours pumped 122
★ 3 for Government purposes with total hours pumped 34

METEOROLOGICAL SUMMARY

As it is not possible for the Meteorological Service of the Republic of Cyprus to obtain measurements of various meteorological elements in the northern part of the Island because of its being occupied by Turkish troops, the data given below relate to the weather experienced in the sourthern part of the Island during the hydrometeorological year 1977–1978.

PRECIPITATION

The yearly total precipitation averaged over the southern part of the Island during the hydrometeorological year October 1977 to September 1978 was 549 mm which is 103% of normal (see diagram on page 32).

The total precipitation amounts, during the period, were below normal over a small part of the eastern Troodos slopes, the Mesaoria plain and part of the south-eastern coastal areas and they ranged between 70% and 90% while over the remaining areas they were above normal and ranged between 100% and 125% (see Isohyetal map on page 33).

Regarding the monthly distribution of precipitation it was above normal in the months of December 1977 to April 1978, while it was much below normal (around 50%) in October and November 1977 and in the remaining months of the period.

The following table giving the incidence of rainfall during the hydrometeorological year 1977–1978 illustrates the situation (see also graphical representation on page 31).

TABLE II–1

INCIDENCE OF RAINFALL IN HYDRO-METEOROLOGICAL YEAR 1977-1978

Month	Rainfall in mm	Rainfall in inches	Percentage of yearly total	Pergentage of monthly normal
October	15.3	0.60	2.8	44
November ...	9.5	0.37	1.7	19
December	161.2	6.35	29.4	123
January	164.1	6.46	30.0	136
February	91.2	3.59	16.6	116
March	78.6	3.09	14.2	125
April	25.6	1.00	4.7	109
May	0.5	0.02	0.1	2
June	1.8	0.07	0.3	31
July.....	NIL	NIL	–	0
August	trace	trace	–	0
September ...	0.9	0.03	0.2	14
Totals ...	548.7	21.58	100.0	

Note: Yearly total as percentage of yearly normal: 103%

The maximum amount of rainfall reported in a 24–hour period during the hydro-meteorological year was 96.4 mm reported by Kannaviou Station on 8th December 1977. The first snowfall occurred on mount Olympus on the 3rd December 1977 which is the median date for the first snowfall in Cyprus. Subsequently snowfalls occurred during the ensuing months January 1978 to April 1978, the last of which was a slight one reported on 22nd April 1978 about 10 days later than the median date.

TEMPERATURE

During the hydrometeorological year 1977–1978 the air temperature as a whole was slightly above normal in most areas. In particular monthly mean air temperature was below normal in October, December, April, August and September and above normal in November, January, February, March, May, June and July.

For the extreme maximum and extreme minimum temperatures recorded during the hydrometeorological year under review see table II–2

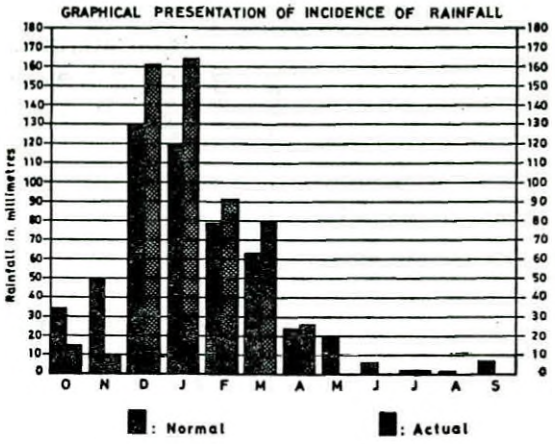


TABLE II–2

INCIDENCE OF MAXIMUM AND MINIMUM TEMPERATURES 1977-78

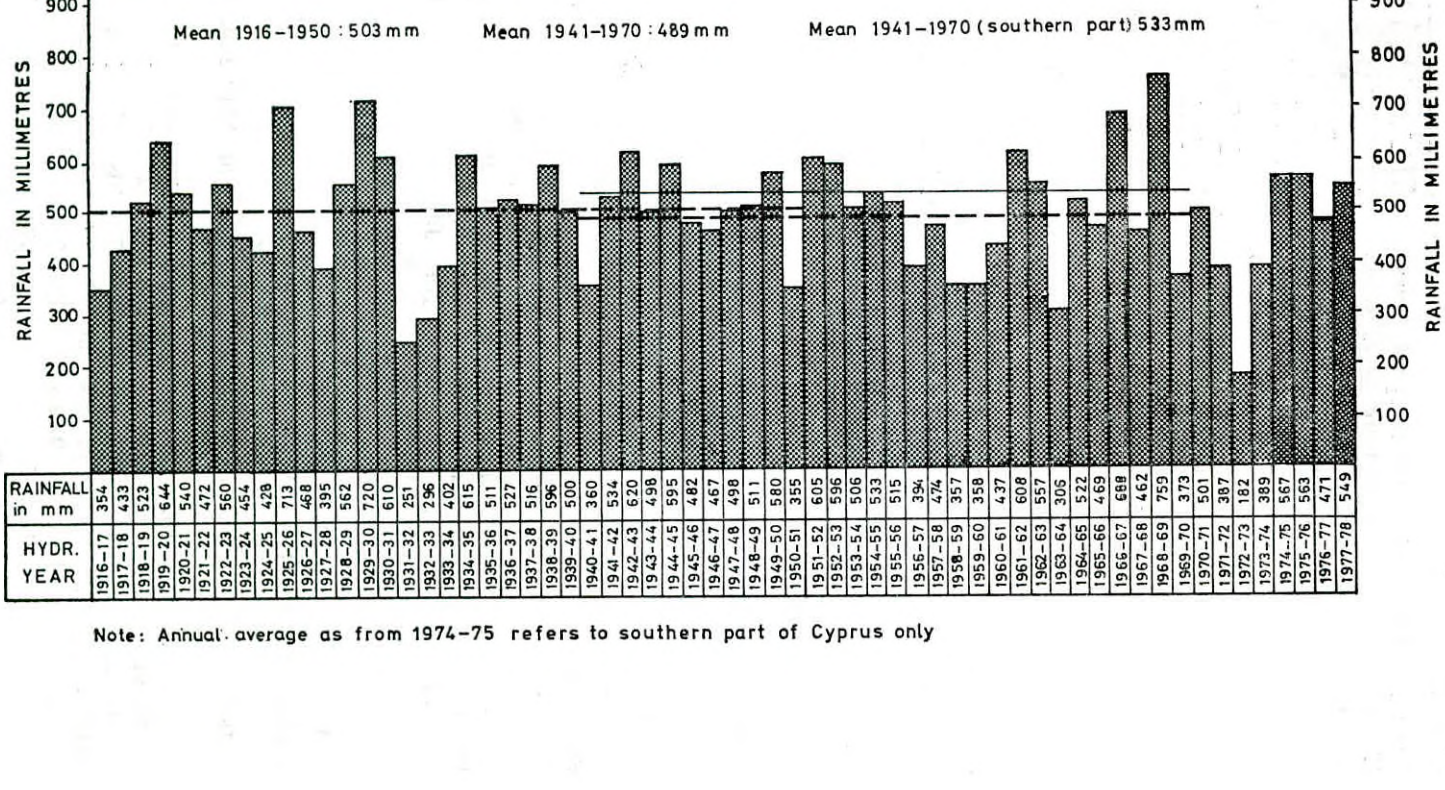
Station	Extreme maximum temperature and date		Extreme minimum temperature and date	
	°C		°C	
Nicosia	43.5	8th July	0.9	25th December
Limassol	42.0	9th July	3.0	24th December
Larnaca Airport	39.9	9th July	3.1	24th December
Paphos	33.9	13th July	5.3	24th December
Panayia Bridge	40.1	7th July	–2.5	24th December
Saittas	38.5	5th, 8th and 9th July	0.0	24 & 25 December
Amiandos	34.5	8th & 14th July	–3.5	24th December
Prodhromos	33.0	14th July	–4.0	24th December
Stavros Psokas	37.5	6th & 7th July & 10th August	0.0	24 & 27 December
Kornos	41.0	5th &9th July	3.0	25th December
Platania	36.0	21st July	–2.6	24th December
Phasouri	39.0	20th June	0.0	24th December

TABLE II–3

TOTAL MONTHLY EVAPORATION 1977-78

Station	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Yearly Total
Nicosia	132	79	41	36	49	78	128	257	300	339	267	191	1897
Athalassa	133	79	40	43	56	89	142	245	285	304	249	188	1853
Saittas	119	83	39	33	49	77	108	223	262	310	239	178	1720
Akhelia	157	117	85	80	75	77	117	194	225	238	212	180	1757
Yermasoyia	156	99	63	57	65	93	125	232	287	315	248	188	1928
Polemidhia	147	119	75	63	65	92	131	212	251	288	230	186	1859
Prodhromos	89	63	27	40	60	70	112	193	214	260	201	128	1457

ANNUAL AVERAGE RAINFALL OF CYPRUS
FROM 1916 – 1978



HYDR. YEAR	RAINFALL in mm
1916–17	354
1917–18	433
1918–19	523
1919–20	644
1920–21	540
1921–22	472
1922–23	560
1923–24	454
1924–25	428
1925–26	713
1926–27	468
1927–28	395
1928–29	562
1929–30	720
1930–31	610
1931–32	251
1932–33	296
1933–34	402
1934–35	615
1935–36	511
1936–37	527
1937–38	516
1938–39	596
1939–40	500
1940–41	360
1941–42	534
1942–43	620
1943–44	498
1944–45	595
1945–46	482
1946–47	467
1947–48	498
1948–49	511
1949–50	580
1950–51	355
1951–52	605
1952–53	596
1953–54	506
1954–55	533
1955–56	515
1956–57	394
1957–58	474
1958–59	357
1959–60	358
1960–61	437
1961–62	608
1962–63	557
1963–64	306
1964–65	522
1965–66	469
1966–67	688
1967–68	462
1968–69	759
1969–70	373
1970–71	501
1971–72	387
1972–73	182
1973–74	389
1974–75	567
1975–76	563
1976–77	471
1977–78	549

Note: Annual average as from 1974–75 refers to southern part of Cyprus only

EVAPORATION

Monthly total evaporation in mm measured from United States Weather Bureau (U S W B) Class "A" pan during the hydro-meteorological year 1977–1978 at selected stations is given below:

SURFACE WATER

Permanent Stream Gauging Stations

On important streams at selected places, permanent flow gauging stations equipped with automatic water level recorders have been established for the purpose of calculating the quantity of water flowing from each station. All these stations have to be inspected regularly i.e. every week, fortnight or month for the purpose of checking and maintenance of equipment, change of charts, velocity measurements of flowing water with current meter for calibration purposes, etc. During the wet season the visits are more frequent for high flow measurements and sampling for suspended sediment and chemical analysis. The condition of float wells and weirs is also checked and cleaned when necessary.

In the northern part of the Island, we have not been able to attend any flow gauging stations, because of the presence of the Turkish invasion troops, so their condition is not known to us.

Flow Gauging Stations on Irrigation Intakes

Besides the permanent stream gauging stations, which are established on streams, a number of flow gauging stations have been established on irrigation intakes for the purpose of calculating the water diverted from certain streams in a certain area for irrigation purposes.

The general conclusion obtained from the study of records of the above flow gauging stations is the normal flow on most of them with the exception of a few where the flow was below normal, because of the low rainfall in their catchment.

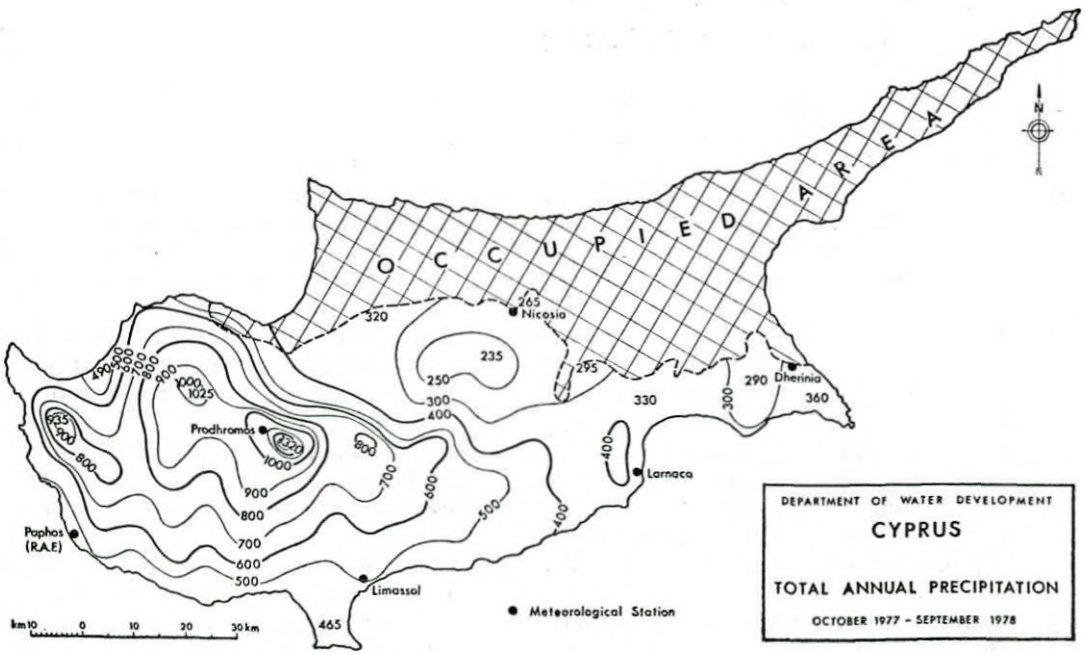
The annual flow of some selected rivers at selected flow gauging stations is presented in table II–6

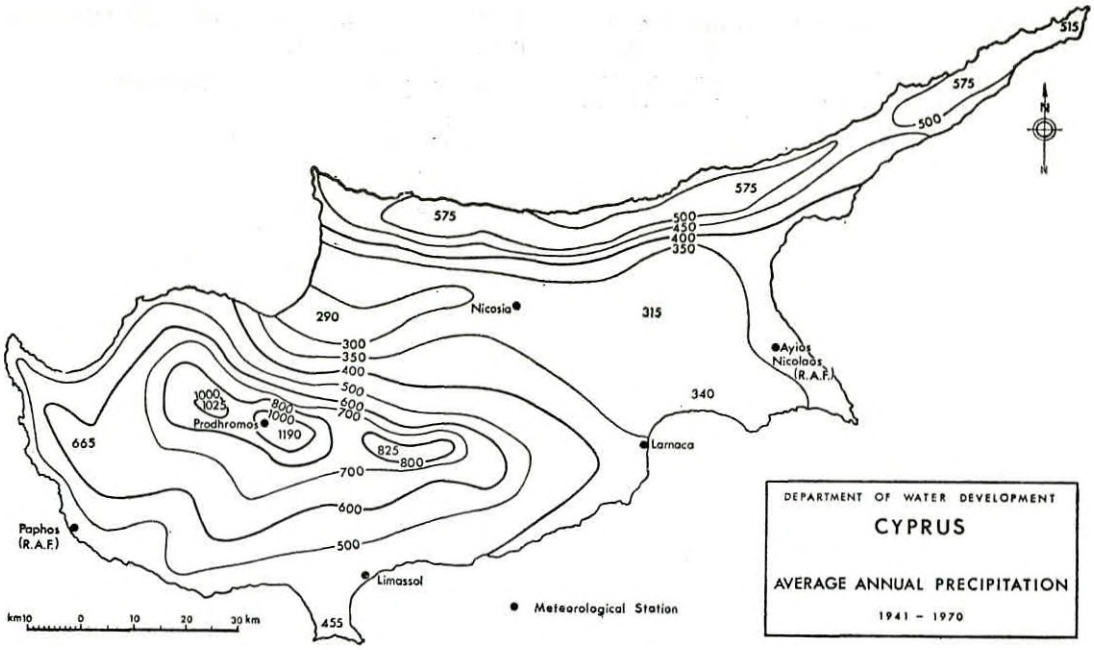
New Flow Gauging Stations

During the year under review three new flow gauging stations were constructed.

★ Ayia Stream near Ayia Forest Station. Construction of a "V" shaped structure 3 m wide, slope 1:5

★ Vathys Stream—Paralimni Lake main





inflow source. Construction of a "V" shaped structure, with metal sheet, 5 m wide, slope 1:5.

★ Pashalivadhi Stream near Kato Amiandos. Construction of a "V" shaped structure 5 m wide, slope 1:5.

Repairs and Improvements to the Existing Flow Gauging Stations

During the year repairs and improvements were carried out on the following flow gauging stations:

★ Dhiarizos River near Philousa. Construction of a "V" shaped structure 17 m. wide, slope 1:10, on the apron of the existing weir and extension of the apron by 1.5 m.

★ Xeros River near Phinikas. Alterations to the lower section of the weir by the construction of a "V" shaped structure, 36.6 m wide, slope 1 m, and river training u/s of the station by tractor.

★ Limnitis River near Limnitis Saw Mill (old Station). Alterations to the lower section of the weir by the construction of a half "V" shaped structure 6 m wide, slope 1:6.

★ Marathasa River u/s of Kalopanayiotis Dam. Construction of a half "V" shaped structure 7.20 m wide, slope 0.60 m under the new bridge.

★ Elea River near Vizakia. Alterations to the lower section of the weir by the construction of a half "V" shaped structure 6 m wide, slope 1:15 and construction of a float well near the sill.

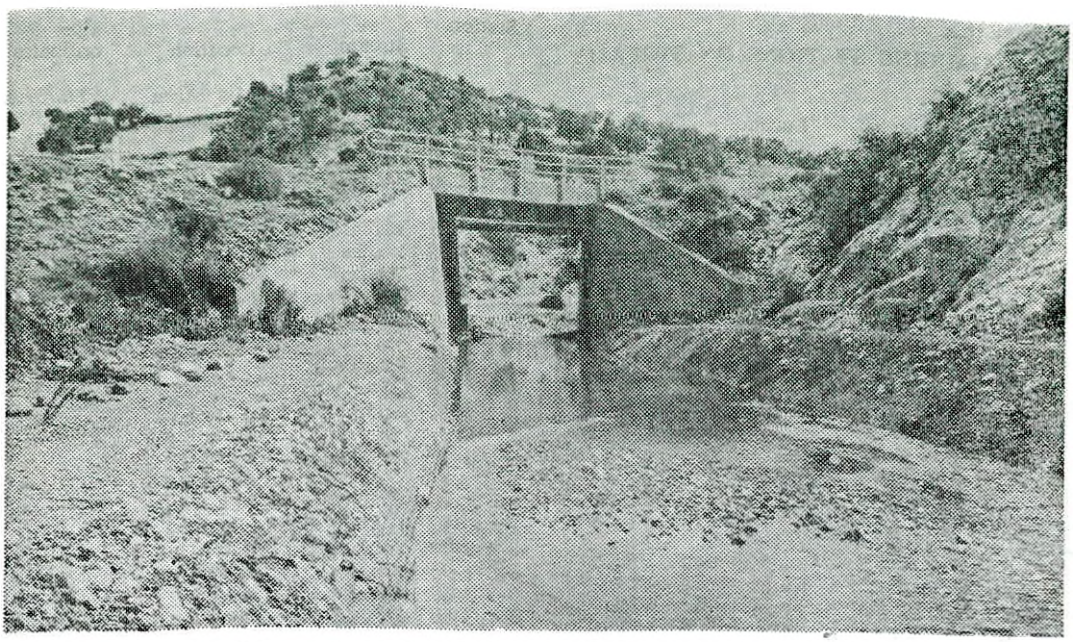
★ Mylou River near Kornos. Alterations to the lower section of weir by the construction of a half "V" shaped structure 9m wide, slope 1:10 and construction of a float well near the sill.

★ Zyghos River near Khalassa. Alterations to the lower section of the weir by a half "V" shaped structure 9.5 m wide, slope 0.65m and construction of a float well.

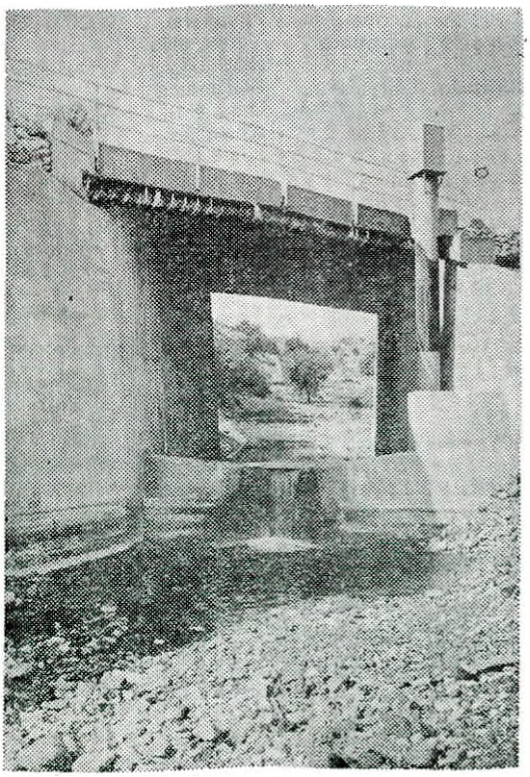
★ Evdhimou River near Evdhimou. Construction of a "V" shaped structure 10m wide, slope 1:10 on the apron of the existing weir.

★ Ayios Onoufrios River near Kambia. Lining of the river bed upstream of the weir for the normal operation of the station.

★ Akrounda River u/s of Yermasoyia Dam. Lining the river bed upstream of the weir for the normal operation of the stream



River training upstream of flow gauging stations is being experimentally carried out. In the photograph gravelly banks being secured with steel wire netting.
Upstream view of weir.



Downstream View of weir.

Flood Discharges

Although the rainfall during the hydrological year was slightly above normal, no remarkable floods have been recorded. The most noteworthy floods, however, recorded at the flow gauging stations during the same period were as follows:

- ★ Dhiarizos river near Philousa about 25 m^3 per second on 9th February, 1978. Its catchment area is 264 km^2.
- ★ Ezuzas river near Akhelia about 25 m^3 per second on 9th February, 1978. Its catchment area is 211 km^2.
- ★ Kouris river near Khalassa about 17 m^3 per second on 8th December 1977. Its catchment area is 100 km^2.
- ★ Tremithos river near Ayia Anna about 15 m^3 per second on 28th December 1977. Its catchment area is 90 km^2.
- ★ Zyghos river near Khalassa about 12 m^3 per second on 7th February 1978. Its catchment area is 124 km^2.
- ★ Limnitis river near Limnitis saw mill about 11 m^3 per second on 11th January 1978. Its catchment area is 49 km^2.
- ★ Aradhippou river near Yematousa about 5 m^3 per second on 17th December 1977. Its catchment area is 20 km^2.

TABLE II–4
FLOW GAUGING STATIONS ON STREAMS

Station No	Stream	Location	Co-ordinates
1–1–3–95	Khapotami	Kissousa	VD805513
1–1–7–95	Khapotami	Kouklia	VD627383
1–2–4–95	Dhiarizos	Philousa	VD754575
1–2–7–90	Dhiarizos	Kouklia	VD601411
1–3–5–05	Xeros	Lazaridhes	VD725652
1–3–8–60	Xeros	Phinikas	VD615470
1–4–4–50	Ezousas	Kannaviou	VD610633
1–4–9–80	Ezousas	Akhelia	VD524444
1–8–2–80	Avgas	Toxeftra (Akamas)	VD394644
2–2–3–95	Khrysokhou	Skoulli	VD497709
2–2–6–90	Stavros–tis–Psokas	Evretou	VD520705
2–8–3–10	Limnitis	Limnitis Sawmill	VD737822
2–9–3–40	Marathos*	Varisha	VD770872
2–9–4–90	Kambos*	Potamos–tou–Kambou	VD826892
3–1–3–95	Xeros*	Karavostasi	VD852889
3–2–4–95	Marathasa*	Karavostasi	VD863895
3–3–1–70	Ay. Nikolaos	Kakopetria	VD900707
3–3–2–60	Platania	Kakopetria	VD927698
3–3–3–95	Karyotis	Evrykhou	VD906773
3–3–5–95	Karyotis*	Pendayia	VD883902
3–4–2–90	Atsas	Evrykhou	VD931810
3–5–1–50	Lagoudhera	Adhelphi Forest	WD029722
3–5–4–40	Elea	Vyzakia	WD018806
3–7–1–20	Platanistasa	Platanistasa	WD042682
3–7–1–50	Peristerona	Panayia Br. F.S.	WD075754
3–7–3–90	Akaki	Malounda	WD163783
3–7–5–95	Merika*	Avlona	WD093924
3–7–7–85	Skylloura*	Ay. Vasilios	WD156969
3–7–8–60	Ovgos*	Kyra	WD050964
3–7–8–65	Ovgos*	Ovgos Dam	WD034973
3–7–8–90	Ovgos*	Morphou	VD973974
3–7–9–05	Serrakhis*	Masari Dam	WD080930
3–7–9–50	Serrakhis*	Morphou Dam	WD007948
3–8–6–50	Aloupos*	Aloupos Chiftlik	VE980018
4–2–3–70	Panagra*	Panagra	WE077119
4–4–2–50	Boghaz*	Kyrenia Road Forest	WE296077
5–2–3–50	Melini*	Ayia Trias	XE125337
5–9–4–90	Kharangas*	Boghaz (F)	WE883100
6–1–1–80	Ay. Onoufrios	Kambia	WD225735
6–1–1–85	Pedhieos	Kambia	WD224741
6–1–2–95	Pedhieos*	N'sia Railway Br	WD319941
6–1–3–84	Makedonitissa Upper	Makedonitissa	WD283908
6–1–3–85	Makedonitissa Lower	Engomi	WD291915
6–1–4–20	Tengelis*	Kythrea	WE415010
6–1–4–50	Pedhieos*	Mia Miiea	WD376958
6–1–5–50	Vathys	Athalassa	WD345867
6–1–7–15	Kephalovryso Spring*	Kythrea	WE445030
6–1–7–40	Ak Sou*	Petra–tou–Dhigeni	WE499001
6–5–1–85	Yialias	Kochati	WD306727
6–5–3–15	Yialias	Nisou	WD360755
6–5–3–95	Yialias*	Pyroi	WD446824
7–1–7–50	Kolopannes*	Kalopsidha	WD746842
7–2–3–50	Liopetri	U/S Liopetri Dam	WD806732
7–2–7–05	Paralimni Lake Outflow	Paralimni	WD892801
8–2–1–90	Aradhippou	N'sia–L'ca Road	WD517683
8–2–2–90	Aradhippou	Panayia Yematousa	WD516689
8–4–3–40	Tremithos	Ayia Anna	WD442668
8–4–5–30	Tremithos	Klavdhia	WD490615
8–4–5–40	Tremithos	Kiti Dam	WD510590
8–5–1–90	Pouzis	Mazotos	WD472518
8–7–3–60	Mylou	Kornos	WD332613
8–7–3–80	Syrkatis	Skarinou	WD343535
8–8–2–50	Maroni	Vavla	WD261558
8–8–3–30	Maroni	Khirokitia	WD317503
8–9–1–70	Akapnou	Melini	WD159577
8–9–7–50	Vasilikos	Kalavasos	WD275472
8–9–7–95	Vasilikos	Vasiliko	WD292425
9–2–3–85	Yermasoyia	Phinikaria	WD093475
9–2–4–95	Akrounda	Yermasoyia Dam U/S	WD078460
9–4–3–80	Garyllis	Polemidhia Dam U/S	VD977450
9–6–2–90	Kryos	Khalassa	VD911474
9–6–4–95	Kouris	Khalassa	VD920470
9–6–5–10	Zavos	Khandria	VD994672
9–6–5–30	Agros	Agros	WD017629
9–6–7–75	Zyghos	Khalassa	VD941471
9–8–1–95	Evdhimou	Evdhimou	VD780397

* Situated within Turkish occupied areas

TABLE II–5
FLOW GAUGING STATIONS ON IRRIGATION INTAKES

Ser No	Intake	Location	Co-ordinates
1	Mylos	Peristerona ...	WD077856
2	Astromeridhiano	Peristerona ...	WD078855
3	Orounda	Orounda	WD083837
4	Riatikon	Meniko	WD144854
5	Afxenti	Meniko	WD152848
6	Vathys*.....	Masari Dam ...	WD077925
7	Avlona*	Avlona	WD091913
8	Masari*	Masari	WD071934
9	Kyra*	Kyra	WD057942
10	Katakrous*	Kyra	WD053945
11	Zavrazis*	Morphou Dam	WD023951

12	Polemios*	Pendayia	VD885888
13	Kritihos*	Pendayia	VD891881
14	Nikoklia	Nikoklia	VD618433
15	Kouklia	Kouklia	VD612419
16	Mandria	Mandria	VD589427
17	Akhelia	Akhelia	VD533449

* Situated within Turkish occupied areas

TABLE II-6
DISCHARGE OF SELECTED RIVERS AS MEASURED AT SELECTED FLOW GAUGING STATIONS FOR THE YEAR 1977-78

Ser No	Station	Stream	Location	Annual flow m^3x10^3
1	2-8-3-10	Limnitis	Saw mill ...	11.3
2	3-3-1-70	Ay. Nikolaos	Kakopetria	13.3
3	3-3-3-95	Karyotis	Evrykhou ...	14.9
4	3-5-4-40	Elea	Vizakia	6.3
5	3-7-1-50	Peristerona ...	Panayia F.S.	13.1
6	3-7-3-90	Akaki	Malounda ...	10.5
7	6-1-1-80	Ay. Onoufrios	Kambia	1.6
8	6-1-1-85	Pedhieos	Kambia	3.9
9	6-5-3-15	Yialias	Nisou	1.1
10	8-4-3-40	Tremithos ...	Ay. Anna ...	2.5

Spring discharges

Most of the springs and minor streams are gauged on a routine basis while a number of them are gauged for a short period after the request of another division of the Department.

During the hydrological year 1977–1978, 2,422 spring and minor stream discharges were taken on 163 springs and minor stream; 1,032 discharges were taken on 83 springs which are under regular monthly observations and 1,391 discharges were taken on 81 springs and minor streams for a certain period at various intervals.

As the precipitation during the hydrological year under review was above normal, most of the springs had a high increase of flow during winter and spring times and maintained a higher than normal flow during the whole summer.

Inflow of Water in Dams

During 1978 a number, out of the 48, most important dams in Cyprus which were in previous years under regular observation, could not be attended, as being in the northern part of Cyprus, under occupation by the Turkish troops.

The water accumulated in the 30 dams which were under regular observations was satisfactory, being in volume at its maximum 30.7 MCM, or 74% of the total capacity of these dams, being 41.65 MCM.

During this year, 21 dams overflowed, all of them during January. In three of them, in Larnaca–Famagusta districts, the inflow was at its maximum about 7% of their capacity. Analytically, the situation is shown on table II–7

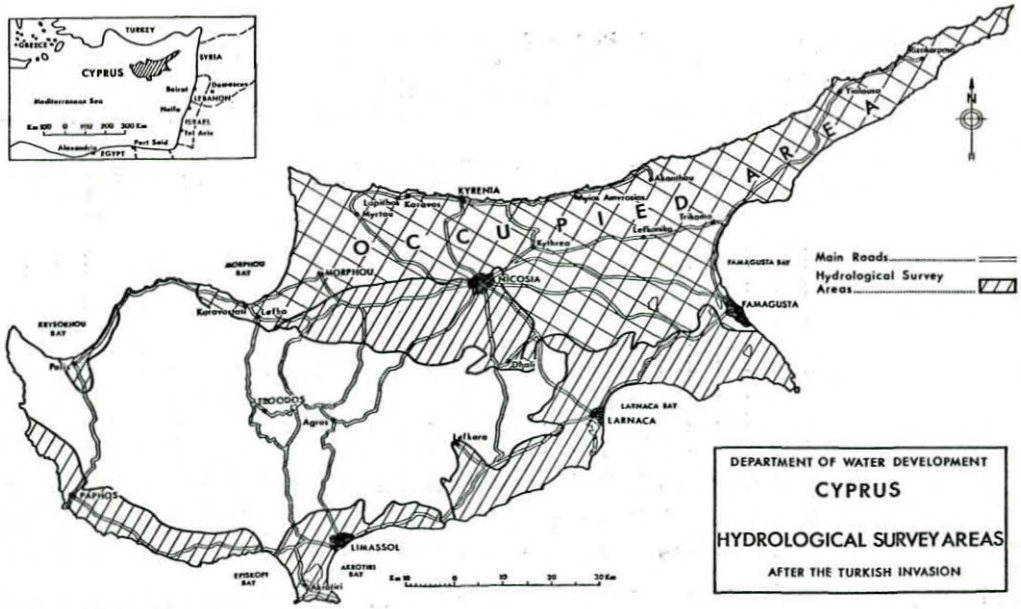
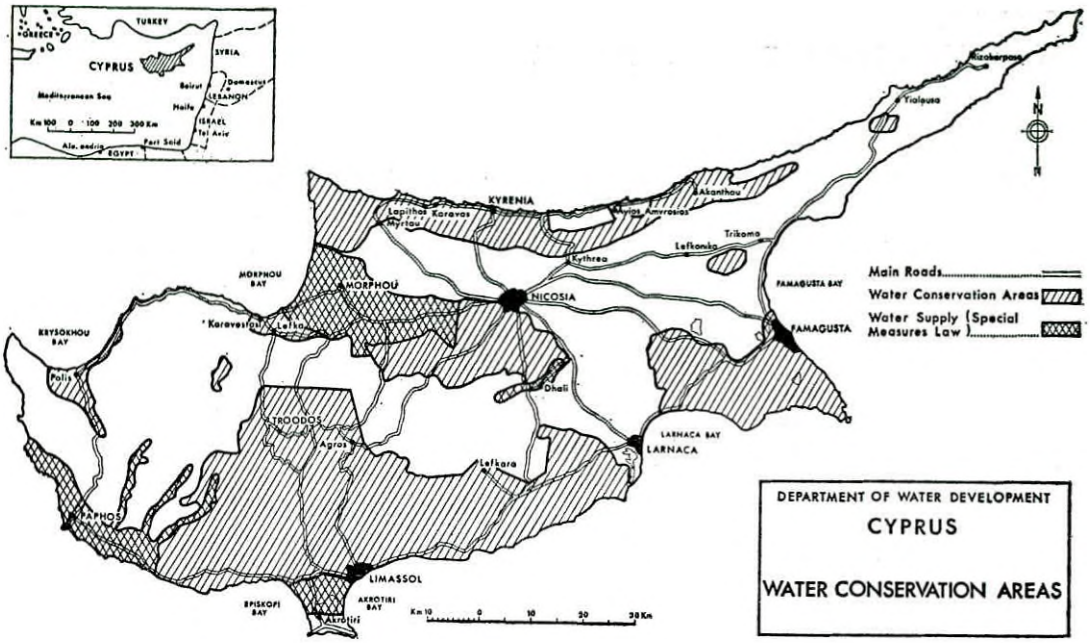


TABLE II–7

VOLUME OF WATER ACCUMULATED AND COMMENCING DATE OF INFLOW FOR VARIOUS DAMS DURING THE YEAR 1978

Ser No	Dam	Capasity $10^3 x m^3$	Inflow commencing date (1978)	Manimum volume accumulated $10^3 x m^3$	Date of maximum accumulation (1978)	Minimum volume accumulated $10^3 x m^3$	Date of minimum accumulation (1978)	Remarks
1	Agros	72	January	50	April	8	November	
2	Akrounda	22	January	22	January	Empty	July	Overflowed
3	Arakapas	130	January	130	January	13	September	Overflowed
4	Argaka	1 150	January	1 150	January	298	October	Overflowed
5	Athalassa	790	January	25	April	Empty	October	
6	Ayia Marina	300	January	300	January	79	November	Overflowed
7	KaloKhorio	81	January	81	January	Empty	August	Overflowed
8	Kalopanayiotis	390	January	390	April	76	October	Overflowed. Gate closed 10.4.78
9	Kandou	38	January	38	January	12	December	Overflowed
10	Kiti	1 500	January	110	January	Empty	June	
11	Kyperounda	60	January	60	January	Empty	October	Overflowed
12	Lefka (Marathasa)	360	January	360	January	309	October	Overflowed
13	Lefka (Kafizes)	110	January	110	January	58	September	Overflowed
14	Lefkara	14 000	January	6 943	May	4 294	December	
15	Liopetri	340	January	14	January	Empty	March	
16	Lymbia	220	January	220	March	80	December	Gate closed 10.2.78
17	Lythrodhonda Upper	32	January	32	February	Empty	July	Overflowed. Gate closed 31.1.78
18	Lyhtrodhonda Lower	32	January	32	January	Empty	September	Overflowed
19	Mavrokolymbos	2 200	January	1 638	April	157	November	
20	Ormidhia (Vathys)	100	December	15	December	Empty	January	
21	Palekhori (Kambi)	640	January	640	January	16	October	Overflowed
22	Perapedhi	55	January	55	January	Empty	September	Overflowed
23	Petra Upper	22	January	22	January	Empty	August	Overflowed
24	Petra Lower	32	January	32	January	Empty	August	Overflowed
25	Pomos	860	January	860	January	193	October	Overflowed
26	Polemidhia	3 400	January	2 672	April	440	January	
27	Prodhromos	110	January	110	February	15	November	Overflowed
28	Pyrgos	270	January	270	January	30	October	Overflowed
29	Trimiklini	330	January	330	May	304	September	Overflowed. Gate closed 17.5.78
30	Yermasoyia	14 000	January	14 000	February	7 630	October	Overflowed



GROUND WATER

Ground Water Hydrological Work

Hydrological surveys of the ground water bearing systems were carried out on small scale by this Department before 1960. Since then, they were rapidly amounting in scale until the most important known aquifer systems were brought in a few years time under Hydrological Observation. It is unfortunate that most of our maps with the well location and other information were destroyed by fire, during the events of 1974, or lost in the area occupied by the Turkish troops. So, during the year under review, the plotting of boreholes/wells and the collection of other hydrological information continued in the free areas, where hydrological work was being carried out before.

Through the Hydrological Surveys all wells/boreholes, springs and chain-of-wells are registered and plotted on maps. A dense network of observation boreholes, is being levelled. Through these observation boreholes/wells, the water level is being measured twice a year, at the end of the dry season (November), when it is expected to be at lowest and at the end of the wet season (March), when it is expected to be at highest level. In areas where more detailed information is necessary, a network has been established of observation boreholes where monthly or bimonthly measurements are taken.

Out of a large portion of the above network of wells and boreholes, water samples are obtained twice a year (November and March), for chemical analysis to evaluate the trends of any quality change of the water in each aquifer. The extent of the areas which were covered before the Turkish invasion, by hydrological surveys was about 3,700 km^2, but now the free area where such work may be carried out is about 2/3 of that (see map on page 37).

As regards the groundwater situation, it was still worstening in the south-eastern part of the Island, since the extraction was much more in excess from the recharge. In the other aquifers the water table situation remained about the same as last year, except in the Akrotiri aquifer where there was a marked improvement. Details may be seen in the following table of selected observation boreholes.

TABLE II–8

SELECTED OBSERVATION BOREHOLES

Serial No	Hydr. No	Village	March 1977	November 1977	March 1978	November 1978	Water level increase (+) or decrease (–) March 77–78	Nov 77–78
56/56	192	Liopetri	+1.15	–0.24	–0.22	–0.02	–1.37	+0.22
20/63	1 516	Paralimni	+20.88	+20.18	+19.93	+19.73	–0.95	–0.45
22/63	1 518	"	+6.12	+5.98	+5.97	+5.97	–0.15	–0.01
51/51	774	Phrenaros	+5.03	+4.42	+5.42	+3.95	+0.39	–0.47
79/56	975	"	+7.72	+7.79	+8.08	+8.04	+0.36	+0.25
88/54	24	Kolossi	+3.05	–0.20	+3.15	+0.70	+0.10	+0.90
51/63	813	Limassol ...	+1.08	+0.48	+1.28	+0.90	+0.20	+0.42
45/63	811	Zakaki	+0.83	+0.18	+1.08	+0.58	+0.25	+0.40
107/61	17	Yermasoyia	+8.95	+1.43	+16.18	+2.18	+7.23	+0.75
108/59	8	"	+30.83	+18.13	+35.75	+17.85	+4.92	–0.28
7/60	22	"	+3.38	+1.55	+7.28	+0.81	+3.90	–0.74
134/59	27	"	+(7.40)	+(1.36)	+13.78	+1.46	+6.38	+0.10
161/50	180	K. Trimithia	+187.41	+187.52	+187.53	+187.34	+0.12	–0.18
160/50	222	"	+195.14	+194.07	+195.27	+194.35	+0.13	+0.28
125/60	15	Episkopi ...	+23.91	+17.76	+30.01	+19.86	+6.10	+2.10
EB94/70	1 236	Akrotiri ...	+1.41	–0.24	+2.11	+0.22	+0.70	+0.46

Control and Conservation of Ground Water

The Advisory Committee for the issue of well permits established by the Ministry of Agriculture and Natural Resources operated this year with M. Peppis, as president, on behalf of the Director of Water Development Department. Representatives of the Directors of Geological Survey and Agricultural Departments are members of this committee, whose task is to advise the Director of Water Development Department on matters related to well sinking permits. At the meetings, the Legal Advisor of this Department, Ch. Kyriakides and the Regional Engineer of the district where applications were to be examined, participated.

The Committee performed during 1978, 47 meetings and examined 2,282 applications sent to the Director, WDD by the District Officers, as follows:–

Water Supply (Special Measures) Law areas	139
Water Conservation areas	1546
Non Water Conservation areas	597

Water Conservation Areas (Wells Law Cap 351)

An area is declared as a Water Conservation Area, when the exploitation of its water resources is such, that it may affect the quantity or quality of the water of that area.

On map on page 39 the areas which have been declared as "Water Conservation Areas" under the wells Law Cap 351 are shown. Particulars of these areas are also shown on the following table.

Applications for well permits falling within a Water Conservation Area, are being sent by the District Officers to the Water Development Department for technical advice and recommendations. These recommendations which are based on the knowledge of the existing water situation of each aquifer, the development in the area and the existence of other wells or boreholes, chain–of–wells and springs, as well as any other Government Water works are mandatory to the District Officer.

TABLE II-9 **WATER CONSERVATION AREAS**

Ser No	Water Conservation Area	Order No	Date	Gazette No	Date
1	K/Trimithia–Ayii Trimithias, Paleometokho, Mammari	556	31.10.51	3584	31.10.51
2	Nicosia	556	31.10.51	3584	31.10.51
3	Tersephanou–Klavdhia	374	18. 8.52	3639	27. 8.52
4	Laxia	374	18. 8.52	3639	27. 8.52
5	F'sta, Phrenaros, Paralimni, Ormidhia, Xylotymbou, Pergamos, Kouklia, Avgorou, etc.	164	3. 3.56	3924	8. 3.56
6	Akrotiri, Phasouri, etc.	165	3. 3.56	3924	8. 3.56
7	Morphou, Syrianokhori, Prastio, Nikitas, Elea, Pendayia	1052	30.10.56	3995	8.11.56
8	Dhali, Potamia	1194	29.11.56	4008	6.12.56
9	Ayios Andronikos, etc.	916	26. 9.57	4081	3.10.57
10	Morphou, Peristerona, Astromeritis, Akaki, etc.	314	3. 5.58	4133	15. 5.58
11	Vasilia, Lapithos, Kyrenia, Ayios Epiktitos, etc.	245	28. 4.59	4228	30. 4.59
12	Makedhonitissa, etc.	544	16.11.59	4277	26.11.59
13	Moni, Pyrgos	226	27. 7.61	75	27. 7.61
14	Yermasoyia	443	8.12.61	112	8.12.61
15	Dhiorios 'Djipi Loc'...	324	21. 6.62	163	21. 6.62
16	Yialia, Ayia Marina, Argaka, Polis	359	7. 7.62	168	7. 7.62
17	Yialias River (Potamia, Dhali, Nisou, Mathiati)	189	25. 4.63	245	25. 4.63
18	Kiti, Pervolia, Meneou, Dhromolaxia	50	28. 1.65	384	28. 1.65
19	Kouklia, Anarita, Timi, Akhelia	529	26. 8.65	435	26. 8.65
20	Lapathos, Gypsos	545	9. 9.65	438	9. 9.65
21	Moni (Extension)	642	14.10.65	444	14.10.65
22	Lakatamia, Dheftera, Anayia, Pera, etc.	744	11.11.65	453	25.11.63
23	Ayia Erini	280	19. 5.66	499	2. 6.66
24	Paramali, Evdhimou	S.B.A. 68	29. 7.67	S.B.A. 212	29. 7.67
25	Lysi, Kondea	776	7. 9.67	599	22. 9.67
26	Akanthou	777	7. 9.67	599	22. 9.67
27	Pergamos (Extension)	889	19.10.67	606	3.11.67
28	Ayios Amvrosios	890	19.10.67	606	3.11.67
29	Kyrenia Range Limestone Mass	817	7.11.68	693	22.11.68
30	Vasilikos, Xeropotamos	862	28.11.68	697	13.12.68
31	Yeroskipos, Konia, Ktima, Peyia	741	4. 9.69	748	19. 9.69
32	Karavostasi, Peristeronari	50	29.12.69	771	16. 1.70
33	Yeri	75	8. 1.70	773	23. 1.70
34	Neokhorio, Androlikou	845	14.10.71	904	29.10.71
35	Yiolou, Loukrounou, Skoulli	845	14.10.71	904	29.10.71
36	Pissouri, Evdhimou	576	10. 8.72	958	25. 8.72
37	Kormakitis, Myrtou, Dhiorios	851	7.12.72	979	15.12.72
38	Akanthou (Extension)	288	15.11.73	1054	30.11.73
39	Ayios Ioannis (Malounda)	307	25.11.74	1158	25.11.74
40	Kambos Chakistra	—	—	1180	4. 4.75
41	Parekklisha	206	23.10.75	1233	7.11.75
42	L'ssol–Paphos–L'ca Extension of W C As	215	30. 9.77	1429	3. 3.78

Water Supply (Special Measures) Law 32/64

The major aquifers of Western Mesaoria and Akrotiri Peninsula, which were declared as water conservation areas in the past, have been covered by the water supply (Special Measures) Law, since 1965, whose purpose is to further and more efficiently protect and control the water resources. The Paphos coastal area and the Paphos major river valleys, which will be covered by the Paphos Irrigation Project, have also been covered by that Law in 1974 and 1975.

The areas covered by this Law are shown on map page 39 and particulars given in the table below.

For the above areas

★ the District Officer, with the concurrence of the Director of Water Development Department, can withdraw any permit for any well or can apply any modifications on the extraction of water as required.

★ On the permits which are renewed yearly, conditions are imposed regarding the quantity of water to be extracted, the method of extraction, the area to be irrigated, the measurement of water, the conveyance of water and the utilization of water.

Water Meters

The preservation of the aquifers through the close control of the groundwater extraction and use, which is the object of the declaration of an area under the provisions of the Water Supply (Special Measures) Law, cannot be effected without metering the water pumped from each borehole or well.

According to the provisions of the above referred law, water meters should be installed in the Water Supply (Special Measures) Law areas. Information about the installation and operation of water meters is not available for Western Mesaoria area, since this area is still under Turkish occupation. For Paphos area the Law has not yet been enforced. In Limassol–Akrotiri area 404 water meters have been installed of which 324 in continuous operation. The total volume of water recorded is 11,830 MCM. During the year 167 illegal pumpings have been reported to the District Officer, out of which 130 were presented to Court.

Private Drillers (Wells Law, Section 36)

According to the above law, no one is allowed to operate a drilling rig without a Driller's licence. Such a licence is issued by the Director of the Water Development Department, after the interested person to become

TABLE II–10 **WATER SUPPLY (SPECIAL MEASURES) LAW AREAS**

Ser No	Area	Order No	Date	Gazette No	Date
1	Western Mesaoria (Pendayia–Morphou–Kokkini Trimithia)	—	—	331	9. 7.64
2	Akrotiri peninsula	—	—	331	9. 7.64
3	South–Eastern Mesaoria (F'sta–Paralimni–Ormidhia–Akhna), Later withrawn	—	—	331	9. 7.64
4	Potami	89	12. 2.66	479	24. 2.66
5	Dhiarizos River	196	23. 5.74	1104	21. 6.74
6	Xeropotamos River	196	23. 5.74	1104	21. 6.74
7	Ezousas River	196	23. 5.74	1104	21. 6.74
8	Peyia–Aspros River (Ext. of Yeroskipos–Peyia W C A West of Peyia village)	196	23. 5.74	1104	21. 6.74
9	Mavrokolymbos River (Ext. of Yeroskipos–Peyia W C A)	196	23. 5.74	1104	21. 6.74
10	Kouklia–Paphos–Peyia	111	6. 6.75	1193	6. 6.75
11	Nisou–Potamia valley	274	15.12.78	1488	15.12.78

Driller applies for it and when the Director of the Department is satisfied that the applicant is competent to carry out such a job. A fee is paid for the licence and each year for its renewal.

According to the same law, every driller has to notify the Director of the Water Development Department of his intention to drill a borehole, to keep samples from the rocks penetrated and send to the above said Director, together with a technical report on each borehole drilled.

During 1978, this Department issued 5 Drillers licences and renewed 41 others. The number of private drilling rigs which drilled for water during 1978 was 59 and this Department has been notified about the drilling or cleaning of 203 boreholes. Information from private drillers has been received by this Department for 130 boreholes.

During 1978 64 private Drillers were reported to the District Officers for illegal drilling.

WATER QUALITY

Chemical Analyses

During the year, 450 samples of water were sent to the Government Analyst and 1,555 to the W D laboratory for chemical analysis. Out of these, 1,061 samples were taken from springs, wells or boreholes, which are used or proposed as water supply sources. The remaining 944 samples were taken from rivers, springs, observation boreholes and other miscellaneous sources.

In addition to the above, 1,350 samples of water taken from observation boreholes in the hydrological survey areas, were analysed by the Water Resources Division for chloride content.

Bacteriological Analyses

During the year, 391 samples were sent to the Pathological Laboratory for bacteriological analysis with results as follows:

Water Supply	No of samples	No of unsatisfactory samples
Nicosia	80	29
Limassol ...	152	31
Larnaca ...	159	19
TOTAL ...	391	79

The unsatisfactory samples at Nicosia, Limassol and Larnaca were usually of unchlorinated water. All chlorinated samples at main reservoirs were highly satisfactory.

Suspended Sediment Analyses

In view of the future construction of large dams in Cyprus and the problem arising from reservoir sedimentation, the sediment sampling programme was continued. Though not very intensive, the programme provided for sampling during routine visits to the flow gauging stations and additional sampling during floods in as many rivers as possible.

During the year, 140 samples of river water were taken for suspended sediment analyses.

CENTRAL COMMITTEE FOR THE ISSUE OF LOANS AND THE REACTIVATION OF TURKISH CYPRIOT OWNED WELLS

The Council of Ministers, at its meeting of the 19th February, 1976—Decision No 14,694—decided the establishment of the above said Committee. The terms of reference of the committee are to accept and examine applications from Greek Cypriot displaced farmers to use wells/boreholes abandoned by their Turkish Cypriot owners and to grant loans for the purchase, repair and installation of pumping plants and pipelines for the irrigation of abandoned fields of Turkish Cypriot ownership. For this purpose, the Government placed at the disposal of the Committee, the sum of £457,500 for the above said loans.

According to the above said decision of the Council of Ministers, the Committee is presided by the Director–General, Ministry of Agriculture and Natural Resources, who transferred the chairmanship to the Director of Water Development Department. Other members are the Director–General, Ministry of the Interior, the Director–General, Ministry of Finance, the Director–General, Planning Bureau, the Commissioner for Co–operative Development, the Director, Department of Agriculture and the representatives of the Ministry of Agriculture and

TABLE II–11

APPLICATIONS EXAMINED AND LOANS ISSUED FOR THE REACTIVATION OF TURKISH CYPRIOT WELLS ABANDONED BY THEIR OWNERS

Particulars	Nicosia	Limassol	Larnaca	Paphos	Totals
Applications approved (Number).....	2	4	9	13	28
Wells/boreholes allocated (Number)	2	4	7	13	26
Farmers benefited (Number)	4	7	12	24	47
Area to be irrigated (Donums)	12	55	113	339	519
Loans granted (Number)	1	3	9	13	26
Loans granted (Pounds £).....	450	2 210	9 855	21 676	34 191
Loans issued (Pounds £)	450	2 230	13 685	21 676	38 131
T/C pumping plant allowed to be used (Number)	1	—	—	1	2
Estimated value of T/C pumping plant (Pounds £)	250	—	—	250	500
Amortization rate (Pounds £/Year).....	25	—	—	34	59

Natural Resources at the District Committees for the protection of Turkish Cypriot properties, or their representatives.

The Committee convened at its first session on 27th March, 1976, and at the beginning, the rules and procedures have been decided upon which it would function.

Accordingly, special application forms have been prepared, obtainable from the Regional Offices of the Water Development Department, which displaced farmers could fill when applying to be granted a loan to purchase and install pumping plants and pipelines and/or permission to utilise existing pumping equipment on the specific well/borehole for which application was made. The applications which in most cases are from groups of farmers at the first stage examined by the District Officer and the District Agricultural Officer. When the applicant or applicants are lawful tenants of abandoned by their owners Turkish Cypriot fields, leased to them by the Central Committee for the protection of Turkish Cypriot Property—the Regional Engineer transmits the application with suggestions as to which fields may be irrigated from the same boreholes or group of boreholes accompanied by an irrigation scheme, where necessary, with the estimated cost, to the Committee which decides as to the kind of equipment to be installed, the amount of water to be pumped, the fields to be irrigated and the loan to be granted.

The decisions of the Committee are then notified to the Loan Commissioner who releases the proper amount so that it may be distributed by the local cooperative Banks to the interested farmers. In case of groups of farmers the loan remains in the hands of the local cooperative Banks which undertake to purchase, install and run the pumping plants and to deliver water for irrigation to the interested farmers, who sign an agreement for the repayment of the loan and the running expense as well.

The repayment period for the loans has been set to seven years with an interest of 4.5%. When part or the whole pumping unit of Turkish Cypriot ownership exists on the borehole/well, a loan may be granted for the purchase of what is missing and the value of the existing equipment with its anticipated life is calculated. Taking into account these parameters and after substracting the residual value which the pumping plant is expected to have after a maximum of eleven years or at the end of its expected life, an amortization rate is calculated which has to be repaid every year by the involved farmer or farmers. From its establishment the Central Committee for the issue of loans and the reactivation of Turkish Cypriot owned wells/boreholes

had 47 meetings during which it approved 406 applications from 1,194 displaced farmers for the irrigation of 11688 donums of land. The amount of loans granted by the end of this year was £347,819.—and the pumping plants of Turkish Cypriot ownership to £41,890—

During the year under examination, the Committee had 7 meetings during which it approved 28 applications from 47 farmers for the irrigation of 495 donums of land. The amount of loans granted is £34,191 and the value of pumping plants of Turkish Cypriot ownership to £500.

Details are given in table II–11.

Use of computer techniques for the storage and retrieval of hydrological and hydrogeological data

Work was initiated in 1975 for storing and retrieving our hydrological and hydrogeological data in a computer readable form. The purpose and scope was given in the 1975 Annual Report of this Department.

Work continued since then, although at small paces due to the lack of enough personnel to devote fully its time on this job and the progress made each year was presented in summary in the annual reports of the Department.

This year the Instructions Manual prepared by Mr. D.Kypris has been completed, where basic information on the use of a computer is given, the information to be recorded is classified, the codes to be used for non numerical information are given and explained in connection with the use of the master/data cards.

A pilot area has also been selected, namely the Akrotiri aquifer area and part of the hydrogeological and other relative information has been recorded on the cards and transferred to computer magnetic tapes.

Research carried out in cooperation with the Institute of Geological Sciences (London)

The project which started in 1977 with the objective of finding the effect of rainfall on recharge by means of lysimeters entered its second year.

The research is being carried out in association with the IGS which is providing both financial and technical assistance.

Further to the 100 m² lysimeter which was constructed in situ at the Paralimni site for the evaluation of the rainfall recharge an additional one of similar size was constructed at the same locality. The new lysimeter is to be cultivated with crops normally planted in the area (potatoes and vegetables) and irrigated with similar irrigation systems currently being used in the area for the purpose of assessing the return flow to the aquifer from irrigation. By December, the lysimeter was planted with potatoes and equipped with sprinklers for the first experiment. See photo on page 16.

Already a large amount of information has been gathered which is being evaluated regarding the recharge from rainfall. This, along with data on return flow will be used in the water balance studies of local aquifers of similar conditions. J. Jacovides, Hydrologist and L. Savvides, Topographer Engineer are working on this project with Dr. R. Kitching of the IGS.

Environmental Isotope Survey of the Troodos Area

The improvement of understanding of the complicated hydrogeology of the Troodos area, has become quite necessary with the implementation of the Pitsilia Project. For this purpose and, among other conventional techniques employed, a survey of the environmental isotopes of the water in the area, has been undertaken in 1977 and continued throughout the 1978. This survey has been made possible by the granting of an extension of a research contract by the International Atomic Energy Agency (IAEA) with J. Jacovides, Hydrologist, as Chief Investigator. In total some 150 samples were collected and sent to the IAEA Laboratories (Vienna) for analysis for the radioisotope Tritium and the stable isotopes of water Deuterium and Oxygen—18.

Of these samples, 92 are from springs, 61 from boreholes, 16 from streams, 5 from snow and 3 from rainfall.

From the study of the analytical results

received so far, it has become apparent that the waters in the Troodos area may be differentiated both in terms of the location of their recharge zone, based on the stable isotope change with altitude, as well as the "age" or "transit time" since recharge occurred. The latter is based on the Tritium content of the water.

Thus, as a preliminary conclusion, it appears that the water masses may be classified in 4 groups.

- ★ The high altitude springs and boreholes around the central core of Troodos including Amiandos, Prodhromos, Kakopetria and Kyperounda, where the water exhibits high Tritium (50 T.U) indicating recent recharge and light water (–7.5‰ 0–18).
- ★ The peripheral area covering the lower zone of Pitsillia, Saittas, and Pedhoulas exhibiting relatively heavier water (–6.7‰ 0–18) and Tritium (25 T U) indicating components of old and recent recharge.
- ★ The zone of Pelendria, Kato Mylos, Ayios Theodhoros which is distinguished by relatively heavier water (–6.0‰ 0–18) indicating local recharge and Tritium (5 T U) suggesting a large old component recharge, and
- ★ The Arakapas fault area where the oxygen–18 content is about–5‰ indicating as source of recharge the local rainfall and a reservoir of "long transit time" suggesting a large reservoir or small component of recent recharge.

A comprehensive report on the Environmental Isotope Survey (Cyprus) giving all the sampling and conclusions derived has been prepared by J Jacovides, Hydrologist at the end of 1978 and is available at the Department's Library.

PITSILIA PROJECT

Measurements are taken from all springs and wells situated at a distance of about 1000 feet from boreholes drilled by Government for the above Project.

It covers 25 villages most of them under Pitsilia Project and quite a few in Troodos–Marathasa area.

Regular flow or water level measurements were taken twice a year from 245 springs or weirs and 84 wells and monthly measurements from 36 boreholes.

Weekly observations on boreholes, springs or wells situated close to 3 boreholes at Pelendria, Potamitissa and Ayios Theodhoros, during an extensive test pumping, have been taken.

A total of 1,860 measurements were taken during 1978 as follows:

Flow measurements from 245 springs or weirs	490
Static Water Level from 120 boreholes or wells	600
Measurements from nearby springs, weirs or wells to the test–pumped boreholes at Pelendria–Potamitissa and Ayios Theodhoros	780

III DIVISION OF PLANNING

by
Dr. C A Christodoulou
Senior Water Engineer
Head of Division

INTRODUCTION

The Planning Division of the Water Development Department consists of the following two branches:

★ *Reconnaissance and Feasibility Reporting*
★ *Investigations and Laboratories*

RECONNAISSANCE AND FEASIBILITY REPORTING BRANCH

SOUTHERN CONVEYOR PROJECT

General

As stated in the 1977 annual report the Southern Conveyor Project (SCP) is the largest irrigation project ever undertaken in Cyprus. As originally proposed the project will cover an area beginning east of Paphos Town and extending to the Kokkinokhoria area. Its main objective is the optimum utilization of the surface and groundwater resources of the area.

This is to be achieved by a system of reservoirs, intakes, canals, pipelines and tunnels which will link together all the significant sources of water with all the main demand centres. It is envisaged that at full development a large area of land will be irrigated while domestic and industrial needs for the areas of Limassol, Larnaca and Nicosia will be covered.

The offices built to house the SCP teams were completed by the middle of March 1978 and staff began moving in, immediately afterwards.

By the end of April most of the staff had moved into their offices, and by the middle of May all the experts from the British Ministry of Overseas Development had arrived and taken up their posts. Staff recruitment continued and by the end of 1978 the Project's staff team consisted of:

Project Manager: Civil Engineer, Land Resources Development Centre (LRDC), British Ministry of Overseas Development (ODM)

Deputy Project Manager: Senior Water Engineer, WDD

1 Executive Engineer I, WDD
2 Executive Engineers II, WDD
2 Executive Engineers, (daily paid) WDD
1 Topographer/Irrigation Engineer, WDD
1 Agricultural Officer II, Department of Agriculture
2 Assistant Agricultural Officers (Agriculturists) Department of Agriculture
1 Assistant Agricultural Officer (Agricultural Economist) Department of Agriculture
1 Hydrologist I, WDD
1 Hydrologist II, WDD
1 Geologist II, WDD
1 Administrative Officer, WDD
3 Technical Assistants, WDD
5 Draughtswomen, WDD

OLM Staff Working with the Team

1 Agriculturist, LRDC
1 Economist/Agricultural Economist, LRDC
1 Civil Engineer, LRDC

The project is to be carried out in two stages; the first stage involves the identification of the different development options available and the appraisal of their respective economic viability. The findings of stage one will be presented to the Cyprus Government which will consider all the options and decide which of these should be implemented.

After this has been decided the project will proceed to Stage II which will involve the preparation of a feasibility study of the selected options.

Work Progress

There are five sections within the SCP namely Hydrology, Hydrogeology, Engineering, Agriculture and Agricultural Economics. An outline is given below of the progress achieved by each of the teams.

HYDROLOGY

After adapting the rainfall–runoff model and other peripheral programmes to the computer, the section completed the preparation of observed mean daily and monthly flows at two points for the Ezousas, Xeropotamos, Dhiarizos and Khapotami up to 1976/77.

Rainfall data in the Paphos District as well as constants (Thiessen etc) required to transform rainfall data into depth–area–rainfall for 1916 to 1977 were compiled and prepared to serve as input to the Mero Model.

Time was also spent in perfecting a new technique to determine the quantities of water that could be diverted, on a monthly and annual basis.

Following the resignation of Chr Phanartzis, Hydrologist, the rainfall–runoff model and other peripheral models were adapted to the IBM 370 computer; using the Plotter of this computer the calibration of the Mero mathematical model for the two points required on the Xeropotamos river and one of the two required for the Dhiarizos river were completed, and input data for the second point on the Dhiarizos and data for the two points on the Ezousas were also prepared.

Consultants: M Beran of the Institute of Hydrology worked with the team for about two weeks (14–26 August) on a number of aspects of the programme.

HYDROGEOLOGY

In the field of Hydrogeology work was carried out separately for Kiti/Perivolia and Kokkinokhoria aquifers.

Base maps were prepared for both areas and all wells and boreholes were plotted. Geologic cross–sections were drawn and contour maps showing the impervious base of the aquifers were prepared.

Monthly water–table observations were recorded for the months of June to December 1978 for both areas.

Continuous water–level recorders were installed; one in the Kiti area and three in the Kokkinokhoria area.

A survey of all the wells and boreholes of the Kiti/Perivolia area was carried out by questioning, to determine the crop and extent of land irrigated as well as quantities of water extracted.

A survey of some 3000 wells and boreholes was also carried out in the Kokkinokhoria area, by questioning, for the estimation of monthly abstraction.

Tenders were invited and confirmed for the drilling of 1–2 test wells and upto 5 observation wells for test pumping in the Kiti/Perivolia area and 3 test wells and 7 observation wells in the Kokkinokhoria area; the data collected will be required as an input to the groundwater mathematical model.

Finally a mathematical model of the gravel aquifer in the lower reaches of the Dhiarizos river was prepared and two calibration runs on the IBM 370 computer were carried out.

The model will help in assessing the effects of upstream diversion by the SCP on the recharge of this aquifer.

Consultants: Dr R Kitching, Hydrogeologist/mathematical modeller from the

Institute of Geological Sciences, made the first of his planned advisory visits between the 12th and 21st September and discussed details of the mathematical model.

ENGINEERING

Two separate studies have been in progress in Engineering; both are concerned with determining the best route available for conveying water from the Kouris river to selected areas in Limassol, Larnaca and Kokkinokhoria; the one is using a pipeline conveyor and the other using a canal based conveyor.

Several routes were drawn for the canal based conveyor and detailed field investigations were carried out for the selection of the route that seemed to be the most suitable.

Reconnaissance investigations were made over the entire length of the selected route which is approximately 135 km and alternative alignments and geological factors as related to excavation and canal construction were thoroughly examined.

A computer programme is also being prepared for calculating excavation and fill quantities; finally a preliminary costing of the canal and terminal dams at Alaminos at Akhna or Ormidhia (whichever site is eventually chosen) have also being prepared. For the pipeline conveyor a preliminary alignment was drawn for a pipeline linking the Kouris river with a reservoir site at Alaminos, which will be approximately 65 km long and from there to the terminal reservoir in Akhna or Ormidhia; this latter section will be approximately 45 km long.

Reconnaissance investigations were carried out for 36 alternative sections linking Kouris to Alaminos and for 35 sections linking Alaminos to either Akhna or Ormidhia. Geological investigations were also conducted to determine the type of excavation for the pipeline.

A computer model has been constructed to determine minimum pipe diameter and other hydraulic parameters, temperature, and circumferential stresses and forces at the bends; volume of each type of excavation is also estimated as well as the type of pipe; finally the model will calculate the slope of each section, number of washouts and air valves.

Various routes were also examined for the conveyor linking Ezousas, Xeropotamos, Dhiarizos with Kouris river; it seems likely at this stage that a tunnel based conveyor will be more suitable but this is not yet finalized.

Finally, possible storage sites at Alaminos, Akhna and Ormidhia were identified, and tentative estimates were prepared of quantities for the construction of a dam at Alaminos.

Consultants

Howard Humphreys were appointed as consulting engineers, and were asked to prepare cost estimates for the Kouris dam. E Jackson an engineer of the Firm visited the project from the 19th of July to the 4th of August and investigated the availability of material for such a construction and made preliminary investigations to determine the possible effect of the rate of sedimentation of a reservoir in the Kouris valley by the Amiandos mine spoil tips. Dr J Newbery, a geologist of the same Firm also visited the project from 1st to 5th August. J Reid visited the project to submit a report on the work carried out by his Firm; it was decided, however, that the report would be treated as a draft and the final one would be submitted in January 1979.

IRRIGATION ENGINEERING

In the field of irrigation engineering, crop water requirements on a monthly basis have been estimated and monthly and annual estimates of present water use have been prepared for selected areas

Cost estimates of the distribution network for the Polemi/Stroumbi potential irrigation area have also been prepared, as well as, detailed cost estimates of a range of on-farm irrigation systems according to farm size crop; these have been published in the form of a report WDD No I/28.

AGRICULTURE

One of the first tasks carried out by the Agricultural Section was the identification of

areas with potential for irrigation development. These areas can be classified into two categories; those west of Kouris valley on one hand and those east of Kouris on the other. The former will be receiving water at the expense of the Southern Conveyor, and such areas (covering 1,600 ha) are, among others, Polemi/Stroumbi, Pitargou and Kouklia within the Kouris valley (Limassol district) areas like Lania, Pano Kividhes, Kato Limnatis and others totalling about 800 ha have been identified. Another district area is the Khapotami area totalling about 1,500 ha and includes Pissouri/Alekhtora, Evdhimou, Paramali and others.

Areas east of Kouris

Limassol District

Areas identified within the district cover an area of about 3,500 ha and include an area west of Limassol up to the village of Episkopi, as well as Parekklisha, Moni, Pyrgos, Pendakomo and others.

Larnaca District

In this area several irrigation blocks have been identified with a total hectarage of over 8,000; those include the areas of Kophinou, Alaminos/Mazotos, Anglisides, Kiti/Perivolia, Dhoromolaxia and others.

Kokkonokhoria

Within the area of Kokkinokhoria which includes villages both in Larnaca and Famagusta districts; areas identified include Ormidhia, Xylophagou, Avgorou, Liopetri, Sotira, Paralimni (coastal), Ayia Napa and others; total area identified is over 10,000 ha. Soil surveys were carried out where considered necessary like the Paphos area and west of Limassol including Kouris valley; preparatory work for the soil survey in the Kokkinokhoria area was completed and the programme set up.

Land use survey was conducted over the whole project area apart from Kokkinokhoria.

Farm input–output surveys of selected progressive farmers were completed for Paphos and initiated in the Limassol and Kokkinokhoria area.

Cropping patterns were devised for selected irrigation development areas in Paphos which were thought to be representative areas; these were Polemi/Stroumbi; Kouklia and Mamonia/Phasoula.

An investigation into the existing structure of the agricultural industry including processing was carried out, through a series of visits and interviews with officials of the Co-operative crop marketing boards, big farms and plantations etc with the aim of determining what the constraints on and prospects for the expansion of the agricultural industry are.

AGRICULTURAL ECONOMICS

One of the first tasks carried out by the Economics section was to decide on and map-together with the Agricultural section—the areas with potantial for irrigation development.

Following this, indicative crop budgets were prepared with the aim of obtaining a preliminary impression of crop profitability and of the expected benefits from the introduction of irrigation.

The methodology for a farm survey in the form of the questionnaire was prepared; the aim of the farm survey is to provide information on farm/household incomes, farm resources and constraints, individual input/output coefficients for the various potential irrigation areas of the project. The interviewing of 400 farmers was carried out by the Agricultural Research Institute. In the meantime computer output tables were prepared by the Agricultural Economics Section for the analysis and presentation of the results.

Finally a start was made on assessing—with the cooperation of the Land Consolidation Authority—the extent of land consolidation that would be economically justifiable.

Consultants: A Jordan, a statistician of the LRDC worked with the economics team from 6 to 21 September and offered his advice on the methodology to be used for the farm survey as well as for the appropriate computer programme to be used.

Also J Winter of the Tropical Research Institute (TRI) spent a few days discussing details with regard to the contribution of the TRI to the marketing programme of the project.

INVESTIGATION AND LABORATORY BRANCH

General

In 1978 the work of the Site Investigation, Laboratories and Grouting Sections of the Division of Planning, related to a number of major and more minor projects undertaken by the Department. Furthermore, at the request of other Government Departments and private organizations, a number of projects were undertaken and completed during the year.

The increased volume of work noted in the two previous years, persisted in 1978 and this led to the full utilization of available machinery and personnel throughout the year.

Site investigation work performed was mainly involved with subsurface geological, foundation and construction material investigations at the feasibility and design study stages.

Departmental projects for which site investigation work was carried out were as follows:

- ★ Paphos Irrigation Project: Asprokremmos Dam, storage reservoirs, elevated towers.
- ★ Pitsillia Rural Development Project: Ayii Vavatsinias pond, Akapnou pond No.2, Xyliatos Dam.
- ★ Southern Conveyor Project: Klavdhia Terminal Storage Reservoir
- ★ Solea Valley Irrigation Scheme: Phlasou Ponds 1 and 2, Evrykhou Pond, Tembria Pond and Tembria Dam.
- ★ Lania Regional Irrigation Scheme: Dhoros–Monagri Pond.
- ★ Larnaca Orini Scheme: Ayii Vavatsinia Dam.
- ★ Vasilikos–Pendaskinos Project: Nicosia Water Supply.

Site investigation or drilling work undertaken for others was of a very diverse nature and included:

- ★ Foundation investigations for Refugee housing estates, at the request of the Department of Town Planning and Housing were carried out at Linopetra, Tsiakkileri, Phrenaros, Nicosia, Limassol, Larnaca and Kophinou.
- ★ Bridge Foundation investigations at Yermasoyia bridge for the new Nicosia–Limassol road, at the request of the Public Works Department.
- ★ Drilling for blasting purposes at Petra tou Romiou on the Limassol–Paphos road for the Public Works Department.
- ★ Foundation investigations for Larnaca and Limassol Ports on the request of the Public Works Department.
- ★ Site investigations for the Earth Station at Kakoradjia, at the request of the Cyprus Telecommunications Authority.
- ★ Site investigations for the CYTA new Nicosia Headquarters.
- ★ Drilling for earthing purposes at the request of the Cyprus Broadcasting Corporation.
- ★ Site investigation for the new extention of the Larnaca Marina, at the request of the Cyprus Tourism Organization.

Following the example of previous years and for site investigations, a very close collaboration was maintained with the Engineering Geology Section and in certain cases with the Geophysical Section of the Geological Survey Department.

The work of the Laboratories Section may be distinguished into that of the main and field laboratories. In the main (soils/concrete) laboratories in Nicosia, tests were performed in connection to foundation and construction materials investigations relating to Departmental projects. Tests were also performed at the request of other Government Departments, private organizations and the Nicosia Municipality.

Site/Material Investigations, Grouting Works

Table III–1 gives relevant details of all site construction material and grouting works performed during the year giving also duration of work for each project.

TABLE III-1 **1978 SITE/MATERIAL INVESTIGATIONS AND GROUTING**

Ser No	Project	Aim of Investigation	Fieldwork as carried out	Machinery Used	Expenditure £
A.	DEPARTMENTAL PROJECTS				
1	Southern Converyor Project Akhna Reservoir (Continued from 1977)	Subsurface geological investigations to establish permeability/ foundation conditions	4 boreholes with undisturbed/disturbed sampling and pressure testing, total depth 110 m	1 Core Drill 1 Auger Drill 1 Flush Pump	1 750
2	Southern Conveyor Project (Klavdhia Reservoir) (Continued from 1977 to 17.2.1978)	Subsurface geological investigations to establish permeability/ foundation conditions	6 boreholes, total depth 190 m with associated pressure testing and SPT/U4 sampling 8 trial Pits, total depth 30 m	2 Core Drill 2 Flush Pumps 1 Light Percussion Drill 1 Backactor Excavator	2 450
3	Paphos Main Canal Investigations (Ay. Varvara) from 9.3.1978 to 5.5.1978	Subsurface geological investigations to establish the permeability of the foundations for the drain system	4 boreholes, total depth 13 m	1 Auger Drill 1 Core Drill 1 Flush Pump	500
4	Asprokremmos Dam Investigations (shaft) from 22.3.1978 to 11.4.1978	Subsurface investigations for the 60 m Shaft	1 borehole, total depth 30 m 1 trial pit	1 Core Drill 1 Flush Pump	500
5	Xyliatos Dam Clay Core Material (Investigations (Work carried out periodically from April 1978 to June 1978)	Material Investigations	8 trial Pits with sampling	1 Backactor	200

TABLE III–1 **1978 SITE/MATERIAL INVESTIGATIONS AND GROUTING (Continued)**

Ser No	Project	Aim of Investigation	Fieldwork as carried out	Machinery Used	Expenditure £
6	Ayii Vavatsinias Pond Preliminary Investigations	Subsurface geological investigations to establish excavation conditions	6 trial Pits	Hand Excavator	200
7	Solea Valley Project Evrykhou Pond from 4.5.1978 to 31.12.1978	Subsurface geological investigations to establish excavation conditions, depth of fresh rock and availability of till material	20 trial pits, total depth 56 m 3 boreholes total depth 36 m	1 Auger Drill 1 Core Drill 1 Flush Pump 1 Backactor	3 000
8	Solea Valley Project Phlasou Pond from 4.5.1978 to 31.12.1978	Subsurface geological investigations to establish excavation conditions, depth of fresh rock and availability of fill material	10 trial pits total depth 25 m 5 boreholes total depth 89 m	1 Auger Drill 1 Core Drill 1 Flush pump 1 Backactor	3 000
9	Paphos Main Canal Investigations (Asprokremmos Dam)	Subsurface geological investigations to establish depth of bedrock	9 boreholes	1 Auger Drill 1 Core Drill 1 Flush Pump	2 500
10	Nicosia Water Supply Investigations from 27.6.1978 to 15.8.1978	Subsurface geological investigations to assess the excavation and foundation conditions for the various structures	8 boreholes and about 30 trial pits	1 Core Drill 1 Auger Drill 1 Flush Pump 1 Backactor–Excavator	2 500
11	Lania Regional Irrigation Scheme from 6.12.1978 to 31.12.1978	Subsurface geological investigations to access the excavation conditions	1 core drill borehole	1 Core Drill 1 Flush Pump	650

TABLE III-1 **1978 SITE/MATERIAL INVESTIGATIONS AND GROUTING (Continued)**

Ser No	Project	Aim of Investigation	Fieldwork as carried out	Machinery Used	Expenditure £
12	Akapnou Pond No. 2	Subsurface geological investigations to access the excavation conditions	A number of trial pits	1 Backactor–Excavator	150
13	Orini Larnacos Ayii Vavatsinias Investigations from 12.12.1978 continue during 1979	Subsurface geological investigations	Access road construction	1 Backactor 1 Bulldozer	800
B.	OTHER GOVERNMENT PROJECTS				
1	Linopetra Housing Scheme for PWD & Plan. & Housing from 25.1.78 to 11.2.1978 (completed)	Subsurface geological investigations to access the bearing capacity and excavation conditions	4 boreholes with associated SPT testing and disturbed/ undisturbed sampling	Auger Drill	500
2	Tsiakkileri Housing Estate	Subsurface geological investigations with water testing to access the permeability for sewerage problems	4 boreholes with associated water tests	1 Overburden Drill 1 Compressor 1 Flush Pump	500
3	Phrenaros Housing Estate	Subsurface geological investigations to clarify the permeability conditions for the sewerage scheme	2 boreholes coredrilled and pressure tested to a total depth of 52 m	1 Core Drill 1 Flush Pump	500
4	Yermasoyia Bridge PWD from 25.4.78 to 16.5.78	Subsurface geological investigation to access the bearing capacity bridge construction	2 boreholes with associated SPT testing and disturbed/ undisturbed sampling	1 Overburden Drill 1 Compressor 1 Flush Pump	600

TABLE III–1 **1978 SITE/MATERIAL INVESTIGATIONS AND GROUTING (Continued)**

Ser No	Project	Aim of Investigation	Fieldwork as carried out	Machinery Used	Expenditure £
5	Petra tou Romiou PWD from 1.5.78 to 21.9.78	Drilling for blasting for Road remedial work	—	1 Wagon Drill 1 Compressor 1 Pneumatic Rock Drill	5 640
6	Larnaca Port Investigations PWD from 22.5.78 to 6.6.1978	Subsurface geclogical investigations to access the foundation conditions	1 borehole, total depth 17.95 m with disturbed/ undisturbed sampling and SPT	1 Light Percussion Drill	500
7	Yermasoyia New Bridge PWD	Subsurface geological investigations to access the foundation conditions for the Bridge	2 boreholes with disturbed/ undisturbed sampling and SPT	1 Overburden Drill 1 Flush Pump	1 200
8	Limassol New Port Site Investigation	Installation of a piezometer	1 borehole for the installation of a piezometer	1 Percussion Drill 1 Flush Pump	100
9	Government Housing Estates Nicosia–Limassol–Larnaca	Subsurface foundation investigations	—	1 Auger Drill 1 Light Percussion	650
C.	PRIVATE AND BOARD PROJECTS				
1	G Paraskevaides Site Investigations Nicosia Area	Subsurface foundation investigations	8 boreholes with U4 sampling and SPT	1 Auger Drill 1 Core Drill 1 Flush Pump	250
2	SYTA Satellite St Near Kakoradja c/o I & A Philippou from 23.1.78 to 15.4.78	Subsurface geological foundation investigations	19 boreholes with U4 sampling and SPT	1 Core Drill 1 Overburden Drill	3 100

TABLE III-1 **1978 SITE/MATERIAL INVESTIGATIONS AND GROUTING (Continued)**

Ser No	Project	Aim of Investigation	Fieldwork as carried out	Machinery Used	Expenditure £
3	CYTA Headquarters Nicosia	Subsurface foundation investigation to establish bearing capacity with disturbed/undisturbed sampling and SPT	8 boreholes with U4 sampling and SPT	1 Auger Drill	3 240
4	FYSKO Constructing LTD, Nicosia	Subsurface foundation investigation to establish bearing capacity, presense of any cavities	7 boreholes with disturbed and U4 sampling and SPT	1 Auger Drill	400
5	Chr. Yenethlis Nicosia	Subsurface investigation to check for any cavities	4 boreholes	1 Rotary Percussion	50
6	CYPRUS Broadcasting Corporation Earthing	For Earthing purposes	1 borehole, total depth 30 m for earthing purposes	1 Overburden 1 Compressor	550
7	Dhrousha Relay Station CBC 17.8.78 to 30 8.78	Drilling for earthing purposes	2 boreholes for earthing purposes	1 Overburden Drill 1 Flush Pump	580
8	Kelokedhara CBC	Drilling for earthing purposes	2 boreholes for earthing purposes	1 Overburden 1 Compressor	700
9	Cyprus Tourism Organization "Extension of Larnaca Marine"	Subsurface geological investigation to access the bearing capacity, with disturbed/undisturbed sampling	2 boreholes with U4 sampling and SPT	1 Light Percussion	500

TABLE III–2
SOILS LABORATORY TESTS DURING 1978

Project	Paphos Irr Project		Solea Project				Pitsilia Rural Dev Project						
Type of Test	Asprokremmos Dam	Main Canal and Pumping Station	Phlasou Pond No. 1	Phlasou Pond No. 2	Evrykhou Pond	Tembria Pond	Xyliatos Dam	Akapnou Pond No. 2	Pakhyammos Reservoir	Nicosia Water Supply	Private Firms	Miscellaneous	Total of each test
Sieve analysis (Wet/Dry	33	12	6	12	14	8	9	3	2	6	54	12	171
Hydrometer analysis ...	3	4	6	12	14	8	12	3	14	10	48	18	152
Atterberg limits	10	47	6	12	—	8	16	3	14	4	48	—	168
Specific gravity	3	4	6	12	14	8	12	3	12	10	48	18	150
Natural density	22	79	—	—	—	—	12	—	469	3	48	—	633
Moisture content	25	89	6	12	14	8	25	3	565	3	46	—	796
Compaction	15	37	6	12	5	8	12	3	35	—	—	—	133
Permeability	1	—	6	12	5	8	12	3	1	—	8	—	56
Undrained triaxial.....	—	—	—	—	—	1	—	—	—	2	16	—	19
Drained triaxial	—	—	—	—	—	—	2	—	—	—	—	—	2
Large shear box	—	—	—	—	—	—	3	—	—	—	—	1	4
Consolidation	1	—	—	—	—	1	—	—	—	2	7	—	11
Suspended sediment	—	—	—	—	—	—	—	—	—	—	—	113	113
Total	113	272	42	84	66	58	115	21	1 112	40	323	162	2 408

TABLE III–3
CONCRETE AND FIELD LABORATORIES TESTS DURING 1978

Tests	Paphos Project		Tenders for concrete aggregate	For private sector	Miscellaneous	Kokkini Trimithia channels control	Total
	Main Canal	Aspro-Kremmos					
Mix design	—	—	—	—	2	2	4
Density of aggregates	10	—	—	5	2	6	23
Sieve analysis	322	38	87	—	15	20	482
Silt content	77	26	38	—	12	70	223
Organic impurities	77	26	38	—	12	70	223
Specific gravity	—	2	—	—	2	10	14
Water absorption	—	4	—	—	10	10	24
Moisture content	45	40	—	—	25	10	190
Aggregate crushing value	—	—	—	—	2	5	7
Bulking of sand	—	—	—	—	2	—	2
Cube crushing	853	313	—	13	30	160	1 369
Slump	321	151	—	—	2	40	514
Core crushing strength	—	—	5	19	14	—	48
Test of channels	—	—	—	—	—	210	210
Totals	1 705	600	178	37	130	613	3 263

Laboratories

The work performed in the Soils Laboratory is analysed in Table III–2 with relevant details as to the type and number of tests performed for each project.

The work of the concrete and field laboratories is presented in the same way on table III–3.

Personnel

On the 31st of December 1978 the total number of personnel employed with the section was 33. The number of, title or speciality and function of personnel employed are shown on the following table:

Title	Function			
	Sup	Lab	Dril	
Executive Engineer I ...	1	–	–	–
Executive Engineer II ...	1	–	–	–
Inspector of Works	2	–	–	–
Technical Assistant	–	7	–	–
Laboratory Technician	–	5	–	–
Foreman	–	–	2	–
Driller	–	–	4	–
Casual labour.....	–	–	11	–

Machinery and Equipment

During 1978 the Soils Laboratory was enriched with the following equipment:

One proving machine, 2 dial gauges and one sieve shaker. For all other soils, concrete drilling and grouting equipment see tables of 1977 WDD annual report.

The Trakhoni extension is the final phase of the Yermasoyia-Polemidhia Project near Limassol The Trakhoni extension includes the construction of a pumpouse, a concrete lined reservoir (shown in the photograph) and a distribution network for the irrigation of 4390 donums of land. The total area to be irrigated by the project is 16,000 donums (2145 Ha) in the areas of Akrounda, Phinikaria, Yermasoyia, Polemidhia, Phasouri, Zakaki, Ayios Nikolaos and Trakhoni. The total cost of the project upto its completion in 1979 will be approx £4.5 million including the construction of Yermasoyia and Polemidhia Dams.

IV DIVISION OF DESIGN

by
Chr. Marcoullis
Senior Water Engineer
Head of Division

Introduction

The Design Division of the Water Development Department deals mainly with the preparation of detailed designs of all major projects undertaken by the Department. These projects involve the design of dams and other hydraulic structures, irrigation networks or domestic water supply schemes. In case such works are to be constructed by contract the designs are supplemented with specifications, conditions of contract and other documents.

Further to the Branches particular to the above mentioned types of design, this Division incorporates the Topography and the Drawing and Records Branches of the Department. The first undertakes all topographical works, survey , etc of the whole Department, whereas the second carries out all drawing work of all the major and minor projects, keeps the technical records and looks after the library of the Department and carries out the photo–process lab, photographic and reproduction work.

By the end of 1978 the following qualified personnel were working with the Design Division:

One Senior Water Engineer, Head of the Division
Three Executive Engineers Class I
Five Executive Engineers Class II
Three Topographer Engineers

The main activities of the Division during 1978 were mostly focussed on the implementation of the Pitsilia Integrated Rural Development Project and the designs of the various Irrigation Works envisaged by the project. Some other works of the Division were connected with the Vasilikos–Pendaskinos Project and particularly with what concerns the Nicosia Water Supply scheme.

The actual design work carried out during the year under concern, by each Branch of the Division is described below:

DAMS BRANCH

The detailed design of Xyliatos Dam has been carried on throughout the year. Xyliatos Dam is the only dam envisaged within Pitsilia Project, which also provides for the construction of about 20 ponds and for an equal number of borehole schemes. In addition to the dam, the detailed designs of Ephtagonia pond No. 1, Pelendria and Khandria ponds were fully completed whereas final design work was carried out for the two Akapnou ponds and Ayii Vavatsinias small storage-diversion dam and pond. Preliminary design work was carried out on a number of other ponds, including Kannavia, Kato Mylos, Melini and Ephtagonia No. 2 ponds.

Xyliatos Dam

This is a rockfill dam with a storage capacity

of about 1.3 MCM water for the irrigation of a gross area of about 2,200 donums in the Xyliatos village vicinity.

The damsite is located on the Lagoudhera tributary of Elea river.

A rockfill type of dam with a central clay core was finally adopted after ruling out the concrete gravity type which was found unsuitable on geologic and economic grounds. The dam crest elevation will be 541,75 m, its normal water level 537.5 m and the crest length about 157 m. The height of the dam will be 41 m with upstream and downstream slopes of 1:1.6

The spillway, which is located on the left abutment, will be of the free overflow type with a concrete lined chute that will end in a deflector bucket and a low flow chute. Its width at the weir crest will be 15 m reduced to 10 m at the end of the low flow chute.

A straight 135 m long concrete lined tunnel of the horsehoe type is to be provided in the left abutment to be used for flood diversion during construction and later as a scour outlet. A 0.50 m dia irrigation pipe, 0.45 m dia. at the outlet, supported on cantilever supports above the tunnel floor will be controlled by a manually operated gate valve housed in a small control chamber located at the downstream end of the tunnel.

Due to the simultaneous work on field investigations both for the foundations of the embankment and other structures of the dam and for the materials to be used for the construction, the actual design work had to be intensified during the second half of the year.

By November 1978 J M Reid of Howard Humphreys and Sons was appointed as a consultant to help the team of engineers assigned to the design of the dam in the preparation of the final drawings.

By the end of the year, most of the calculations were completed, whereas more than 50% of the drawings were drafted some of which were fully completed.

The work on the drawings will continue next year along with the preparation of the contract documents with the view of asking tenders for the construction during the first half of 1979.

Ephtagonia Pond No. 1

A detailed description of this pond was also given in 1977 annual report.

The detailed design and drawings of Ephtagonia Pond had been completed in 1977. A full set of contract documents, specifications etc were prepared during the first months of 1978 and tenders were invited. The tender was awarded to Iacovou Bros Construction Company for an amount of about £55,000. Construction is expected to start early in 1979.

Pelendria Pond

A detailed description of this pond has been given in 1977 annual report.

The preparation of the final contract documents, drawings, specification etc was completed in the spring and tenders for the construction were invited. Four contractors submitted tenders and the contract was awarded to Fysco Contracting Ltd at approx. £77,000.

By the end of 1978 the Department and the Contractor were ready to sign the contract and the construction of the pond was expected to commence early in 1979.

Khandria Pond

Khandria Pond is the third pond to be constructed as part of the Pitsilia Project. It is located about half a kilometer west of Khandria village and just south of the main Kyperounda–Khandra road.

The storage capacity of the pond will be about 70,000 m³. The pond will be impounded with water diverted through a 750 m long, 200 mm dia steel pipeline, from Zavos stream which flows through the western side of the village and will irrigate a net area of 100 donums of cherries, almonds, potatoes, legumes and some other vegetables.

Geologically, the site is situated in a valley of weathered gabbro, which will be easy to excavate. The total volume of excavation and fills will be about 87,500 m³ and the total

area of the PVC membrane to be used for watertightness will be about 17,500 m².

The detailed design of the pond was completed in the autumn and after the preparation of the contract documents, tenders were invited, the submission of which was expected early in January 1979.

Akapnou Ponds

The Akapnou scheme consists of the construction of two ponds and a diversion weir. All the quantity of water required to fill the ponds will be supplied during the winter from a tributary of Vasilikos river. An intake weir will be constructed on the stream from where the water will be diverted by gravity through a 200 mm dia pipeline. The pipeline will consist of 780 m of steel pipe, surface–laid and 1430 m of AC pipes, burried.

The preparation of all drawings and contract documents was almost completed by the end of the year which will allow the invitation of tenders early in 1979.

The first pond site is located about 1,200 metres northwest of Akapnou village. The site is situated on a fairly gentle terrain which is interrupted at its central part by a ridge. Geologically the pond site is situated in pillow lavas. The total volume of earthworks will be about 5,000 m³. The total area of lining membrane will be about 24,000 m².

The storage capacity of the pond will be 132,000 m³ and its height 9.0 m.

The second pond site is located 1000 m north of Akapnou village and 100 m west of the earth road between Akapnou and Ora villages. The site is situated on a fairly gentle terrain. The pond is to be founded at the greatest part on the bedrock which is lava. The weathered lava is found at the first 1–2 m depth. This limits the height of the pond to 8.5 m. The total volume of earthworks involved will be 35,400 m³ and consists of soft (ripping and blasting) excavations. The tectonic structure strongly indicates that the permeability is high and the pond site must be lined in order to avoid leakage. The total area of PVC sheeting to be used will be 16,900 m².

The storage capacity of the pond will be 69,000 m³ and it will irrigate a net area of 95 donums.

The use of both ponds will enable the irrigation of a net area of about 300 donums.

Ayii Vavatsinias Scheme

This scheme involves the construction of a small diversion storage dam and a pond. The pond will draw water from the dam by gravity through a 100 mm dia surface–laid galvanised iron pipe.

The pond site is located above the main Ora–Melini road. It is situated in a valley of a stream which discharges in a tributary of the Vasilikos river. The valley is relatively narrow and surrounded by hills with a natural gradient of about 25%. The geology of the site consists of diabase, gabbro and granophyric dykes. Due to the high degree of weathering the excavations in general are expected to be soft and rippable. Limited blasting may also be necessary. The total volume of earthworks involved will be about 34,500 m³. Due to the anticipated high permeability of the pond site a membrane lining is considered essential for watertightness, the total area of which will be about 12,000 m².

The pond will have a capacity of 55,000 m³ and its operation will be combined with the dam.

Due to the topographical and geological advantages of the selected diversion site of the pond, it was decided to construct instead of the usual diversion weir, a little diversion–storage dam which would add to the storage capacity of the scheme another 58,000 m³ of water.

The damsite is located on a tributary of Vasilikos river about 1 km southwest of Ayii Vavatsinias village. Both damsite and reservoir areas are underlain by igneous rocks mostly diabase. The river bed at the damsite is quite narrow, about 10 m wide and both left and right abutments are very steep. The height of the dam which will be designed as a concrete arch dam, will be 18 m from the foundation level and the depth of foundation will vary from 3 m to 5 m. The amount of concrete involved in the construction of the dam will be 1500 m³

and the foundation excavation 750 m^3 of hard excavation.

The utilization of both storage facilities will allow the irrigation of a net area of about 155 donums, most of which is now a part of an existing irrigation division.

Most of the design drawings and contract documents were almost completed by the end of the year requiring only the final checking. It should be mentioned here that the dam will be constructed by force account whereas the pond will be given to contractors.

IRRIGATION BRANCH

Most of the works dealt with by this Branch were also associated with Pitsilia Project. However, the finalization of irrigation network drawings for most of the schemes examined was very limited, either because for most of these schemes the prior completion of land consolidation, which is a time consuming operation, was necessary, or because of administration problems.

Therefore most of the work was concentrated on the collection of the necessary land suitability and topographical maps, on site visits for the selection of the area to be irrigated, draft layouts of distribution systems and for some of the schemes the preparation of the final drawings and bill of quantities.

Such works were carried out for pond schemes such as Ephtagonia, Pelendria, Khandria, Ayii Vavatsinias, Akapnou, Melini, Kannavia and Kato Mylos and for borehole schemes such as Pelendria, Kalokhorio and Potamitissa.

Xyliatos Dam

Most of the work done in connection with Xyliatos Dam was directed towards the final setting of the boundaries of the area to be irrigated which will eventually reach 2300 donums gross. The Branch has worked in close cooperation with the Department of Agriculture, the office of the District Officer and the Land Consolidation Authority, throughout the year, during which L C A managed to initiate actual land consolidation activities.

Land Consolidation

In its capacity as a member of Land Consolidation Committees, the Department was represented by this Branch in activities associated with land consolidation in the following schemes, further to the mentioned above Xyliatos Dam: Kalodhorio, Pelendria, Louvaras, Potamitissa.

Pumping Tests

As already mentioned Pitsilia Project provides for the utilization of a number of boreholes which have been drilled by the Geological Surveys Department in the area. Due to the nature of the boreholes and the complex conditions of occurrence of groundwater in the igneous rocks of Troodos in order to check the dependability of such groundwater, this Branch has undertaken the organization and execution of prolonged pumping tests with the view to simulating actual operation conditions. The purpose of the tests was to prove as far as possible that the available groundwater was enough quantitavely to sustain the envisaged scheme and that the borehole yield was compatible to that assumed for the design of the scheme which was obtained from short period tests.

The results obtained from the pumping tests were very satisfactory in the case of Pelendria, Ayios Theodhoros and the two boreholes of Kalokhorio, less satisfactory for Potamitissa, not satisfactory for Louvaras whereas for Arakapas borehole and Agros the test was suspended due to technical reasons and will have to be repeated next summer.

MAJOR PROJECTS

In addition to Pitsilia Project, this Division continued being involved in the administration of the Vasilikos–Pendaskinos Project. As mentioned in 1977 annual report, the high capital costs involved in the implementation of this project and especially its foreign exchange component call for international financing of the project. In this respect a Mission of the World Bank visited Cyprus in June 1978 for the appraisal of the Project. This lead to the negotiation, by the end of the year, of a loan of 11 million dollars by the World Bank to the Government of Cyprus for this project. The formal loan agreement is expected to be concluded early in 1979.

DOMESTIC WATER SUPPLIES

In its efforts to ameliorate as far as possible the acute problem of Nicosia water supply shortage, the Government has, through the Water Development Department, initiated during 1978 the design of two schemes to provide additional water supplies to Nicosia. The first one is connected with Vasilikos–Pendaskinos Project and the second with the delivery of water from boreholes drilled in the Peristerona–Akaki area.

Vasilikos–Pendaskinos Project–Nicosia Water Supply Phase I

This scheme is in fact a first phase of the component of the Vasilikos–Pendaskinos Project, which provides for the ultimate delivery of 5 MCM water to Nicosia after the whole of the project is completed.

The scheme (which involves the temporary connection of the Nicosia Water Supply to that of the Larnaca–Famagusta Water Supply system, so as to enable the first to draw any treated water surplusses from the second which depending on the hydrological conditions, may reach one to two million cubic metres annually) consists of:

- ★ A pipeline, 38 km long, 500 and 600 mm in diameter starting from Skarinou Station and ending at the Lakatamia balancing reservoir.
- ★ A pumping station located just downstream of the planned Dhypotamos Dam on Pendaskinos river, which will boost the water to the highest point of the route of the pipeline near Stavrovouni.
- ★ A balancing reservoir and a break pressure tank located at Stavrovouni and Nisou areas respectively.

The preparation o the final design, drawings and contract documents of the scheme, was undertaken in June 1978 by the British Consulting firm Lemon and Blizard. By that time this Division had selected the route of the pipeline and had carried out the necessary basic topographical work.

The design work was almost completed by the end of the year and tenders for the construction of the scheme will be invited early next year.

Nicosia Water Supply, Peristerona-Akaki Emergency Scheme

With a view to securing additional water supplies for Nicosia, the Geological Survey Department initiated by the last quarter of 1978 a drilling programme in the area between Peristerona, Orounda and Akaki villages. The drilling work was carried out both by the Department's equipment and by a private drilling contractor.

After the first encouraging results of the drilling operations, this Division was asked to examine the conveyance of the located groundwater to Nicosia.

During the last two months of the year the following three alternative routes of pipeline were studied. The first along the Morphou–Nicosia road, the second along the Akaki–Paleometokho earth road and the third higher up via Meniko village. The second alternative was finally selected and a very intensive programme was drawn to enable the fastest completion of topographical and other design work, so that the construction of the scheme be completed before summer 1979.

TOPOGRAPHY BRANCH

Topographic information is of great importance to the engineering staff for all the stages of a project under consideration. The feeding of such information starts from the reconnaissance stage and ends when the construction of the project is completed. Sometimes it goes even further after the construction is completed with instrumental observations for movement detection or deformation of structures or the neighbouring slopes. This is the task this Branch is assigned to perform and it mainly consists of:–

Profile Levelling
Cross Sectioning
Setting out project outlines or other features
Contour surveys
Instrumental observation for movement detection
Staking–out for acquisition purposes etc.

Suitable modern surveying instruments and equipment are available in the Department and adjustments and minor repairs are being done by this Branch.

The staff of this Branch is interdepartmentally trained and during the year 1978 numbered twenty one persons as follows:

1 Senior Inspector
8 Technical Assistants (monthly paid)
6 Technical Assistants (hourly paid)
6 Rod-men

For auxiliary works, not necessitating trained staff, casual labourers are employed from the local areas of operations.

Pitsilia Rural Development Project and the Nicosia Water Supply Schemes (Dhypotamos and Peristerona) were the most time consuming and priority projects this Branch has dealt with in 1978. A detail list of the survey work carried out is given below:

SURVEY WORK CARRIED OUT DURING 1978

PROJECT	TYPE OF SURVEY
1 Xyliatos Dam	Contour Surveys
2 Ephtagonia Pond	
3 Pelendria Pond.....	
4 Khandria Pond	
5 Akapnou Pond I	
6 Akapnou Pond II	
7 Ayii Vavatsinias Dam	
8 Ayia Irini Pond	
9 Odhou Dams (2)	
10 Sarandi Pond	
11 Pharmakas Pond	
12 Platanistasa Pond	
13 Diversion Sites and Conveyor pipelines for above projects	
14 Ayios Theodhoros L/ssol pipeline	
15 Nicosia Water Supply	
(i) Dhipotamos–N/sia pipeline and site ... surveys	Profile levelling, contour surveys
(ii) Peristerona–N/sia pipeline	
16 Lania Regional Irrigation Scheme	Profile Levelling and Dam Reservoir contour Survey
17 Klirou Dam	Contour Surveys
18 Makheras Dam	
19 Gourri Dam	
20 Ayios Georgios Pond	
21 Paralimni Lake	
22 Solea Valley Ponds (2)	
23 Dhekelia B' Power Station	
24 Amiandos Asbestos Mines	Instrumental observations
25 Settlement Markers of Dams	
(i) Kalopanayiotis	
(ii) Lefkara	
26 Sedimentation Studies of Dams:	Cross sections and contour surveys
(i) Kiti	
(ii) Lymbia	
(iii) Arakapas	
(iv) Kambi.....	
(v) Kalopanayiotis	

DRAWING AND RECORDS BRANCH

The Drawing and Records Branch is made up of the following sections:

- ★ The Drawing and Chartography Section
- ★ The Plan Reproduction and Plan Registry Section
- ★ The Photographic Section and Photo Process Lab.
- ★ The Technical Library and Technical Information Section

The staff of the Drawing Rranch at the end of the year numbered 19 i.e.8 Draughtsmen scale 5, 1 Technical Assistant scale 5, 8 daily paid Technical Assistants including 3 recruited specially for the Southern Conveyor Project and 2 hourly paid Technical Assistants.

In addition during the summer, 4 students of the Higher Technical Institute were employed to carry out drawing work within their training programme for varying periods of 4–8 weeks.

The work of the Drawing and Records Branch can be listed as follows:

WORK CARRIED OUT BY THE DRAWING BRANCH

Ref	Description	Time spent in hours	Man months	% of total
a	Existing Dams (completion plans, sedimentation maps, control monuments etc)	792	5.0	2.5
b	Irrigation distribution systems for Dams	338	2.1	1.1
c	Routine Irrigation Schemes	1 248	7.9	3.9
d	Domestic Water Supplies	2 898	18.3	9.1
e	Recharge Schemes	299	1.9	0.9
f	Antiflood Schemes	—	—	—
g	River Training Works	256	1.6	0.8
h	Hydrological	391	2.5	1.2
i	Programmes and Organisation	437	2.8	1.4
j	Paphos Project	1 914	12.1	6.0
k	Vasilikos–Pendaskinos Project	1 257	8.0	3.9
l	Pitsilia Integrated Rural Development Project	4 204	27.0	13.3
m	Southern Conveyor Project	4 278	27.0	13.3
n	Solea Valley	402	2.5	1.3
o	Akrotiri and Kouris Delta Project	—	—	—
p	Khrysokhou Project	—	—	—
q	Training of staff and HTI students	676	4.3	2.1
r	Completion Plans and Reports	1 818	11.5	5.8
s	Reports	831	5.3	2.6
t	Odd Jobs	176	1.1	0.5
u	Agricultural show	376	2.4	1.2
v	Auxiliary Services			
	(i) Library	714	4.5	2.2
	(ii) Plan Registry	461	2.9	1.4
	(iii) Plan Reproduction	2 136	13.5	6.7
	(iv) Drawing Materials Store	165	1.0	0.5
	(v) Photographic Section and Photo Process Lab	1 898	12.0	5.9
	Total for Auxiliary Services	5 374	34.0	16.7
w	Leave etc:			
	(i) Leave Paid	1 660	10.5	5.3
	(ii) Leave Without Pay	47	0.3	0.1
	(iii) Sick Leave	1 176	7.4	3.7
	(iv) Maternity Leave	627	4.0	2.0
	(v) D C	426	2.7	1.3
	Total for Leave etc	3 936	24.9	12.4
	Grand Total	31 901	201.0	100%

Drawing and Cartography Section

As can be seen from the above table 30% of the time of the staff was taken by auxiliary services and leave. Nearly 40% was taken by the various projects ie Paphos, Vasilikos—Pendaskinos, Pitsilia, Southern Conveyor and Solea valley. The remaining 30% was spent on various other works of the Department the most prominent being Domestic water supplies mainly for refugee housing and self housing estates in various parts of Government controlled areas.

Plan Reproduction and Plan Registry Section

Plan reproduction continued during 1978 with one continuous process and one still machine. Some 2600 orders were issued for 30 000 prints of various types and sizes. At the end of 1978 a new continuous process machine was purchased. The Nissen hut which used to house the soil mechanics lab is being renovated to house the printing section early in 1979. The plan registry work is being shared by the Drawing Office staff but it is hoped that most of the plan bins will be accommodated with the printing section and the work carried out by the printing room staff.

The Photographic Section and Photo Process Lab

During 1978 the photographic section continued the coverage of construction works of the Department in black and white and colour still photography as well as colour cinematography. With the commencement of construction work on Asprokremmos Dam 1978 the items included in the contract for progress photography were deleted and the work was assigned to the photographic section at an estimated cost of £1,800.

The work of the photo Process Laboratory continued smoothly during 1978 for the reproduction, reduction or enlargement of maps. A new piece of equipment was purchased during 1978 for the Photo Process Laboratory namely a lighted wet lining up desk to facilitate register in map production.

Technical Library and Technical Information Section

In 1978 the effort to rebuild the Technical Library of the Department was continued satisfactorily.

An amount of £555 was spent on the purchase of 64 new volumes of books through Governmental votes. In addition a sum of over £185 was spent by FAO/UNDP for the purchase of 44 volumes of books requested by the Library. The purchase of books for our Technical Library by FAO/UNDP on account of the project CYP/75/016 reached up to the end of 1978 the sum of $2,000. The FAO/UNDP offer for the purchase of books is for $3,000 and was made in 1976, and will continue in 1979. The Library continued to issue monthly notes on material received and of articles of special interest in periodicals. Following are lists of books purchased and of WDD reports.

BOOKS PURCHASED DURING 1978

McGRAW—HILL BOOK CO. INC. 1971. Yearbook of science and technology. New York, 1971. Book No. 8238. £11.600

McGRAW—HILL BOOK CO. INC. 1973. Yearbook of science and technology. New York, 1973. Book No. 8239. £11.700

McGRAW—HILL BOOK CO. INC. 1974. Yearbook of science and technology. New York, 1974. Book No. 8240. £11.200

McGRAW—HILL BOOK CO. INC. 1975. Yearbook of science and technology. New York 1975. Book No. 8241. £11.400

McGRAW—HILL BOOK CO. INC. 1976. Yearbook of science and technology. New York 1976. Book No. 8242. £11.700

D M CONSIDENE. Chemical and process technology encyclopedia. U S A, 1974. Book No. 8243. £21.000

Γ. ΧΑΛΚΙΟΠΟΥΛΟΥ. Πεντάγλωσσον λεξιλόγιον τεχνικῶν ὅρων. 'Αθῆναι
BOOK No. 8244. £11.000

ARNOLD MANDESON. Τέλειον ἑλληνοαγγλικὸν λεξικόν. 'Αθῆναι, 1761.
Book No. 8245. £3,000

ARNOLD MANDESON. Τέλειον ἀγγλοελληνικὸν λεζικόν. 'Αθῆναι, 1961.
Book No. 8246. £3.000

COLLINS. Contemporary Greek dictionary. Greek – English, English – Greek. Great Britain, 1977. Book Nos. 8247, 8301, 8302, 8303. £0.950 mils each. Total cost £3.800

ΕΠΙΤΡΟΠΗΣ ΦΙΛΟΛΟΓΩΝ. Σύγχρονον ὀρθογραφικὸν—ἑρμηνευτικὸν λεξικὸν ἑλληνικῆς γλώσσης καθαρευούσης—δημοτικῆς, 'Αθῆναι, 1961. Book No. 8248. £7.000

R MILLET. Design & technology plastics. Great Britain, 1977. Book No. 8249. £2.500

F HICKOK. Handbook of solar and wind energy. USA, 1975. Book No. 8250. £10.000

L S BLAKE. Civil engineer's reference book. London, 1975. Book No. 8251. £24.000

HOWATSON-LUND-TODD. Engineering table and data. Great Britain, 1972. Book No. 8252. £3.500

R W ABBETT. American civil engineering practice. Vol. II. USA, 1956. Book No. 8253. £22.500

R W ABBETT. American civil engineering practice. Vol. III. USA, 1957. Book No. 8254. £25.500

D M HALL. Elements of estimating. Great Britain, 1972. Book No. 8255. £5.650

R K SARKAR. Slab design-Elastic methord. West Germany. Book No. 8256. £4.900

S W WHITE. Structural analysis learnt by example. Simply supported beams: cantilevers. Great Britain, 1972. Book No. 8257. £2.950

P G MOORE. Principles of statistical techniques. Cambridge, 1969. Book No. 8258. £7.000

F P BEER-E R JOHNSTON, SR. Vector mechanics for engineers: Statistics & dynamics. USA, 1972. Book No. 8259. £14.000

P M FERGUSON. Reinforced concrete fundamentals. USA, 1973. Book No. 8260. £16.000

CH BAZLINTON. Metric detailing charts for reinforced concrete (to CP110, CP114, BS44€6). United Kingdom, 1975. Book No. 8261. £1.900

L A DISNEY–CHAS E REYNOLDS. Reinforcement for concrete. London, 1973. Book No. 8262. £3.500

P MORRELL. Design of reinforced concrete elements. Great Britain, 1977. Book No. 8267. £6.000

BRITISH STANDARDS INSTITUTION. CP 114: Part 2: 1969. The structural use of reinforced concrete in buldings. Part 2. Metric units. London, 1969. Book No. 8268. £5.500

AMERICAN CONCRETE INSTITUTE. Behavior of concrete under temperature extremes. USA, 1973. Book No. 8269. £3.500

PRESTRESSED CONCRETE INSTITUTION. Architectural precast concrete. USA, 1973. Book No. 8270. £6.500

P E REGAN–C W YU. Limit state design of structural concrete. London, 1973. Book No. 8263. £8.000

A WASTILL–L H MARTIN. Elementary structural design in concrete to CP 110. London, 1975. Book No. 8264. £3.950

E W BENNETT. Structural concrete elements. London, 1973. Book No. 8265. £6.000

G S PAMASWAMY. Modern prestressed concrete design. Great Britain, 1976. Book No. 8266. £4.750

CH H GRONEMAN—E R GLAZENER. Technical woodworking. USA, 1976. Book No. 8271. £8.500

E L ARIBA. Wood in building. Great Britain, 1971. Book No. 8277. £1.950

F A INOTT. Carpentry and joinery. A multi-questions course. Great Britain, 1974. Book No. 8272. £1.500

K TERZAGHI–R B PECK. Soil mechanics in engineering practice. USA, 1967. Book No. 8273. £6.500

G N SMITH. Elements of soil mechanics for civil and mining engineers. Great Britain, 1974. Book No. 8274. £4.000

P L CAPPER—W F CASSIE. The mechanics of engineering soils. Great Britain, 1976. Book No. 8275. £4.850.

J C JAEGER—N G W COOK. Fundamentals of rock mechanics. Great Britain, 1976. Book No. 8276. £7.500

M B PERRIN. An introduction to the chemistry of rocks and minerals. Great Britain, 1975. Book No. 8278. £1.900

A PARRISH. Mechanical engineer's reference book. London, 1973. Book No. 8279. £22.000

OBERG–JONES–HORTON. Machinery's handbook. 20th edition Revised and enlarged. USA, 1976. Book No. 8280 £13.500

D G FINK—J M CARROLL. Standard handbook for electrical engineers. USA, 1969. Book No. 8281. £24.900

D F NEWTON. Elements of environmental health. USA, 1974. Book No. 8282. £10.000

K IMHOFF—W S MULLER—D K B THISTLETHWAYTE. Disposal of sewage and other water-borne wastes. London, 1972. Book No. 8283. £9.900

G V JAMES. Water treatment. Edinburg. 1971. Book No. 8284. £5.500.

A J RAUDKIUI—R A CALLANDER. Analysis of groundwater flow. London, 1976. Book No. 8285. £6.750.

N B WEBBER. Fluid mechanics for civil engineers. London, 1976. Book No. 8286. £3.250.

E WALKER–S MORGAN. Construction science 1. Part one. London, 1975. Book No. 8277. £2.500

E WALKER–S MORGAN. Construction science 2. Part two. London, 1976. Book No. 8289. £2.500

R L FULLERTON. Building construction in warm climates. Volume 1. Great Britain, 1975. Book No. 8290. £2.500

R L FULLERTON. Building construction in warm climates. Volume 2. Great Britain 1975. Book No. 8291. £3.000

J E GORMAN. Simplified guide to construction management for architects and engineers. USA, 1976. Book No. 8292 £7.500.

FULCHER – RHODES – STEWART – TICKLE – WINDSOR. Painting and decorating an information manual. London, 1975. Book No. 8293 £4.500.

H W CHATFIELD. The science of surface coatings. London, 1962. Book No. 8294. £10.000.

B F PEGG–W D STAGG. Plastering. A craftsman's encyclopedia. Great Britain, 1976. Book No. 8295. £5.950.

DAVIS – FOOTE – KELLY. Surveying. Theory and practice. USA, 1968. Book No. 8287. £9.500.

A E INGHAM. Aspects of modern land surveying. Hydrography for the surveyor and engineer. Great Britain, 1974. Book No. 8296. £3.950.

R A HIGGINS. Engineering metallurgy. Part 1. Applied physical metallurgy. Great Britain, 1975. Book No. 8297. £2.750.

R A HIGGINS. Engineering metallurgy. Part 2. Metallurgical process technology. Great Britain, 1975. Book No. 8298. £3.250.

K STRAUSS. Applied science in the casting of metals. Great Britain, 1970. Book No. 8299. £11.500.

R T HOULDCROFT. Welding process technology. Great Britain, 1977. Book No. 8300. £8.750.

Mc GRAW-HILL. Yearbook of science and technology for 1977 USA. Book No. 8353. £13.500.

Books Purchased by FAO/UNDP for WDD Library

U LANGEFORS – B KIHLSTROM. Rock blasting. Sweden, 1973. Book No. 8228.

ICID. Multilingual technical dictionary on irrigation and drainage. English–french. New Delhi, 1967. Book No. 8304. $12.00.

ICID. FRAMJI – MAHAJAN. Irrigation and drainage in the world. A global review. Vol. I. New Delhi, 1969. Book No. 3805 $20.00.

ICID. FRAMJI–MAHAJAN. Irrigation and drainage in the world. A global review Vol. II. New Delhi, 1969. Book No. 8306. $20.00.

ICID. FRAMJI. Design practices of irrigation canals in the world. New Delhi, 1972. Book No. 8307. $12.00.

ICID. Controlling seepage losses from irrigation canals. World–wide survey, 1967. New Delhi, 1968. Book No. 8308. $4.00.

ICID. World–wide survey of experiments and results on the prevention of evaporation losses from reservoirs. New Delhi, 1967. Book No. 8309. $3.00

J N LUTHIN. Drainage engineering. USA, 1973. Book No. 8310. $16.46.

M B FIERING – B B JACKSON. Synthetic stream flows. Water resources monograph 1. Washington, 1971. Book No. 8311. $2.00.

U S DEPTM. OF THE INTERIOR – BUREAU OF RECLAMATION. Concrete manual. A water resources technical publication. A manual for the control of concrete construction. Washington, 1975. Book No. 8312. $10.15.

B VOIGHT. Rockslides and avalanches, 1. Natural phenomena. Developments in geotechnical engineering Vol. 14A. Netherlands, 1978. Book No. 8313.

E L GRANT – W G IRESON – R S LEAVENWORTH. Principles of engineering economy. USA, 1976. Book No. 8314.

US DEPT. OF THE INTERIOR – BUREAU OF RECLAMATION. Paint manual. A water resources technical publication. Washington, 1976. Book No. 8315. $5.40.

SOIL CONSERVATION SERVICE. National engineering handbook Section 4. Hydrology. Washington, 1972. Book No. 8336.

SOIL CONSERVATION SERVICE. Engineering handbook. Appendix No. 1. Hydrologic, hydraulic and earth work data. Nebraska, 1968. Book No. 8337.

SOIL CONSERVATION SERVICE. Engineering handbook for work unit staffs. Appendix No. 2. Standard structural plans. Nebraska, 1976. Book No. 8338.

SOIL CONSERVATION SERVICE. National engineering handbook. Section 16. Drainage of Agricultural land. Washington, 1971. Book No. 8339.

SOIL CONSERVATION SERVICE. Irrigation water requirements. Technical release No. 21. Washington, 1970. Book No. 8340.

SOIL CONSERVATION SERVICE. National engineering handbook, Section 15. Irrigation. Washington, 1964. Book No. 8341.

THE INSTITUTION OF CIVIL ENGINEERS. Civil engineering standard method of measurement. London, 1976. Book No. 8373. £2.50.

THE INSTITUTION OF CIVIL ENGINEERS. Ultimate load design of concrete structures. London, 1975. Book No. 8365. £3.50

THE INSTITUTION OF CIVIL ENGINEERS. Engineering hydrology today. London, 1976. Book No. 8371. £14.00.

THE INSTITUTION OF CIVIL ENGINEERS. River flood hydrology. London, 1966. Book No. 8367. £6.00.

THE INSTITUTION OF CIVIL ENGINEERS. Flood studies conference. London, 1975. Book No. 8370. £14.00.

THE INSTITUTION OF CIVIL ENGINEERS. Milestones in soil mechanics. London, 1975. Book No. 8372. £6.00.

THE INSTITUTION OF CIVIL ENGINEERS. Management of national and regional water resources. London, 1973. Book No. 8369. £8.50.

H E THOMAS. The conservation of ground water. USA, 1970. Book No. 8374.

THE INSTITUTION OF CIVIL ENGINEERS. Arbitration procedure (1973) with introduction, notes for guidance and annexes. London, 1976. Book No. 8366. £2.00.

N B WEBBER. Fluid mechanics for civil engineers. London, 1971. Book No. 8368. £3.95.

V L STREETER. Handbook of fluid dynamics. USA, 1964. Book No. 8364. £38.95.

BS 1377:1975. Methods of test for soils for civil engineering purposes. London, 1975. Book No. 8358. £10.30.

BS 5377:1976. Code of practice for the structural use of concrete for retaining aqueous liquids (formerly CP 2007). London, 1976. Book No. 8361. £5.90.

CP3: chapter v: part 1: 1967. Code of basic data for the design of buildings. Chapter V. Loading. Part 1. Dead and unposed loads. London, 1967. Book No. 8359. £2.60.

CP3: chapter v: part 2: 1972. Code of basic data for the design of buildings. Chapter V. Loading. Part 2. Wind loads. London, 1972. Book No. 8360. £10.30.

CP 2001:1957. Site investigations. London 1957. Book No. 8362. £7.80.

CP 2004:1972. Code of practice for foundations. London, 1972. Book No. 8363. £13.10.

US COMMITTEE ON LARGE DAMS. Foundations for dams. New York, 1974. Book No. 8383 $12.00.

AMERICAN SOCIETY OF CIVIL ENGINEERS. Pipeline design for water and wastewater. USA, 1975. Book No. 8385 $4.00.

AMERICAN SOCIETY OF CIVIL ENGINEERS. Hydraulic engineering and the environment. USA, 1973. Book No. 8386. $10.00.

BRITISH STANDARD INSTITUTION British standard code, of practice. CP 2003 (1959) Earthworks. London, 1959. Book No. 8384 £7.80.

BULGARIAN ACADEMY OF SCIENCES. Earthquake engineering. Sofia, 1973. Book No. 8396 £9.00.

THE INSTITUTION OF CIVIL ENGINEERS. Diaphrag mwalls and anchorages. London, 1975. Book No. 8394. £16.00.

THE CONCRETE SOCIETY Standard method of detailing reinforced concrete. London, 1973. Book No. 8397.

THE INSTITUTION OF CIVIL ENGINEERS. An introduction to engineering economics. London, 1976. Book No. 8395. £3.00.

WDD REPORTS

C A C KONTEATIS. Annual report of the department of water development for the year 1976. Nicosia, 1978. Book No. 8229.

B M MILINUSIC. Paphos irrigation project. Progress report No. 8. Covering period from 1.10.77 to 1.1.78. Nicosia, January, 1978. Report No. D/48. Book No. 8231.

D C KYPRIS. Cyprus contribution to groundwater in the Middle East. Nicosia, 1978. Book No. 8316.

B M MILINUSIC. Paphos irrigation project. Revised cost estimate and schedules of expenditure. Nicosia, 1978. Book No. 8318.

B M MILINUSIC. Paphos irrigation project. Progress report No. 9. Covering period from 1.1.1978 to 1.4.1978. Nicosia, April, 1978. Report No D/49. Book No. 8334.

G SOCRATOUS. Vasilikos–Pendaskinos Project. Feasibility study Vol. VII. Supplementary data. Nicosia, May, 1978. Book No. 8356.

C KRIDIOTIS. National bank of Greece. New Limassol headquarters. Site investigation. Nicosia, June, 1978. Report No. F/63. Book No. 8376.

BY CH KYRIAKIDES. The government waterworks law 1929. Cap. 341 (incorporating amendments made by Laws passed up to the 30th January 1977) Nicosia, January 1977. Report No. L/22. Book No. 8355.

BM MILINUSIC. Paphos Irrigation Project. Progress report No. 10. Covering period from 1.4.78 to 1.7.78. Nicosia, July, 1978. Report No. D/50 Book No. 8391.

C A C KONTEATIS. Foundations manual. Nicosia, June, 1978. Report No. S/12. Book No. 8398.

CHR. MARCOULLIS – N. TSIOURTIS. Pitsilia integrated rural development project. Pelendria and Ephtagonia schemes. Mini feasibility studies. Nicosia, July, 1978. Report No. D/52. Book No. 8401.

N TSIOURTIS. Pitsilia integrated rural development project. Khandria irrigation scheme. Mini feasibility studies. Nicosia, September 1978. Report No D/53 Book No. 8418.

N TSIOURTIS. Loan CY–1483. Pitsilia integrated rural development project. Irrigation waterworks law and operation and maintenance program. Nicosia, September, 1978. Report No. I/27 Book No. 8420.

N TSIOURTIS. Agros irrigation project (Karkopoulia irrigation division) Nicosia, June, 1978. Report No. I/26 Book No. 8418.

J F LAURENCE. Southern conveyor project. Second quarterly progress report. June 1 – September 30, 1978, Nicosia, September 1978. Report No. P/9 Book No. 8422.

C A C KONTEATIS. Water Development Department. Annual report 1977. Nicosia, November, 1978. Book No. 8483.

WATER RESOURCES DIVISION. Hydrological year–book of Cyprus 1973–1974. Nicosia, November, 1978. Book No. 8450.

G PETROCOSTAS – C KRIDIOTIS. Solea valley project. Phlasou pond (Vouppos). Site and fill material investigations. Nicosia, November, 1978. Report No. F/66. Book No. 8451.

G PETROCOSTAS – C KRIDIOTIS. Cyprus tourism organization. Building complex at Marina Larnaca. Site investigations. Nicosia, November, 1978. Report No. F/65. Book No. 8453.

B M MILINUSIC. Paphos Irrigation Project. Main canal construction contract No. C3–S9–39/76/23 Inspection report. Nicosia, December, 1978. Report No. D/55. Book No. 8455.

B M MILINUSIC. Paphos Irrigation Project. Progress report No. 11 Covering period from 1.7.78 to 1.10.78. Nicosia, October 78. Report No. D/54. Book No. 8457.

P MARATHEFTOU. Hydraulic model study of Lefkara dam spillway. Nicosia, October, 1978. Report No. D/51 Book No. 8459.

V DIVISION OF CONSTRUCTION

by
A P Georghiades
Senior Water Engineer
Head of the Division

Introduction

The Division of Construction which deals with the planning, supervision and control of all construction works of the Department by direct labour or by contract, is one of the major divisions of the Department and is sub-divided into four main branches:-

- ★ The Planning and Control Branch (including the Tenders Section)
- ★ The Major Projects Branch
- ★ The Minor Projects Branch, and
- ★ The Workshop

During 1978 the Division consisted of the following staff:-

1	Senior Water Engineer - Head
1	Executive Engineer, Class I
1	Mechanical Engineer, Class I - Head of the Workshop
2	Executive Engineers, Class II
1	Superintendent of Works
3	Senior Inspectors of Works
9	Inspectors of Works
3	Chief Foremen
8	Assistant Chief Foremen
3	Technical Assistants
50	Monthly paid Foremen
35	Weekly paid Foremen
117	Total staff

Over and above this technical staff, the Division engaged 441 regular employees of various trades and a number of casual employees for the execution of all the schemes.

Another function of the Division is the collection of data regarding actual rates, standards of materials and equipment, the results of which are appraised and utilized for future planning and cost estimating.

The execution of the new schemes included in the 1978 Development Budget commenced in Spring, soon after the Budget was approved by the House of Representatives.

CONSTRUCTION PROGRAMME AND PROGRESS

Some of the new schemes included in the 1978 Construction Programme were put in hand in March-April, soon after the approval of the Budget by the House of Representatives and the issue of the respective loans, which represent the village contributions towards the total estimated cost of the schemes.

It should be stated here that in addition to the usual schemes approved for execution the Department had to respond to the request for the construction of other water works of vital importance. Such works were the Refugee Housing Estates and Refugee Self-Housing Schemes, the Pitsilia Integrated Rural Development Project, Water Supply Schemes for Industrial Areas for the Ministry of Commerce and Industry, Stock Farms for

the Department of Agriculture, water supply and irrigation schemes undertaken from deposits for Village Water Commissions, Irrigation Divisions or Associations, other Government Departments and Private Developers.

Eventually the total volume of works undertaken by the Department during 1978 reached the amount of £3 115 506. The expenditure incurred on all these schemes during the year reached the amount of £1 965 088.

In spite of the great volume of work undertaken for construction, the staff of the Construction Division worked hard and with their utmost zeal and it can be said that all urgent needs were attended with the greatest speed and care.

It should be stated, however, that the staff encountered enormous difficulties in the recruiting of casual skilled and unskilled labour for the construction of the works, due to the scarcity of labour force in the Island. In some cases the Department had to respond urgently giving top priority for the execution of water supply schemes for the housing of Refugees and emergency schemes where the old supplies were exhausted and new supplementary schemes had to be implemented immediately to relieve the situation.

Table V–1 shows the volume of works undertaken by the Department during the year. Detailed lists showing all the schemes undertaken for construction appear elsewhere in this Report.

PLANNING BRANCH

This new branch created within the Construction Division recently, is considered of vital importance for the implementation and the satisfactory progress of the Construction Programme. Although this new Branch has not yet been adequately staffed, its activities contributed greatly towards the execution of all schemes. New efforts were made late in the year to reorganize and engage additional technical staff in this branch so that it can operate more efficiently and be able to respond to the increasing demand for its activities, which mainly are:–

★ The Programming and cost control of all schemes under construction.
★ The assessment of the Division's requirements in materials, such as pipes, pipe–fittings, pumping untis, etc. and their order through the Government Central Stores, in time for the implementation of the year's programme of work.
★ The invitation of direct tenders for the supply of other materials not available in the Central Stores, such as building materials etc. and the hiring of machinery.
★ The acquisition of immovable property which is affected by the construction of the schemes.
★ The distribution of resources, such as labour force, plant and materials to the various schemes in all districts.
★ The checking of the estimate of the schemes designed by the Small Projects Planning Division to ensure their execution within estimated cost.
★ The supply of services towards the installation of electricity supply at the site of various works.

CONTROL BRANCH

The main objective of this branch is to ensure that schemes are executed within the estimated cost and locate problems and excesses where this is unavoidable and take prompt action to remedy the situation. For this the officers of the branch work in association with the supervising personnel for any problem that might arise, regarding the execution of schemes, or on any mod fications that become inevitable, in the light of actual local conditions with the least repercussions on the cost of the scheme.

During the year this Branch was understaffed as a result of shortage of Senior Technical officers and the transfer from our Division of one Executive Engineer, Class I and so the work was mainly carried out by the Head of the Division assisted by the Superintendent of Works.

Another activity of this Branch is to exercise control over the execution of all schemes. It follows up and sees that all construction

TABE V–1
SCHEMES UNDERTAKEN FOR CONSTRUCTION DURING 1978

Ser. No	Description	No of schemes	Amount allocated £	Expenditure incurred £
1	Rural Domestic Water Supplies	68	673 339	370 491
2	Minor Irrigation Works	77	398 067	164 665
3	Major Irrigation Works	30	666 396	557 460
4	Town Water Supply Schemes	14	323 596	256 750
5	Water Supply and Irrigation Schemes Included in the Pitsillia Project	14	132 068	49 407
6	Water Supply schemes for Housing the Refugees	106	531 652	269 993
7	Schemes undertaken for other Government Departments ...	76	258 292	164 226
8	Rural Domestic W.S. schemes from village deposits	134	27 223	27 223
9	Minor Irrigation Schemes from village deposits	23	8 447	8 447
10	Works executed for Private Developers (mainly distribution mains for land development)	200	96 426	96 426
	Total		3 115 506	1 965 088
	Note: Paphos Project expenditure not included in the above figures is.....			3 294 336
	Grand total			£5 259 424

programmes are adhered to, by the supervising technical officers, that the progress of the works is attained at reasonable standards and as planned.

The supervision of schemes under construction in Limassol, Larnaca, Famagusta and Paphos districts was undertaken by the respective Regional Officers of the Department, with a senior officer from the main office acting as Co–ordinator and at the same time carrying out all preparatory work for the commencement of the schemes. The Head of the Division apart from periodic visits to Regional Offices and site visits is continuously kept informed on the progress of the works through the Co–ordinators and by relative reports from the Regional Engineers.

LABOUR FORCE

For the construction of one scheme the Division usually engaged a gang consisting of a Foreman, monthly or weekly paid, regular artisans of various trades of the Department and casual unskilled labour who are recruited locally through the Government Labour Offices.

The average daily labour force engaged by the Construction Division during 1978 all over the Island was 801 persons out of which 441 were regular employees of various trades, i.e. builders, carpenters, pipelayers etc. and 360 casual labourers including skilled and unskilled.

The total expenditure incurred during the year on wages alone (on schemes carried out by direct labour only) reached the amount of £1 176 438 which is a record figure.

During 1978 the recruitment of casual labour force became even more acute than before, especially in the towns where the private sector competes with Government Departments in securing adequate skilled and unskilled labour.

In order to cover the urgent needs in this field the Division had to transport a number of unskilled labour force from various areas to the sites of the works by Government or hired transport.

The great difficulties encountered in the securing of labour force are mostly attributed to the following:–

- ★ Competition of the private sector which offers higher wages.
- ★ The great demand for construction works of all types after the Turkish invasion.
- ★ The employment of a number of Cypriot skilled and unskilled labourers in the neighbouring Arab countries.
- ★ The retiring of a number of skilled labourers and the trend by the younger generations to turn to other trades.

PIPES AND PIPE FITTINGS

The practice followed for many years is to purchase pipes and pipe-fittings of all types from the Government Central Stores.

In order to have all pipes and fittings in stock and in time for the early and uninterrupted execution of the schemes, the Department puts an order of all its needs early, prior to the approval of the Budget, as soon as the schemes proposed for execution are known.

During 1978 a length of 283,311 meters of pipes of various types were laid all over the Island at an expenditure of £485 807.

Table V-2 that follows shows in detail all types of pipes laid in 1978.

TABLE V-2 **PIPES LAID DURING 1978**

GALVANIZED IRON PIPES - CLASS B

Dia inches	Length m	Value £
1/2	19 632	2 742
3/4	1 254	392
1	14 106	5 537
1 1/4	14 652	7 459
1 1/2	2 976	2 533
2	19 884	15 778
2 1/2	7 632	7 799
3	16 560	21 044
4	27 288	53 177
Total	123 984	£116 461

STEEL PIPES — CLASS B

Dia inches	Length m	Value £
6	2 208	7 100
8	4 560	24 070
10	48	353
12	108	933
16	12	154
18	24	302
34	6	223
Total	6 966	£33 135

ASBESTOS CEMENT PRESSURE PIPES — CLASS B

Dia inches	Length m	Value £
3	5 508	3 173
4	48 340	42 981
6	18 204	36 655
8	4 804	11 570
10	958	2 496
12	5 921	21 617
14	710	3 840
16	4 100	7 955
20	7 050	15 000
Total	95 595	£145 287

ASBESTOS CEMENT PRESSURE PIPES — CLASS C

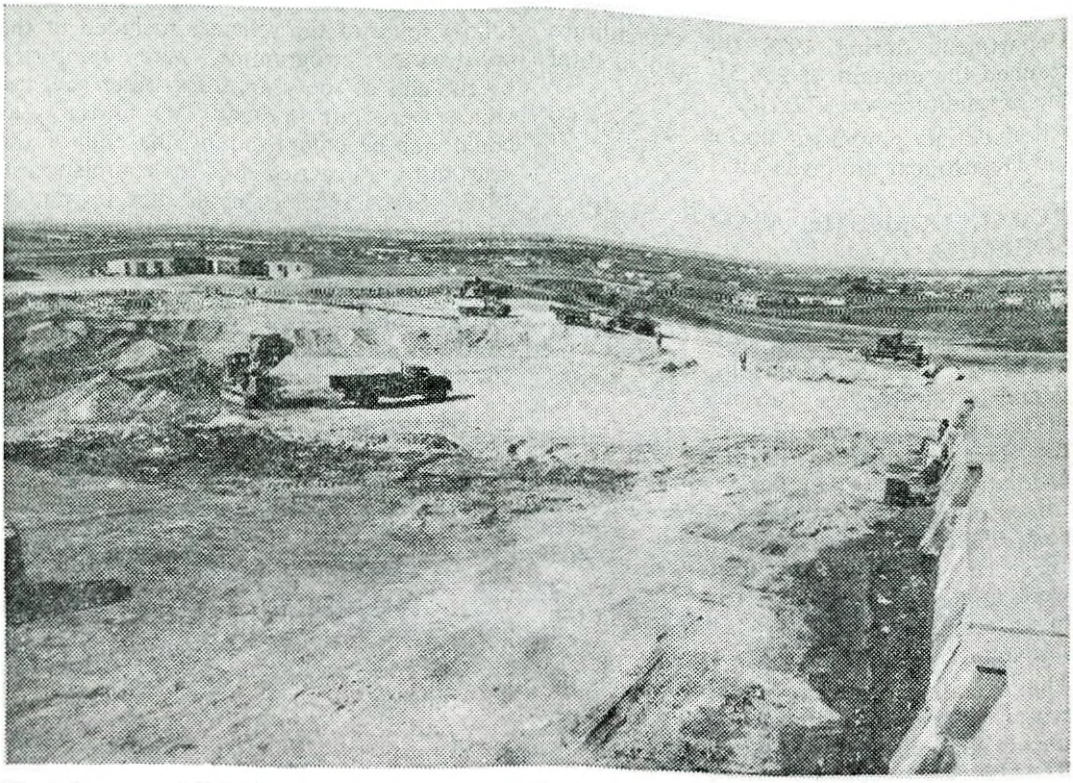
Dia inches	Length m	Value £
3	12 324	7 206
4	8 732	8 173
6	4 696	7 825
8	220	606
12	5 666	13 908
16	4 100	7 955
18	40	319
20	7 050	15 915
24	600	10 732
28	2 400	58 516
32	300	7 966
Total	46 128	£139 121

PVC PIPES — CLASS B

Dia mm	Length m	Value £
90	48	23
160	3 438	5 040
400	2 682	23 165
450	2 082	21 802
Total	8 250	£50 030

PVC PIPES — CLASS C

Dia mm	Length m	Value £
90	2 388	1 773
Total	2 388	£1 773



Site being excavated for the new Lakatamia Reservoir—Nicosia W.S. which will be completed in 1980.

SUMMARY OF ALL PIPES LAID DURING 1978

Ser No	Type	Length m	Value £
1	Galvanized iron pipes—Class B	123 984	116 461
2	Steel pipes—Class B	6 966	33 135
3	Asbestos cement pipes—Class B	95 595	145 287
4	Asbestos cement pipes—Class C	46 128	139 121
5	PVC pipes—Class B	8 250	50 030
6	PVC pipes—Class C	2 388	1 773
	Total	283 311	£485 807

CONSTRUCTION PLANT

For all machinery essential for the execution of any one scheme, the Department has to apply primarily to the EMS for the hiring of Government machinery. If however, Government machinery is not available at the time, the Department hires machinery from the private sector through open tenders. During 1978 for the execution of all the schemes the Department hired machinery of all types from the EMS at an expenditure of £41 656 and from the private sector through open tenders at an expenditure of £196 458. The types of machinery hired by the Department from the EMS as well as from the private sector, showing also the expenditure incurred during 1978 is given in Table V–3.

BUILDING MATERIALS

All building materials, such as cement shingle, sand, etc are purchased by the Department from the private sector through open tenders. Cement is purchased from the two local cement factories and during the year 26,240 bags of cement were purchased at a value of £16,233.

For all the other materials purchased by the

Department during 1978 the expenditure reached the amount of £56,317 and in total the expenditure was £72,550.

All materials purchased during the year by the Department are given on Table V–4

RURAL DOMESTIC WATER SUPPLY SCHEMES

The construction programme for 1978 included 68 Rural Domestic Water Supply Schemes at an estimated cost of £673,339. These 68 schemes were split all over the Island in the five free districts. 28 schemes of an estimated cost of £208,370 were in the Nicosia district, 12 schemes of an estimated cost of £118,875 were in the Limassol district, 13 schemes of an estimated cost of £105,296 were in the Paphos district, 10 schemes of an estimated cost of £97,402 were in the Larnaca district and 5 schemes of an estimated cost of £143,396 were in the Famagusta district.

The overall expenditure incurred on all 68 Rural Domestic Water Supply Schemes during 1978 reached the amount of £370,491. The biggest expenditure incurred on one District was £106,623 for the Famagusta district.

Lists showing in detail all schemes undertaken by district are shown on Table V–5 that follows:–

MINOR IRRIGATION WORKS

The 1978 construction programme included 77 Minor Irrigation Schemes of an estimated cost of £398,067 in all districts.

34 of these schemes of an estimated cost of £244,940 were for the Nicosia district, 32 schemes of an estimated cost of £60,292 were in the Limassol district, 9 schemes of an estimated cost of £58,835 were in the Paphos district and 2 schemes of an estimated cost of £34,000 were in the Larnaca district.

On all Minor Irrigation Schemes the expenditure incurred during the year reached the amount of £164,665. By district the expenditure incurred on Minor Irrigation Schemes was £119,370 for Nicosia, £36,282 for Limassol, £2,573 for Paphos and £6,440 for Larnaca.

As it will be observed from the lists that follow some of the schemes included in the construction programme were completed by the end of the year, some other schemes which were put in hand late in the year could not be completed by the end of the year and were carried over for completion in 1979. Some schemes could not be put in hand during the year for various administrative difficulties and were carried over for execution in 1979.

All the schemes that were included in the construction programme for execution in 1978 are shown in detail on Table V–6.

TABLE V–3

MACHINERY HIRED DURING 1978

MACHINERY FROM THE EMS

Ser No	Description	Working days	Value £
1	Heavy machinery	962	9 108
2	Excavators–Diggers	164	1 476
3	Compressors	215	1 670
4	Concrete mixers ...	2 300	2 670
5	Land Rovers	9 890	23 228
6	Others	1 065	3 504
	Total		£41 656

MACHINERY HIRED FROM PRIVATE SECTOR

Ser No	Description	Working days or hours	Value in £
1	Compressors	11 633	10 966
2	Diggers.....	25 792	58 187
3	Tractors	9 497	19 059
4	(i) Tipper Lorries (General Contract)	—	6 708
	(ii) Tipper Lorries.....	8 409 (Hrs)	13 358
5	Caterpillars	8 940	31 909
6	Electrowelding machines	1 366	976
7	Buses	740	4 272
8	Land Rovers	6 187	22 343
9	Saloon cars	92	687
10	Mixers	392	1 014
11	Compactors	1 223	3 225
12	Drilling Machines	98	497
13	Cranes	428	1 238
	Total..	—	£174 439
	Excavation and filling in of trenches for pipe-laying	35 370 meters/run	22 019
Total	.. .. ..		£196 458

TABLE V–4

BUILDING MATERIALS PURCHASED DURING 1978

Ser No	Description	Quantities	Value £
1	Cement	26 240 bags	16 233
2	Mild Steel	190 tons	18 878
3	Sand	9 337 m^3	11 190
4	Shingle	4 932 m^3	8 828
5	Aggregate	5 318 m^3	7 313
6	Sand for pipe bedding	8 105 m^3	5 783
7	Others	–	4 325
	Total		£72 550

WATER METERS INSTALLED DURING 1978

Ser No	Dia inches	Number	Value £
1	1/2	4 880	17 847
2	3/4–6	207	5 070
3	8–16	3	1 362
	Total	5 090	£24 279

TABLE V–5

RURAL DOMESTIC WATER SUPPLY SCHEMES UNDERTAKEN IN 1978

Ser No	Description	Amount allocated for 1978 £	Expenditure incurred in 1978 £	Remarks
NICOSIA DISTRICT				
	(a)Carry Over Schemes			
1	Kakopetria (St. tank and new distr. system with water meters).....	26 842	24 886	In progress
2	Dhali (Distribution system)	11 731	4 370	In progress
3	Galata (Extension of distribution system)	1 390	152	Completed
4	Argates–Episkopio–Kambia–Analiondas (Supplementary supply)	1 672	376	Completed
5	Galata–Kakopetria (Improvement of spring)	566	—	Completed
6	Laxia–Yeri (Supplementary supply).....	2 146	1 742	In progress
7	Kambi (Pharmakas) (Supplementary supply for spring & St. tank)	572	—	For 1979
8	Paleometokho (Add. st. tank)	1 566	—	Completed
	Pitsillia Regional Scheme			
9	Part B1–Combined for Lagoudhera–Sarandi–Polystipos–Alona–Platanistasa–Askas–Livadhia–Xyliatos & Ayia Marina (Supplementary supply from Kannoures spring)	9 000	—	Being revised
10	Part B2—Combined for Xyliatos—Ayia Marina (Distribution box & main conveyors)	1 689	4	Completed
11	Phterykoudhi (Distribution system) ...	455	420	Completed
12	Ayia Marina (Xyliatos) (Distribution system)	779	86	Completed
13	Kambos (Improvements)	4 500	—	Rejected

TABLE V–5
RURAL DOMESTIC WATER SUPPLY SCHEMES UNDERTAKEN IN 1978 (Continued)

Ser No	Description	Amount allocated for 1978 £	Expenditure incurred in 1978 £	Remarks
14	Perakhorio (Nisou) (St. tank and distr. system)	4 024	3 572	Completed
15	Kannavia (Supplementary supply)	4 200	—	Being revised
16	Pedhoulas (St. tank, pump unit, suppl. supply—combined with irr. scheme)	5 700	5 700	Completed
17	Klirou (Improvement to main conveyors & pumping unit)	1 883	1 189	Completed (Supply of electricity pending)
18	Anayia (New pumping unit and supply of electricity)	541	474	Completed
19	Lymbia—Emergency scheme (Supplementary supply from b/h)	633	492	Completed
20	Malounda (Supplem. supply)	281	327	Completed
	(b) New Schemes			
21	Paleometokho (Suppl. supply from new b/h)	13 000	9 055	In progress
22	Astromeritis (Suppl. supply from new b/h)	7 500	6 549	In progress
23	Peristerona (Addit. stor. tank)	3 500	2 745	In progress
24	K. Koutraphas (New scheme)	3 000	—	Rejected
25	Psomolophou (Phase A & B) (New scheme)	41 000	24 978	In progress
26	Agrokipia (Extension)	3 400	—	Being revised
27	Meniko (Suppl. supply)	4 800	3 720	Completed
28	Tseri (New scheme)	52 000	6 244	In progress
	Total for Nicosia district	208 370	97 081	
	LIMASSOL DISTRICT			
	(a) Carry Over Schemes			
1	Pissouri (Suppl. supply from spring)	2 900	4 283	Completed. Compensations Pending.
2	Kalokhorio (Installation of chlorinator & extensions)	1 498	1 056	Completed
3	Moutayiaka Reg. scheme (St. tank, main conveyor)	3 906	2 261	Completed. (Inst. of chlorinator pending)
4	Souni—Zanaja (St. tank and house-to-house)	3 968	507	Completed
5	Vasa (Kilani) (St. tank, pumping unit & house-to-house)	4 230	3 745	Completed (Ins. of pumping unit pending)
6	Sykopetra (St. tank, suppl. supply and house-to-house)	1 120	27	Completed
7	Pelendria (Extensions)	560	—	Completed
8	Sotira (Suppl. supply from B/H and distr. system)	2 611	2 258	Completed

TABLE V-5

RURAL DOMESTIC WATER SUPPLY SCHEMES UNDERTAKEN IN 1978 (Continuep)

Ser No	Description	Amount allocated for 1978 £	Expenditure incurred in 1978 £	Remarks
9	Episkopi (St. tank and distr. system)...	20 804	20 236	In progress
10	Platres Pano (St. tank suppl. supply and distr. system)	12 178	10 608	Completed. (Electricity to B/H pending)
11	Amathus area (New scheme for the development of the area)	60 000	32 213	In progress
	(b) New Schemes			
12	Ayios Yeoryios (Alamanou) (Suppl. supply)	5 100	553	Completed
	Total for Limassol district	118 875	77 747	
PAPHOS DISTRICT				
	(a) Carry Over Schemes			
1	Pendalia (House-to-house distr. system)	1 982	—	Completed
2	Stroumbi—Polemi (Supplem. supply from B/H)	7 667	—	Completed
3	Arminou Reg. Scheme—Philousa—Pretori-Kedhares (Supp. supply from B/Hs)	16 022	3 576	In progress
4	Kilinia (House-to-house distr. system)	1 772	742	Completed
5	Galataria (House-to-house distr. system)	1 828	186	Completed
6	Arkhimandrita (House-to-house distr. system)	2 332	2 185	Completed
7	Ayia Marinoudha (House-to-house distr. system)	2 595	2 554	Completed
8	Paphos Lower Villages Place "C" Armou—Marathounda—Episkopi Mesa Khorio—Mesoyi—Trimithousa (Suppl.supply from new B/Hs).....	12 052	9 503	In progress
9	Armou (House-to-house distr. system)	1 711	13	Completed
	(b) New Schemes			
10	Eledhio (House-to-house distr. system)	4 585	2 988	Completed
11	Kholi (House-to-house distr. system)	7 450	6 303	In progress
12	Statos—Ayios Photios (Additional supply)	20 500	6 809	In progress
13	Theletra (New village) (House-to-house scheme)	24 800	8 340	In progress
	Total for Paphos district	105 296	43 199	
LARNACA DISTRICT				
	(a) Carry Over Schemes			
1	Lefkara Reg. ccheme (For minor works)	3 011	3	Completed

TABLE V–5
RURAL DOMESTIC WATER SUPPLY SCHEMES UNDERTAKEN IN 1978 (Continued)

Ser No	Description	Amount allocated for 1978 £	Expenditure incurred in 1978 £	Remarks
2	Odhou (Improvement of spring and house–to–house)	3 656	1 734	Completed. (Compensations pending)
3	Anaphotia (Suppl, supply)	23 107	17 107	In progress
4	Mazotos—Kivisil (Add. supply and house–to–house)	418	172	Completed
5	Voroklini (Extension of distr. system and house–to–house)	817	803	Completed
6	Khirokitia (Suppl. supply).....	1 500	—	Being revised
	(b) New Schemes			
7	Athienou (Suppl. supply from new B/H)	7 000	3 122	Completed
8	Xylophaghou (Suppl. supply)	4 000	—	Being revised
9	Kiti—Meneou—Perivolia—Dhromo-laxia—Tersephanou (Suppl.supply)	14 000	9 015	In progress
10	Troulli—Kellia (Supply. supply)	40 000	13 885	In progress
	Total for Larnaca district	£97 402	£45 841	
	FAMAGUSTA DISTRICT			
	(a) Carry Over Schemes			
1	Paralimni—Ayia Napa (Supplementary supply)	36 199	19 373	Completed
2	Sotira (Supplementary supply)	3 797	2 014	Completed
3	Paralimni—Ayia Napa (Add. supply from Famagusta main)	72 000	60 322	In progress
	(b) New Schemes			
4	Dherinia (Add. supply from Famagusta main).....	21 000	15 330	In progress
5	Akhyritou—Vrysoulles (Main conveyor from Tower tank and new distrib. system)	13 400	9 584	Completed
	Total for Famagusta district	£146 396	£106 623	

RURAL DOMESTIC WATER SUPPLY SCHEMES UNDERTAKEN FOR EXECUTION IN 1978

Summary of all Districts

Ser No	District	No of schemes	Amount Allocated for 1978 £	Expenditure incurred in 1978 £
1	Nicosia	28	208 370	97 081
2	Limassol	12	118 875	77 747
3	Paphos	13	105 296	43 199
4	Larnaca	10	97 402	45 841
5	Famagusta	5	143 396	106 623
	Total	£68	£673 339	£370 491

TABLE V-6

MINOR IRRIGATION SCHEMES UNDERTAKEN FOR EXECUTION IN 1978

Ser No	Description	Amount allocated for 1978 £	Expenditure incurred in 1978 £	Remarks
NICOSIA DISTRICT				
(a)	**Carry Over Schemes**			
1	Dhali–Ftelia & Katevas (Pumping scheme and piped distr. system)	4 159	—	Completed
2	Orounda—Matsari (Pumping scheme and distr. system)	2 801	—	Work interrupted.
3	Potami (Pumping scheme and piped distr. system)	1 419	—	Completed
4	Paleometokho (Recharge Works).....	1 629	—	Completed
5	Palekhori—Maroullena (Intake)	391	80	Completed
6	Pharmakas—Koskinas (Piped distr. system)	852	—	Completed
7	Astromeritis (Lining of channels)	685	—	Completed
8	Akaki–Meniko (Lining of channels) ...	14 511	12 710	In progress
9	Linou—Linopsas (R C Channels)	774	774	Completed
10	Pera Orinis (Vizakia) (Pumping scheme and distrib. system)	12 924	5 774	In progress
11	Pedhoulas (Pumping scheme with st. tank & piped distr. system combined with W S scheme)	14 900	12 630	Completed
12	Mosphili (New pumping unit)	5 500	3 826	Pending supply of electricity & inst. of puming unit
13	Argates (Lining of channels)	6 346	5 596	Completed
14	Xyliatos (Irr. tank, piped distr. system and lining of channels)	2 177	2 131	Completed
15	Galata—Sina Oros (Irr. tank)	10 000	—	To be revised
16	Palekhori—Mylouri (Piped distr. system)	763	693	Completed
17	Yialias river (Recharge works).....	3 472	3 064	Completed
18	Orounda–Peristerona (Lining of channels)	4 687	4 674	Completed
	(b) New Schemes			
19	Orounda (Maoutsos) (Pumping scheme, lining of channels and piped distr. system)	13 300	3 324	In progress
20	Chakistra (Yephiri—Phase "A")	20 000	—	Under investigation
21	Kambos (Kameno Pedhi—Phase "A")	20 000	—	—do—
22	Moutoullas (Marathon, Ay. Konstantinos, Chrysomilies)	4 800	4 064	Completed
23	Kakopetria	4 800	3 748	In progress
24	Evrykhou	19 000	18 625	In progress

TABLE V-6
MINOR IRRIGATION SCHEMES UNDERTAKEN FOR EXECUTION IN 1978 (continued)

Ser No	Description	Amount allocated for 1978 £	Expenditure incurred in 1978 £	Remarks
25	Kaliana (Neron Tsappas)	4 200	1 597	In progress
26	Dhali (Lining of channels)	7 200	—	To be re-estimated
27	Peristerona (Lining of channels)	10 000	10 000	Completed
28	Astromeritis (Lining of channels)	10 000	7001	In progress
29	Anayia (Lining of channels)	10 000	3 100	In progress
30	Pera—Politiko (Lining of channels) ...	4 500	4 365	Completed
31	Linou (Linopsas)	8 000	8 000	Completed
32	Kambos	750	525	Completed
33	Yialias (Near Potamia) (Recharge works)	5 400	3 060	In progress
34	Pedhieos (Near Anayia—Psomolophou) (Recharge works).....	15 000	9	For 1979
	Total for Nicosia district	£244 940	£119 370	
	LIMASSOL DISTRICT			
	(a) Carry Over Schemes			
1	Episkopi (Pumping scheme, st. tank & piped distr. system)	2 111	555	Completed
2	Kato Platres (St. tank & piped distr. system)	1 319	1 033	Completed
3	Kolossi (Pumping scheme & piped distr. system)	512	23	Completed
4	Agros (Anastasia) (Piped distr. system)	580	—	Completed. (Installation of weir gate pending)
5	Ayios Dhimitrios (Kaloyiros) (Spring and piped distr. system)	378	378	Completed
6	Ayios Dhimitrios (Kryo nero) (St. tank, spring & piped distr. system) ...	964	964	Completed
7	Ayios Ioannis (Agros) (Teratsia) (Piped distr. system)	1 029	466	In progress
8	Paleomylos (Khardji) (St. tank and piped distr. system).....	617	264	Completed
9	Kyperounda (Arkappis—Khalospities) (St. tank and piped distr. system)	1 038	235	Completed
10	Trimiklini (Zenonas) (Piped distr. system)	1 300	—	Rejected
11	Mandria (Mylavris) (Piped distr. system)	1 831	—	Completed
12	Mandria (Pumping scheme and piped distr. system)	2 288	—	Completed
13	Agridhia (Piped distr. system)	857	—	Completed

TABLE V-6
MINOR IRRIGATION SCHEMES UNDERTAKEN FOR EXECUTION IN 1978 (continued)

Ser No	Description	Amount allocated for 1978 £	Expenditure incurred in 1978 £	Remarks
14	Louvaras (P. Pervolia) (Spring and piped distr. system).....	402	402	Completed
15	Dhymes (Piped distr. system)	1 470	1 206	Completed
16	Pano Platres (R C channels & piped distr. system)	4 714	274	Completed
17	Prodhromos (Platania, Antonides) (St. tank and piped distr. system)	402	399	Completed
18	Louvaras (Tsioukalas) (St. tank and piped distr. system).....	420	—	Completed
19	Agros (Vournes) (Piped distr. system)	1 000	1 000	Completed
20	Trimiklini (New distr. system)	1 100	—	Not executed
21	Mandria (Mylavris) (New storage tank)	600	20	In progress
22	Arsos (Athkies) (Spring and piped distr. system)	840	445	Completed
	(b) New Schemes			
23	Prodhromos (Kyparissi) (St. tank)	3 300	1 667	Pending land acquisition for storage tank
24	Prodhromos (Sklidhros) (Piped distr. system)	500	397	Completed
25	Pelendri (K. Englisis) (Piped distr. system)	1 800	1 683	Completed
26	Khandria (Avlakou) (Piped distr. system)	800	800	Completed
27	Pera-Pedhi (Lining of channels & piped distr. system).....	8 600	6 904	In progress
28	Kyperounda (P. Stremmata) (Piped distr. system)	1 800	1 610	Completed
29	Ayios Ioannis (Agros) (Yerambelos) ...	670	—	Rejected
30	Potamitissa (Yeradjia) (Piped distr. system)	2 900	2 900	Completed
31	Phini (Vines-Mylos) (Main conveyor 6" dia)	12 400	10 920	Completed
32	Khandria (Arkadjin) (Piped distr. system)	1 750	1 737	Completed
	Total for Limassol district	£60 292	£36 282	
PAPHOS DISTRICT				
	(a) Carry Over Schemes			
1	Khoulou (195/63) (Pump. schemes & piped distr. system).....	1 305	70	Completed
2	Khoulou (181/63) (Pump. scheme and			

TABLE V–6
MINOR IRRIGATION SCHEMES UNDERTAKEN FOR EXECUTION IN 1978 (continued)

Ser No		Amount allocated for 1978 £	Expenditure incurred in 1978 £	Remarks
	distr. system)	713	6	Completed
3	Steni (Pumping scheme & piped distr. system)	1 900	71	Completed
4	Polis (Khrysokhou) (Pumping scheme & piped distr. system)	3 670	1 972	Pending supply of electricity
5	Polemi (Pumping scheme and piped distr. system)	2 361	167	Completed
6	Skoulli (Pumping scheme and piped distr. system)	1 586	63	Completed
7	Amargeti (Pumping scheme and piped distr. system)	1 800	224	Scheme re-estimated
8	Yialia—Ayia Marina (Extension of distr. system)	25 500	—	Pending issue of additional funds
	(b) New Schemes			
9	Anarita (Phase A)	20 000	—	Funds daggered
	Total for Paphos district	£58 835	£2 573	
	LARNACA DISTRICT			
	(a) Carry Over Schemes			
1	Khirokitia (Anephantis) (Pumping unit, st. tank and piped distr. system)	11 000	6 440	Completed
	(b) New Schemes			
2	Alaminos (Latourou) (Recharge works)	23 000	—	Under investigation
	Total for Larnaca district	£34 000	£6 440	

MINOR IRRIGATION SCHEMES UNDERTAKEN FOR EXECUTION IN 1978

Summary of all districts

Ser No	District	No of schemes	Amount allocated for 1978 £	Expenditure incurred in 1978 £
1	Nicosia	34	244 940	119 370
2	Limassol	32	60 292	36 282
3	Paphos	9	58 835	2 573
4	Larnaca	2	34 000	6 440
	Total	77	£398 067	£164 665

PITSILIA INTEGRATED RURAL DEVELOPMENT PROJECT

The Pitsilia Integrated Rural Development Project construction commenced in 1978 with 14 Minor Irrigation and Village Water Supply Schemes of an estimated cost of £132,068. Some delay was observed in the commencement of these schemes as a result of various administrative and other problems which finally were overpassed and work was put in hand on only five of the 14 approved schemes. It is expected to put the work in hand for the remaining 9 and other new schemes early in 1979.

The expenditure incurred on these five schemes during 1978 was £49,407.

All the above schemes are shown on Table V–7.

TABLE V–7
PITSILIA INTEGRATED RURAL DEVELOPMENT PROJECT

Ser No	Description	Amount allocated for 1978 £	Expenditure incurred in 1978 £	Remarks
	(a) Water Supply Schemes			
1	Phikardhou	4 530	4 485	Completed
2	Dhierona	2 000	1 544	Completed
3	Kambi (Pharmakas)	1 950	—	Pending land survey and construction of road
4	Lazania	1 608	1 588	Completed
5	Kyperounda	52 000	30 335	In progress
	(b) Irrigation Schemes			
6	Agros (Kato Taliou)	4 100*	—	
7	Agros (Pano Lambadha)	930*	—	
8	Agros (Kaouros)	1 600*	—	
9	Askas	2 500*	—	
10	Odhou (Irr. Division No. 1)	10 000	11 455	Completed
11	Odhou (Irr. Division No 2)	3 600		
12	Alona	16 000	—	Village contribution pending
13	Kambi (Pharmakas)	10 500*	—	
14	Ayios Ioannis (Kato Mylos)	20 700*	—	
	Total	£132 068	£49 407	

* Village contribution made available **very** late in the year

MAJOR IRRIGATION WORKS

The 1978 construction programme included 26 major irrigation schemes of a total estimated cost of £1,223.576. These 26 schemes represented carry over, and new schemes and involved dam maintenance work and distribution networks maintenance.

The overall expenditure incurred during the year reached the amount of £817,460. The Paphos Irrigation Project is not included in these schemes, except Lot 4C1 and 4C2, for which a detailed description is given elsewhere in this report.

A detailed report on some other Major Irrigation Schemes executed during 1978 is also given elsewhere further on, in this report. Details of all the 26 major irrigation schemes included in the 1978 construction programme are given on Table V–8.

TABLE V–8
MAJOR IRRIGATION SCHEMES UNDERTAKEN FOR EXECUTION IN 1978

Ser No	Description	Amount allocated for 1978 £	Expenditure incurred in 1978 £	Remarks
1	Mavrokolymbos Dam	376	246	Completed
2	Yermasoyia Dam	1 196	—	Completed
3	Masari Dam	788	218	—
4	Palekhori—Kambi Dam	3 082	83	Completed
5	Lefkara Dam	6 108	55	Completed
6	Khirokitia Pipeline	707	—	Completed
7	Khirokitia Treatment plant	923	—	Completed
8	Kiti leakages	2 641	96	Postponed
9	Lymbia Dam	7 660	7 681	Completed
10	Arakapas Dam	493	6	Completed
11	Argaka—Magounda Dam	3 200	2 987	Completed
12	Mavrokolymbos Distr.	16 067	512	In progress
13	**Yermasoyia—Polemidhia Project**			
	(a) Yermasoyia Distr–Main Conveyor	1 643	237	Completed
	(b) " " Akrounda, Phinikaria	2 013	—	Completed. For minor works
	(c) Zakaki (Extension)	538	—	—do—
	(d) Phasouri (")	3 099	2 357	—do—
	(e) Trakhoni (")	195 894	191 971	In progress
	(f) Ayios Nikolaos (L'ssol)	120 000	108 216	Completed
14	Palekhori Distr.	130	—	Completed
15	Southern Conveyor	6 000	1 374	In progress
16	Pakhyammos Irrig. works	40 545	60 111	In progress
17	Polemidhia irrig. works	36 432	36 702	Completed
18	Yermasoyia irrig. work	41 003	60 805	Completed
19	Mari irrig. scheme	56 480	7 586	In progress
20	Pissouri—Alektora irr. works	99 000	87 289	—do—
21	Ayia Marina (Paphos)	3 720	3 687	Completed
22	Pomos distr. system	45	—	Completed
23	Lefkara distr.	12 861	3 701	In progress
24	Kiti distr.	205	—	Completed
25	Palekhori—Sklydhros distr.	3 547	1 540	In progress
26	Paphos irrig. project Lot 4C1 &4C2	557 180	260 000	In progress
	Total	£1,223 576	£817 460	

TABLE V-9
TOWN WATER SUPPLY SCHEMES UNDERTAKEN FOR EXECUTION IN 1978

Ser No	Description	Amount allocated for 1978 £	Expenditure incurred in 1978 £	Remarks
1	Nicosia within the walls (New distr. system)	7 740	7 740	Completed
2	**New trunk pipelines—Nicosia WS**			
	(a) Lakatamia Res.—Pendadaktylos str. pipeline	27 882	22 123	Connection with new R'voir pending
	(b) Engomi Res.—Kalypso str.	8 280	1 416	Completed
	(c) Pentadaktylos str.—Stadhiou str. (Strovolos)	40 188	39 131	Completed
	(d) Strovolos Res.—Old mental hospital	141 370	139 404	Completed
3	Supplem. W S from B/H 46/78	3 800	386	
4	K/trimithia Emergency scheme (supplem. W S from B/H 2/76)	21 982	3 822	
5	Supplementary W S from B/H 48/78 (Airport)	6 500	2 047	
6	Lakatamia Reservoir	50 000	33 211	In progress
7	Engomi Reservoir	2 634	—	Completed
8	Tseri—Paleometokho Emergency scheme	1 467	—	Completed
9	Pendayia	3 229	—	
10	Paphos Municipality W S	4 124	3 070	Completed
11	Larnaca Water Board	4 400	4 400	Completed
	Total	£323 596	£256 750	

Note: Items 1 to 9 above are all for Nicosia Water Supply

TOWN WATER SUPPLY SCHEMES

During the year the Department had to deal with 11 town water supply schemes of an estimated cost of £323,596. The overall expenditure incurred on all these schemes during the year reached the amount of £256,750.

A detailed report on some of the most important schemes is given elsewhere, further on in this report. A list showing the 11 Town Water Supply Schemes that were undertaken for construction by the Department during the year is given on Table V-9 above.

Nicosia Within the Walls Distribution System

The installation of a pressurised water supply system in the "within the walls city of Nicosia" started at the end of 1973. The works were interrupted in 1974 because of the Turkish invasion and the prevailing situation. By then only 37% of the whole project was completed. Towards the end of 1975 the Nicosia Water Commission decided to complete the system. This second phase of the works started on the 12th of January 1976 and lasted up to the end of July 1976. Unfortunately it was again interrupted, the reason, this time being, that the Sewage Board had decided to complete their system in the within the walls area.

The co-ordination of the construction works for the two systems in some of the streets was necessary and so the completion of the new pressurised water supply system was postponed. Another 26% of the whole

system was completed during this second phase.

The third and final period of the construction works started on the 12th of December 1977. The various stages of this project involved:

Excavations: Where there were no other utility lines running along or crossing our trenches the excavation was being done relatively easy with the use of a digger. Where there were any difficulties or possibilities of damaging other utility lines, hand excavation was being done. The depth of the excavation was 1 to 1.30 m this again being indicated by the various difficulties involved.

Bedding, Pipe Laying and Testing: Sand was used as bedding material. Also approved granular material was used from the centre line of the pipe to 30 cm above the crown of the pipe. Finally backfilling was being done with selected material obtained from the excavation adequately compacted.

All pipes used (4" and 6" dia) were asbestos cement pressure pipes class "B". All service connections from the water main to the street line at each property were between 3/4" and 1" dia PVC (Polyvinic chloride) pipes, also class "B".

After laying and backfilling all newly laid pipes were subjected to leakage pressure test at 120 psi. The water mains were being tested in sections never exceeding 200 m. After a successful test the pipes were being flushed and put into operation.

General Remarks

These works proceeded with many expected difficulties because of the various utility lines coexisting in very narrow streets. Nevertheless, the progress was very satisfactory and within seven months about 24% of the whole system was completed. Another 13% of the original system has now been abandoned as it extends in the no-mans-land area, created after the Turkish invasion of 1974.

The old distribution boxes were disconnected from the system and all the consumers in the Greek sector cf the within the walls city of Nicosia, are now served from the new pressurised water supply system.

The actual expenditure incurred during 1978 is £38,000. The amount of £7,740 shown on the table for Town water supply schemes, represents only payment of regular employees and Departmental charges. All other payments as well as the issue of materials were done through the Nicosia Water Board.

Pipeline from the Strovolos Reservoir to the Old Mental Hospital

The above work estimated at £174,000 is financed by the Nicosia Water Board and involves the laying of 2,400 metres long 700 mm dia AC pressure pipeline, Class 20 ATMS and 600 m long 600 mm dia AC pipeline. The main objective of this work is to reinforce the existing network of Nicosia Water Supply and provide sufficient capacity of water to areas 2 and 3, based on a study by consultants Mac Laren of Canada.

Work on this scheme commenced on 28.11.1977 and by the end of the same year a length of about 800 metres of pipeline was completed. In 1978 work continued and was completed by the end of the year except one connection with the existing pipeline near the Old Mental Hospital.

The whole pipeline was tested successfully for a pressure of 100 Ibs psi.

The total expenditure reached the amount of £142,000.

Contract No C1 39/76/27 (Lots 4C 1 & 4C 2) of Paphos Irrigation Project

Due to failure on contractors ASPEM Construction Ltd to execute the above contract which includes the installation of canalletti of various sizes 7,920 m long and Asbestos Cement Pressure pipes of various diameters 14,400 m long, this work was undertaken by the Department through direct labour.

The Contractors commenced the above works late in 1977 and continued until May 1978 covering a period of about six months, and an expenditure of about £18,000.

The cost of the scheme was revised during 1978 to £557,180. This estimate includes the purchase of AC pipes and canaletti, as well as labour costs etc. During 1978 all

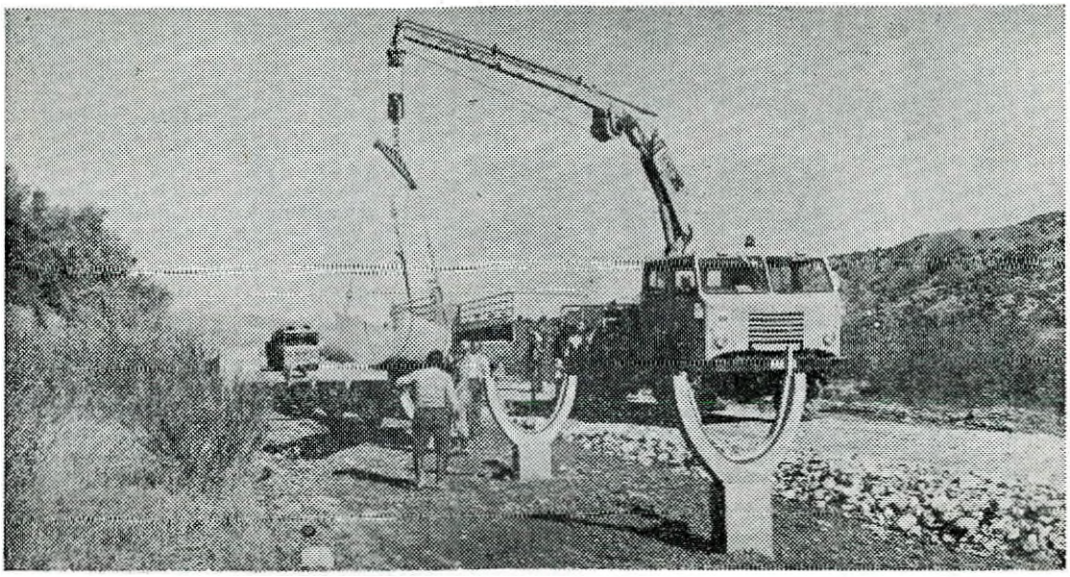
A C pipes with their specials and part of the canaletti were delivered at the site of the works and considerable work was executed by the Department. The overall expenditure during 1978 including the cost of A C pipes and specials, reached the amount of £260,000. By the end of the year approximately 50% of the total works was completed, satisfactorily. Work will be continued in 1979 and it is expected that this part of the Paphos Irrigation Project will be completed by the end of August 1979.

Although the scheme was not completed during the year by the end of January 1979 an emergency pumping was carried out, giving about 300 m³/hour for the irrigation of the plantations.

YERMASOYIA-POLEMIDHIA PROJECT

(1) Ayios Nikolaos Extension

The scheme was designed to irrigate an area of about 1100 donums of citrus and vines, which belong to the Ayios Nikolaos farm situated south of Akrotiri salt lake. It



Canaletti shown in the photograph being laid, will be used for the conveyance of water from boreholes to the Paphos Irrigation Project main canal.

Pissouri Irrigation Scheme

The scheme was designed to irrigate the vineyards of Pissouri village area which is estimated to be 4,000 donums. It consists of a diversion weir on the Khapotami river near Pano Arkhimandrita village and a 12" dia 13,000 m long A C main conveyor to Pissouri plantations.

The scheme was included in the 1978 budget as an emergency scheme after a decision by the Council of Ministers in the spring of 1978 and was put in hand in July 1978.

By the end of the year the diversion weir was completed and a length of about 8200 m of the main conveyor was placed.

consists of 6 900 m A C and PVC pipes of various diameters from 150–500 mm.

The work was put in hand early in 1978 and was completed by the end of the same year. The total amount spent was £108,216 against an estimated cost of £120,000.

(2) Trakhoni Extension

The scheme which started in 1977 continued in 1978 and consists of a pumping scheme, a night storage reservoir and the distribution system. On completion, the scheme will irrigate an area of about 4 500 donums of citrus, vines and vegetables.

The total estimated cost as revised in 1978

was £893,000. During 1978 the amount of £191,971 was spent on the scheme which is expected to be completed by the end of June 1979.

(3) Yermasoyia Irrigation Division

This scheme was designed to irrigate an area of about 1 050 donums in the Yermasoyia river valley from the Yermasoyia Dam and a number of B/Hs of the Irrigation Division in the aquifers of the same river.

The scheme consists of a main conveyor of 200 and 250 mm dia from Yermasoyia Dam and distribution system of AC pipes of 100–200 mm dia. The main conveyor was laid in 1977 as phase I of the whole scheme and the distribution system started in the beginning of 1978 and continued throughout the year. A length of about 14,800 m of AC pipes was layed and an amount of £60,805 was spent.

The scheme will continue in 1979 and is expected to be completed by the summer of the same year.

(4) Polemidhia Irrigation Division

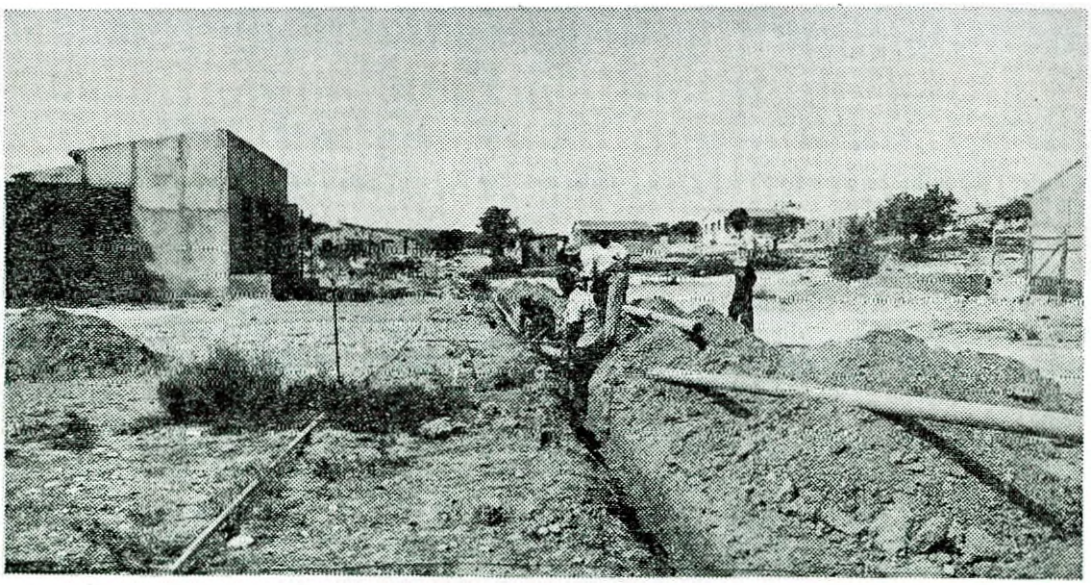
This scheme is designed to cover an area of about 1200 donums from Polemidhia dam, cultivated mainly with seasonal crops.

The work was put in hand by the end of 1977 and continued during the year of 1978. A length of 5,580 m of AC pipes were layed of 100–600 mm dia and an amount of £36,702 was spent.

The original estimated cost was £120,000 but later this was revised to £96,000. The revision was considered as necessary as some of the area was developing into a residential area and although this will be irrigated at the wish of the owners, finally it was excluded from the distribution system and outlets were allowed at key points for irrigation through existing earth channels.

WATER SUPPLY SCHEMES TO REFUGEE HOUSING AND SELF-HOUSING SCHEMES

As already mentioned, in addition to its usual activities the Department, during the year under review, had to respond to the urgent demand for the supply of water to all the Refugee housing and the self-housing schemes. 99 such schemes of an estimated



Soon after the Turkish invation of Cyprus in July-August 1974 the Department was called to provide running water to makeshift refugee camps. Since then nearly £1.5 million has been spent from extra-departmental votes on water supply schemes for refugee housing estates. In the photograph pipelaying is taking place for a Larnaca District Refugee self housing estate.

cost of £531,652 were involved; 78 of these schemes of an estimated cost of £330,095 were related to self-housing and 21 to housing estates of an estimated cost of £201,557.

The overall expenditure incurred on the execution of all these schemes during the year reached the amount of £269,993. It should be noted that the Department always dealt with these schemes with the utmost urgency, giving them top priority over the execution of all other works and this of course caused enormous difficulties having in mind the shortage of skilled and unskilled labour force.

Some of these housing estates can easily be classified as major projects. Such schemes are the Platy Housing Estate at Eylenja with an expenditure of £30 618 during 1978 and Ayios Mamas at Kato Lakatamia with an expenditure of £24,130.

52 of the schemes were completed by the end of the year, 2 schemes were abandoned and the remaining 45 schemes were carried over for completion in 1979.

Table V–10 shows in detail all 99 Refugee housing schemes undertaken for execution during 1978.

TABLE V–10

WATER SUPPLY SCHEMES TO GOVERNMENT HOUSING ESTATES AND SELF-HOUSING PROJECTS FOR THE DISPLACED PEOPLE

Ser No	Description	Amount allocated for 1978 £	Expenditure incurred in 1978 £	Remarks
(a)	**Self-housing Projects**			
	NICOSIA DISTRICT			
1	Pera Khorio (Nisou) A	1 434	356	Completed
2	" " B	1 294	144	Completed
3	" " C	7 641	3 749	In progress
4	Ayii Trimithias A	56	7	Completed
5	" " B	9 500	4 659	In progress
6	Paleometokho A	255	99	Completed
7	" B	4 400	3 632	In progress
8	Peristerona A	88	61	Completed
9	" D	7 200	6 109	In progress
10	Yeri A	2 091	1 657	Completed
11	Yeri B	5 100	—	For execution in 1979
12	Nisou A	324	18	In progress
13	" B	407	39	In progress
14	Laxia B	5 848	5 303	In progress
15	Orounda A	188	35	Completed
16	Kokkini Trimithia A	4 857	358	Completed
17	" " B	7 264	174	In progress
18	Tseri B	839	216	In progress
19	" C	6 800	832	In progress
20	Klirou A	2 200	181	In progress
21	Meniko A	1 900	1 659	Completed
22	Astromeritis B	3 700	350	In progress
23	Akaki C	6 700	1 744	In progress
24	Akaki D	600	497	In progress
25	Alambra A	3 100	58	Abandoned

TABLE V–10

WATER SUPPLY SCHEMES TO GOVERNMENT HOUSING ESTATES AND SELF–HOUSING PROJECTS FOR THE DISPLACED PEOPLE (continued)

Ser No	Description	Amount allocated for 1978 £	Expenditure incurred in 1978 £	Remarks
26	Aredhiou B	1 350	211	Completed
27	Aredhiou C	1 570	1 201	In progress
28	Dhali B	2 700	1 905	Completed
29	Agrokipia A	4 800	243	In progress
	LARNACA DISTRICT			
30	Kiti A	1 460	100	Completed
31	" B	748	291	Completed
32	" C	6 700	5 641	Completed
33	Alethriko A	655	66	Completed
34	" B	3 150	3 105	Completed
35	Kalokhorio B	886	21	Completed
36	" C	930	162	Completed
37	" D	5 000	3 197	In progress
38	Livadhia A	225	138	Completed
39	" B	323	212	Completed
40	" C	5 000	3 123	Completed
41	" D	10 000	5 053	In progress
42	Tersephanou B	530	124	Completed
43	Dhromolaxia B	312	218	Completed
44	" C	5 500	3 753	Completed
45	" D	18 000	8 637	In progress
46	Athienou A	447	38	Completed
47	Perivolia A	116	116	Completed
48	" B	2 900	1 832	In progress
49	Kornos A	523	118	Completed
50	Xylophaghou C	769	275	Completed
51	" D	10 200	8 030	Completed
52	Anglisidhes B	5 000	3 457	Completed
53	Voroklini B	4 500	3 464	Completed
54	" C	6 400	2 409	In progress
55	Skarinou A	3 300	—	Abandoned
56	Kophinou B	15 200	8 756	In progress
	FAMAGUSTA DISTRICT			
57	Vrysoulles A	8 247	542	Completed
58	" C	1 400	1 050	Completed
59	Phrenaros A	446	115	Completed
60	" C	1 066	164	Completed
61	Sotira C	3 400	2 261	Completed
62	Paralimni C	1 031	325	Completed
63	Dherinia A	4 081	795	In progress

TABLE V–10

WATER SUPPLY SCHEMES TO GOVERNMENT HOUSING ESTATES AND SELF–HOUSING PROJECTS FOR THE DISPLACED PEOPLE (continued)

Ser No	Description	Amount allocated for 1978 £	Expenditure incurred in 1978 £	Remarks
64	" B	9 607	1 902	In progress
65	Avgorou E	3 700	2 655	Completed
	LIMASSOL DISTRICT			
66	Kolossi A	1 795	87	Completed
67	" B	12 200	7 478	In progress
68	Trakhoni A	1 123	641	Completed
69	" B	13 500	8 836	Completed
70	Pano Polemidhia A	1 664	407	Completed
71	Pano Polemidhia B	3 670	2 232	Completed
72	" " C	8 870	6 534	Completed
73	Kato Polemidhia A	17 300	4 935	In progress
74	Episkopi B	6 200	4 630	Completed
75	Evdhimou A	1 065	1 065	Completed
76	Moutayiaka A	7 000	4 621	In progress
77	Ayia Phyla A	6 000	4 292	In progress
	PAPHOS DISTRICT			
78	Timi A	13 750	671	In progress
	Total	330 095	154 131	
	(b) Housing Estates			
1	Pano Lakatamia (Anthoupolis)	27 530	16 310	In progress
2	Laxia	3 999	3 999	Completed
3	Strovolos II "A"	724	249	Completed
4	" III "B"	12 116	6 710	Completed
5	Platy—Eylenja	46 166	30 618	In progress
6	Ayios Mamas (K. Lakatamia)	31 189	24 130	In progress
7	Ayios Nikolaos Pallouriotissa)	1 175	1 113	In progress
8	Ayia Varvara (Pallouriotissa)	6 920	3 895	In progress
9	Ayios Yeoryios (Pallouriotissa)	15 688	12 588	In progress
10	Ayios Athanasios (Linopetra) L'l	6 100	7 873	Completed
11	Ayia Napa	4 200	3 226	Completed
12	Ayios Ioannis (L'ca)	11 600	9	In progress
13	Kapsalos (L'l)	4 000	365	In progress
14	Ayios Yeoryios (L'ca)	5 500	1 822	In progress
15	Makarios III (L'l)	3 150	950	In progress
16	Ayii Anargiri (L'ca)	18 000	—	In progress
17	Zyyi	1 500	826	In progress
18	Makarios III (L'ca)	900	323	In progress
19	Kophinou (Invest)	500	354	Completed
20	Platy (Invest)	300	150	Completed
21	Kamares II (L'ca)	300	352	Completed
	Total	£201 557	£115 862	

Note: Letters A, B, C, D denote phases of construction of refugee estates

SCHEMES UNDERTAKEN FOR CONSTRUCTION FOR OTHER DEPARTMENTS VILLAGE AUTHORITIES PRIVATE DEVELOPERS ETC.

Schemes Undertaken for Construction for Other Government Departments

During the year the Department undertook 76 schemes for construction on behalf of other Government Departments. Most of these schemes were related to water supplies to Turkish villages, industrial areas, stock farms etc. The funds were allocated by the Ministry of the Interior, the District Officers, the Ministry of Commerce & Industry and the Departments of Agriculture and Forests etc.

Table V–11 shows all 76 schemes that were undertaken for execution in 1978.

In total, on all schemes executed for other Departments the expenditure incurred during 1978 reached the amount of £164 226.

Village Water Supply Schemes from Village Deposits

During the year 134 such schemes were undertaken by the Department for execution from funds deposited by the Village Water Commissions. These schemes were related to extensions of distribution mains, installation of water meters, maintenance of pumping units etc. On all these schemes the expenditure incurred during 1978 reached the amount of £27 223.

Minor Irrigation Schemes Undertaken for Villages from Funds Deposited by the Irrigation Committees.

During the year 23 such schemes were undertaken for execution by the Department. Mostly they were related to maintenance of pumping units, minor extensions etc. The overall expenditure incurred during the year reached the amount of £8 447.

Schemes Undertaken for Private Developers

It is the usual practice of the Department to undertake such water works for land development especially within inhabited town or village areas, so that the standard of work is maintained to the same level as the remaining distribution system of the town or village concerned.

During 1978 the Department undertook the construction of 200 such schemes for private developers. The expenditure involved on these schemes reached the amount of £96 426.

LABOUR

The average number of labourers employed by the Department during 1978 was 801 as compared with 937 in 1977.

55% were classed as regulars and 45% were casual labourers. 78% were skilled employees, 15% semiskilled and 7% unskilled.

No Turks were employed during 1978. The approximate daily average of labourers engaged per month was as follows:

January	816
February	752
March	711
April	716
May	746
June	721
July	781
August	875
September	869
October	894
November	874
December	857
Monthly average	801

TABLE V–11

SCHEMES UNDERTAKEN FOR CONSTRUCTION FOR OTHER GOVERNMENT DEPARTMENTS

Ser No	Description	Amount allocated for 1978 £	Expenditure incurred in 1978 £
(a)	**Maintenance and Improvements of Water Supply to T/C properties. Funds allocated by Ministry of Interior and D O.**		
1	Maintenance of T/C B/Hs	7 402	2 173

TABLE V–11

SCHEMES UNDERTAKEN FOR CONSTRUCTION FOR OTHER GOVERNMENT DEPARTMENTS (continued)

Ser No	Description	Amount allocated for 1978 £	Expenditure incurred in 1978 £
2	Evdhimou W S	1 243	1 099
3	Klavdhia W S	4 545	2 755
4	Stavrokonou	2 076	80
5	Paramali	1 613	104
6	Anglisidhes	63	63
7	Tokhni	853	621
8	Mouttallos (P)	29 783	29 617
9	Pano Polemidhia	758	511
10	Peristerona (N'sia)	4 359	1 389
11	Kandou	440	168
12	Goshi	460	182
13	Pyrga	100	90
14	Kochati	754	647
15	Aplanda	4 950	3 887
16	Anaphotia	1 975	1 469
17	Menoyia	8 750	4 588
18	Ayios Theodhoros	200	170
19	Kophinou	1 500	1 140
20	Mari	1 700	1 525
21	Bekir Pasha (B/H)	120	109
22	Moustafa Houssein (B/H)	200	200
23	Kellia	8 000	2 777
24	Theletra	22 900	8 723
25	Ayia Anna	4 000	1 167
26	Mathiatis	1 135	313
	(b) Industrial Areas, Funds allocated by Ministry of Commerce & Industry		
27	Aradhippou Industrial Area	4 700	3 450
28	Paralimni " "	12 000	8 595
29	Strovolos " "	6 000	3 123
30	Paphos " "	13 800	11 642
31	Phrenaros " "	6 625	4 275
	(c) Livestock Areas. Funds Allocated by Ministry of Agriculture		
32	Akaki Livestock area	8 500	6 138
33	Kolossi " "	18 600	6 670
34	Mandria " "	7 000	6 139
35	P & K Polemidhia Farming area	13 000	67
	(d) Replacement of Pipelines due to Construction of roads by PWD		
36	Kokkines—Tsiakkilero	500	481
37	Phrenaros (B/Hs)	547	547

TABLE V–11

SCHEMES UNDERTAKEN FOR CONSTRUCTION FOR OTHER GOVERNMENT DEPARTMENTS (continued)

Ser No	Description	Amount allocated for 1978 £	Expenditure incurred in 1978 £
38	Larnaca—Paphos—Zyyi (B/Hs)	600	510
39	Presidential Palace W S	470	443
40	Potamos Yermasoyia	600	444
41	Vrysoulles	190	110
42	Yermasoyia river	960	960
43	U N Peristerona Hut	180	168
44	New Bridge—Yermasoyia R	240	240
45	Saittas—Karvounas	3 000	2 766
46	Dheftera—Kambia Road	120	90
47	Souni Zanaja	200	140
48	Petra tou Romiou	4 600	5 712
49	Polis—Akamas	6 160	5 149
50	Galata Road.....	788	788
	(e) Other Schemes		
51	Athalassa Nursery—Forest Dept	3 976	3 090
52	Polemidhia—Testing of B/Hs—GSD	4 500	4 393
53	Dhali—Testing of B/Hs—GSD	600	543
54	Laxia (Irrig)—ARI	530	356
55	Laxia—Town Plan. & Housing.....	1 000	333
56	Kalopanayiotis Dam (Irrig)—DO	2 000	1 944
57	Akhna Forest Camp W S—TP & H.....	5 157	4 003
58	Fire Hydrants—Fire Service	1 350	1 185
59	Ayios Ioannis (Paphos)—Improv. Board	170	164
60	Mavrokolymbos Dam—DO	110	102
61	Khrysokhou W S—DO	60	55
62	Stavros Refugees Camp—TP & H	120	112
63	Kholi, Skoulli, Goudhi Irr.—DO	959	671
64	Akhelia Tsiftlik Irrig. MANR	330	323
65	Episkopi, Fly Over Water Channel—Ministry of Interior	800	688
66	Ayios Ioannis (Malounda) Irrig—Ministry of Interior	400	362
67	Spitali—Paramytha WS—DO	150	145
68	Polemi (Irrig.)—DO	713	240
69	Dhrymou W S—DO	370	323
70	Argaka W S—DO	500	125
71	Panayia ton Emnon WS—M. of Interior	300	293
72	Iera Moni Archangelou Michael—DO ...	200	200
73	Larnaca Salt Lake Pumping Scheme Ministry of Finance	13 000	8 723
74	New Lambousa School W S.....	1 118	1 235
75	Xylophaghou Police Station W S—Ministry of Interior	325	244
76	Bellapais Camp—Ministry of Interior ...	295	160
	Total.....	£258 292	£164 226

V/1 PAPHOS IRRIGATION PROJECT

by
K Spanos
Executive Engineer II
Deputy project Manager

General

During the year 1978 the construction activities for the implementation of the Paphos Irrigation Project were extended to nearly all parts of the Project and by the end of the same year the Project was reaching its highest intensity in the construction programme which is to be continued the next 2 years or so.

Altogether, by the middle of 1978, works for 9 Contracts for supply or construction were continued or just put in hand of total value of £14,334,464 as shown by the progress chart on page 104. Some oft he works on contract were completed during the year 1978, like the Main Canal, the Central Offices at Yeroskipos and the Supply of A C Pipes with fittings and valves for the Wellfield Conveyance System, but the majority of them were continued in 1979. The 1978 Development Estimates provisions for the Paphos Project amounted to £2,902,000 which at the end was exceeded by £392,337 for which a special warrant was issued at the end of the year.

For the supervision of the execution of the Contract works some more technical staff were employed during the year 1978 giving the following total number of staff occupied with the Project works at the end of 1978:

Technical Staff	Administrative Staff
1 Executive Engineer I, Project Manager	1 Administrative Officer
1 Executive Engineer II, DPM	1 Accounting Officer
2 Executive Engineer II, (monthly)	3 Clerical Assistants
2 Executive Engineer II, (daily)	2 Secretary–typists
2 Technical Assistants (monthly)	1 Telephonist
19 Technical Assistants (daily)	1 Messenger
4 Surveyors	9 No. total administrative staff
5 Draughtsmen	
3 Foremen	
39 No. total technical staff	

In addition to the above staff, the services of 2 F.A.O. Experts were utilised as well as of 3 expatriate Civil Engineers from the Consultants who were assisting the work of the 2 Resident Engineers.

PROGRESS OF WORKS

Out of the 9 Contracts which were under execution during the year 1978, 5 were continued from the previous year and 4 were started around the middle of the reporting year. Details about each one of them is given herebelow:

1. Main Canal—Contract No. C3-59 39/76/23

About 65% of the works involved in the Main Canal Construction have been completed during the year 1977 and all relevant details about these works were given in the annual report 1977.

By the middle of 1978 the remaining part of the works has been substantially completed by the Contractor "General Construction Co. Ltd" which consisted mainly of about 60,000m² of canal lining, filling all canal longitudinal and cross-sectional joints with guttaterna, 3 bridges, 5 culverts, 1 crossing of thalweg and 4 watering places. Finally the small horizontal cracks which appeared on some panels of the concrete lining over the first half of the canal length were repaired by covering them with cement mortar mixed with sikalatex and bentonite. During the watertightness test the losses from the canal were found to be much less than the acceptable limits and therefore the canal was proved successful and completion certificate was issued by the Resident Engineer in December 1978. Operation of the Canal will start from 1979 to irrigate the sectors of the Eastern Area with water from the wells in the river gravels of Dhiarizos, Xeropotamos and Ezusas.

The total net payments to the Contractor for works carried out during 1978 was £278,863 bringing the Canal cost up to the end the year to £842,249. It is estimated that the final cost figure for this contract will be of the order of £950,000 which includes the amount of £111,000 paid to the Contractor as additional to contract rates compensating increases in labour and basic materials costs.

At its award the contract sum based on the original estimated quantities and basic rates was amounting to £992,826.

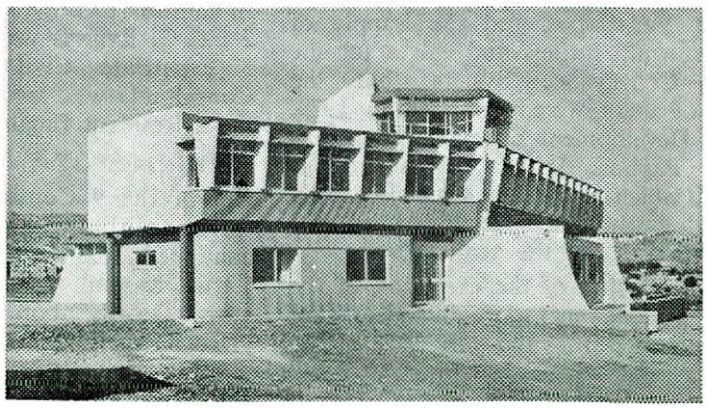
The total saving of about £150,000 was the result of reduction in the quantities carried out mainly because of over-estimation by the Consultants at tender stage as well as because of modifications in the original plans during construction where there was room for improvement or economy.

2. Central Offices Contract No. 39/77/22

The construction of the Project Central Offices at Yeroskipos was continued by the Contractor "HadjiDemosthenous Co. Ltd." in order to complete all internal and external wall and floor finishes. The progress on this work was rather slow and its completion was reached by July 1978 i.e. with about 5 months delay. Finally the transfer of the Project and Regional Office staff to the new Offices became possible in November 1978 due to a late connection of the telephone lines. The contract sum of £40,414 was exceeded by some £822 which was the cost of the additional works carried out.

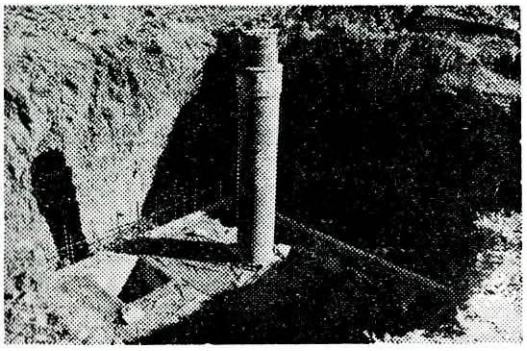
3. Supply and Installation of Well Pumps Contract No. S1 39/76/28

Although works were started by the Contractor Caramondani Bros Ltd from October 1977 very little progress was achieved during the first months of their activities.



Paphos Irrigation Project Central Offices at Yeroskipos.

The slow progress in his works for the construction of the well head structures was also continued during the first 4 or 5 months of the year 1978 due to the heavy winter rains and the continuous flows in the three rivers of Dhiarizos, Xeropotamos and Ezusas. In all the Contractor had to erect 21 well head structures and install their submersible electric pumps to a depth of about 26 metres together with all necessary electrical and hydromechanical equipment. The remaining 3 Project boreholes were already equipped



Construction of borehole well head. 24 such boreholes are included in the Paphos Irrigation Project.

and put in operation by the Agriculture Dept. Finally the Contractor, after extensive dewatering operations in about half of the wells which were located right in the middle of the river beds, managed to complete the civil works towards the end of the year 1978. Altogether about 205 m^3 of concrete class 350/25 were poured and 7,826 kg of steel reinforcement were used for the 21 well head structures. The quality of the civil works was not always satisfactory and some repairs were asked to be carried by the Contractor. The pump manufactures, EMU and RITZ, had their pumps ready and tested at their factory during the first quarter of the year 1978. Following the test approval by the Consultants all the pumps were shipped to Cyprus and delivered to the site by June 1978.

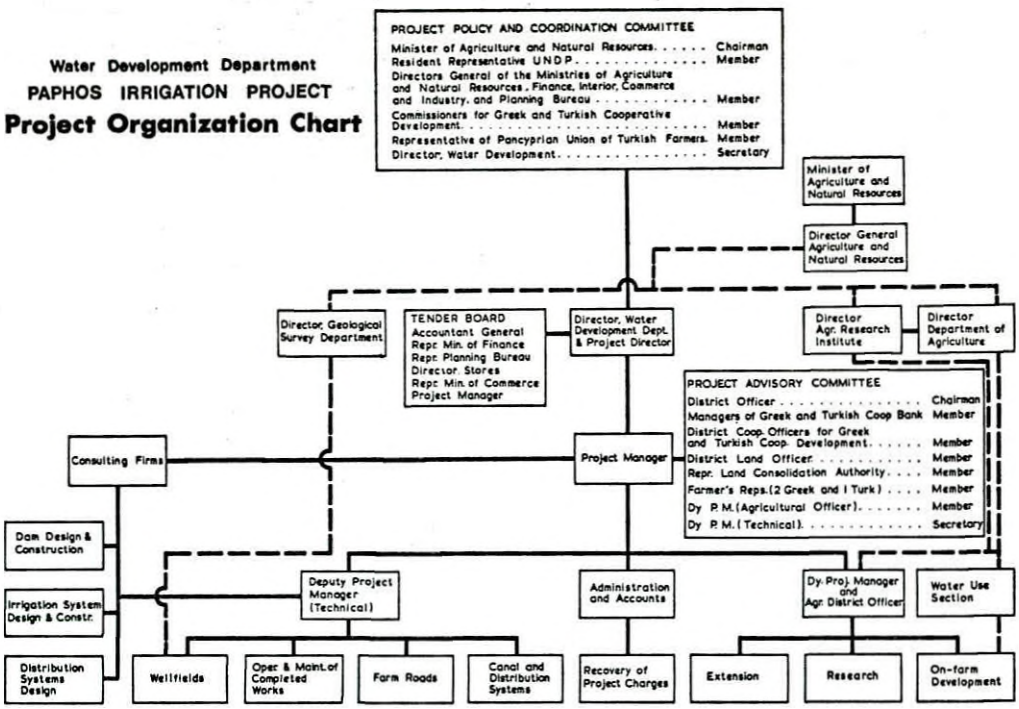
In the meantime the set up of the electrical panels was prepared in the Contractor's workshop. Installation of the electro-mechanical equipment started from July 1978 and proceeded quite satisfactorily. Some difficulties were met again in the boreholes where ground water table was kept nearly up to the ground surface. By the end of the year 1978 all 21 pumps had been installed but their testing was scheduled for the beginning of the year 1979. From the total contract sum of £142,372 the Contractor has received total payments during the year 1978 amounting to £81,402.

4. Installation of Wellfield Conveyance System and Eastern Main Pipeline. Contract No. C1 39/76/27.

Following the award of this contract to ASPEM Construction Ltd. at the sum of £162,889 some work on the pipeline installation from the lower boreholes was started from November 1977. During the first quarter of the year 1979 the Contractor did not show any activities in the installation of the canaletti lines either in Dhiarizos or Ezusas rivers but he only continued at quite slow rates his work on the pipeline installation despite some serious warnings from the Resident Engineer. By May 1978 the Contractor was already 4 months behind his programme and showed no indication of any possible improvement in his progress rate as his financial position had worstened with time. In view of the above the Contractor has been given the notice of forfeiture as provided in the Conditions of Contract. In order to avoid any further loss of time and big cost increases the continuation of the works has been undertaken by the Construction Section of W.D.D. at the estimated cost of about £260,000. From the end of May 1978 various sections of the work in both the pipelines and the Canaletti were organised and by the end of the year more than 50% of the total amount was completed. More details about the actual work carried out are given in chapter V of the report.

5. Supplies for Wellfield Conveyance System—Lot 3S1 Canaletti

Although the first canaletti were manufactured in May 1978 their delivery to the site started in December 1978 in order to be installed along the Dhiarizos river. Their cradles, footings and supports were delivered and installed for the same river



earlier. The quality of the supplies was not always acceptable and some cradles and footings had to be rejected on the site as being cracked.

By the end of the year the total amount of £17,938 was paid to the suppliers J&P for the accepted items delivered to the site out of a total contract sum of £66,850.

Lot 3S2, 3S3 Supply of A C pipes, fittings and valves

The supply of the above items by ISASBEST of Israel at the total contract cost of £208,402 was started in October 1977 and completed by the middle of 1978 except for some special fittings from a variation order. Apart from some difficulties in making some of the C.I. pieces to fit with the A.C. pipes the quality of the supplies was quite good.

6. Installation of Irrigation Network and Construction of Reservoirs for Eastern Sector Contract No. C7 39/77/38-39.

The award of the above contract for which international tenders were invited in 1977 was finally offered to the French company SOCEA at the price of £1,592,534 (excluding the cost of the supplies by the sub-contractors) which was the lowest offer. The contract agreement between SOCEA and W.D.D. was signed on the 18th February 1978.

The total length of A.C. pipes to be laid under the above contract is 450 Km of various diameters from 80 mm dia. to 600 mm dia. together with all necessary hydraulic equipment. It also includes the construction of 7 balancing reservoirs and one storage reservoir.

The works for the construction of the storage reservoir which will serve the irrigation network of Ayia Varvara started in June 1978.

The reservoir will provide a storage of about 3,000 m^3 and its main feature is the concrete lining of 15 cm thickness placed on its bottom and side slopes of 3 to 2. The necessary earthworks which included about 4,700 m^3 of excavation mainly by ripping and 1,000 m^3 of backfilling to form the reservoir

slopes were completed by the end of October 1978. Concreting works were started with some delay due to the long time taken by the contractor to organize his weight batching of the concrete as imposed by the contract specifications. By the end of the year 1978 about 135 m³ of concrete class 300/25 was placed for the reservoir lining which was about 60% of the total quantity.

The quality of the work was quite good.

The pipelaying for the irrigation network was started according to the programme i.e. beginning of October 1978 in the sectors of Kouklia and Akhelia after the receipt of the required quantities of A.C. pipes and fittings. This work proceeded quite normally and in a well organized manner. The trench excavation was carried out by the use of a trenching machine imported by the Contractor for the 80—200 mm dia pipes and 3 other diggers for the bigger diameter. The output of the trenching machine alone can reach more than 1 km of length per day. A slow down in the works was noted during the month of December and reached only 45% of the previous month. In total 60km of pipes have been installed by the end of the year 1978 whereas according to programme 95km of pipeline should have been completed. The Contractor, however, is expecting to recover the delays in the coming months so that completion of the works will be achieved as originally planned at the end of the year 1979.

The total amount paid to the Contractor for his works including an advance payment for mobilization reached the sum of £273,782 which is about 17% of the total contract sum.

7. Supplies for Irrigation Networks of Eastern Area.

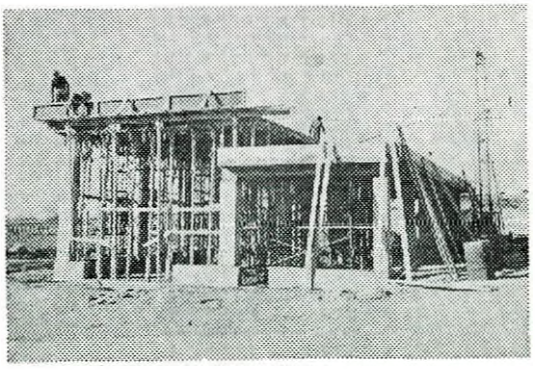
7.1. Lot 5 S1 Supply of Pipes and Special pieces Contract No. S 5-1 39/77/31.

This contract has been awarded to the cheapest tenderer which was "The Cyprus Pipes Industry Ltd." for the sum of £1,267,270. The A.C. pipes of 100 mm dia. up to 600 mm dia except the 450 mm dia are produced by the factory of C.P.I. The remaining diameters of 80 mm dia. and 450 mm dia will be imported from Hellenit of Greece. All the cast iron fittings will be also imported and the countries of origin are Greece (Chytiria Volos), England (Henry Robinson) and Yugoslavia (Poljoopskrba). The first supplies of pipes were delivered in July 1978 and continued quite satisfactorily up to the end of the year 1978 with a total of 154 km of A.C. pipes for the sectors of Kouklia, Akhelia and Koloni delivered at their storage yards. Some delays, however, were noted in the delivery of C.I. fittings causing some obstructions to the installation works. Altogether 130 tons of fittings were delivered to the site, but they could not meet the quantity requirements needed for completing the above three sectors.

The receipt of all the materials delivered was undertaken by the Project after a thorough check through visual inspections as well as hydraulic tests. The total payments issued to C.P.I. for all the accepted materials by the end of December 1978 amounted to £333,772.

7.2. Lot 5 S2 Supply of Valves. Contract No. S5-2 39/77/32

This contract has been awarded to Caramondani Bros. Ltd. for the sum of £113,868 which was the lowest offer. The manufacturers of the Valves will be Upadaya of India for sluice valves, Erchard of Germany for butterfly valves and Chytiria Volos for air valves. The first shipment of 500 sluice valves was on its way from India in December 1978.



One of the pumping stations of the Paphos Irrigation Project under construction in 1978.

7.3. Lot 5 S3 Supply of Hydrants. Contract No. S5–3 39/77/33

This contract has been awarded to Neophytos Demetriou for the sum of £251,052 which was again the lowest offer. The hydrants will be manufactured by Schlumberger of France. The total number of hydrants required is 665 pieces and by the end of the year 1978 more than 50% were delivered to the site at the total payment of £126,109.

8. Main Contract: Construction of Pumping Stations and Western Conveyor. Contract No. 6C 39/77/37

For the execution of the above contract international tenders have been invited which were opened on the 30th January 1978. Altogether 8 tenderers have participated (3 local and 5 foreign) with quite close prices. Following the evaluation of the bids, the tender was awarded to COSTAIN Civil Engineering Ltd. (U.K.) being the cheapest for the sum of £2,606,600 and the Contract Agreement was signed on the 21st June 1978.

The above works include:

★ The construction of 14 Pumping Stations of total constructed area of over 2,400 m^2 at the cost of about £250,000.

★ The supply and installation of the electromechanical equipment for 15 pumping systems to serve an equal number of irrigation networks plus for the main lift pumping unit to feed the Western Main Conveyor with 1.7 m^3/s of water from the end of the Main Canal. For their operation the total power requirements of all the above pumping systems will be of the order of 5500 KVA. The cost of all the electro-mechanical works will amount to about £690,000.

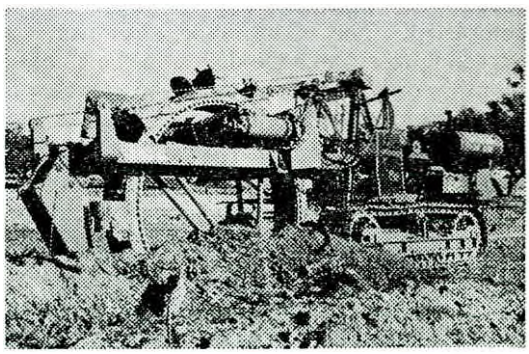
★ The construction of the Main Western Conveyor of 23km of pipe length extending from Yeroskipos to Ayios Yeoryios with maximum diameter of 900 mm dia. which is stepped down to 400 mm dia. at its end, at the total cost (supply plus installation) of £1,462,000.

★ The installation of a remote monitoring system for the control of the pumping stations operation from a central terminal room located at the Yeroskipos Project Offices, at the cost of about £100,000.

The work on the construction of the first 3 pump houses was started in August 1978 by the Sub-contractor of COSTAIN for the civil works "FYSKO Co. Ltd.". By the end of the year the civil works were in progress over 5 pump houses of the Eastern Project area. In all more than 300 m^3 of concrete class 350/15 have been casted for the foundations, the floor slabs and some of the columns and ring beams for the above works.

The quality of the works was generally quite satisfactory but its progress was slower than the anticipated schedule.

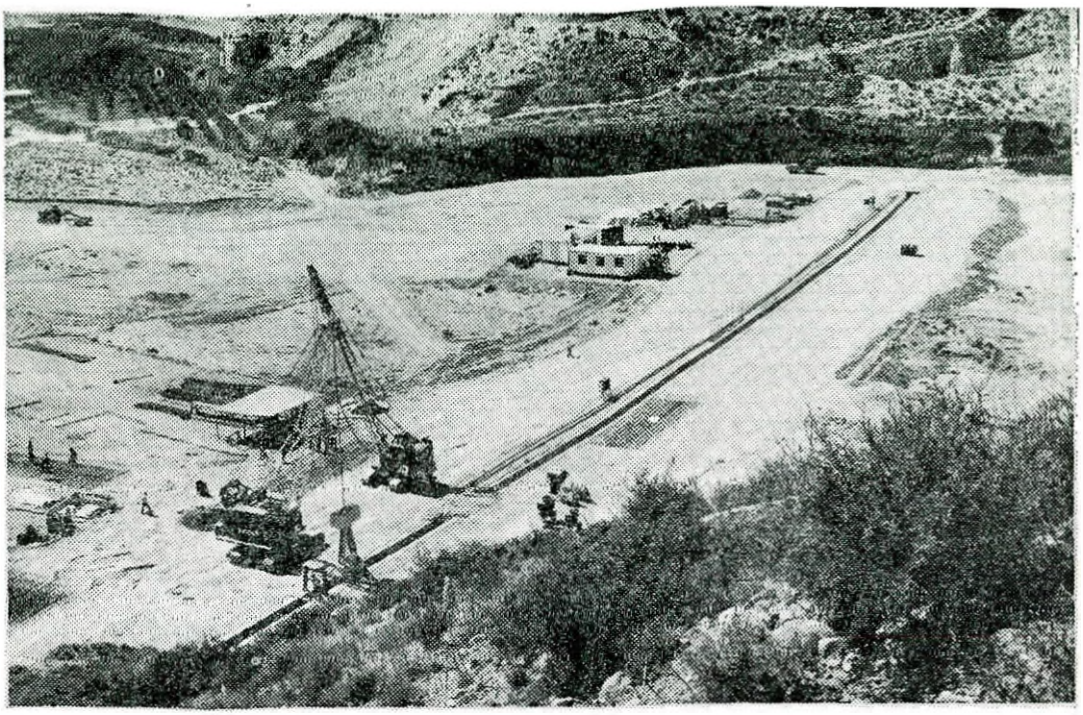
With regard to the Electromechanical equipment, the installation and supply of which was undertaken by "Worthington Simpson Ltd.", the overhead cranes for the first 5 pumping stations have been delivered to the site, while the pumps and motors were under production at the manufacturers' factory. During the year 1978 only one payment has been issued to the Contractor, the Advance for mobilization which amounted to £260,660.



An Irrigation distribution network of a total length of 600 km is being constructed for the Paphos Irrigation Project. In the photograph a trench excavator is shown at work.

9. Asprokremmos Dam—Contract No. C2 39/77/26

Following the evaluation of the bids for this contract (details were given in Annual Report 1977) the lowest tenderer was accepted which was the "Joint Venture" of "Joannou & Paraskevaides Ltd." with



General view of work at Asprokremmos Dam. Machinery can be seen working on the excavation for the 25 m deep cut-off wall along Dam axis.

"Medcon Construction Ltd." at the sum of £6,743,837. The Contract Agreement was signed on the 11th May 1978 and proceedings with the work followed immediately after and the following progress was achieved by the end of the year 1978.

Access Roads: Earthworks for the construction of the dam access road, of total length of about 2 km, started from June 1978 and proceeded normally up to the end of October 1978 when the final road formation level was reached. Total quantities of excavation and fill carried out was 52,000 m^3. The pavement of the access road is programmed after the completion of the main dam construction works.

Diversion Tunnel. Excavation works in open cut at the outlet and inlet of the tunnel started as programmed in June 1978. The tunnel pilot shaft excavation by controlled blasting was started in mid July from both ends of the tunnel but its progress was slower than the anticipated programme. Finally the pilot drive of about 3 meters diameter was completed by mid November carrying a total delay of about 2 1/2 months. Subsequently to this a revised diversion scheme consisting of a bank construction to retain the river flows in 50 metres wide section of the river channel on the left abutment side was adopted.

After completion of the pilot tunnel the Contractor proceeded with the excavation to produce the enlarged tunnel section starting from the upstream end with the intention that when the enlargement has progressed into the tunnel the concreting of the lining will commence and follow along. The total length of the diversion tunnel is 314 metres with internal diameter when lined with concrete of 4 metres. The estimated completion time for tunnel concreting is expected around mid 1979 which is about 6 months later than the original programmed date.

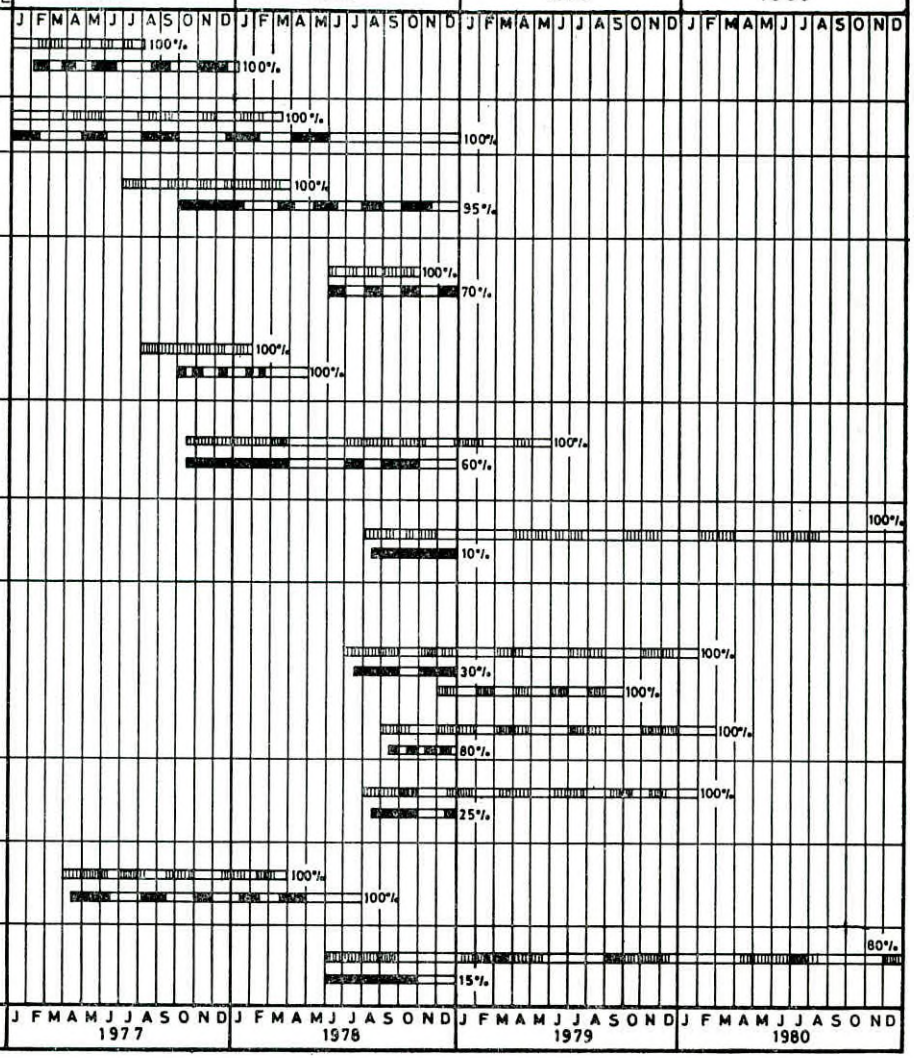
Drainage Galleries. A total length of 750 km of drainage galleries on both abutments are provided. Their excavation have commenced on programme in mid October and progressed satisfactorily. By the end of the year 1978 the left abutment gallery complex was 60% complete whilst the right hand one was only at its start.

PAPHOS IRRIGATION PROJECT

PROGRESS CHART FOR WORKS UNDER CONTRACT

10 20 30 40% . . . . Scheduled
10 20 30 40% . . . . Actual Progress

LOT No.	DESCRIPTION OF WORKS	CONTRACT SUM	GROSS PAYMENT TO DATE
		£	£
S 20 S 21 S 22	Supply of Laboratory Equipment Survey Equipment and Vehicles	66,602	67,083
1 C 1 S	Main Canal Construction	992,826	842,249
2	Supply and installation of Well Pumps	142,372	88,520
	SUPPLIES FOR WELLFIELD CONVEYANCE SYSTEM		
3 S1	Canaletti	66,850	18,514
3 S2 3 S3	A.C. Pipes with Fittings and Valves	208,402	209,496
4 C1 & 4 C2	Installation of Wellfield Conveyance System and Eastern Main Pipeline	162,889 (260,000 WDD)	126,877
6 C	Main Contract - Supply and Installation of Pumping Stations, Western Conveyor and Remote Indication	2,606,603	260,660
	SUPPLIES FOR IRRIGATION NETWORK OF EASTERN AREA		
5 S1	A.C. Pipes and Fittings	1,267,257	333,772
5 S2	Valves	113,868	——
5 S3	Hydrants	251.052	126,109
7 C1 7 C2	Installation of Irrigation Network and Construction of Reservoirs for Eastern Area	1,640.984	273,782
10	Central Offices	40,413	39,605
12	ASPROKREMMOS DAM Dam Construction	6,743,837	1,380,071
			Months Year



Diaphragm Cut Off Concrete Wall: This wall which will be constructed with reinforced concrete of 0.8 m thickness in the river gravels under the dam embankment will have a maximum depth of about 29 metres and length of 200 metres. Its construction by the specialist geotechnical sub-contractor ICOS of U.K. started in mid September. The progress on this work was according to the programme and up to the end of the year 1978 about 70% of the wall was completed.

Excavation—Left Abutment: This work was started ahead of programme towards the end of July and progressed satisfactorily. By the end of the year 1978 the soft excavation was substantially completed and rock excavation of the core key trench commenced. Some 130,000 m^3 of soft excavation and 12,600 m^3 in rock were carried out.

Spillway: During the excavation for the tunnel outlet over which the spillway flipbucket will be constructed the presence of deeply sloping rock was noticed which gave rise to fears about the flipbucket foundations.

Based on the results of further exploratory borings it was decided to move the tunnel outlet and the flipbucket upstream by 15 metres. A revised spillway alignment was set while new model testings to establish its exact new design was requested to be carried out by the British Hydromechanics Research Association of U.K. who have also worked on the original spillway model tests. Until the final decision on the revised spillway alignment is taken only soft excavation of the spillweir was permitted to commence at the end of September about 2 1/2 months ahead of schedule and was continued up to the end of the year 1978.

Finance:

In addition to the 10% advance for mobilization of £674,384 the Contractor's valuations for work done up to the end of November 1978 have been certified by the Resident Engineer and the total amount paid to the Contractor up to end of 1978 was £637,196.

FINANCIAL INFORMATION

The total amount of £2,902,000 has been allocated as a daggered provision in the 1978 Development Estimates for the Paphos Irrigation Project. In fact the actual commitments for the various project works during the year 1978 exceeded the above amount and a special warrant was issued to cover the additional expenditure which brought the total amount spent to £3,294,337. A summary of the expenditure incurred during the year 1978 is shown in the table below. The total amount spent for the Project since its start reached the sum of £4,616, 686 which represents about 19% of the total currently estimated cost of the Project.

TABLE V/1–I
PAPHOS PROJECT—ACTUAL EXPENDITURE INCURRED—YEAR 1978

Ser No	Scheme—Item	Actual expend. 1977	Total exp. 1977–1978	Remarks
A	**Contract Works:**	£	£	
1	Main Canal	278 863	842 249	Nearly completed
2	Central Offices	21 203	39 605	Completed
3	Supply and Installation of Well Pumps.	81 402	88 520	Continued
4	Installation of Wellfield Conveyance System.	113 520	126 877	Continued
5	Supplies for Wellfield Conveyance. ...	152 472	227 435	Continued
6	Installation of Irrigation Network and Construction of Reservoirs for E. Area	273 782	273 782	Continued

TABLE V/1–I

PAPHOS PROJECT—ACTUAL EXPENDITURE INCURRED—YEAR 1978

Ser No	Scheme—Item	Actual expend. 1977 £	Total exp. 1977–1978 £	Remarks
7	Supplies for Irrigation Network for E. Area	459 881	459 881	Continued
8	Main Contract—Pumping Stations and Western Conveyor.	260 660	260 660	Continued
9	Asprokremmos Dam	1 380 071	1 380 071	Continued
	Total	£3 021 854	£3 699 080	
B	**Engineering and Administration**			
1	Consulting Firms and Experts	145 094	367 769	
2	Project Organization and Management.	51 812	86 878	
	Total	£196 906	£454 647	
C	**Other Works**			
1	Construction of Premises	2 178	43 197	
2	Purchase of Equipment	2 400	66 143	
3	Inspection of Pipes & Fittings	16 729	16 729	
4	Investigations, Surveys and Laboratory Works	19 263	76 641	
5	Diversion of Services and compensations	1 254	10 713	
6	Extension Services, Training and Agr. Research	33 555	33 555	
7	Works completed by 1977	—	215 981	
	Total	£75 379	£461 337	
	Grand total	£3 294 337	£4 616 686	

Note: For breakdown of the above expenditure see table I–5 on page 17.

VI DIVISION OF OPERATION AND MAINTENANCE

By
N. Tsiourtis
Executive Engineer I
and
G Charalambous
Superintendent of Works

Introduction

This Division includes the Branches dealing with:

★ The management, operation and maintenance of Government irrigation works
★ The maintenance of contributory irrigation projects, and
★ The operation and maintenance of Town Water Supplies.

Definitions

Government Waterworks: These are the projects constructed under the Government Waterworks Law Cap 341. These projects are listed in Table VI–1.

Contributory Waterworks: These are projects constructed under the Irrigation Division Law Cap 342. A list of these projects is given in Table VI–6.

MANAGEMENT AND OPERATION PROCEDURES

The management and operation of the various categories waterworks are carried out as follows:

A Government Waterworks: The management and operation of these projects are carried out by Waterworks Committees established according to the provisions of the relevant Law. The Waterworks Committees are usually composed of the following.

Chairman
District Officer of the district in which the project is constructed
Members
Director of the Water Development Department or his representative
Director of the Agricultural Department or his representative
Director of the Lands and Surveys Department or his representative
Two or more farmers elected by the farmers

The Committee is responsible for the overall administration and management of the Government Waterworks Project such as:

★ to make recommendations on the development, conservation, management and efficient use of the available water resources of the project,
★ to manage and operate the project with a view to
  (a) improve the standard of agricultural practices
  (b) improve the methods of irrigation
  (c) increase the revenue from land and water utilization to the full economic value
  (d) to sell the water at the nominal rates approved by the Government and see that the fees and charges are collected. (See Table VI–1)

TABLE VI-1 GOVERNMENT IRRIGATION PROJECTS-DATA FOR 1978

No	Project	Capacity $m^3 \times 10^3$	Area Commanded Donums	Water Available* for Utilization $m^3 \times 10^3$	Water used for irrigation $m^3 \times 10^3$	Water used for D. W. S. $m^3 \times 10^3$	Water used for recharge $m^3 \times 10^3$	Total Quantity used $m^3 \times 10^3$	Evaporation Losses $m^3 \times 10^3$	Seepage Losses $m^3 \times 10^3$	Area Irrigated Donums	Water Utilized Index %	Land Utilized Index %
1	Argaka	1 150	2 340	1 301	1 092	NIL	100	1 192	98	6	1 396	91.6	59.7
2	Ayia Marina	300	1 500	509	380	NIL	50	430	48	53	508	84.5	33.9
3	Kalopanayiotis	363	435	363	180	NIL	NIL	180	42	91	435	49.6	100.0
4	Kiti	1 610	6 200	1 060	54	NIL	1 004	1 058	30	538	200	99.8	3.2
5	Lefkara**	13 850	615	7 214	35	2 856	NIL	2 891	533	41	100	40.0	16 3
6	Mavrokolymbos	2 180	3 355	1 572	1 425	NIL	NIL	1 425	142	NIL	1 315	90.6	39.2
7	Pomos	860	2 850	1 218	1 004	NIL	NIL	1 004	82	153	851	82.4	29.9
8	Polemidhia	3 450	11 050	14 118	5 265	NIL	828	6 093	1 705	2 485	10 050	43.1	91.0
9	Yermasoyia	13 500											
10	Athalassa	791	310	25	22	NIL	NIL	22	3	NIL	50	88.0	16.1
	Total	38 061	28 655	27 380	9 457	2 856	1 982	14 295	2 683	3 367	14 905	52.2	52.0

* This is the water that possibly may be utilized: storage + overflow or seepage that may be utilized after deducting evaporation and seepage losses.

** Water allocated mainly for domestic water supply.

The Committees have their own budgets, approved by the Minister of Finance.
The water selling rates approved by the council of Ministers are shown on Table VI–3.

B Contributory Irrigation Projects (Major and Small): The operation of the contributory projects is carried out by the Irrigation Division Committees. These committees are chaired by the District Officer and as members to the committees are beneficiaries elected by the general assembly meetings of the Irrigation Division beneficiaries. The Water Development Department in such cases gives technical advice both to the District Officer and to the Committee. The costs of the operation of these projects is borne in total by the beneficiaries. (See table VI–6).

C Government Recharge Waterworks: These are managed directly by the Water Development Department. (See table VI–7).

MAINTENANCE PROCEDURES

The maintenance of the irrigation waterworks is carried out by the Water Development Department but depending on the type of the Project the expenses are either paid in full by the Government or are shared between the Government and the Irrigation Divisions. The procedures are as follows:

A Government Waterworks: The maintenance of these projects is carried out by the Water Development Department being the Government Agency for waterworks and the costs are borne in full by the Government. By the term maintenance we mean routine dam and pipeline maintenance, valves and water meters repair or replacements, paintings of metal works or woodwords etc.

B Contributory Irrigation Projects: The maintenance of these projects is carried out by the Water Development Department but the costs are shared between the Government and the specific Irrigation Division usually at a ratio of 2 to 1.

Water Development Data

Cyprus is an island and all available water resources are those that result from overall precipitation. The total precipitation in an average year is estimated at 4600 MCM

where 1270 MCM/annum are lost in the form of evaporation, 900 MCM/a are lost in the form of evapotranspiration from cultivated crops, 1480 MCM/a are lost in the form of evapotranspiration from forest pasture and grass and irrigated crops. The annual surface runoff is estimated at 600 MCM and the groundwater and springs another 350 MCM. As it is seen from the above only 950 MCM or 21 % of the total precipitation are available for development both surface and groundwater. The groundwater resources being easier to develop are at present overpumped. The annual extraction from the boreholes is estimated at 370 MCM and the total springs yield is around 30 MCM. Out of these quantities 300 MCM are used for irrigation where the rest 100 MCM are used for domestic and industrial uses.

The surface water resources being much more expensive to develop remained undeveloped until the beginning of the 1960's. By the beginning of 1960 the total water storage capacity of dams all over the island amounted to 6.2 MCM commanding an area of 11400 donums of irrigated land. Soon after this (after independance) the Government of the Republic started a construction program to develop as much as possible more surface water resources. Many projects were constructed which increased the water storage capacity of dams to 64.7 MCM, 45.4 MCM for irrigation or domestic water supply and the rest 17.738 MCM for recharge purposes. Details on the projects and the rate of storage development are given in Drg. No. AG/IR/37 "Cyprus Dam Projects and Regional Development" page 5 and "Progress in Dam Construction" page 9.

Summary of Management, Operation and Maintenance Data

The overall average precipitation during the year under review was 549 mm or 103 % of the 51 year average of the Government controlled area, where the total volume of water available in the dams in the Government controlled area amounted to 35.771 MCM. From this quantity 10.993 MCM was used for irrigation, 2.856 MCM was used for domestic water supplies, 5.939 MCM was used for recharge or seeped through or below the dams and another 2.863 MCM was lost as evaporation. The rest 13.620 MCM remained in the dams for over year storage or lost as overflow. Projects in the Turkish occupied area are not included here as we cannot collect the necessary information.

The total area commanded by the irrigation projects is estimated at 633,13 donums where an estimated area of 17,860 donums has been irrigated, planted with citrus, bananas, deciduous, vegetables, potatoes etc.

Maintenance works totalling £9,533 were carried out on fourteen projects. These include routine maintenance on the dam structures and the distribution systems. For the Government waterworks (irrigation and recharge works) a total of £8,165 were spent where for the rest £1,368 were spent on the contributory projects.

A Government Waterworks

Summary of Management, Operation and Maintenance Data

In the year under review, the total quantity available from government irrigation projects reached the figure of 27.380 MCM. From this total, a quantity of 14.295 MCM or 51.2 % was utilized 9.457 MCM for irrigation, 2.856 MCM for the domestic water supply and 1.982 MCM for recharge purposes. The rest of the water remained in storage or lost in the form of overflow. In the same period 2.683 MCM was lost in the form of evaporation where another 3.367 MCM were lost as seepage or deep percolation (see Table VI–1).

The irrigation water was used to irrigate fully or partly 14,855 donums of land planted with citrus, bananas, vines, deciduous, vegetables, potatoes, cereals and olives (see Table VI–2).

The gross income from the sale of water amounted to £101,367 being the income from the sale of water at the rates shown on Table VI–3. The operational expenses amounted to £33,592 being the cost for the payment of the watermen, the bill collectors etc. which amounted to 3.98 mils/m³ of water sold or

2.34 mils/m³ of water utilized. The maintenance expenses on government projects amounted to £81,165 i.e 0.967 mils/m³ of water sold or 0.57 mils/m³ of water utilized. The total annual operation and maintenace expenses amounted to £41,757 which amounts to 4.94 mils/m³ sold or 2.92 mils/m³ utilized.

Evaporation losses from the reservoirs amounted to 2.683 MCM or 7% of the total storage capacity available. The seepage losses were estimated at 3.367 MCM or 8.8% of the total storage mostly from the Polemidhia and Yermasoyia dams.

The overall water storage capacity and land utilization indexes are 52.2% and 52% respectively. Of the 9.457 MCM used for irrigation 8.447 MCM was sold at the nominal rates, (89.32%) where the rest 1.01 MCM, (10.68%) was given free of charge as water right or overflows.

TABLE VI–2
CROPS AND AREAS IRRIGATED BY GOVERNMENT IRRIGATION PROJECTS

Ser No	Crop	Area in Donums
1	Citrus	5 636
2	Bananas	1 090
3	Vines	1 864
4	Deciduous	625
5	Vegetables	4 310
6	Potatoes	430
7	Cereals	880
8	Olives	55
	Total	14 855

TABLE VI–3
GOVERNMENT IRRIGATION PROJECTS AND APPROVED WATER CHARGES in mils/m³

Ser. No	Project	Overflow	Vegetables	Vines	Deciduous	Citrus	Flat Rate
1	Argaka	Free	10	15	15	15	10
2	Ayia Marina ...	5	–	–	–	–	18
3	Kalopanayiotis	–	–	–	–	–	10
4	Kiti	–	–	–	–	–	10
5	Lefkara	–	10	15	15	15	–
6	Mavrokolymbos	–	10	15	15	15	–
7	Polemidhia	3	10	15	15	15	–
8	Pomos	5	–	–	–	–	10
9	Yermasoyia	3	10	15	15	15	–

TABLE VI–4 **DATA ON MANAGEMENT, OPERATION AND MAINTENANCE OF GOVERNMENT IRRIGATION PROJECTS**

Ser. No.	Project	Dam Reservoir Capacity m³x10³	Area Command. Dons	Water Available* m³x10³	Water Used m³x10³	Water Sold m³x10³	Area Irrigated Donums	Gross Income	Expenditure			Income Net
									Operat.	Maint.	Total	
								£	£	£	£	£
1	Argaka	1 150	2 340	1 307	1 192	677	1 396	8 663	2 088	936	3 024	5 312
2	Ayia Marina	300	1 500	509	430	380	508	3 555	1 290	720	2 010	1 545
3	Kalopanayiotis	363	435	363	180	180	435	3 240	2 048	432	2 480	760
4	Kiti	1 614	6 200	1 060	1 058	54	200	542	100	739	839	– 297
5	Lefkara	13 850	615	7 214	2 891	35	100	353	100	830	930	– 577
6	Mavrokolymbos	2 180	3 355	1 572	1 425	1 425	1 315	17 410	4 370	1 203	5 573	11 837
7	Pomos.....	860	2 850	1 218	1 004	1 004	851	9 127	4 141	793	4 934	4 193
8	Polemidhia	3 864	11 050	14 118	6 093	4 692	10 050	58 477	19 455	2 502	21 957	36 520
9	Yermasoyia	13 500										
10	Athalassa	791	310	25	22	NIL	50	—	—	10	10	—
	Total	38 061	28 655	27 380	14 295	8 447	14 905	£101 367	£33 592	£8 165	£41 757	£59 610

* Including storage + overflow or seepage that may be utilized after deducting evaporation and seepage losses

TABLE VI-5 DATA ON WATER USE FOR THE LAST 10 YEARS FOR THE GOVERNMENT PROJECTS

No	Description	Unit	1969	1970	1971	1972	1973	1974	1975	1976	1977	1978
1	Capacity	1000m³	23 420	23 420	23 420	23 420	2 340	37 890	37 890	37 890	37 890	38 061
2	Water available	"	NA	6 160	5 352	3 777	1 858	6 367	27 612	28 000	32 003	27 380
3	Water utilized for irrigation	"	NA	NA	NA	NA	NA	NA	7 776	8 388	9 704	9 457
4	Water used for DWS	"	NIL	NIL	NIL	NIL	NIL	NIL	1 000	1 365	2 058	2 856
5	Water used for recharge ...	"	NA	NA	NA	NA	NA	NA	NA	6 016	3 323	1 982
6	Total Water used.....	"	NA	NA	NA	NA	NA	NA	8 776	15 769	15 085	14 295
7	Evaporation losses	"	NA	NA	NA	NA	NA	NA	2 854	2 570	2 662	2 683
8	Seepage losses	"	NA	NA	NA	NA	NA	NA	NA	428	359	3 367
9	Water sold.....	"	1 038	1 961	2 467	2 757	11 137	26 138	60 600	73 747	93 485	8 447
10	Gross income	£	21 241	22 594	26 891	29 391	971	2 544	5 522	6 624	7 999	101 367
11	Operation cost	£	5 911	5 849	7 688	7 282	6 450	11 048	12 619	18 627	34 500	33 592
12	Maintenance cost	£	7 582	5 328	3 342	4 849	4 278	4 603	3 174	4 496	8 059	8 165
13	Total expenditure	£	13 493	11 177	11 030	12 131	10 728	15 651	15 793	23 123	42 559	41 757
14	Net income	£	7 748	11 417	15 861	17 260	409	10 487	44 808	50 264	50 926	59 610
15	Area irrigated	Donums	NA	NA	NA	NA	NA	NA	12 458	17 376	15 459	14 905

A summary of the above data in detail is given in Tables VI–1, VI–4, and VI–5 where more details are given for each project under separate headings.

TableVI–5 gives data on the operation and maintenance of the government irrigation projects for the last 10 years.

Table VI–8 gives data on the operation and maintenance for the last two years.

The decrease in the quantity of the available water was the effect of the precipitation distribution, the climatic conditions during the spring season and the water demand. The decrease in water used for irrigation is primarily due to the climatic conditions in late spring and early summer months. There is obviously an increase in the quantities given for domestic water supply the reasons of which are given in the Domestic Water Supply Section. The seepage losses and recharge water are given separately but eventually all of it percolates in the aquifer thus recharging the aquifers downstream. The increase in the seepage was due mainly to the high water level in the Polemidhia dam which resulted in high seepage rates.

Evaporation losses measured or partly calculated remained the same. The total water used decreased by 5.2% where the water sold increased by 5.6% which means that the water taken free of charge as water rights has decreased.

The gross income from the sale of water has increased by 8.4% due to the increase of the quantities of water sold and due to the increase in the price of water in some of the projects.

The operation costs were down by 2.6% mainly due to the reduction of costs of pumping water from the Yermasoyia dam to irrigate the Akrounda and Phinikaria areas. The maintenance costs remained the same.

B Contributory Irrigation Projects

In general there are 24 contributory irrigation projects with total capacity of 7.318 MCM commanding an area of 34,658 donums. Ten projects of total capacity of 5.204 MCM or 71% of the total capacity of contributory schemes, commanding an area of 26,020

TABLE VI–6
DATA ON CONTRIBUTORY IRRIGATION WORKS

Ser. No.	Project	Capacity m3x103	Area command. Dons	Water available for util. m3x103	Water used for irrigat. m3x103	Water used for DWS m3x103	Water used for recharge m3x103	Total quantity used m3x103	Evapor. losses m3x103	Seepage losses m3x103	Area irrigated Dons
1	Arakapas	130	200	130	120	—	—	120	10	—	171
2	Palekhori	640	1 000	640	580	—	—	580	44	—	828
3	Prodhromos	110	170	110	100	—	—	85	10	—	120
4*	Morphou	2 000	6 740	—	—	—	—	—	—	—	—
5*	Lefka Marathasa	360	1 300	—	—	—	—	—	—	—	—
6*	Geunyeli	1 000	850	—	—	—	—	—	—	—	—
7*	Kanli	1 100	4 000	—	—	—	—	—	—	—	—
8*	Mia Milea	330	1 300	—	—	—	—	—	—	—	—
9*	Ovgos	250	6 370	—	—	—	—	—	—	—	—
10*	Lefka Kafizes	110	770	—	—	—	—	—	—	—	—
11	Pyrgos	270	1 600	270	245	—	—	215	25	—	307
12	Trimiklini	330	650	330	304	—	—	304	26	—	—
13	Lythrodhonta (Upper)	32	115	32	29	—	—	29	3	—	105
14	Kalokhorio (Klirou)	81	1 350	81	73	—	—	73	8	—	300
15	Akrounda	22	60	22	20	—	—	20	2	—	29
16*	Galini	22	1 300	—	—	—	—	—	—	—	—
17*	Petra Upper	22	4 690	—	—	—	—	—	—	—	—
18*	Petra Lower	32		—	—	—	—	—	—	—	—
19	Lythrodhonda (Lower)	32	115	32	29	—	—	29	3	—	105
20	Kandou	38	563	38	34	—	—	34	4	—	46
21	Perapedhi	55	195	55	50	—	—	50	5	—	71
22	Agros	72	300	50	45	—	—	37	5	—	53
23	Kyperounda	60	80	60	54	—	—	54	6	—	80
24	Lymbia	220	940	220	200	—	—	200	20	—	740
	Total	7 318	34 658	2 070	1 883	—	—	1 883	171	—	2 955

* Project in Turkish occupied areas

donums are situated in the Turkish occupied area and on which no data is collected. From the rest of the projects the total water collected amounted to 2.070 MCM out of which 1,883 m³ was used for the irrigation of 2,955 donums where the rest was lost in the form of evaporation (see Table VI–6).

C Recharge Works

In the island there are about 33 recharge works of total capacity 17.738 MCM. Out of these projects 20 of total capacity 15.694 MCM or 88.5% of the total recharge capacity are situated in the Turkish occupied areas, or in no mans land. On these no government control is possible and no data on their use is available. For more information on projects in the government control areas see Table VI–7.

DETAILS ON OPERATION OF GOVERNMENT IRRIGATION PROJECTS

ARGAKA PROJECT

The Argaka Irrigation Project consists of a dam reservoir of maximum capacity at spillway crest 0.990 MCM and a distribution system made of closed conduits commanding an area of 2,340 donums (312 ha). Irrigation in the Project area started early in January 1978 and continued throughout the year until late in December 1978. An area of 1,396 donums was irrigated by utilizing about 1.092 MCM of water. The area irrigated was planted with citrus, bananas, vines, deciduous, vegetables, cereals and melons.

Out of the 1.092 MCM of water utilized, 677,409 m³ were sold to the farmers at the

nominal rates where the remaining 415,135 m³ were taken from the overflow, free of charge. The gross income from the sale of water was £8,663. The expenditure of management was £2,088 where that of maintenance amounted to £830. Net income to the Project was £5,312.

Project Hydrology

The project hydrologic data, as recorded during the year, are tabulated on Table VI–9. The dam reservoir was filled to spillway crest on January 11th and overflow continued until May 28th, 1978. During this period a total quantity of 3,962,000 m³ had overspilled. The minimum level of water in storage ever reached was in October with total quantity in storage around 298,000 m³.

TABLE VI–7
RECHARGE WATERWORKS DATA

Ser No.	Project	Capacity m³x103	Water avail. m³x103	Water used for recharge m³x103	Water lost in evaporation m³x103
1*	Kouklia	4 545	—	—	—
2*	Ayios Loucas	455	—	—	—
3	Sotira	45	10	9	1.0
4	Panayia Fam.	45	10	9	1.0
5	Paralimni	115	15	13.5	1.5
6	Ayia Napa	55	10	9.0	1.0
7**	Famagusta Antiflood	50	—	—	—
8	Fhrenaros	115	15	13.5	1.5
9	Dherinia	23	5	4.1	0.5
10	Phrenaros	45	5	4.5	0.5
11	Avgorou	68	5	4.5	0.5
12*	Kondea	82	—	—	—
13	Xylophaghou	86	5	4.5	0.5
14	Sotira	32	5	4.5	0.5
15*	Lysi	77	—	—	—
16*	Ayios Yeoryios Kyr.	68	—	—	—
17*	Ayios Epiktitos	34	—	—	—
18*	Akanthou	45	—	—	—
19**	Akhna	40	—	—	—
20	Xylotymbou	50	—	—	—
21*	Syngrasis	1 115	—	—	—
22*	Ayios Yeoryios Fam.	90	—	—	—
23*	Famagusta Recharge	165	—	—	—
24*	Ayios Nicolaos Fam.	1 365	—	—	—
25*	Paralimni Lake	1 365	—	—	—
26*	Ayios Loucas Lake	4 545	—	—	—
27*	Makrasyka	195	—	—	—
28**	Akhna Messania	90	—	—	—
29**	Vrysoulles Fam.	140	—	—	—
30*	Morphou Recharge	130	—	—	—
31*	Morphou Protopapas	90	—	—	—
32	Ormidhia	100	15	14	1
33*	Masari	2273	—	—	—
	Total	17 738	100	90.5	9.5

* Projects in Turkish occupied area. Gate constantly open for recharge
** Projects in No Man's Land

TABLE VI–8
DATA ON MANAGEMENT AND OPERATION OF GOVERNMENT IRRIGATION PROJECTS FOR THE LAST TWO YEARS

Item No.	Data	Unit	1977	1978	% change on 1977
1	Capacity	1000m³	38 061	38 061	—
2	Water available	"	32 003	27 380	–14.5
3	Water utilized for irrig.	"	9 704	9 457	–2.5
4	Water utilized for DWS	"	2 058	2 856	+38.8
5	Water utilized for recharge	"	3 323	1 982	–40.4
6	Total water used	"	15 085	14 295	–5.2
7	Evaporation Losses	"	2 662	2 683	+0.7
8	Seepage Losses	"	359	3 367	—
9	Water sold	"	7 999	8 447	+5.6
10	Gross income	£	93 485	101 367	+9.4
11	Operation cost	£	34 500	33 592	–2.6
12	Maintenance cost	£	8 059	8 165	+1.3
13	Total expenses	£	42 559	41 757	–1.9
14	Net income	£	50 926	59 610	17.0
15	Area irrigated	donums	15 459	14 905	–3.6
16	Area Commanded	donums	29 345	28 655	–2.5

TABLE VI–9
ARGAKA DAM — HYDROLOGY FOR 1978

Item No.	Description	Quantity m³	% Storage Capacity
1	Initial amount in storage	328 000	33.13
2	Inflow during the year	4 816 680	486.53
3	Total release	679 700	68.66
4	Leakages	5 880	0.59
5	Evaporation	98 100	9.91
6	Overflow	3 962 000	400.20
7	Final amount in storage	399 000	40.30
8	Minimum quantity in storage	298 370	30.14
9	Storage capacity	990 000	100.00

TABLE VI–9
ARGAKA DAM—HYDROLOGY FOR 1978

Water Utilization and Crops Irrigated

The project is built for irrigation purposes and as such, a quantity of 1.092 MCM of water was utilized for the irrigation of 1396 donums of land planted with various crops as indicated in Table VI–10.

Further to this quantity of water used for irrigation, an additional quantity of 100,000 m³ of water overflowing the spillway crest had recharged the aquifer downstream the dam. Water from this aquifer is pumped by the Limni Mines and the local farmers to satisfy their demands for the mines operation and of agricultural lands not within the Argaka Project area.

Table VI–10 shows the utilization of the project water and Table VI–11 shows the crops irrigated.

TABLE VI–10
ARGAKA DAM—WATER UTILIZATION

Item No	Description	Quantity m³	% of Stor. Cap.
1	Water used for irrigation	1 092 544	110
2	Water used for recharge.....	100 000*	10
3	Total water	1 192 544	120
4	Water lost in pipe bursting	2 289	0.20

* This is a rough estimate

TABLE VI–11
ARGAKA DAM—CROPS IRRIGATED

Ser. No.	Crop	1st period don.	2nd period don.	Total Area don.
1	Citrus	231	231	231
2	Bananas	210	210	210
3	Vines	30	—	30
4	Deciduous ...	50	15	50
5	Vegetables ...	140	205	345
6	Potatoes	—	—	—
7	Cereals	515	15	530
	Total ..	1176	676	1396

Water Sale, Income, Operation and Maintenance Costs.

The water released for irrigation was 677,409 m³ out of which 2,289 m³ was lost in pipe bursting. The total quantity utilized for irrigation, water released from the dam reservoir and overflow amounted to 1,092,544 m³. Out of this, only 677,409 m³ was sold to the farmers at the nominal rates where the rest was given free of charge because of water rights. From the sale of water a total of £8,663 was collected. For the operation of the project an amount of £2,088 was paid to the water men and bill collectors where for the maintenance of the project another £936 was spent.

Net income for the benefit of the project is £5,312. All the data concerning water sale, operation and management costs are shown on Table VI–12.

TABLE VI–12
ARGAKA DAM—INCOME AND EXPENDITURE DATA

Item No	Description	Quantity m³	Amount £
1	Water sold at nominal rates	677 409	8 663
2	Water sold at reduced rates	NIL	NIL
3	Water given free of charge	415 135	NIL
4	Total quantity utilized and gross income	1 092 544	8 663
5	Operation cost	—	2 088
6	Maintenance cost	—	936
7	Net Income	—	5 312

Project Performance for the Last two Years

Table VI–13 shows the performance of the project for the last two years. As shown, there was a decrease in the total volume of water used for irrigation by 23.11% where the area irrigated was reduced by 16.94% The reduction was due to the increase of the area under permanent crops (citrus and bananas).

Generally, the water utilization could be considered as satisfactory, although certain increase may be expected in the future.

TABLE VI–13
ARGAKA-DATA ON PROJECT FOR THE LAST TWO YEARS

Item No	Data	Unit	1977	1978	% change on 1977
1	Capacity	1000m3	990	990	NIL
2	Water available in storage	"	1 749	—	–31.85
3	Water utilized for irrigation ...	"	1 421	1 092	–23.11
4	Water sold	"	781	677	–13.26
5	Water given free	"	640	415	–35.14
6	Water used for recharge	"	150	100	–33.33
7	Gross income ...	£	7 810	8 663	+10.88
8	Operation cost	£	1 633	2 088	+27.86
9	Maintenance cost	£	752	936	+24.46
10	Total expenses	£	2 385	3 024	+26.80
11	Net income ...	£	5 426	5 312	+ 2.10
12	Area irrigated	dons	2 102	1 746	–16.94

AYIA MARINA PROJECT

The Ayia Marina Irrigation Project consists of a dam reservoir of capacity at spillway crest of 0.300 MCM and a distribution system commanding an area of 1,500 donums. The distribution system consists of a main canal at the terminal of which tertiary pipes branch–off to distribute water to each individual plot. Irrigation in the project area started late in February, 1978 and continued throughout the year, until late in November. An area of 508 donums was irrigated by utilizing about 0.380 MCM. The area irrigated was planted with bananas, vines, deciduous, vegetables and cereals. The water utilized was sold to the farmers at the approved rates. Out of the 0.380 MCM utilized, 0.313 MCM were released from the dam and sold to the farmers at nominal rates, whereas the remaining 66,900 m³ were taken from the overflow and were paid at reduced rates. The total gross income from the sale of water amounted to £3,555. The expenditure for the operation was £1,290 and that for maintenance £340. Net income to the project was £1,925.

Project Hydrology

The project hydrologic data as recorded during the year, are tabulated on Table VI–14

The dam was overflowing from January 28th 1978 to May 22nd 1978. Minimum quantity of water ever stored during the year under review, was 79,000 m³ and this occurred in October, 1978.

TABLE VI–14
AYIA MARINA DAM-HYDROLOGY FOR 1978

Item No	Description	Quantity m3	% of storage capacity
1	Initial amount in storage ...	102 000	34.00
2	Inflow during the year	730 000	24.30
3	Total release	314 000	104 70
4	Leakages	53 000	17 60
5	Evaporation	48 000	16 00
6	Overflow	316 000	105 30
7	Final amount in storage ...	101 000	35 60
8	Minimum quantity in storage (November).....	79 000	26.33
9	Storage capacity	300 000	100.00

TABLE VI–15
AYIA MARINA DAM-WATER UTILIZATION

Item No	Water Utilization	Quantity m3	% of storage capacity
1	Water used for irrigation ...	380 000	126.7
2	Water used for recharge ...	50 000	16.7
3	Total water utilized	430 000	143.4

Water Utilization and Crops Irrigated

During the year under review, a total quantity of 380,000 m³ of water was utilized for the irrigation of approximately 508 donums planted with various crops. Details about the water utilization and the crops irrigated and their extent are shown on Tables VI–15 and VI–16.

Further to the water utilized for irrigation, a small quantity from the overspilled water recharged the small aquifer downstream the dam. Water is pumped from this aquifer for irrigation of areas not within the project area.

Water Sale, Income, Operation and Maintenance Costs

From the sale of 380,000 m³ of water, the gross income to the project, amounted to £3,555. Management and operation expenses being the wages of the water man and that of the dam attendant, amounted to £1,290. Maintenance costs on the dam and the

distribution system was £720. Net income to the project is £1,545. Details regarding sale of water income and costs are given on Table VI–17.

TABLE VI–16
AYIA MARINA DAM-CROPS IRRIGATED

Ser No	Crops	1st period donums	2nd period donums	Total Area donums
1	Citrus	20	20	20
2	Bananas	45	45	45
3	Vines	14	—	14
4	Deciduous	4	4	4
5	Vegetables	201	124	325
6	Potatoes	—	—	—
7	Cereals	100	—	100
	Totals	384	193	508

TABLE VI–17
AYIA MARINA DAM-INCOME AND EXPENDITURE DATA

Item No	Description	Quantity m^3	Amount in £
1	Water sold at nominal rates	313 000	3 130
2	Water sold at reduced rates	66 900	425
3	Water given free of charge	NIL	—
4	Total quantity utilized and gross income	379 900	3 555
5	Operation cost		1 290
6	Maintenance cost		720
7	Net income		1 545

Project Operation Data for the Last Two Years

TABLE VI–18 shows data on the operation of the project for the last two years. The water utilization shows an increase by 4.4% where the income showed an increase by 6.6%. The operation expenditure showed a reduction by 11.59%.

The area under irrigation was increased by 93 don or by 32.2% while the water utilized has increased by 4.4%.

Generally, the utilization of water in the project area is satisfactory.

TABLE VI–18
AYIA MARINA DAM-DATA ON PROJECT FOR THE LAST TWO YEARS

Item No		Unit	1977	1978	% change on 1977
1	Capacity.....	1000m3	300	300	NIL
2	Water available in storage	"	364	300	NIL
3	Water utilized for irrigation.....	"	364	330	+4.4
4	Water sold	"	364	380	+4 4
5	Water given free	"	NIL	NIL	NIL
6	Water used for recharge	"	50	50	NIL
7	Gross income ...	£	3 335	3 555	+6.6
8	Operation cost	£	1 459	1 290	-11.59
9	Maintenance cost	£	340	720	+111.76
10	Total expenses ...	£	1 799	2 010	+ 11.73
11	Net income	£	1 083	1 545	+ 42.66
12	Area irrigated ...	Donums	415	508	+ 22.4

KALOPANAYIOTIS PROJECT

The Kalopanayiotis irrigation project consists of a dam reservoir of capacity 363,000 m^3 and a distribution system of closed conduits commanding an area of approximately 435 donums. Irrigation in the project area, started early in May, 1978 and continued throughout the year, until mid October 1978. During this period, a total quantity of 179,994 m^3 of water was used for the irrigation of an area of approx. 435 donums planted mainly with deciduous. All the water was sold to the farmers at a fixed rate of 18 mils/m^3, and the gross income was £3,240. The operation expenses were £2,048 where the maintenance cost spent on routine works and emergency repairs, was £432. Net income to the project was £760.

Project Hydrology

The project hydrologic data, as recorded during the year under review, are tabulated in Table VI–19. The dam scouring gate was opened on December 29th 1977 and the reservoir emptied by January 24th, 1978. The scouring gate was closed in April 10th 1978 and by April 24th the reservoir was filled to spillway crest. Overflow over the spillway crest lasted from April the 24th to June the 17th 1978. Irrigation releases lowered the water level in the dam, but increased inflow raised the water level again to spillway crest. Overflow occurred again from December 22nd up to the end of the year.

★ The dam scouring gate was open in the period December 1977 to January 24th 1978

The smallest quantity ever remained in the reservoir during the irrigation season, was 76,000 m3 and occurred in October 1978.

TABLE VI–19
KALOPANAYIOTIS DAM-HYDROLOGY FOR 1978

Item No	Description	Quantity m3	% of storage capacity
1	Initial amount in storage...	286 000	78.78
2	Inflow during the year ...	6 000 000	1652.89
3	Total release	89 362	24.62
4	Leakages	90 632	24.96
5	Evaporation	42 329	11.66
6	Overflow	169 201*	46.61
7	Final amount in storage ...	280 000	77.13
8	Minimum quantity in storage (October 78)	76 000	20.93
9	Storage capacity.....	363 000	100.00
10	Flow through scouring gate	5 614 512	1546.69

* The dam scouring gate was open in the period December 1977 to January 24th 1978

TABLE VI–20
KALOPANAYIOTIS DAM-WATER UTILIZATION

Item No	Water Utilization	Quantity m3	% of storage capacity
1	Water used for irrigation ...	179 994	49.58
2	Water used for recharge	NIL	NIL
3	Total water utilized	179 994	49.58

Water Utilization

During the year under review, a total quantity of 179,994 m3 of water was utilized for the irrigation of 435 donums of deciduous plantations in the project area. The plantations are mainly apple trees, pear trees and peach trees. Part of the water utilized was taken from the seepage collected downstream in a collection weir. See Table VI–20 for water utilization.

Water Sale, Income, Operation and Maintenance costs

From the sale of water the gross income during the year under review, was £3,240. Operation expenses, including attendant and water man wages and travelling costs, amounted to £2,048. Maintenance expenses were £432. Net income to the project amounted to £760. Details on these are shown on Tables VI–21 and VI–22.

TABLE VI–21
KALOPANAYIOTIS DAM—CROPS IRRIGATED

Ser No	Crop	1st period donums	2nd period donums	Total area donums
1	Citrus	—	—	—
2	Bananas ...	—	—	—
3	Vines	—	—	—
4	Deciduous	435	435	435
5	Vegetables	—	—	—
6	Potatoes ...	—	—	—
7	Cereals ...	—	—	—

TABLE VI–22
KALOPANAYIOTIS DAM-INCOME AND EXPENDITURE DATA

Item No	Description	Quantity m3	Amount £
1	Water sold at nominal rates...	179 994	3 240
2	Water sold at reduced rates ...	NIL	NIL
3	Water given free of charge ...	NIL	NIL
4	Total quantity utilized and gross income.....	179 994	3 240
5	Operation cost		2 048
6	Maintenance cost.....		432
7	Net income		760

TABLE VI–23
KALOPANAYIOTIS DAM-DATA ON PROJECT FOR THE LAST TWO YEARS

Item No	Description	Unit	1977	1978	% change on 1977
1	Capacity.....	1000m3	363	363	NIL
2	Water in storage	"	363	363	NIL
3	Water utilized for irrigation.....	"	164	180	+ 9.75
4	Water sold	"	164	180	+ 9.75
5	Water given free	"	NIL	NIL	NIL
6	Water used for recharge	"	NIL	NIL	NIL
7	Gross income ...	£	2 954	3 240	+ 9.68
8	Operation cost	£	1 503	2 048	+ 36.26
9	Maintenance cost	£	1 075	432	-40.18
10	Total expenses ...	£	2 578	2 480	-3.81
11	Net income	£	376	760	+102.12
12	Area irrigated ...	Donums	435	435	NIL

Project Operation Data for the Last two Years

Table VI–23 shows the operation data for the last two years. The amount of water utilized for irrigation, has increased by 9.75% where the area irrigated has remained the same. The increase was mainly due to the fact that the plantations grow in age, resulting to an increase in water demand.

The operational costs were up by 36.26%. The water utilization in the project area seems satisfactory although further increase of the quantity utilized is expected.

KITI DAM

The Kiti dam irrigation project consists of a dam reservoir of storage capacity 1,610,000m³ and a distribution system, made of open canals commanding an area of approximately 6,200 donums in the Kiti, Perivolia and Tersephanou villages. Irrigation in the project area started in mid February and ended in March 1978 when all water available was utilized. A total of 54,230 m³ of water were sold at a rate of 10 mils/m³ for the irrigation of approximately 200 donums of seasonal crops, mainly potatoes, carrots and ladies fingers. The gross income amounted to £542.3 whereas the operation expenses were £100.

The maintenance expenses of the dam and distribution system were of the order of £739. The project presents a loss of £297.

The dam was empty by the end of May and was completely dry until December 1978. A total quantity of 1,080,431 m³ was collected, out of which 447,600 m³ were released for recharge downstream whereas 140,570 m³ seeped under the dam embankment and recharged the gravel aquifer.

Project Hydrology

The project hydrologic data as recorded during the year under review are shown in Table VI–24.

Inflow to the reservoir occurred in January–March in intermitent periods. Maximum amount in storage ever reached was 270,000 m³ in January 1978.

Water from the reservoir was lost, either in the form of evaporation or seeped through the Meneou and Bekir Pasha chains of wells to recharge the aquifers south and east of the reservoir.

TABLE VI–24
KITI DAM-HYDROLOGY FOR 1978

Item No	Description	Quantity m³	% of storage capacity
1	Initial amount in storage ...	8.000	0.5
2	Inflow during the year	1080 431	67.11
3	Total release (For Irrig. & Recharge)	501 830	31.17
4	Leakages (downstream aquifer)	538 470	33.44
5	Evaporation	30 010	1.86
6	Overflow	NIL	–
7	Final amount in storage ...	NIL	–
8	Minimum quantity in storage	NIL	–
9	Storage capacity	1610 000	100.00

TABLE VI–25
KITI DAM-WATER UTILIZATION

Item No	Description	Quantity m³	% of storage capacity
1	Water used for irrigation ...	54 230	3.37
2	Water used for recharge ...	1004 191	62.37
3	Total water utilized	1058 421	65.74

Water Utilization and Crops Irrigated

Irrigation in the project area, lasted for 20 days and during this period, a total quantity of 54,230 m³ of water was utilized. This quantity irrigated approximately 200 donums of seasonal early crops as shown on Tables VI–25 and VI–26.

TABLE VI–26
KITI DAM — CROPS IRRIGATED

Ser. No.	Description	1st period donums	2nd period donums	Total Area donums
1	Citrus	NIL	NIL	NIL
2	Bananas	NIL	NIL	NIL
3	Vines	NIL	NIL	NIL
4	Deciduous ...	NIL	NIL	NIL
5	Vegetables ...	200	—	200
6	Potatoes	—	—	—
7	Cereals	—	—	—
	Total	200	200	200

Water Sale, Income, Operation and Maintenance Cost

From the sale of water, the gross income amounted to £542 where the operation cost was £100. The maintenance cost was £739. The project presents a loss of £297. Details regarding water sale and cost, are shown on Table VI–27.

TABLE VI–27
KITI DAM-INCOME AND EXPENDITURE DATA

Item No	Description	Quantity m³	Amount £
1	Water sold at nominal rates	54 230	542.3
2	Water sold at reduced rates	NIL	NIL
3	Water given free of charge...	447 600*	—
4	Total quantity utilized and gross income.....	501 830	542.3
5	Operation cost		100
6	Maintenance cost.....		739
7	Net loss		297

* For recharge purposes

TABLE VI–28
KITI DAM-DATA ON PROJECT FOR THE LAST TWO YEARS

Item No	Description	Unit	1977	1978	% change on 1977
1	Capacity.....	1 000m³	1 610	1 610	NIL
2	Water available ...	"	258	1 080	318
3	Water utilized for irrigation	"	72	54	–25
4	Water sold	"	72	54	–25
5	Water given free ...	"	NIL	447	—
6	Water used for recharge	"	169	1 004	494
7	Gross income	£	720	542	–24
8	Operation cost ...	£	100	100	—
9	Maintenance cost...	£	842	739	–12.2
10	Total expenses	£	942	839	–10.9
11	Net loss	£	218	297	36.2
12	Area irrigated	Donums	170	200	+17.6

Project Operation Data for the Last Two Years

Table VI–28 shows data on the operation of the project for the last two years. There can be no comparison of the data since the water inflow to the reservoir is not steady and dependable. However, comparison of the figures of the last two years, shows that the amount of water in storage has increased, the water sold or utilized and the area irrigated have decreased. The operation cost was the same where the maintenance costs were down by £103 or 12.2%

Generally, the picture does not seem very promising. However, with the new method of operation introduced later in December, the aquifer downstream the dam is expected to recover with beneficial effects on the project area as a whole. As it is seen a quantity close to 1 MCM has recharged the aquifer downstream.

LEFKARA DAM

The Lefkara dam project is a dual purpose project, mainly for the supply of Domestic Water to Famagusta town and partly for the irrigation for agricultural land downstream the dam. The dam consists of (a) a dam reservoir whose capacity is 13.85 MCM (the largest in Cyprus), (b) a distribution system (piped) for the supply of irrigation water to an area of approximately 615 donums, (c) a feeder pipeline and (d) a domestic water treatment plant near Khirokitia and the pipeline to Famagusta town.

As a result of the Turkish invasion and the occupation of the Famagusta town, the reserved water for Famagusta has been utilized to supply water to the Larnaca and Famagusta towns, other villages and refugee camps en route to Famagusta, whose population has been greatly increased or created from the refugees who were expelled from their villages and town by the occupation army.

This part of the report will deal only with the dam reservoir and water utilization for irrigation and water supply in general, where details, regarding domestic water supply will be given in the section dealing with domestic water supply.

From the sale of irrigation water, the gross income for 1978 amounted to £353. Maintenance works were carried out at a total cost of £830.

TABLE VI–37

MAVROKOLYMBOS DAM-DATA ON PROJECT FOR THE LAST TWO YEARS

Item No		Unit	1977	1978	% change on 1977
1	Capacity	1 000m³	2 180	2 180	NIL
2	Water available	"	586	1 791	205
3	Water utilized for irrigation	"	619	1 425	+130.21
4	Water sold	"	529	1 331	+151.61
5	Water given free	"	90	93	+3.70
6	Water used for recharge	"	NIL	NIL	
7	Gross income	£	8 919	17 410	+95.20
8	Operation	"	6 224	4 370	-29.79
9	Maintenance cost	"	1 184	1 203	+1.60
10	Total expenses	"	7 408	5 573	-24.77
11	Net income	£	1 511	11 837	+683.39
12	Area irrigated	Donums	520	1 315	+152.88

TABLE VI–36

MAVROKOLYMBOS DAM - INCOME AND EXPENDITURE DATA

Item No	Description	Quantity m³	Amount £
1	Water sold at nominal rates	1 331 400	17 410
2	Water sold at reduced rates	NIL	NIL
3	Water given free of charge	93 300	NIL
4	Total quantity utilized and gross income	1 424 685	17 410
5	Operation cost		4 370
6	Maintenance cost		1 203
7	Net income		11 837

Project performance for the last two Years

Table VI–37 shows data on the operation of the project for the last two years. There is an increase in the quantity of water available which resulted to increase in income. The operation expenses are lower because of water being taken from the dam instead of the boreholes as in 1977.

POMOS PROJECT

The Pomos irrigation project consists of a dam reservoir of maximum capacity at spillway crest of 860,000 m³ of water and a distribution system made of a main canal and a closed type distribution system commanding an area of 2,850 donums.

Irrigation in the project area started early in March 1978 and continued throughout the year until early in December 1978.

An area of 851 donums of land planted with citrus, bananas and vegetables was irrigated by utilizing 1,004,136 m³ of water. From the total water utilized 801,023 m³ were taken directly from the dam reservoir whereas the remaining 203,113 m³ were taken from the overflow occurring in the period January the 11th–May the 25th 1978.

The total gross income from the sale of water amounted to £9,127. The expenditure for the maintenance was £1,087 whereas the operation and management costs were £4,141. Net income to the project for the year under review was £3,899.

Project Hydrology

The project hydrologic data as recorded during the year are tabulated in Table VI–38.

The reservoir was filled to spillway crest on January the 6th and overflow occurred during the period January the 11th to May 28th 1978. Minimum water level in the reservoir occurred in October with water in storage in the order of 214,000 m³.

Water Utilization and Crops Irrigated

The 1,004,136m³ of water were utilized for the irrigation of 851 donums within the project area. Details about the water utilized and the crops irrigated are shown on Tables VI–39 and VI–40.

TABLE VI–39

POMOS DAM—WATER UTILIZATION

Item No	Description	Quantity m³	% of storage capacity
1	Water used for irrigation	1 004 136	116.74
2	Water used for recharge	——	
3	Total water utilized	1 004 136	116.74

TABLE VI–40

POMOS DAM—CROPS IRRIGATED

Ser No	Crop	1st period donums	2nd period donums	Total Area donums
1	Citrus	150	150	150
2	Bananas ...	285	285	285
3	Vines	—	—	—
4	Deciduous ...	1	1	1
5	Vegetables ...	97	68	165
6	Potatoes	—	—	—
7	Cereals ...	250	—	250
	Total ..	783	504	851

Water Sale, Income, Operation and Maintenance Costs

From the sale of water (see details on Table VI–41) the total gross income amounted to £9,127 whereas the operation and management costs were £4,141. Maintenance works on the dam and distribution system were £1,087. Net income to the project for the year under review amounted to £3,899.

TABLE VI–38

POMOS DAM-HYDROLOGY FOR 1978

Item No	Description	Quantity m³	% of storage capacity
1	Initial amount in storage	408 000	47.44
2	Inflow during the year ...	4 077 000	474.06
3	Total release	801 000	93.13
4	Leakages	153 000	17.79
5	Evaporation	81 900	9.52
6	Overflow	3 019 000	351.04
7	Final amount in storage	430 000	50.00
8	Minimum quantity in storage (October 1978) ...	214 000	24.88
9	Storage capacity	860 000	100.00

TABLE VI–41

POMOS DAM-INCOME AND EXPENDITURE DATA

Item No	Description	Quantity m³	Amount £
1	Water sold at nominal rates	801 023	8 112
2	Water sold at reduced rates	203 113	1 015
3	Water given free of charge.....	NIL	NIL
4	Total quantity utilized and gross income	1 004 136	9 127
5	Operation cost		4 141
6	Maintenance cost.....		1 087
7	Net income		3 899

Project Performance Data for the Last Two Years

Table VI–42 shows data regarding hydrologic, water utilization, water sales, gross income, operation, maintenance costs, net income and areas irrigated for the last two years.

The last column of the table shows the change in percentages of the quantities of 1978 over the previous years.

The quantity of water utilized for irrigation has reduced by 1.28% where the gross income has risen by 0.51%. The area irrigated was increased by 5.99% and this was mainly due to the increase of the area under permanent crops ie citrus from 134 donums to 150 donums and vegetables 140 donums to 165 donums.

The operational costs were increased by 12.8% where the maintenance cost is the same. Total expenses were up by £1,328 or

by 13.40%. However the total net income reduced by £1,282 or by 24.75%.

Generally the project water has been utilized satisfactorily.

TABLE VI–42
POMOS DAM-DATA ON PROJECT FOR THE LAST TWO YEARS

Item No		Unit	1977	1978	% change on 1977
1	Capacity.....	1 000m³	860	860	NIL
2	Water available	"	1 188	1 218	+2.52
3	Water utilized for irrigation.....	"	1 017	1 004	-1.28
4	Water sold	"	1 017	1 004	-1.28
5	Water given free	"	NIL	NIL	—
6	Water used for recharge	"	NIL	NIL	—
7	Gross income ...	£	9 087	9 127	+0.51
8	Operation cost	£	1 813	4 141	+128.41
9	Maintenance cost	£	1 087	1 087	NIL
10	Total expenses ...	£	3 900	5 228	+13.40
11	Net income	£	5 181	3 899	-24.75
12	Area irrigated ...	Donums	567	601	+5.99

YERMASOYIA — POLEMIDHIA PROJECT

The Yermasoyia–Polemidhia Irrigation Project consists of the Yermasoyia dam, the reservoir of which has a capacity of 13.5 MCM and the Polemidhia dam with reservoir capacity in the order 3.43 MCM. Total storage capacity of the combined project is 16.93 MCM. The distribution system of the project consists of closed conduits now commanding an area of about 11,050 donums but further extensions now under construction in the areas Trakhoni and Ypsonas are to add another 4,390 donums within the project perimetry.

Irrigation in the project area started early in January 1978 and continued throughout the year until late in December 1978. A total quantity of 5,265,220 m³ of water was utilized from both dams (5,188,000 m³ from Yermasoyia dam and 77,220 m³ from the Polemidhia dam) for the irrigation of 10,050 donums (partial or full) in the Zakaki, Phasouri, Akrounda—Phinikaria areas and Yermasoyia and Polemidhia Irrig. Divisions. Of the 5,265,220 m³ of water 716,960 m³ was given free of charge as water rights to the Yermasoyia and Polemidhia Irrigation Divisions (218,630 m³ for Kato Polemidhia, 498,330 m³ for the Yermasoyia Irrigation Division) and 514,913 m³ was given at reduced rates at overflow.

Overflow occurred only from the Yermasoyia dam in the period February 10th to April 24th and the total quantity was 4,218,000 m³ of water. All of this water recharged the Yermasoyia aquifer downstream the dam structure. This aquifer is pumped for the supply of domestic water to the Limassol Town, and the Moutayiaka Regional domestic water supply.

Total gross income from the sale of water amounted to £58,447 where the operating costs including power expenses amounted to £19,455. The maintenace works carried out by the WDD were of the order of £2,502 details on which are given under "MAINTENANCE OF GOVT IRR. WORKS"

Project Hydrology

The project hydrologic data as recorded during the year under review are tabulated in the following tables. The data for each dam reservoir are given separately.

POLEMIDHIA DAM

The inflow to the Polemidhia dam during the year under review totalled 2,892,190 m³ representing 84.32% of the reservoir capacity. The reservoir did not fill to spillway crest. Leakages occurred through the dam and part of these were intercepted downstream for irrigation purposes. Releases from the dam reservoir were only 419,320 m³ where the total water utilized for irrigation and recharge amounted to 419,320 m³. As it is seen most of the leakage water was intercepted for irrigation. (See Table VI–43).

TABLE VI–43
POLEMIDHIA DAM-HYDROLOGY FOR 1978

Item No	Description	Quantity m³	% of storage
1	Initial amount in storage	422 000	12.30
2	Inflow during the year ...	2 892 190	84.32
3	Total release	419 320	72.21
4	Leakages	1 651 000	48.13
5	Evaporation	258 870	7.55
6	Overflow	NIL	.... NIL
7	Final amount in storage ...	985 000	28.72
8	Minimum quantity in storage (January 1978) ...	422 000	12.30
9	Storage capacity.....	3 430 000	100.00

YERMASOYIA DAM

The inflow to the dam during the year under review was estimated at 12,440 MCM mostly occurring in the months of January to June and in December. Out of this inflow 4,218,000 m³ overspilled and recharged the aquifer downstream. Overflow took place over a period of three months February to April 1978 (see Table VI–44).

TABLE VI–44
YERMASOYIA DAM-HYDROLOGY FOR 1978

Item No	Description	Quantity m³	% of storage capacity
1	Initial amount in storage	8 500 000	63.0
2	Inflow during the year ...	12 420 000	92.0
3	Total release	5 188 578	38.4
4	Leakages	833 626	6.2
5	Evaporation	1 445 996	10.7
6	Overflow	4 218 000	105.3
7	Final amount in storage	9 235 000	68.4
8	Minimum quantity in storage (October 1978) ...	7 630 000	56.5
9	Storage capacity	13 500 000	100.0

Water Utilization from Both Dams

Details regarding water utilization from both dams separately and in combine are shown on Tables VI–45, VI–46 and VI–48. In summary during the year under review a total quantity of 6,093,060 m³ of water was utilized for irrigation and recharge purposes. Out of this quantity 5,265,220 m³ was utilized for the irrigation (fully or in part) of 10,050 donums as indicated in Table VI–47. The rest 827,840 m³ was utilized to recharge the Garyllis and Yermasoyia aquifers downsteam of both dams.

TABLE VI–45
POLEMIDHIA DAM—WATER UTILIZATION

Item No	Water Utilization	Quantity m³	% of storage capacity
1	Water used for irrigation	77 220	2.25
2	Water used for recharge	342 100	9.97
3	Total water utilized	419 320	12.22

TABLE VI–46
YERMASOYIA DAM-WATER UTILIZATION

Item No	Water Utilization	Quantity m³	% of storage capacity
1	Water used for irrigation	5 188 000	38.4
2	Water used for recharge (Overspilled and recharged D/S aquifer)	485 740	3.6
3	Total water utilized	5 673 740	42.0

TABLE VI–47
YERMASOYIA—POLEMIDHIA PROJECT—IRRIGATED CROPS

Ser No	Crop	Area donums
1	Citrus	5 100
2	Vines	1 700
3	Deciduous	130
4	Vegetables	3 100
5	Olive trees	20
	Total	10 050

Water Sale, Income, Operation and Maintenance Costs

Details about the quantity sold at the nominal rates, water given free of charge as water rights and the water given at reduced rates are given in Table VI–48.

TABLE VI–48
YERMASOYIA—POLEMIDHIA PROJECT—WATER UTILIZATION

Ser No	Description	Quantity m³	% of storage capacity
1	Water used for irrigation (Y & P)	5 265 220	31.10
2	Water used for recharge	827 840	4.89
3	Total water utilized	6 093 060	35.99

From the sale of water the total gross income was £58,477. The operation cost, including power cost for the Akrounda–Phinikaria pumping station totalled £19,455 where the maintenance costs spent on routine works was £2,502. Details regarding income and expenditure are shown on Table VI–49.

TABLE VI–49
YERMASOYIA-POLEMIDHIA PROJECT-INCOME & EXPENDITURE DATA

Ser No	Description	Quantity m^3	Amount £
1	Water sold at nominal rates	4 033 347	56 932
2	Water sold at reduced rates	514 913	1 545
3	Water given free of charge as water rights to:		
	–Yermasoyia irrigation Division	498 330	—
	–Polemidhia Irrigation Division	218 630	—
4	Total quantity/income	5 265 220	58 477
5	Operational cost		16 670
6	Power cost (Akrounda–Phinikaria)		2 785
7	Maintenance cost		
	–Yermasoyia £1 315		2 502
	–Polemidhia £1 187		
8	Total cost		21 957
9	Net income		36 520

TABLE VI–50
YERMASOYIA-POLEMIDHIA PROJECT-DATA ON PROJECT FOR THE LAST TWO YEARS

Ser No	Description	Unit	1977	1978	% change on 1977
1	Capacity	1 000m^3	16 930	16 930	—
2	Water available	"	18 780	18 780	—
3	Water utilized for irrigation	"	5 495	5 265	–4.18
4	Water sold	"	5 007	4 548	–9.17
5	Water given free	"	488	717	+46.92
6	Water used for recharge	"	2 954	828	—
7	Total quantity used	"	8 449	6 093	–27.88
8	Gross income	£	60 011	58 477	–2.56
9	Operation cost	£	14 817	16 670	+12.50
10	Power cost	£	5 950	2 785	–46.75
11	Maintenance cost	£	1 734	2 502	+44.29
12	Total expenditure	£	22 501	21 957	–2.42
13	Net income	£	37 510	36 520	–2.64
14	Area irrigated	Donums	10 050	10 050	NIL

Project Operation Data for the Last Two Years

Table VI–50 shows data on the operation of the project (Yermasoyia—Polemidhia) for the last two years. The last column indicates the changes of data (in percentage) with respect to the year 1977.

There has been a decrease of the quantity of water utilized for irrigation. Compared with 1977 figures the reduction has been down 4.18% The gross income has been reduced by 2.56% However there has been an increase of the operation cost by 12.50% and a decrease of the power cost by 46.75%

. ——— .

DETAILS OF MAINTENANCE WORKS— ON GOVERNMENT IRRIGATION PROJECTS

Argaka: Repairing of crest curbing, cleaning of embankment from wild vegetation, painting of all metal structures and treating of bridge timber with creosote, cleaning of access road, painting of all manhole covers of distribution system, repairing of various sluice valves and replacing of 100 m length of piping.

Expenditure for Dam	£698
" " Distribution	£238
Total	£936

Athalassa: Painting of perforated outlet pipe

Expenditure	£ 10

Ayia Marina: Cleaning of the embankment from wild vegetation, painting of the guard house, constructing of a protective wall, painting of all metal structures, cleaning of the Teratsia weir, painting of all manhole covers replacing of 5 No. sluice valves and maintaining of all valves of the system.

Expenditure for Dam	£385
" " Distribution	£335
Total	£720

Kalopanayiotis: Cleaning of the area around the grill, painting of all metal structures and manhole covers, painting of guard house, desilting of the downstream collector weir and pulling down of the old temporary store room.

Expenditure for Dam	£346
" " Distribution	£ 86
Total	£432

Kiti: Constructing of a concrete ladder on the embankment, maintaining of the penstock, desilting of the area around the outlet pipe, painting of all metal structures, planting of forest trees downstream of the embankment installing of a Greek/English notice board and cleaning of canals.

Expenditure for Dam	£409
" " Distribution	£330
Total	£739

Kouklia—Under Turkish occupation

Lefkara: Repairing of breakages of W.S. main, removing of avalanched soil and rocks from crest square, repairing of access road, painting of piping of hydraulic system in inclined galery, painting of woodwork of guard house, constructing of a water tank trestle, painting of electric poles and bridge and planting of trees.

Expenditure	£830

Masari—Under Turkish occupation

Mavrokolymbos: Painting of all metal structures, treating of bridge timber with solignum, cleaning of embankment from wild vegetation, replacing of 4 No. water meters, maintaining of various sluice valves, painting of all manhole covers, water sealing of of joints with gutta terna and repairing of breakages to irrigation mains.

Expenditure for Dam	£ 273
" " Distribution	£ 930
Total	£1203

Polemidhia: Painting of all metal structures, maintaining of penstock winch, removing of wild vegetation from embankment and meteorological station, maintaining of various sluice valves, painting of all manhole covers and repairing of breakages of main conveyor.

Expenditure for Dam	£ 315
" " Distribution	£ 872
Total	£1187

Note: Extra work was done on the distribution system (mainly breakages).

Pomos: Cleaning of embankment from wild vegetation, painting of all metal structures, treating of bridge timber with creosote, painting of woodwork of guard house, painting of all manhole covers, repairing of guard house, painting of all manhole covers, repairing of breakages to pipings and sluice valves, and replacing of 5 No. sluice valves 3" dia.

Expenditure for Dam	£ 367
" " Distribution	£ 426
Total	£ 793

Syngrasis—Under Turkish occupation

Yermasoyia: Painting of radial gates and all other metal structures, maintaining of the diesel engine and winch of the penstock and repairing of breakages of the Akrounda main.

Expenditure for Dam	£ 419
" " Distribution	£ 896
Total	£1315

CONTRIBUTORY DAM PROJECT MAINTENANCE EXPENSES

Agros: Repairing and painting of woodwork of guard house, cleaning of spillway and chute, painting and maintaining of the Karkopoulia unit and fencing of the Karkopoulia reservoir.

Govt. contribution	£ 175
Village contribution	£ 83
Total	£ 258

Lythrodhonda Upper and Lower: Maintaining of both penstocks and desilting of lower dam

Govt. contribution	£ 28
Village contribution	£ 13
Total	£ 41

Perapedhi: Emergency desilting operation, major repairs to penstock and grill and installing of a metal ladder.

Govt. contribution	£686
Village contribution	£ 50
Total	£736

OPERATION AND MAINTENANCE OF TOWN WATER SUPPLIES

International Water Supply Association

The exchange of correspondence with the International Water Supply Association was the main activity of the Cyprus National Committee. A meeting of the Committee will be held next year for the purpose of studying the possibilities of organizing a Seminar in Cyprus.

Management of Water Supplies

The administration of (a) the Greater Nicosia Water Supply Scheme and (b) the Famagusta Water Supply Project was the main task of this Branch of the Operation and Maintenance Division of the Department. The first to provide water to Nicosia town and suburbs and the second to Larnaca and Famagusta towns, Refugee camps and several other communities situated in the homonymous Districts. Water demands for the aforesaid communities could be faced satisfactorily except for Nicosia town where, due to shortage, restrictions were imposed in the supply. More details are given below.

Greater Nicosia Water Supply Scheme

A scheme wholly financed by the Cyprus Government, it was first put into commission in 1958, providing water to the suburban area of Nicosia town, and has since execution been under the administration of this Department. Although this scheme is an independant one, yet, it was designed in a way that it may be easily amalgamated with that of the Nicosia Water Board through existing interconnections of ring and trunk mains of the two schemes.

Amalgamation efforts of the two schemes are by now well in progress and there is every reason to believe that they will succeed thus giving an end to a rather confusing process in the water supply to Nicosia citizens. The idea is that Government will keep the ownership and administration of all sources whilst Nicosia Water Board will undertake the distribution of water to consumers within the defined "area of supply".

Irrespective to the existence of more than one Authority for the supply of water to Nicosia and suburbs, and though the sources of Greater Nicosia Scheme are supplementing to a certain extent the water requirements of Nicosia Water Board's consumers, yet the shortage problem of water was faced commonly and restrictions were imposed over the whole "area of supply". More particulars in this respect are given under heading "Nicosia Town and Suburbs Water Supply".

The highest daily consumption in 1978 for the Greater Nicosia Water Supply Scheme "area of supply" was 16,670 m^3 on 24th September 1978 (under restrictions).

During the year under review the distribution system of Greater Nicosia Scheme was extended by 4,935 metres of 4" dia, 7,800 metres of 6" dia and 1,050 metres of 8" dia of asbestos cement pipes laid in Refugee Housing Estates and new developments made by private individuals. In addition 1,451 new house connections were made bringing the total number of consumers to 16,380 by 31st December 1978.

A statement giving expenditure and revenue over Greater Nicosia Scheme for the year 1978, is shown on Table VI–52.

Nicosia Town and Suburbs Water Supply

The habitation of Nicosia area by Greek Refugees, the re-activated building industry, the increased consumption observed in the Turkish Sector of the town, have all attributed to an increased demand in water which could not be met by existing sources and restrictions to the supply were imposed on 11th April 1978. The restrictions applied, provided a supply of 20 hours in every 48 hours to all consumers.

It is estimated that the number of people now residing in Nicosia and Suburbs or otherwise supplied with water by the Authorities concerned, amount to 180–200 thousand persons requiring some 37,000—40,000 m^3 daily during summer months. The maximum capacity of existing sources is only 25,000 m^3 daily under continuous pumping. With a view to minimizing the great difference

between availability and consumption of water a new scheme has been designed for the conveyance of water from Peristerona–Orounda–Akaki triangle where some successful boreholes have already been drilled. The scheme provides for a quantity of 5,000—6,000 m³ daily and is expected to be completed in August next year.

The total quantity of water conveyed from all sources during 1978 reached the figure of 9,044,993 m³ and was distributed as follows:

	m³
★ Greater Nicosia Scheme (area of supply)	3 670 023
★ Nicosia Water Board (area of supply)	4 032 220
★ Nicosia Water Commission (town within walls)	732 550
Total	8 434 793

The highest daily consumption for all "areas of supply" was 33,260 m³ (supply under restrictions) on 24th September 1978.

In addition to the short–term supplementary scheme, the Cyprus Government has approved the execution of a long–term supplementary scheme which will solve the water supply problem of Nicosia and suburbs. All necessary formalities are well in progress and its execution in phases is expected to start as soon as possible. (See Vasilikos–Pendaskinos project under DESIGN DIVISION).

Famagusta Water Supply Project

A scheme to provide water to Famagusta and Larnaca towns as well as to several villages and Refugee camps in the aforesaid Districts. The scheme provides both underground water being pumped from boreholes in the area of Khirokitia and Psematismenos villages and surface water from Lefkara dam being treated at Khirokitia Treatment Plant. As long as demands in water by the communities served are met by the pumping of the various underground sources, the Treatment Plant remains idle, during which period maintenance work is carried out. Usually, operation of the Treatment Plant starts late in spring. During 1978 the Treatment Plant was put into commission on 14th May 1978. By that time the water impounded into Lefkara Dam was 6,935,000 m³ representing 50% of the dam capacity.

The total amount of water pumped and/or treated from all sources of this Project was 3,748,475 m³ (including losses) and was distributed as follows:

	m³
(i) Famagusta town	1 018 027
(ii) Larnaca Water Board	1 060 770
(iii) Regional village water supplies	858 149
(iv) Local irrigators	57 091
(v) Refugee camps	262 434
Total	3 256 471

A statement showing expenditure and revenue of the Famagusta Water Supply Project for the year 1978 is given on Table VI–51.

Water Supply to Government Residences and Institutions

A regular supply of water for domestic use and irrigation to all Government Residences and Institutions could be maintained throughout the year from existing sources. The sources used for irrigation, being located within inhabitated areas of the town are liable to contamination and therefore it is not recommended that this water is used for drinking purposes.

Technical Advice

This branch offers technical advice to several Government and Semi–Government Organizations, mainly to Water Boards, attending regularly respective meetings.

FACTS ABOUT EACH OF THE TOWN WATER BOARDS

Nicosia Water Board

The appointment of a new Manager is recorded late in the year. Shortage of water is experienced and restrictions to the supply were imposed. Improvements to the distribution system as recommended by the Consultants—Messrs McLaren International —were in progress. Further details are given below:

★ The total quantity of water consumed

as registered by area meters was 4,517,410 m³ including Nicosia Water Commission.

★ The total maximum consumption per day (including Nicosia Water Commission) was 16,590 m³ on 24.9.78 (for 24–hour supply).

★ The total number of consumers on 31.12.78 was 16,833.

★ Extension of distribution system during 1978: A C pipes 4″ dia 1,096 metres. Total length of distribution system including extensions for 1978: A C pipes 12″, 10″, 8″, 6″, 4″, dia 237,003 metres

★ The total number of hydrants installed in 1978 was 5.

The total number of hydrants installed up to 31.12.1978 was 890.

Limassol Water Board

Existing sources could meet water requirements and a regular supply was maintained throughout the year. The employment of Consultants is being arranged to study necessary improvements to the existing distribution system and propose new installations in order that a satisfactory supply all over the "area of supply" is maintained until the year 2000. Additional data on the activities of this Water Board is detailed as under:

★ Total quantity of water supplied from all sources 6 376 855 m³

★ Total quantity of water consumed as registered by area meters ..... 6 342 758 m³

★ Total maximum summer consumption ..... 24 973 m³

★ Total number of consumers by 31.12.78 ..... 21 908 No

★ Extension of distribution system during 1978

6 800 m of 4″ dia AC
1 178 m of 6″ dia AC

★ Total length of distribution system by 31.12.1978 (including extensions) ..... 308 347 m

★ Number of fire hydrants installed in 1978 ..... 30 No

★ Total number of fire hydrants installed within the "area of supply" by 31.12.1978 ..... 1 105 No

Famagusta Water Board

Since the Turkish occupation of Famagusta, Cyprus Government has been supplying water, free of charge, to meet requirements of the Turkish people and the troops in the area.

Larnaca Water Board

With water production from its own sources and the supplementation offered from the Famagusta Water Supply Project, demands were met satisfactorily and regular supply was possible. More information is given below:

★ Total quantity of water supplied from all sources 2 578 880 m³

★ Total quantity of water consumed as registered by area meters ..... 2 523 680 m³

★ Total maximum summer consumption ..... 8 722 m³

★ Total number of consumers at 31.12.1978 ..... 9 513 No

★ Extension of distribution system during the year 1978:

8 024 m 4″ dia AC
345 m 6″ dia AC
30 m 8″ dia AC

★ The total length of distribution system is not available ..... —

★ Hydrants installed during the year 1978 ..... 51 No

★ Total number of hydrants installed within water supply area by 31.12.1978 485 No

Paphos Water Supply

Administration of this Town's Water Supply is in the hands of the Municipality. A regular supply could be maintained through pumping of the existing sources. The maximum daily consumption was 3,696 m³. During the year a total quantity of 889,668 m³ was pumped to supply 2,939 consumers by 31.12.1978.

TABLE VI–51
FAMAGUSTA WATER SUPPLY PROJECT

Expenditure and Revenue account for 1978

Expenditure

Pumping and Maintenance Charges

	£
(i) Wages	24 509
(ii) Electricity	23 695
(iii) Materials and others	10 690
Total	£58 896

Running Expenses Khirokhitia and Lefkara Installations

(i) Wages	14 759
(ii) Electricity	2 014
(iii) Materials and others	15 457
Total	£32 232

Regional Scheme Water Supply Running Expenses

(i) Wages	1 107
(ii) Electricity	4 298
Total	£ 5 405
GRAND TOTAL	£96 534

Revenue

	£
Sale of water	108 570
Outstanding payments by 31.12.1978	258 716
Total	£367 287

Note:

The cost of Famagusta Water Supply Project up to the end of 1978 amounted to £2,971,721. Roughly the amortization for this capital investment is £249,210 annually (at 8% for 40 years). Thus the deficit for the year 1978 amounts to £237,174, not considering outstanding payments as revenue.

TABLE VI–52
GREATER NICOSIA SCHEME
(Including Morphou Bay Scheme)
Expenditure and Revenue account for 1978

Expenditure

		£
(*a*)	*Pumping & Maintenance charges*	
	(i) Wages	45 458
	(ii) Electricity	10 730
	(iii) Materials and others	18 161
	Total	£ 74 350
(*b*)	*Morphou Running Expenses*	
	(i) Wages	3 583
	(ii) Electricity	73 167
	(iii) Materials and others	3 742
	Total	£ 80 493
(*c*)	*Tseri Running Expenses*	
	(i) Wages	5 940
	(ii) Electricity	9 598
	(iii) Materials and others	7 858
	Total	£ 23 397
(d)	*Purchase of water*	11 473
(e)	*Collection fees*	43 436
	Grand Total	£233 152

Revenue

		£
(*a*)	*Sale of water*	
	(i) In "bulk"	58 219
	(ii) To consumers	286 701
(b)	Connection fees	2 798
(c)	Usage of pipeline	2 812
(d)	Other revenue	3 559
	Total	£354 090

Note:

This statement does not include for the amortization of the installations and equipment of the scheme. The cost of the existing installations was approx. £2,553,000 and the amortization was calculated to be £244,000 per year.

VII DIVISION OF SMALL PROJECTS PLANNING

by
C Andreou
Senior Water Engineer
Head of Division

Introduction

By the end of the year 1978 the staff of the Division consisted of the following:-

One Senior Water Engineer, Head of Division
One Executive Engineer
One Superintendent of Works
One Senior Inspector of Works
Five Inspectors of Works
Two Technical Assistants
One Secretary-Typist

The main activities of the Division during the year under review were the planning and design of:

★ Village Water Supplies
★ Routine Irrigation Schemes

VILLAGE WATER SUPPLIES

The general village water supply situation during 1978 is described in tables VII-1 and VII-2. There are no villages in Cyprus without piped water.

With the completion of six house-to-house supply systems during 1978 only 62 out of a total number of 619 villages still remain with public fountains, ie 1.8% of the total village population.

Out of 557 villages with house-to-house systems 517 enjoyed a per capita daily rate of over 90 litres (20 gallons).

Water Supply Schemes Prepared During 1978

A total number of 87 new schemes were prepared and submitted to the District Officers during 1977 at a total estimated cost of £1,276,224 as shown on Table VII-3. Another 54 schemes were in the course of preparation at the end of the year, as per Table VII-4.

In the above mentioned work carried out by this Division, is included a certain number of schemes concerning the domestic water supply of Government Housing Estates and Self-housing of displaced persons as well as the domestic water supply for livestock areas.

Brief Description of Important Village Water Supply Schemes Prepared During 1978

Tseri: A scheme has been prepared in order to increase the storage of the existing capacity of the reservoirs, and the improvement of the house-to-house supply, at a total estimated cost of £52,000.

Pano and Kato Lakatamia: Construction of new storage reservoir and improvements of the distribution system at a total estimated cost of £46,000.

Anayia: A scheme for the implementation of house-to-house supply and the

TABLE VII–1 **VILLAGE WATER SUPPLIES**

Year	Villages with House-to-House distribution system: Schemes completed	Total No. of villages	Villages %	Population %	Villages with Public Fountains: Total No. of Villages	Villages %	Population %	Villages without a piped supply: Total No. of Villages	Villages %	Population %	Total No. of Villages
1960	—	90	14.33	—	441	70.23	—	97	15.44	—	628
1961	41	131	20.86	—	428	68.19	—	69	10.95	—	628
1962	59	190	30.25	—	380	60.55	—	58	9.20	—	628
1963	67	257	40.90	—	324	51.60	—	47	7.50	—	628
1964	39	296	47.13	66.71	323	51.43	32.29	9	7.44	1.00	628
1965	5	301	47.93	68.86	321	51.11	30.44	6	0.96	0.70	628
1966	7	308	49.05	69.81	316	50.31	29.95	4	0.64	0.24	628
1967	11	319	50.80	71.40	307	48.88	28.46	2	0.32	0.14	628
1968	27	346	55.10	75.72	282	44.90	24.28	—	—	—	628
1969	14	360	57.32	78.60	268	42.68	21.40	—	—	—	628
1970	32	392	62.42	83.23	236	37.58	16.77	—	—	—	628
1971	16	408	64.95	85.42	220	35.05	14.58	—	—	—	628
1972	29	437	69.60	88.70	191	30.40	11.30	—	—	—	628
1973	67	504	81.40	95.10	115	18.60	4.90	—	—	—	619
1974	22	526	85.00	97.20	93	15.00	2.80	—	—	—	619
1975	6	532	85.94	97.55	87	14.06	2.45	—	—	—	619
1976	11	543	87.72	97.60	76	12.28	2.40	—	—	—	619
1977	8	551	89.02	98.04	68	10.98	1.96	—	—	—	619
1978	6	557	89.98	98.20	62	10.02	1.80	—	—	—	619

construction of new storage tank at a total estimated cost of £27,500.

Moutoullas: A scheme has been prepared for the implementation of house-to-house supply at a total estimated cost of £21,000.

Troulli-Kelia: The scheme prepared provide supplementary water supply from the existing Famagusta water supply main conveyor pipeline at a total estimated cost of £40,000.

Paralimni 'Protaras: A scheme has been prepared in order to supply drinking water, to the touristic area of Protaras, at a total estimated cost of £100,000. The source of supply is the Famagusta Water Supply Project.

Ayios Athanasios: A scheme has been prepared which, will supply the Government housing estate 'Linopetra' (housing of displaced persons) and the Industrial Area. The total estimated cost amounts to £104,500. The source of supply is the Water Board Limassol.

TABLE VII–3
VILLAGE WATER SUPPLY SCHEMES PREPARED IN 1978 AND SUBMITTED TO DISTRICT OFFICERS

Ser No.	Village	Nature of Scheme	Est. cost
NICOSIA DISTRICT			£
1	Peristerona	New storage tank ...	3 500
2	Dhali	Extension of distrib. system	550
3	Pitsilia Int. Dev.	House-to-house and additional supply scheme	9 138
4	Astromeritis	Additional supply from new B/H	7 500
5	Alambra.....	New pumping unit	1 200
6	Lakatamia Pano " Kato	New storage tank and mains	46 000

TABLE VII-2 **WATER SUPPLY SITUATION AT THE END OF 1978**

	Satisfactory piped supply (Supply rate 90 litres/head/day & over)								Unsatisfactory piped supply (Supply rate below 90 litres/head/day)								Total No of Villages	Total population 1969
	Villages with House to House				Villages with fountains				Villages with House to House				Villages with public fount.					
	No.	%	Pop.	%	No.	%	Pop.	%	No.	%	Pop.	%	No.	%	Pop.	%		
Nicosia ...	145	85.80	116 261	93.54	8	4.73	1 206	0.97	9	5.33	6 286	5.05	7	4.14	543	0.44	169	124 296
Kyrenia.....	39	82.98	30 869	93.76	2	4.25	55	0.16	1	2.13	540	1.64	5	10.64	1 463	4.44	47	32 927
Famagusta	81	82.66	82 990	92.50	3	3.06	100	0.11	7	7.14	5 693	6.35	7	7.14	934	1.04	98	89 717
Limassol ...	102	89.47	71 917	97.04	4	3.51	50	.07	5	4.39	2 021	2.73	3	2.63	120	0.16	114	74 108
Paphos	100	75.76	44 699	86.47	11	8.33	1 462	2.83	14	10.61	4 612	8.92	7	5.30	922	1.78	132	51 695
Larnaca ...	50	84.74	37 644	92.87	3	5.09	402	0.99	4	6.78	2.298	5.67	2	3.39	190	0.47	59	40 534
Total	517	83.52	384 380	93.01	31	5.01	3 275	0.79	40	6.46	21 450	5.19	31	5.01	4 172	1.01	619	413 277

TABLE VII-3 (continued)

7 Malounda	Extension of distr. system	700
8 Ayia Varvara ...	Extension of distr. system	1 000
9 Tseri	New storage tank and house-to-house scheme	52 000
10 Laxia	Supply of water to new cemetery	800
11 Lythrodhonda ...	Extension of distrib. system	1 450
12 Ayios Mamas Refugee Housing Estate (Kato Lakatamia)	House-to-house scheme	61 000
13 Kakopetria	Extension of distr. system	9 090
14 Ayios Epiphanios	Add. supply from new B/H 95/77	11 500
15 Astromeritis	House-to-house supply to high quarters of the village	20 300
16 Ayii Trimithias...	Add. supply from new B/H	17 000
17 Laxia (67/63) ...	Extension of distr. system	900
18 Yeri (112/35) ...	Supply of water to EAC station	3 500
19 Chakistra	Supply of water to SYTA station	370
20 Akaki Refugee Housing Estate...	House-to-house scheme	3 200
21 Anayia	New storage tank and house-to-house supply	27 500
22 Perakhorio.....	Emergency supply from B/H 115/77 ...	5 200
23 Pharmakas.....	Extension of distr. system	220
24 Moutoullas	House-to-house scheme	21 000
25 Akaki livestock area.....	Storage tank and distr. system from B/H 63/77	24 100
26 Laxia	Supply of water to displ. persons	1 000
27 Dhali	Extension of distr. system	500
28 Ayios Ioannis Arediiou	Add. supply from B/H 120/77	15 000
29 Margi	Improvements	200
30 Ayios Yeoryios (Kapsalos)	Additional supply and house-to-house scheme	20 880
31 Akaki	New storage tank and improvements ...	9 500
32 Yeri (vocational school)	Irrigation scheme ...	15 500
Total		£391 298

TABLE VII–3
VILLAGE WATER SUPPLY SCHEMES PREPARED IN 1978 AND SUBMITTED TO DISTRICT OFFICERS (Continued)

Ser No	Village	Nature of scheme	Est. Cost
	LIMASSOL DISTRICT		£
1	Kolossi–Erimi	Replacement of conveyor pipeline	2 000
2	Kouka	House–to–house scheme	3 100
3	Phinikaria	Extension of distr. system	450
4	Ayios Yeoryios (Alamanou)	Replacement of conveyor pipeline	800
5	Yerasa	Extension of distr. system	450
6	Panayia 'Glossa'	Pumping scheme and distr. pipes	3 000
7	Kandou	Improvement of spring	440
8	Ayios Pavlos	Improvements to distr. system	3 150
9	Amathus Impr. Board	Pumping scheme and distr. pipes	175 500
10	Amathus Impr. Board (Governors Beach)	Pumping scheme and distr. pipes	59 900
11	Mathikoloni	Replacement of pumping unit	1 200
12	'Lambousa' Red Cross Polemidhia Refugee Camp	Pumping scheme storage tank and distr. pipeline	27 900
13	Omodhos	Inst. of water meters	5 000
14	Kividhes–Souni–Zanaja	Improvements	700
15	Zakaki	Extensions	700
16	Paramali	Improvements	3 800
17	Paramytha–Palodhia–Spitali	Additional supply	1 050
18	Perapedhi	Extensions	150
19	Pano Platres	Childrens camping site	6 000
20	Moutayiaka	Storage tank & distr. pipes	7 000
21	Sylikou	Extensions	360
22	Armenokhori	Improvements	430
23	Zakaki	Extensions	870
24	Linopetra Industrial Area (Ayios Athanasios)	Distribution pipelines Pipelines	104 500
25	Trakhoni	Pumping & distr. pipes	36 500
		Total	£449 550
	PAPHOS DISTRICT		
1	Miliou	Additional supply	19 400
2	Kholi	Add. supply & house–to–house scheme	7 450
3	Statos–Ayios Photios	Additional supply	20 500
4	Theletra	Pumping scheme & house–to–house scheme	24 800
5	Peristerona	Additional supply	5 800
6	Khlorakas	Extensions	6 300
7	Nata	Additional supply	7 400
8	Kedhares	Extensions	800
9	Timi	Refugee self–housing	11 500
10	Polis	Limni camping site	13 800
11	Paphos Higher villages	Additional supply	20 200
		Total	£137 950
	LARNACA DISTRICT		
1	Kornos	Extensions	4 000
2	Livadhia	Refugee self–housing estate	10 000
3	Ayios Yeoryios	Refugee housing estate	5 500
4	Kalokhorio	Refugee self–housing estate	5 000
5	Makarios III	Refugee housing estate	16 000
6	Ayii Anargyri	Refugee housing estate	18 000
7	Troulli–Kellia	Supplementary supply from F'sta pipeline	40 000
8	Layia	Supplementary supply	4 426
9	Zyyi	Refugee housing estate	15 000
10	Ayios Ioannis	Refugee housing estate	15 000
11	Voroklini	Refugee self–housing estate	6 400
12	Xylotymbou	Extensions	3 600
13	Ormidhia	Supplementary supply from new B/H	11 500
		Total	£151 026
	FAMAGUSTA DISTRICT		
1	Liopetri	Improvements	5 600
2	Dherinia	Refugee self–housing estate	13 500
3	Akhna	Livestock farming area	4 800
4	Phrenaros	Supplementary supply	6 000
5	Paralimni	Protaras tourist area W S	100 000
6	Ayia Napa	Tourist area W S	16 500
		Total	£146.400

SUMMARY OF TABLE VII–3

District	No of schemes	Estimated cost £
Nicosia	32	391 298
Limassol	25	449 550
Famagusta	6	146 400
Larnaca	13	151 026
Paphos	11	137 950
Total	87	£1 276 224

TABLE VII-4
SCHEMES UNDER PREPARATION

Ser No	Village	Nature of scheme
	NICOSIA DISTRICT	
1	Perakhorio (Nisou)	Additional supply from B/H 115/77 and well hydr. no 67
2	Ayios Mamas Refugee Housing estate (Pano Lakatamia)	Additional supply from proposed B/Hs
3	Dhali	Additional supply from new B/H
4	Kokkini Trimithia	Extensions
5	Ayia Varvara	New house-to-house scheme
6	Agrokipia	Extensions
7	Askas	Supply of water to new cemetery
8	Mathiati	Additional supply from new B/H
9	Laxia-Yeri	New B/H and storage tank
10	Lythrodhonda	Improvements
11	Kokkines Refugee housing estate	Supply of water (house-to-house)
12	Dhenia	Division of plots
13	Mammari	" "
14	Athalassa Refugee housing estate	House-to-house scheme
15	Moutoullas	Extensions
16	Aredhiou	Development of old source of supply
	LIMASSOL DISTRICT	
1	Moniatis	Additional supply
2	Trimiklini	—do—
3	Dhierona	Extensions
4	Plataniskia	Additional supply
5	Ayios Thomas	—do—
6	Ayios Therapon	—do—
7	Pendakomo	—do—
8	Anoyira	—do—
9	Pelendria	Extensions
10	Ypsonas	Additional supply
11	Moni	Improvements
12	Phinikaria	Extensions
13	Pissouri	Improvements
14	Spitali	Extensions
15	Governor's Beach	Drilling of B/H
16	Pyrgos	Extensions
17	Kato Polemidhia	Livestock area
18	Akrounda	Extensions & improvements of spring
19	Evdhimou	Livestock area
20	Kandou	Livestock area
21	Moutayiaka	Livestock area
22	Episkopi	Livestock area
23	Kolossi	Refugee self-housing
24	Ayia Phyla	Refugee self-housing
25	Kato Polemidhia	Ayios Ioannis Refugee self-housing
26	Kato Polemidhia	Makarios III Refugee self-housing
	PAPHOS DISTRICT	
1	Peyia	Replacement of conveyor pipeline
2	Peyia	Drilling of B/H for Coral Bay
3	Emba	Extensions and storage tank
4	Neokhorio	Additional supply
5	'Xeropiyi'	Regional scheme improvements
6	Miliou	House-to house scheme
7	Tsadha	Additional supply
8	Kili	Additional supply
	FAMAGUSTA DISTRICT	
1	Paralimni	Supply to new hospital
2	Dherinia	Improvements to distr. system
3	Paralimni	Extensions to building sites
4	Ayia Napa	Improvements to distr. system
	LARNACA DISTRICT	
1	Pyrga	Improvements to distr. system
2	Xylophaghou	New B/H and improvements
3	Kophinou	Livestock area

IRRIGATION SCHEMES

Routine Irrigation Schemes

The planning and design of small irrigation schemes is to increase the irrigated area near the sources for self employed farming organizations, such as Village Irrigation Associations or Divisions.

The main target is to extend permanent irrigation by 1,000 to 1,500 donums annually, which can be implemented with financial participation by the farmers.

As the main principles underlying this special programme is the quick and effective use of water at or near the source combined with intensive agricultural methods, design

considerations are usually based on land and water use data furnished by the District Agricultural Officers. Project evaluation is undertaken by a Joint Interdepartmental Committee.

The advantages of the Small Projects Programme, whose beginning dates back to the creation of the Department is "speed of reaction" in all phases of Project Development, "wide participation" of farming communities, "greater flexibility" in budgetary procedure and greater exploitation of the existing agricultural and agronomic background of the country.

The planning and design of these schemes can be undertaken at a greater advantage by technical staff whose skill has been acquired by long experience in construction methods and long friction with local problems and practices.

The main types of schemes included in this programme postulatated water conservation either by the improvement of the old established obsolete intake and distribuion system, the construction of small reservoirs for higher or seasonal storage, the exploitation of new boreholes and the artificial recharge of depleted aquifers.

Besides the above mentioned types, a certain number of schemes have been prepared and are now under execution with full government contribution.

A total number of 36 schemes have been prepared during 1978, at a total estimated cost of £640,630 (Table VII–5).

Another 88 schemes were in the course of preparation or investigation by the end of 1978 (Table VII–7).

Some more important schemes prepared in 1979 and submitted to the District Officers or which are in the course of preparation are briefly described herebelow:

Orounda Limni Irrigation Scheme: This scheme has been prepared to pump water from a borehole and convey it by a pipeline and reinforced concrete channels for the irrigation of 250 donums seasonal crops, at a total estimated cost of £13,500.

Solea Valley: Five schemes have been prepared for the lining of channels in the villages of Phlasou, Korakou, Evrykhou, Katydhata and Linou. The object of these schemes is to save water now lost through the existing earth channels. The total estimated cost amounts to £94,000.

Meanwhile work continued on the investigations and the preliminary studies concerning the project for the construction of earth reservoirs for the storing of water during the winter period for more efficient control in irrigation and increase of irrigated land.

Spilia: This scheme is within the Pitsilia Rural Development Project and consists of the construction of a storage reservoir and distribution system. The total estimated cost amounts to £19,000.

Ayios Ioannis-Kato Mylos 'Angoulos Dhipotamia': A scheme has been prepared within the Pitsilia Rural Development Project and consists of the construction of storage tanks and distribution system at a total estimated cost of £20,000.

Interdepartmental Committee for Small Irrigation Projects:

The Committee is functioning in conformity with directions of the Director–General of the Ministry of Agriculture and Natural Resources for the purpose of assessing project viability for budgeting purposes and coordinates the activities of the District Agricultural services for the supply of agro–economic data in the preparatory stages of the projects.

During 1978 35 schemes have been considered by the committee as per Tables VII–6 and VII–6a.

Capital Aid from the Federal Republic of Germany

Up to the end of 1978 a total sum of £1,968,631 (D M 10,904,219) has been reimbursed from the Loan of 18 Million D M for projects which have been completed or which are under construction and for the purchase of a drilling rig as detailed below:–

Major Projects

Total number of projects	10
Investments cost of projects ...	£2 354 000

Amount which can be claimed from loan	£1 631 779
Amount reimbursed upto end of 1978	£1 256 278

Minor Projects (*Over* £15,000)

Total number of projects	24
Investment cost of projects	£ 552 380
Amount which can be claimed from loan	£ 383 578
Amount reimbursed upto end of 1978	£ 370 379

Minor Projects (*Upto* £15,000)

Total number of projects	72
Investment cost of projects	£ 346 160
Amount which can be claimed from loan	£ 283 483
Amount reimbursed upto end of 1978	£ 245 190

Drilling Rig

An amount of £96,845 is included in the above total reimbursed to meet part of the cost of a drilling rig purchased.

Encroachment in Rivers and Streams

Some 72 cases for land encroachment in rivers and streams were examined and the Director of Lands and Surveys Department was advised accordingly.

Quarrying in River Beds

In order to co-ordinate the activities of the Departments concerned ie the District Officers, the Department of Mines and this Department and in order to bring about effective supervision and the enforcement of conditions included in the quarry licences issued by the Department of Mines, an advisory committee was set up in 1976.

During 1978 this committee examined 500 cases and advised the Senior Mines Officer accordingly.

TABLE VII-5 **IRRIGATION SCHEMES COMPLETED IN 1978 AND SUBMITTED TO DISTRICT OFFICERS**

Ser No	File No	Village	Division or Association	Locality	Nature of Proposed Work	Estimated Cost £	Village Contr.	Irrigation Perm.	Irrigation Seas.
NICOSIA DISTRICT									
1	44/42/II	Orounda	Association	Limni	Pumping unit, pipes and channels	13 600	40%	—	250
2	182/57	Akaki	Division	Kamena	Lining of channels	7 850	1/3	—	300
3	63/52/IV	Akaki	Association	Riatiko	Lining of channels	20 000	1/3	—	2 000
4	63/52/IV	Akaki	Association	Neron tou Hodja–Riatiko	Lining of channels	9 920	1/2	100	900
5	152/56	Pera–Politiko	Division	Moulos	Lining of channels (Extensions)	21 200	1/3	—	450
6	88/52	Pharmakas	Association	Koskinas	Main conveyor pipeline	4 400	1/3	50	210
7	88/47/II, III	Ayios Ioannis (Malounda)	Association	Pitsillis	Lining of main channel	6 000	1/3	50	100
8	51/54	Peristerona	Division		Lining of channels	10 000	1/2	800	4 200
9	31/46/II	Astromeritis	Division		Lining of channels	10 000	1/2	1 000	3 000
10	127/40/38	Ayios Epiphanios	Division		Pumping scheme	36 000	1/3	50	170
11	147/39/II	Meniko	Division	Litharkes	Lining of channels	10 000	1/3	—	450
12	42/42/III	Pera	Division	Phassera	Lining of channels	24 000	1/3	200	400
13	127/40/40	Kambi	Division	Yerambela& Kokkinoyia	Storage tank and distr. pipelines	10 500	1/3	87	—
14	127/40/130	Spilia	Division	Stravargakon Kolymbos, etc.	—do—	19 000	1/3	52	—
15	127/40/107	Askas	Division	Themelios	Distribution pipelines	2 500	1/3	10	—
16	30/46	Phlasou-Evrykhou-Korakou	Division	Kousouliotis	Lining of channels	12 500	1/3	100	530
17	42/50	Evrykhou	Division	Kato Atsas	—do—	11 500	1/3	—	200
18	127/40/173	Korakou–Phlasou	Division	Rodhias	—do—	14 000	1/3	10	30
19	30/46	Phlasou–Katydhata	Division	Karydes	—do—	17 000	1/3	25	275
20	127/40/174	Linou	Division	Linopsas	—do—	39 000	1/3	50	400
21	127/40/96	Pedhoulas	Division	Lakkota	Distribution pipelines	2 500	1/3	500	—

TABLE VII–5 **IRRIGATION SCHEMES COMPLETED IN 1978 AND SUBMITTED TO DISTRICT OFFICERS (Continued)**

Ser No	File No	Village	Division or Association	Locality	Nature of Proposed Work	Estimated Cost £	Village Contr.	Irrigation Perm.	Seas.
LIMASSOL DISTRICT									
1	127/40/165	Tris Elies	Division	Kaminoudhi	Distr. pipelines	5 700	1/3	27	—
2	127/40/134	Pelendria	Division	Koripi	—do—	2 400	1/3	14	—
3	127/40/47	Khandria	Division	Panayia	—do—	900	1/3	3	—
4	127/40/49/48	Kyperounda	Division	Appis–Avlaki tous Palazidhes	—do—	1 800	1/3	5	—
5	127/40/49	Kyperounda	Assoc.	Klima	—do—	860	40%	7	—
6	112/59	Kato Amiandos—Pelendria	Division	HjiPhisouni—Kardhama	—do—	4 300	1/3	20	—
7	95/61/II	Kolossi	Division	—	Channel culverts	600	1/3	—	—
8	127/40/134	Pelendria	Division	Potamoulia	Distr. pipelines	2 750	1/3	22	—
9	127/40/52	Ayios Ioannis–Kato Mylos	Division	Angoulos—Dhipotamia	Irrigation tanks & distr. pipelines	20 700	1/3	90	—
PAPHOS DISTRICT									
1	69/64/II	Khrysokhou Valley	—	B/Hs	Pumping scheme	211 000	—	1 270	500
2	88/61	Anarita	Division	B/H 88/61	—do—	50 850	16 950	240	120
3	127/40/143	Kelokedhara	Division	Ziripillis	Improvements to river training	5 300	—	—	—
LARNACA DISTRICT									
1	42/38	Kivisil	—	—	Improvements to existing Irrigation division	9 500	—	—	1 050

TABLE VII–6

SMALL IRRIGATION SCHEMES APPROVED BY THE INTERDEPARTMENTAL COMMITTEE IN 1978

Ser No	Village			Scheme
1	Pelendria	I	D	Potamoulia
2	Pelendria	I	D	Dhimma Koripi Kolokasi
3	Kato Amiandos	I	D	Kardhama HjiFisouni
4	Ayios Ioannis–Kato Mylos	I	D	Angoulos–Dhipotamia
5	Kyperounda	I	A	Klima
6	Peristerona	I	D	Apotos–Alonia Mesis–Hareri
7	Anayia	I	D	
8	Astromeritis	I	D	Tomazos–Eftaskales
9	Alona	I	D	Dhentra tou Pouliou
10	Kambi	I	D	
11	Orounda	I	D	Maoutsos
12	Akaki	I	A	Neron tou Hodja
13	Askas	I	D	Themelios
14	Louvaras	I	A	Monastirka–Kyra
15	Akaki	I	D	Kamena
16	Akaki–Meniko	I	A	Riatikon
17	Orounda	I	A	Limni
18	Pharmakas	I	A	Koskinas
19	Phlasou–Evrykhou –Korakou	I	D	Kousouliotis
20	Mathikoloni	I	D	Esso Pervolia–Paliomylos
21	Ayios Ioannis (Agros)	I	D	Yerambelos

I D –Irrigation Division

I A –Irrigation Association

TABLE VII–6a

SMALL IRRIGATION SCHEMES NOT APPROVED BY THE INTERDEPARTMENTAL COMMITTEE IN 1978

Ser No	Village			Scheme
1	Yerasa	I	D	
2	Pelendria	I	D	Dhimma Koripi–Kolokasi
3	Kalokhorio (L'l)	I	D	Marammenos
4	Spilia	I	D	Stravargakon–Kolimbos –Karidhis–Anastasis–K.Kleptis
5	Ayios Therapon			Kourkoutas–Kephalovrysos

TABLE VII–7

SCHEMES IN THE COURSE OF PREPARATION UNDER INVESTIGATION OR PENDING

Ser No	Village	Scheme
	NICOSIA DISTRICT	
1	Ayia Varvara (Kochati)	—
2	Ayios Ioannis (Malounda)	Land consolidation
3	Peristerona	—
4	Astromeritis	—
5	Argates	Kounnapis
6	Lythrodhonda	K. Pervolia
7	Orounda	Maoutsos, Kremmos etc
8	Aredhiou	—
9	Koutraphas	Mounnes and Kalianitika
10	Katydhata–Linou –Skouriotissa	Limnas
11	Katydhata	—
12	Milikouri	Platys
13	Galata–Sina Oros	—
14	Tembria	—
15	Chakistra	—
16	Tembria–Sina Oros	—
	LIMASSOS DISTRICT	
1	Pyrgos	R C channels and earth reservoir
2	Ayios Ioannis	"Pera Agros" distribution pipeline
3	Ayios Ioannis	"Karpasitis Vrysia" Construction of dam
4	Apsiou	Drilling of B/H
5	Yerasa	Drilling of B/H
6	Kyperounda	"Kardhama–Allayiotes" drilling of B/H
7	Ayios Therapon	Drilling of B/H
8	Ephtagonia	Construction of pond
9	Khandria	"Dhimma" distribution pipeline
10	Trimiklini	Winter irrigation from dam
11	Yerasa	Extensions
12	Louvaras	"Paralonia" distribution pipeline
13	Kaminaria	Drilling of B/H
14	Tris Elies	"Milarka" distribution pipeline
15	Agros	"Pano Vitonia' distribution pipeline
16	Zoopiyi	"Petrakouras" distribution pipeline
17	Zoopiyi	Drilling of B/H
18	Ayios Therapon	Earth reservoir

TABLE VI-7 (continued)

19	Paramali	Earth reservoir
20	Ayios Therapon	"Koukoutas" reservoir and distr. pipes
21	Kyperounda	"Kardhama-Solomidhes" improvements
22	Kato Platres ...	"Samadja" drilling of B/H
23	Parekklisha	"Kambos tou Stratoura" drilling of B/H
24	Kyperounda	"Panayia" distr. pipeline
25	Dhymes	"Livadhia" distr. pipeline
26	Mathikoloni	"Esso Pervolia" distr. pipeline
27	Kolossi	Improvements
28	Evdhimou	Earth reservoir
29	Vouni	Distr. pipeline. New spring
30	Lemithou	Pumping scheme, B/H 49/77
31	Episkopi.....	Drilling of B/H
32	Pelendria	"Hji Pelendros" distr. pipeline
33	Tris Elies	"Dhrakondas" improvements
34	Kato Amiandos-Pelendria	Distribution pipeline
35	Kyperounda	"Latsia" distr. pipeline
36	Ayios Pavlos.....	"Stivakas" distr. pipeline
37	Prastio	"Plekou" diversion weir & distr. pipeline
38	Lemithou	Distribution pipeline
39	Mandria	"Liophandes" drilling of B/H
40	Ayios Theodhoros	"Koufes" improvements
41	Ephtagonia	"Pothos" additional water supply
42	Pelendria	"Kolokasi" distr. pipeline
43	Agros	"Pano Enetikos-Hji Nikolies" distr. pipeline
44	Pelendria	"Vloudhi" distr. pipeline
45	Athrakos	"Kalimera" distr. pipeline
46	Dhymes	"Kambos-Kardhama" distr. pipeline
47	Agros	"Kamara-Omiridhes" distr. pipeline
48	Kyperounda	"Khalospities" distr. pipeline
49	Pissouri	Distr. pipeline and earth reservoir
50	Kilani	Pumping scheme, B/H 89/77
51	Kalokhorio	"Pambakera" constr. of earth reservoir
52	Paleomylos	Hardji-Ayios Yeoryios distr. pipeline

PAPHOS DISTRICT

1	Dhrousha	Earth reservoir and distr. pipeline
2	Mamonia	River training
3	Kritou Terra.....	Distr. pipeline
4	Kato Akourdhalia	Distr. pipeline
5	Kedhares	Earth reservoir and distr. pipeline
6	Tala	Distr. pipeline
7	Amargeti	Distr. pipeline
8	Kallepia	Improvements
9	Kritou Terra.....	Pumping scheme
10	Philousa	Distr. pipelines
11	Kholetria	Distr. pipelines
12	Nata	Distr. pipelines
13	Kritou Terra.....	Improvements
14	Kanaviou	New pumping scheme
15	Pano Yialia	Distr. pipelines
16	Pano Akourdhalia	Pumping scheme
17	Kato Akourdhalia	Distr. pipelines
18	Yiolou	Extensions
19	Kholetria	Improvements

LARNACA DISTRICT

1	Khirokitia	Extension of existing irr. division

VIII LARNACA–F'STA REGIONAL OFFICE

by
T N Hamatsos
Executive Engineer I
Regional Engineer

General

By the end of the year the staff of the Regional office was composed of the following officers:

1 Executive Engineer I, Head of the Office
1 Inspector of Works
5 Monthly paid Technical Assistants
1 Assistant Chief Foreman
1 Foreman Grade I
3 Regular Employees
6 Casual Employees
1 Secretary-typist
2 Drivers

Inspector of Works E Eliades has been working with us one or two days a week after an arrangement with the Director and especially in the construction sector.

In June 1978 three casual employees were appointed to work with the Southern Conveyor Project. The technical staff of the office was engaged in Hydrology and Ground Water Resources, Investigation and Design, Construction and Maintenance.

Apart from the above functions one officer has been working for several months during the year with the Semi-arid zones Project of the Southeastern Mesaoria area under Dr. Kitching and J. Jacovides Hydrologist. Three other staff were working for the Southern Conveyor Project taking the ground water levels of 44 boreholes in the area of Kiti and of 60 boreholes in the area of southeastern Mesaoria. Furthermore they have completed a detailed questioning for about 800 boreholes in the two areas mentioned above.

Meetings

During the year under review, the Regional Engineer attended the following meetings as the representative of the Director of the Department:

Larnaca Water Board
Famagusta Water Board
Famagusta Coordination Committee
Larnaca Coordination Committee
Kiti Dam
Self Housing of Refugees and displaced persons (Famagusta–Larnaca districts)
Joint Water Committee
Tersephanou Soil Consolidation Committee
Central Advisory Committee for boreholes
Others (Director, District Officers, etc)

HYDROLOGY AND WATER RESOURCES

Stream Gauging

During the year two permanent stream gauging observation stations (Paralimni Lake and Liopetri Dam) equipped with automatic water level recorders were in operation and weekly or monthly visits were paid for observation and maintenance.

Ground Water Hydrology

The groundwater conditions of the two districts, Famagusta and Larnaca, were observed by means of 511 wells/boreholes.

The water levels (ie the distance from established bench marks on top of the observation wells/boreholes to the ground water level) of 383 of them were taken twice this year ie in February before the irrigation period and in November after the irrigation period. The water levels of 66 of them were taken every month and another 10 of them were taken every two months. The water level of 20 boreholes round Larnaca Salt Lake were taken six times during the whole year. The water levels of 32 boreholes used for village water supplies were also taken once in the whole year.

Chemical Analyses

A total number of 463 samples were taken from Government communal or private boreholes and sent to the Government Laboratory for chemical analysis. Also a large number of samples were taken from wells and boreholes and were analysed in the Regional Office for chloride content.

Boreholes Test Pumping

During the year the test pumping of 15 boreholes for village water supply and for private use was carried out.

Plotting of Boreholes

During the year the plotting of the boreholes in the hydrological area at Famagusta–Larnaca was continued. Up to the end of the year, 1392 boreholes/wells were plotted in Dherynia, Phrenaros, Sotira, Liopetri, Akhna, Xylophagou, Ormidhia, Xylotymbou, Pyla, Livadhia, Kiti and Pervolia.

Questioning

The annual questionnaire was carried out in the area where the plotting was completed. A total number of 3,633 cases were carried out.

Well Sinking Permits

A total number of 846 applications for sinking and covering permits of wells/boreholes were examined in the two districts, Famagusta and Larnaca and were presented to the Central Advisory Committee for wells/boreholes of the Ministry of Agriculture and Natural Resources. 750 applications are for cases lying in the conservation areas and the other 96 in the non-conservation areas. A total of 518 applications were approved.

Apart from the above applications 410 cases dealing with boreholes/wells were also examined direct from the Regional Office and were submitted to the District Officers of Larnaca and Famagusta. They concerned cases for the renewal of lease agreements of boreholes drilled on Government or Forest land or cases affecting interests of third persons. From these 170 were approved and 140 were not. Furthermore 195 cases dealing with boreholes drilled illegally in the Dhekelia SBA were examined and 55 of them were approved and the rest were rejected.

T/C Wells

A total number of 7 applications were submitted to the Larnaca Regional office for installing pumping units on T/C wells/boreholes, thus raising the total number for 1976, 1977 and 1978 to 127. These applications after being examined on the spot were submitted to the Central Committee.

Quarries

A total number of 78 applications for quarries which were sent to the Regional Office by the Department of Mines were examined on the spot and returned to the above Department with the comments of this office.

INVESTIGATIONS AND DESIGN

Investigations

During 1978 the following investigations were carried out:

LARNACA DISTRICT

Aradhippou: Water supply of Peletico factory, the d version of a small stream which flows through the village and the water supply for new divisions of plots.

Xylotymbou: Improvement of the village water supply, for the water supply of individual stock farming, for individual divisions, for the proposed stock farming area, for individual refugee houses and for the improvement of a small dam near the village.

Ora: Improvement of water supply of the village.

Pyla: Water supply of new individual private divisions of plots.

Kiti: Improvement of the village water supply, for the water supply of new private division of plots and for the replacement of the Pervolia–Kiti water supply pipeline.

Kiti-Tersephanou-Dhromolaxia-Pervolia: For the water supply of the Meneou proposed Government Refugee Camp in relation with the complex water supply of the above villages.

Kophinou: Water supply of 500 new divisions of plots for refugees and for the water supply of the two stock farming areas of the village.

Ayios Theodhoros-Alaminos: Improvement of the water supply of the two villages.

Kelia: Improvement of the village water supply from the Famagusta pipeline and for the proposed stock farming area.

Ayii Vavatsinias: Improvement of the village water supply and the village irrigation divisions.

Xylophagou: Improvement of the village water supply network and the supplementing of the water supply from a new borehole.

Kalokhorio: Improvement of the village water supply and the water supply of the proposed stock farming area.

Dhromolaxia: Water supply of the two proposed stock farming areas of the village.

Kato Lefkara: Improvement of the village water supply.

Mazotos: Improvement of the village water supply.

Zyyi: Water supply of the new Government Refugee Camp.

Mari: Improvement of the village water supply.

Skarinou: Expansion of the village irrigation division.

Maroni: Expansion of the Lakki–Xalona Irrigation Division.

Kivisil: Improvement of the village water supply and the improvement of the old village irrigation division.

Ormidhia: Improvement of the village water supply from a new borehole.

Troulli: Water supply of the village from the Famagusta pipeline.

Khirokitia: Expansion of the Anephantis Irrigation Division. Water supply of the Department of Antiquities House near the Neolithic ancient site of the village.

Oroklini: Improvement and maintenance of the antiflood works of the village.

Tokhni: Installing water meters for T/C houses.

Pyrga: Improvement of the village water supply.

Kalavasos: Improvement of part of the village water supply network.

Klavdhia: Installation of water meters for stock farming.

FAMAGUSTA DISTRICT

Sotira: Investigations for antiflood and recharge works for the village, improvement of the existing dams and the diversion of the rain water from the village to the fields for recharge purposes.

Liopetri: Antiflood and recharge works, improvement of part of the village water supply network and water supply of private divisions of plots.

Akhna Forest Refugee Camp: Water supply of individual stock farms and for the proposed stock farming area.

Paralimni: Improvement of the river flow which passes through the village, improvement of the village water supply from two new boreholes in the area of Sotira village and water supply of individual private divisions of plots, proposed industrial area and the new village hospital.

Dherynia: Expansion of part of the village water supply network, water supply of private

divisions of plots, improvement of the water supply of the Refugee Self Housing Estate and the village water supply in general.

Phrenaros: Improvement of the village water supply from new boreholes and water supply of private divisions of plots.

Vrysoulles: Water supply of the communal park and the removal of private water pumps from the Refugee Camp.

TABLE VIII-1

DESIGNS SUBMITTED TO DIRECTOR FOR APPROVAL

A. VILLAGE WATER SUPPLY SCHEMES

Ser No	Village	Scheme	Est. cost
LARNACA DISTICT			£
1	Troulli-Kellia ...	Improvement of W S	40 000
2	Ormidhia	Improvement of W S	11 500
3	Xylotymbou	Water supply for the Refugee camp	3 600
4	Pyrga	Improvement of W S	2 800
5	Kalavasos	Improvement of W S	2 100
FAMAGUSTA DISTRICT			
1	Ayia Napa	Improvement of W S	13 000
2	Liopetri	Improvement and expansion of W S network	8 200
3	Dherinia	Improvement of W S	8 600
		Improvement of W S of refugee Camp ...	13 500
4	Paralimni	W S of the hospital	3 800

B. IRRIGATION SCHEMES

1	Kivisil.....	Renewal of the old irrigation division ...	9 500
2	Kophinou	W S of stock farming "A"	13 000
		W S of stock farming "B"	2 500
3	Kalokhorio	W S of stock farming "B"	6 500
3	Akhna Forest ...	W S of stock farming	4 800

CONSTRUCTION

During the year the Larnaca Regional Office of the Department undertook the construction of various domestic water supply and irrigation schemes. For all construction works see tables under CONSTRUCTION DIVISION.

Labour Force

The total number of staff employed on construction by the Regional Office was:

Monthly paid Foremen	3
Hourly paid Foremen	2
Temporary Foremen	4
Regular Employees	15

IX LIMASSOL REGIONAL OFFICE

by
T N Nicolaides
Executive Engineer II
Regional Engineer

General

This Office is responsible for the activities of the District of Limassol. Its functions are divided into 3 main categories as follows:

Hydrology. Surface and groundwater hydrological measurements and studies.

Design of Major Irrigation, Minor Irrigation and Water Supply Schemes.

Construction of Major Irrigation, Minor Irrigation and Water Supply Schemes.

This Office is also responsible for the maintenance of all existing irrigation and water supply schemes. The Office is manned by thirty three officers and draughtsmen who serve in the various sections as follows:

—Hydrology	9
—Planning and Design	10
—Construction	11
—Clerical	3

For the execution of the construction works 26 foremen and 285 workers were engaged.

HYDROLOGY

Hydrological measurements were carried out in the prescribed areas which are under the Special Measures or Conservation Law as listed under WATER RESOURCES DIVISION.

Surface Water Hydrology

Rivers

The flow of the rivers is gauged by means of Automatic Water Level Recorders and the results are calibrated by means of current meter measurements.

Eleven Gauging Stations equipped with Automatic Water Level Recorders are established on main rivers of Limassol District, including two on Vasilikos river, lying in the Larnaca District.

Springs

The discharge of sixty four springs were measured at monthly or weekly intervals for the benefit of Village Water Supply, Limassol Water Supply, the design of Minor Irrigation and Water Supply Projects and Hydrological purposes.

Groundwater Hydrology

Hydrological measurements were carried out in the Special Measures Law area of Akrotiri and the water conservation areas of Yermasoyia, Moni–Pyrgos, Paramali–Evdhimou, Pissouri–Evdhimou, Parekklisha and the rest of Limassol District as well as Kalavasos, Zyyi and Tokhni areas in Larnaca District.

Special Measures Law—Akrotiri Aquifer

Hydrological observation and control is exercised by means of 190 wells or boreholes strategically situated in the area.

Water level measurements are taken twice a year from the above wells or boreholes except from 106 wells or boreholes where water levels are observed monthly, so that the behaviour of the water table in the aquifer, is observed more closely. Contour map drawn for this year water levels in boreholes compared with a map drawn, at the same period last year. It was observed that the water situation of the aquifer has improved.

Sea intrusion in the aquifer is observed and studied by means of 65 wells or boreholes at Zakaki–Asomatos area and 23 wells or boreholes at Akrotiri.

Water pumped from the aquifer for irrigation, domestic and industrial purpose is noted monthly for each individual licensed well, by means of water meters (total 404) attached to each pumping unit in order to ensure that the quantity pumped does not exceed the quantity allocated.

It is thus ensured that pumping is kept at the minimum level necessary to preserve the existing plantations in good and productive condition and at the same time ensuring that the aquifer is not extensively damaged.

Water for irrigation was also supplied in this area from Yermasoyia and Polemidhia Dams through the distribution system of the Dams which had already been completed at Zakaki–Phasouri and Trakhoni extensions.

Water extracted from Akrotiri Aquifer

Purpose	Quantity MCM
Irrigation	9.50
Domestic	1.98
Industrial	1.00
Total	12.48
Water supplied from Dams	4.23
Total supplied for irrigation.....	13.73

Water for irrigation in the above area was also obtained from Kouris river, up to May 1978.

Water Conservation Areas

The water situation within the Water Conservation Areas is also observed by means of 283 wells and boreholes, the water level of which is measured twice a year and the total extraction is estimated by the method of questioning.

Especially for Yermasoyia Aquifer the water situation is observed by means of 20 wells and boreholes, the water level of which is measured monthly. Salinity is also observed taking samples for analysis twice a year.

Well Sinking Permits

Well sinking permits granted and application to transfer water to other plots for irrigation or permits to install engine and turbine or adjustment of pumping permits were investigated. 227 applications were investigated and permits were granted for 173 of them.

DOMESTIC WATER SUPPLIES

Limassol Water Supply

Water supply to Limassol from the springs and boreholes is gauged and monthly samples are taken both at the water source and at the two reservoirs, for chemical and bacteriological analysis.

Village Water Supply

The water supply of 110 villages was measured during the period September–November when springs and boreholes are at their minimum output or maximum drawdown respectively. Eighty water samples were taken from the village water supply springs and boreholes for chemical analysis.

Meteorological Observations

Daily records were kept for rainfall (Max 35.5 mm on 29.10.78) water evaporation (Max 16.1 mm on July 1977), temperature (Max 42.5°C on 9.7.78), wind velocity and sun reflection at Yermasoyia Dam.

Records were kept for rainfall (Max 39.8 mm on 29.10.78) and water evaporation (Max average 9.3 mm on July 1978) at Polemidhia Dam.

Quarry and Gravel Pits Permits

Thirty five applications for quarries and gravel pits licences were examined.

PLANNING AND DESIGN

Irrigation Schemes

For the development of irrigation systems fifty eight applications were examined and designs were prepared for eighteen of them.

Water Supply Schemes

Fifty four applications were examined and designs were prepared.

CONSTRUCTION

Construction of Major Irrigation Projects, Minor Irrigation Projects and Water Supply Schemes

Major Irrigation Projects

Trakhoni Extension

An extension of Polemidhia–Yermasoyia Project for the irrigation of 4,390 donums of citrus and vines, Trakhoni extension is divided into the following four main sub-schemes:

Pumping plant, pumping main, night storage reservoir and irrigation distribution network.

The work was scheduled to be completed by the end of 1978 but due to various difficulties such as the priority given to other works it will be delayed and is expected to be completed by the end of February 1979. Four area outlets (3,000 m long, 150 mm dia pipeline) will be completed separately during the summer period of 1979, due to the fact that owners of the land did not consent yet. The cost of the works up to the end of the year 1978 amounted to £829,449.

Ayios Nikolaos Extension

An extension of the Polemidhia–Yermasoyia Project for the irrigation of Ayios Nikolaos farm, south of the salt lake, comprising 1,060 donums of citrus and vines. The pipeline consists of various sizes of AC pipes 500, 400 and 150 mm dia and PVC pipes 450 and 400 mm dia. The scheme was completed by the end of 1978. The final cost was £107,056 against an estimate of £140,000.

Construction of Routine Works

Several schemes were constructed by the Limassol Regional Office for minor irrigation schemes, village water supplies and refugee housing projects. These are listed under CONSTRUCTION DIVISION.

Materials and Machinery

By the end of the year 1978 the following materials and machinery for minor and major irrigation projects have been used.

MATERIALS USED	Major Projects	Minor Projects	Total
Asbestos cement pipes–m	47 800	10 609	58 409
Concrete aggregates–m³	3 489	1 377	4 866
Cement–Tonnes	405	194	499
Steel reinforcing bars–Tonnes	28	23	51
Cast iron specials and joints–No	6 097	4 666	10 763
C I flanged sluice valves–No	935	492	1 427
Water meters–No	78	159	237
PVC pipes–No	4 596	—	4 596
Galvanised iron pipes–m	4 061	35 786	39 847
Victaulic pipes–m	178	2 437	6 651
Sand of bedding–m³	2 731	614	3 345

MACHINERY EMPLOYED (in hours)

Machinery Employed	Major Projects	Minor Projects	Total
Concrete mixers	6 000	1 042	67 042
Diggers	8 960	1 688	10 648
Excavators	—	90	90
Cutting machine	100	193	293
Wheel loaders	4 780	616	5 396
Dumper trucks	1 136	—	1 136
Compressors	4 354	5 615	9 669
Welding machines	2 180	320	2 500
Mobile cranes	190	—	190
Land rovers	10 187	6 272	16 459
Vibrator	—	150	150
Dumper	1 670	—	1 670
Centrifugal pump	50	140	190
Bus	3 200	770	3 970

COMMITTEE MEETINGS

In numerous committee meetings the Regional Engineer expressed the policy of the Department and gave his advice on matters concerned.

X PAPHOS REGIONAL OFFICE

by
A Lambrou
Executive Engineer II
Regional Engineer

General

By the end of the year the staff of the Paphos office was composed of the following:

1 Executive Engineer II, Head of the Regional office
7 monthly paid Technical Assistants
5 daily paid Technical Assistants
1 Secretary–typist daily paid
4 Draughtswomen (shared with Paphos Project)

The technical staff of the office was engaged in *Water Resources, Construction, Design and Investigation.*

WATER RESOURCES BRANCH

The staff of the Water Resources Branch was engaged in the collection of hydrological and hydrogeological data as follows:–

Surface Hydrology

Stream and Spring Gauging

During the year 15 permanent stream gauging stations equipped with automatic water level recorders were in operation and weekly visits were made for observation and calibration purposes by the use of current meter. A total number of 896 current meter measurements were taken during the year for calibration purposes. Also samples for suspended sediment and boron analysis were taken regularly.

During the year 36 springs were under observation and a total number of 422 spring discharges were gauged by current meter or volumetrically.

Village Water Supply

The water supply of 132 villages were checked during the months of September, October and November and samples for ionic and nitrates analysis were taken.

Rainfall Observing Stations

One rainfall observing station (near Philousa) equipped with automatic raingauge recorder was in operation during the year, under weekly visits for observation.

Ground Water Hydrology

Ground water conditions in southwestern Paphos and Polis (Khrysokhou) areas, were observed through 176 wells/boreholes.

The distance from the established bench marks on top of every observation well/ borehole to the ground water level was measured twice a year, at the end of the wet season (March) when it is expected to be at highest and at the end of the dry season (December) when it is expected to be at the lowest level.

In addition, monthly or weekly measurements of the ground water level were taken from