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Republic of Cyprus
Ministry of Agriculture and
Natural Resources

WATER DEVELOPMENT DEPARTMENT

ANNUAL REPORT 1976

Nicosia, November 1977

Reg. No. 8229

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				"	13.9.79	14.12.79	Papatryphanos
				"	14.12.79	15.12.79	Dr. Papatryphanos

WATER DEVELOPMENT DEPARTMENT
ANNUAL REPORT 1976

First printing office issue since Independence

Republic of Cyprus
Ministry of Agriculture and
Natural Resources

WATER DEVELOPMENT DEPARTMENT

ANNUAL REPORT 1976

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

Nicosia, November 1977

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

Printed by KAILAS PRESSS Nicosia

Abbreviations

m	metre
mm	millimetre
MCM	Million Cubic Metres
m3	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 1976 the value of the Cyprus pound on average (daily basis) was:–

$	2.4357
£ st. ...	1.3495
DM ...	6.1228
Drachma	88.2192

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I GENERAL

Introduction

With the end of 1976 the northern part of the Island was still occupied by the Turkish Troops which invaded the area in 1974.

Our knowledge of the hydrometeorological situation in the occupied part of the Island is almost entirely non available due to the fact that there are no contacts with the Turkish side on any level even through the United Nations, except very rarely in cases of an emergency on a common domestic water supply system such as for Nicosia or Famagusta.

Other information from foreign contacts relating to irrigated agriculture indicates that a great number of the younger citrus plantations in the Morphou groundwater basin have been left to dry up, either through ignorance or lack of maintenance and spare parts of the pumping installations.

The Water Development Department

The Department of Water Development is one of the Departments of the Ministry of Agriculture and Natural Resources and is responsible for the Government's overall policy on water resources, planning, design and construction on the Island. It also contributes towards the management of water resources and water development projects together with other interested Ministries and Departments. Such 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 6.

DEPARTMENTAL ORGANIZATION

The Departmental Organization is shown on page 8 and is made up of:

Division of Water Resources

This Division 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.

Division of Planning

This Division deals with the preparation of reconnaisance and feasibility studies prior to the detailed design of such 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.

Division of Design

This Division deals with the detailed design and specification work required for major projects after they have been approved as feasible. In this Division the drawing and topographic functions of the Department are incorporated.

Division of Construction

This Division is responsible for all construction work whether carried out by direct labour or by contract.

COSTAS ZACHARIADES
Accounting Clerk

VASSOS VYRAS
Technical Assistant

PANTELIS NICOLAOU
Technical Assistant

ANTONIOS KORELLIS
Technical Assistant

ANDREAS KEVLARIS
Driller

NICOS DEMETRIOU
Technical Assistant

NICOS HJI STAVROU
Electrician

ARTEMIS FRANGOPOULOS
Technical Assistant

GEORGHIOS HJI CHRIS/LOU
Builder

COSTAS ASHIOTIS
Builder

STILL MISSING

THREE AND A HALF YEARS AFTER THE TURKISH INVASION, A NUMBER OF WATER DEVELOPMENT DEPARTMENT EMPLOYEES AND RELATIVES OF EMPLOYEES ARE STILL MISSING. A PLEA IS, THEREFORE, MADE TO READERS OF THIS REPORT TO JOIN IN THE CALL FOR THE TRACING OF THESE AND ALL OTHER MISSING PERSONS.-THE PHOTOGRAPHS ARE OF MISSING WATER DEVELOPMENT EMPLOYEES ONLY.

Division of Operation and Maintenance

This Division assists in the operation and maintenance of the major projects such as dams and town water supplies. For every major project there is a Project Water Board in the case of Irrigation or a Town Water Board in the case of town domestic water supplies, to which we are a member.

Division of Small Projects Planning

This Division 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.

Regional Offices

The Regional Offices after the Turkish invasion are Larnaca, Limassol and Paphos.

In these Regional Offices the main work carried out is hydrological measurements, collection of engineering data, operation and maintenance of projects investigation and planning for small projects and control of construction work.

Office Management

This office is responsible for the office services, accounts, labour, personnel and stores. At the same time a financial control and co-ordination branch is included which deals with financial aspects including the control of expenditure.

Legal Adviser

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.

His legal duties consist of legal opinions on matters deriving from contracts of work, contracts of sale, tenders, trespass to property, compulsory acquisition and requisition of immovable property.

In addition to the duties described above, the Legal Adviser attends the various meetings especially the meetings held by the Advisory Committee on applications for permits to sink or construct wells or boreholes, or to

renew such permits, or to install machinery in order to use underground or surface water.

It is appropriate here to mention that during the year 1976 this Committee has dealt with over two thousand applications and gave its reasoned decision.

STAFF APPOINTMENTS

On a Monthly (Unestablished or Temporary) Basis

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

Xenophon Antoniades, Technical Assistant, with effect from 1.7.1976.

Nicos Mavrommatis, Technical Assistant, with effect from 1.7.1976.

Charilaos Akritas, Technical Assistant, with effect from 1.7.1976.

Elias Despotis, Technical Assistant, with effect from 1.7.1976.

Andreas Panayides, Technical Assistant, with effect from 1.7.1976.

Panos Andreou, Technical Assistant, with effect from 1.7.1976.

Loucas Loizou, Technical Assistant, with effect from 1.7.1976.

Stelios Constantinides, Technical Assistant, with effect from 1.7.1976.

Constantinos Stavrou, Technical Assistant, with effect from 1.7.1976.

Georghia K. Masouri, Technical Assistant, with effect from 1.7.1976.

Andriani A. Papachristodoulou, Technical Assistant, with effect from 1.7.1976.

Georghios Iordanou, Foreman 2nd Grade, with effect from 1.7.1976.

Elias Neophytou, Foreman 2nd Grade, with effect from 1.7.1976.

Cosmas I. Karayiannis, Foreman 2nd Grade, with effect from 1.7.1976.

Costas G. Constantinides, Foreman 2nd Grade, with effect from 1.7.1976.

Savvas Avgousti, Foreman 2nd Grade, with effect from 1.7.1976.

Georghios Pullos, Foreman 2nd Grade, with effect from 1.7.1976.

Panayiotis Eracleous, Foreman 2nd Grade, with effect from 1.7.1976.

Kyriacos Sfikouris, Foreman 2nd Grade, with effect from 1.7.1976.

Charalambos Themistocleous, Foreman 2nd Grade, with effect from 1.7.1976.

Savvas Kyriacou, Foreman 2nd Grade, with effect from 1.7.1976.

Pavlos Aristotelous, Foreman 2nd Grade, with effect from 1.7.1976.

Charilaos Charalambous, Foreman 2nd Grade, with effect from 1.7.1976.

Costas Andreou, Foreman 2nd Grade, with effect from 1.7.1976.

Andreas Kyriakides, Foreman 2nd Grade, with effect from 1.7.1976.

Andreas Florides, Foreman 2nd Grade, with effect from 1.7.1976.

Charalambos Hji Christodoulou, Foreman 2nd Grade, with effect from 1.7.1976.

On a Permanent Basis

Daedalus Kypris, Engineer Hydrologist, with effeect from 1.5.1976.

Nicos Tsiourtis, Executive Engineer, Class II, with effect from 15.5.1976.

Andreas Ashiotis, Foreman 1st Grade, with effect from 1.7.1976.

Costas Mattheou, Foreman 1st Grade, with effect from 1.7.1976.

Ioannis Metaxakis, Foreman 2nd Grade, with effect from 1.7.1976.

Alexandros Avgousti, Foreman 2nd Grade, with effect from 1.7.1976.

Takis Kallis, Foreman 2nd Grade, with effect from 1.7.1976.

Georghios Costrikkis, Foreman 2nd Grade, with effect from 1.7.1976.

Neophytos Nicolaou, Foreman 2nd Grade, with effect from 1.7.1976.

Yiannakis Savva, Messenger 2nd Grade, with effect from 1.8.1976.

On Contract

The contract of *Charalambos Kyriakides*, Legal Adviser, was renewed for one more year, with effect from 1.7.1976.

Georghios Socratous, was appointed Civil Engineer, with effect from 3.11.1976.

Promotions, Secondments

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

TECHNICAL STAFF OF W.D.D. ON 31.12.76

DRG. No. BM/G/43

	MONTHLY AND DAILY PAID TECHNICAL STAFF			D	AD	SWE	EH	EE	ME	Geo	H	QS	Ch	TIE	LA	SW	SIW	EDR	IW	CF	ACF	TA	DR	F	Total Nos
1	Permanent staff			1	2	1	1	15	1	2	2					3	6	1	17	4	8	45		40	149
2	Temporary staff					1		6			1	1		4	1		2		6		4	22	8	15	71
3	Daily paid staff							2					1	2								40			45
	TOTAL NUMBERS			1	2	2	1	23	1	2	3	1	1	6	1	3	8	1	23	4	12	107	8	55	265
	DISTRIBUTION OF STAFF																								
3	Divisions	i	Water Resources				1			1	1					1			4			19		2	29
		ii	Planning					1											2			6		1	10
		iii	Design					10						5			1	1	1			18	5		41
		iv	Construction					2	1								3		10	1	9	7		41	74
		v	Small Projects Planning													1	2		4	1	1	4			13
		vi	Operation & Maintenance										1			1	2				1	2		4	11
4	Administration (Head Office)			1	2			1							1										5
5	Regional Offices (Limassol, Larnaca & Paphos)							6											1	1	1	35	1	2	47
6	Turkish Officers absent from duty							1														13		2	16
7	On scholarship					1					2			1								2			6
8	Vacancies					1		2		1		1							1	1		1	2	3	13
	TOTAL NUMBERS			1	2	2	1	23	1	2	3	1	1	6	1	3	8	1	23	4	12	107	8	55	265

REFERENCE

D	Director
AD	Assistant Director
SWE	Senior Water Engineer
EH	Engineer Hydrologist
EE	Executive Engineer
ME	Mechanical Engineer
Geo	Geologist
H	Hydrologist
QS	Quantity Surveyor
Ch	Chemist
TIE	Topographer / Irrigation Engineer
LA	Legal Adviser (on contract)
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
DR	Draughtsman
F	Foreman

Promotions

Georghios A. Constantinides, from Senior Inspector of Works, (on secondment), to the permanent post of Senior Inspector of Works, with effect from 15.4.1976.

Georghios Lanitis, from Inspector of Works, (on secondment), to the permanent post of Inspector of Works, with effect from 15.4. 1976.

Joseph A. Karoglanian, from the Temporary post of Inspector of Works to the permanent post of Inspector of Works, on an unestablished basis, with effect from 15.4.1976.

Alecos Charalambous, Assistant Chief Foreman, to the permanent post of Chief Foreman, with effect from 15.4.1976.

Leonidas Triteos, from Assistant Chief Foreman (on secondment) to the permanent post of Assistant Chief Foreman, with effect from 15.4.1976.

Ioannis Athinodorou, from Foreman 2nd Grade, to the permanent post of Foreman 1st Grade, with effect from 15.11.1976.

Ioannis Metaxakis, from Foreman 2nd Grade, to the permanent post of Foreman 1st Grade, with effect from 15.11.1976.

Secondments

Andreas Evripidou, from the post of Inspector of Works, was seconded to the Temporary (Dev.) post of Senior Inspector of Works, with effect from 15.4.1976.

Savvas Hji Pavlou, from the post of Inspector of Works, was seconded to the Temporary (Dev.) post of Senior Inspector of Works, with effect from 15.4.1976.

Pantelis Alexandrou, from the Temporary (Dev.) post of Inspector of Works, (on secondment), was seconded to the permanent post of Inspector of Works, with effect from 15.4.1976.

Tefkros Tsangarides, from the permanent post of Technical Assistant, was seconded to the Temporary (Dev.) post of Inspector of Works, with effect from 15.4.1976.

Andreas Marangos, from the permanent post of Technical Assistant, was seconded to the Temporary (Dev.) post of Inspector of Works, with effect from 15.4.1976.

Costas Hji Stavrou, from the permanent post of Foreman 1st Grade, was seconded to the Temporary (Dev.) post of Assistant Chief Foreman, with effect from 15.4.1976.

RESIGNATIONS, TRANSFERS, RETIREMENTS

Resignations

The following Officers resigned their posts during the year.

Charis Lapas, Executive Engineer, Class I, tendered his resignation, with effect from 6.4.1976.

Vlassis Partasides, Executive Engineer, Class I, tendered his resignation, with effect from 17.12.1976.

Emilia Roditou, Draughtsman, tendered her resignation, with effect from 15.6.1976.

Ourania Iacovou, Draughtsman, tendered her resignation, with effect from 25.6.1976.

Kyriacos Efstathiou, Technical Assistant, tendered his resignation, with effect from 22.9.1976.

Transfers

Georghios Constantinides, Senior Inspector of Works, was transferred from Larnaca to Nicosia with effect from 14.6.1976.

Antonakis Hji Ioannou, Technical Assistant, was transferred from Limassol to Larnaca, with effect from 2.8.1976.

Savvas Katsianis, Technical Assistant, was transfered from Nicosia to Paphos with effect from 1.9.1976.

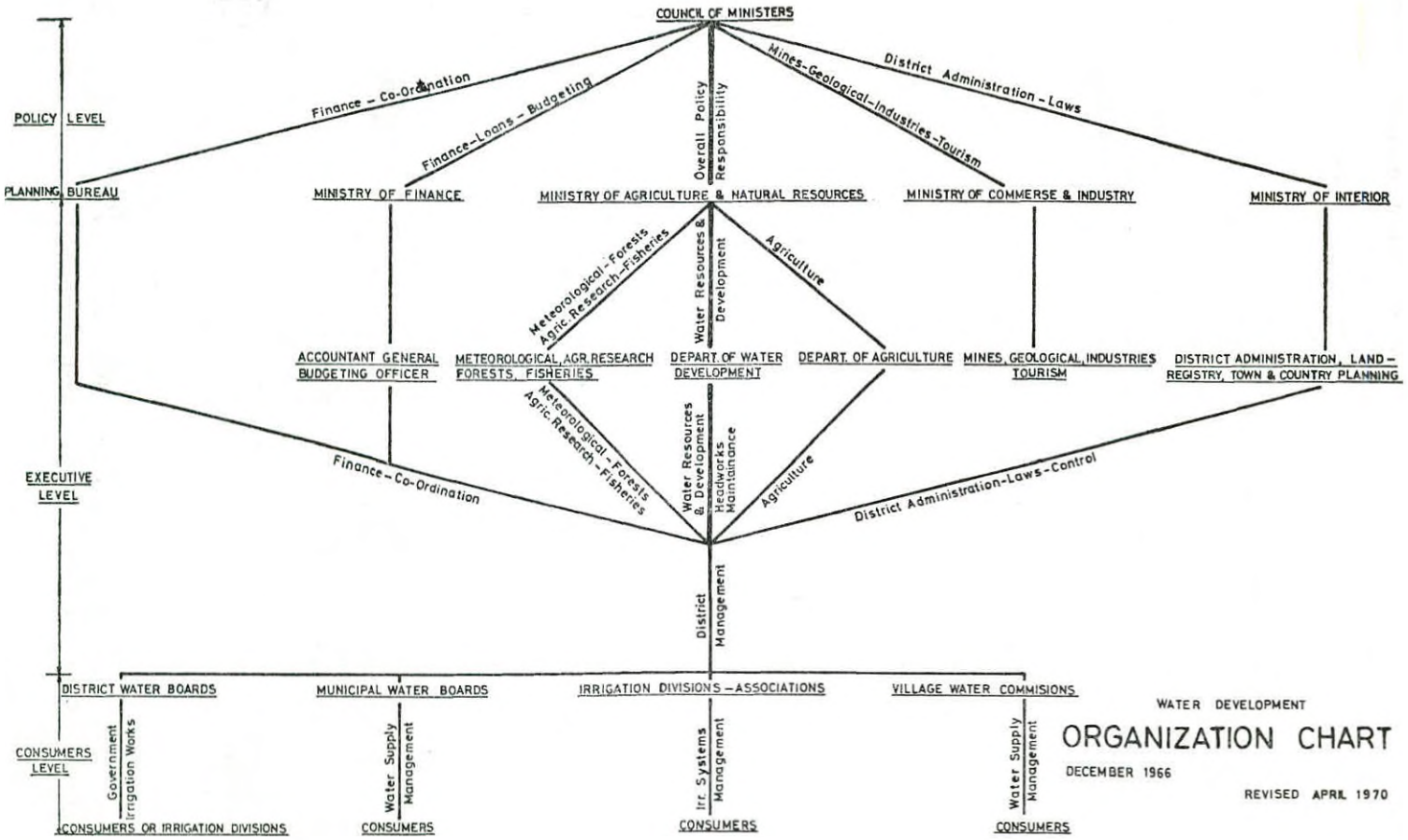
Costas A. Constantinides, Messenger 2nd Grade, was transferred to this Department from the District Court, Nicosia, with effect from 1.10.1976.

Retirements

Loucas Messaris, Chief Foreman, retired from the Government Service, with effect from 1.2.1976.

Lambros Nicolaou, Foreman 1st Grade, retired from the Government Service, with effect from 1.5.1976.

Andreas Pitsillides, Clerk 2nd Grade, G.C.S., retired from the Government Service (on medical grounds), with effect from 1.11.1976.



WATER DEVELOPMENT

ORGANIZATION CHART

DECEMBER 1966

REVISED APRIL 1970

SCHOLARSHIPS, STUDY LEAVES, DUTY ABROAD

Scholarships

Iacovos Iacovides, Hydrologist 1st Grade, was awarded a scholarship by the U.K. programme of Technical Assistance in Water Resources Management at the Newcastle University, for the purpose of obtaining the M.Sc. He left Cyprus on the 2nd October, 1976, and the duration of his scholarship is for 12 months.

Panos Andreou, Technical Assistant, was awarded a scholarship by the Netherlands Government in Photographic Technology leading to Technologist in Aerial Photography. He left Cyprus on the 15th August, 1976, and his scholarship is also for a duration of 12 months.

Study Leaves

Christos Phanartzis, Hydrologist 1st Grade, was awarded an 18 months study leave, for the purpose of following a course of study in the Graduate College of the University of Arizona, U.S.A. and with a view to enabling him to obtain the Ph. D. in Hydrology, commencing the 1st January 1976.

Panayiotis Scordis, Technical Assistant, was granted a two-year study leave for the purpose of following a course of study in Civil Engineering at the University of Dundee, Scotland, which will enable him to obtain the B.Sc. Civil Engineering, commencing the 1st November, 1976.

Conferences and Duty Abroad

C.A.C. Konteatis, Director of Water Development Department has acted as Consultant of FAO for work in the people's Democratic Republic of Yemen, the Yemen Arab Republic, the Kingdom of Saudi Arabia and the Sultanate of Oman, between January and February 1976 in connection with the introduction of modern irrigation techniques and research.

C.A.C. Konteatis, Director and *Andreas Ph. Protopapas*, Regional Engineer, W. D. D. Limassol, inspected the "HELLENIT" Factory in Greece which specialises in the manufacture of asbestos pipes from 2–9.8. 1976 in connection with supplies to Cyprus.

C.A.C. Konteatis, Director of Water Development Department proceeded to the Sultanate of Oman as a World Bank (IBRD) Consultant from the 16th to the 27th August, 1976, in connection with groundwater development for irrigation.

K.C. Hassabis, Assistant Director and *Branco Millinusic*, FAO Senior Irrigation Engineer, Project Manager of Paphos Irrigation Project, visited the Main Offices of SOGREAH, the Consulting Engineers for the Distribution System part of the Paphos Project, in Grenoble, France, between 1.5.76 – 12.5.76.

Vl. Partassides, Executive Engineer Class I, and *G. Charalambous*, Superintendent of Works, visited the "Viotal" Cast Iron Factory in Salonica, Greece, from 10.8.76 – 19.8.76.

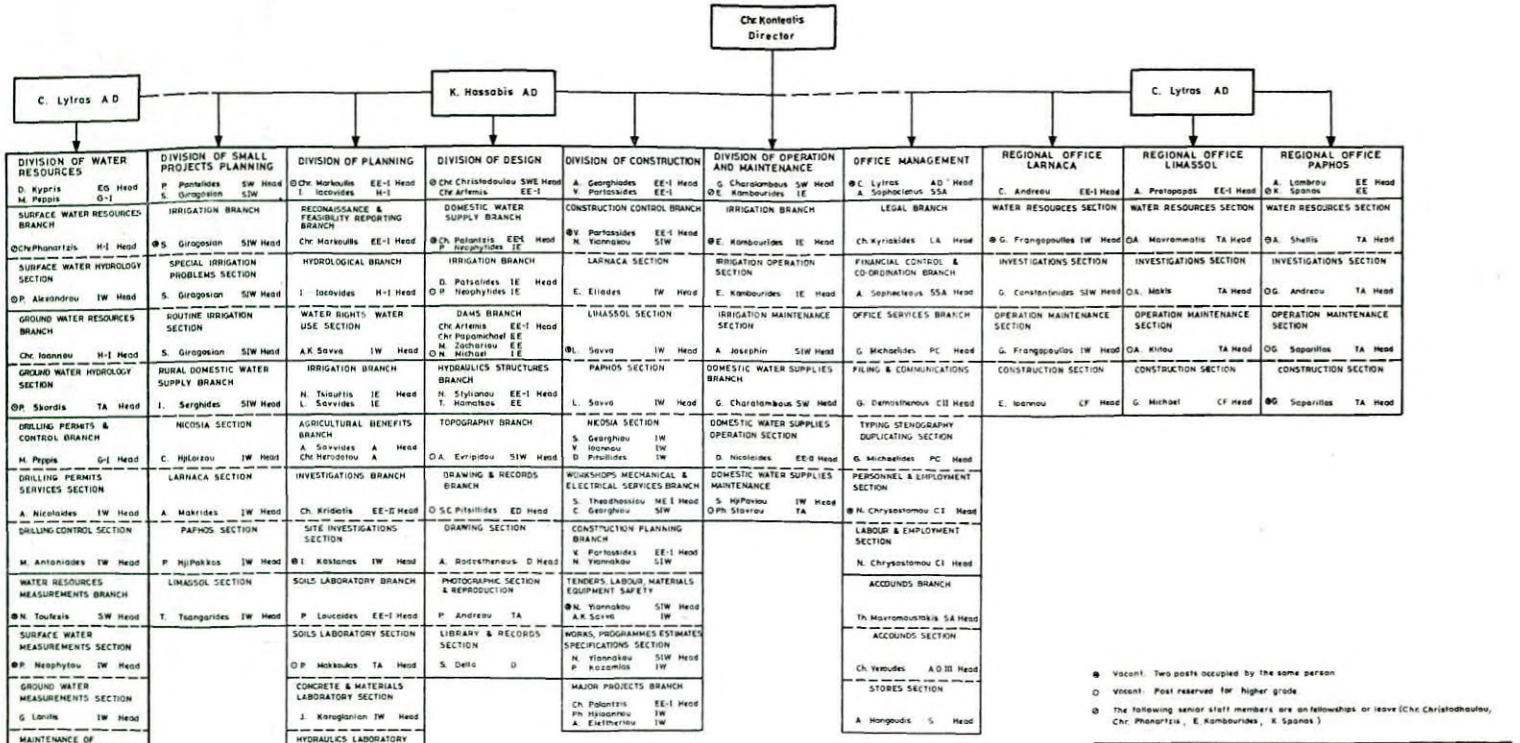
Paraskevoulla Maratheftou, Draughtsman, Water Development Department, proceeded to the U.K. for a period of approximately eight months, starting from September, 1976, for the purpose of being trained in modelling and testing by Messrs. British Hydromechanics Research Association, (BHRA), in connection with model testing of spillway and tunnel for Asprokremmos Dam.

Constantinos Lytras, Assistant Director of Water Development Department, proceeded to the Yemen Arab Republic, (YAR), for about two weeks, commencing the 2nd October, 1976, to serve as a Consultant to the World Bank in connection with groundwater studies.

Iacovos Iacovides, Hydrologist Class I, participated in two meetings of UNESCO, one in France, from 17th to the 25th of May, 1976, and the other in Rome from the 20th to the 23rd December, 1976, during which matters connected with "Pollution of the Mediterranean from land based sources" were discussed.

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

Kyprianos C. Hassabis, Assistant Director of Water Development Department was granted one year's leave without pay, not on grounds of public policy, commencing the 17th December, 1976, for employment overseas with the J & P Contracting Co.



● Vacant. Two posts occupied by the same person

○ Vacant. Post reserved for higher grade

⊙ The following senior staff members are on fellowships or leave (Chr. Christodhoulou, Chr. Phanartzis, E. Kambourides, K Spanos)

REPUBLIC OF CYPRUS
MINISTRY OF AGRICULTURE & NATURAL RESOURCES
DEPARTMENT OF WATER DEVELOPMENT

DEPARTMENT OF WATER DEVELOPMENT

ORGANIZATION CHART

JULY 1976 | D.O. | DRG. No. 8M/G/30

FOREIGN TECHNICAL ASSISTANCE

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

United Nations

Technical Assistance received from the United Nations during 1976 was:

Experts

B. Milinusic, FAO Senior Irrigation Engineer continued his services with us throughout the year mostly being occupied with the Paphos Irrigation Project, of which he is the Project Manager.

British Technical Assistance

Studies undertaken under the British Technical Assistance have been the Southern Conveyor Project and Brackish Water Desalination.

Southern Conveyor Project

In June 1976 a mission from the British Ministry of Overseas Development arrived and a meeting was held at the Ministry of Agriculture and Natural Resources. At this meeting the possibility of British Technical Assistance was discussed and the mission undertook to submit a report to the Ministry of Overseas Development which have been submitted in July and the matter was under consideration. No firm agreement on the matter was reached until the end of the year.

Brackish Water Desalination

During the year the first phase of the project which was initiated in 1975 in cooperation with the U.K.A.E.A. continued and was completed at the end of June.

The first phase of the project assessed the performance of the various processes of reverse osmosis commercially available under ranging qualities of feed water.

The second phase commenced after July 1976 and involved the use of the membranes for specific applications. As first application was chosen the forest nursery at Athalassa where thousands of plants were dying due to high silinity irrigation water. The first three months of operation of the plants resulted in saving of plants worth over £870.

CYPRUS NATIONAL, INTER-DEPARTMENTAL AND DEPARTMENTAL COMMITTEES

International Hydrological Programme

With the completion of the International Hydrologic Decade (1965–1974), UNESCO sponsored a new programme, the International Hydrologic Programme which will implement and carry on the findings and activities of the IHD.

The Cyprus National Committee for the IHD has been reconstituted into a permanent Cyprus National Committee for the IHP consisting of the following:

Chairman

C.A.C. Konteatis,
Director, W D D

Secretary

I. Iacovides,
Hydrologist, W D D

Members

Dr. Th. Christou,
Director, Agricultural Research Inst.
A. Louca,
Director, Department of Agriculture
E. Michaelides,
Director, Department of Forest
Y. HjiStavrinou,
Director, Geological Survey Dept.
Cl. Philaniotis,
Head, Meteorological Office

The main activities during the year were:
Observational data taken from the Cyprus Decade Stations.

Collection of data and preparation on computer cards for the pilot project on Yermasoyia watershed for the project on " computer storage and retrieval of hydrological data".

Research Contract Spronsored by the International Atomic Energy Agency

The research contract " Environmental Isotope Survey of Cyprus" was renewed for a third year by the International Atomic Energy Agency with I. Iacovides, Hydrologist of this Department as principal investigator and Chr. Ioannou, Hydrologist as associated investigator.

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 (10^3 m^3)	CAPACITE TOTALE DU RESERVOIR / GROSS CAPACITY OF RESERVOIR (10^3 m^3)	DESTINATION / PURPOSE	CAPACITE MAXIMALE DES EVACUATEURS / MAXIMUM DISCHARGE CAPACITY OF SPILLWAYS (m^3/s)	TYPE DES EVACUATEURS / TYPE OF SPILLWAYS	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	Mowlem & 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	Mavrokolymbos	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	MASARI	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

The programme of work consisted of a detailed study of the Troodos Mountain Range for which the isotope data already available permit the more comprehensive study in which the following aspects were examined:

Processes of recharge, altitude effect on isotopes, mixture of different bodies of water having different recharge areas and delineation of separate aquifers.

This study is expected to continue in 1977.

International Commission on Large Dams

The International Commission on Large Dams is a non–profit seeking organization with more than 70 member countries. As set out in its Constitution:

" The objects of the Commission are to encourage improvements 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 1976 the National Committee was composed of the following:

Chairman
C. A. C. Konteatis,
Director, W D D

Secretary
C. C. Artemis,
Executive Engineer I, W D D

Members
K. C. Hassabis,
Assistant Director, W D D

A. Papadopoulos,
Representative of the Association of Civil Engineers and Architects

P. Christophorou,
Representative of the Association of Building Contractors.

The 44th Executive Meeting of the International Commission and the XIIth Congress on Large Dams were held in Mexico City, Mexico, during March–April 1976. Unfortunately it was not possible for CYNCOLD to be represented at these functions. The 45th Executive Meeting will be held in Salzburg, Austria, from 13th to 16th September 1977 and will be followed by organized study tours.

International Commission on Irrigation and Drainage

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

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, W D D

Secretary
N. Tsiourtis,
Executive Engineer, W D D

Ex–Officio Members
Director, Department of Forest
Director, Department of Agriculture
Director, Agricultural Research Institute

During the year 1976 the Cyprus National Committee on Irrigation and Drainage continued its correspondence and exchange of information with the Central Office of the ICID and other National Committees.

All publications such as six–month bulletins, annual reports and other documents which were sent by the ICID or any other member country of ICID were distributed to all members of the Cyprus National Committee.

In 1976 the following activities of the ICID took place. The Cyprus Committee did not attend any of such activities.

The First Afro–Asian conference on Irrigation and Drainage was held in Tashkent, the capital of Uzbek Soviet Socialist Republic from September 7–14, 1976.

The subject of the conference was socio-economic aspect of irrigation, drainage and flood control in the Afro–Asian countries.

The twenty seventh Meeting of the International Executive Council of the ICID was held in Banff (Canada) on June 8–10th 1976. The meeting discussed subjects such as membership, publications etc.

The total number of member National Committees of the ICID has risen to 68.

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, W D D

Secretary
G. Charalambous,
Superintendent of Works, W D D

and the representatives of the Ministry of Interior and Water Boards of Nicosia, Limassol, Famagusta and Larnaca as members.

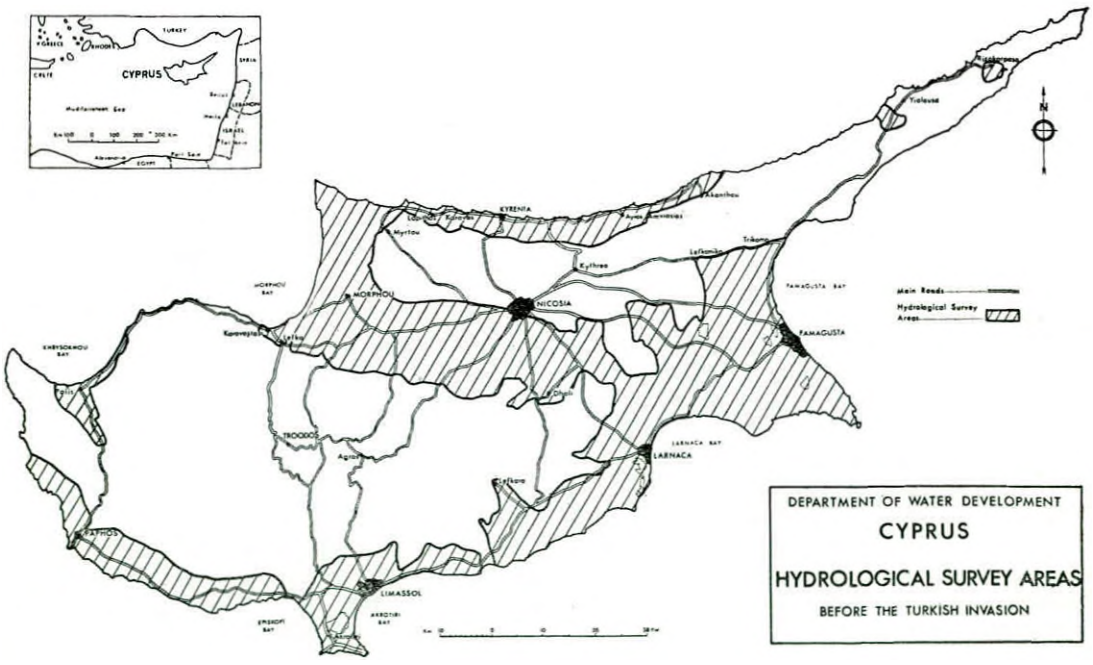
The Cyprus National Committee of the International Water Supply Association exchanged regular correspondence with the Head Office of the Association relative to the activities of this Organization.

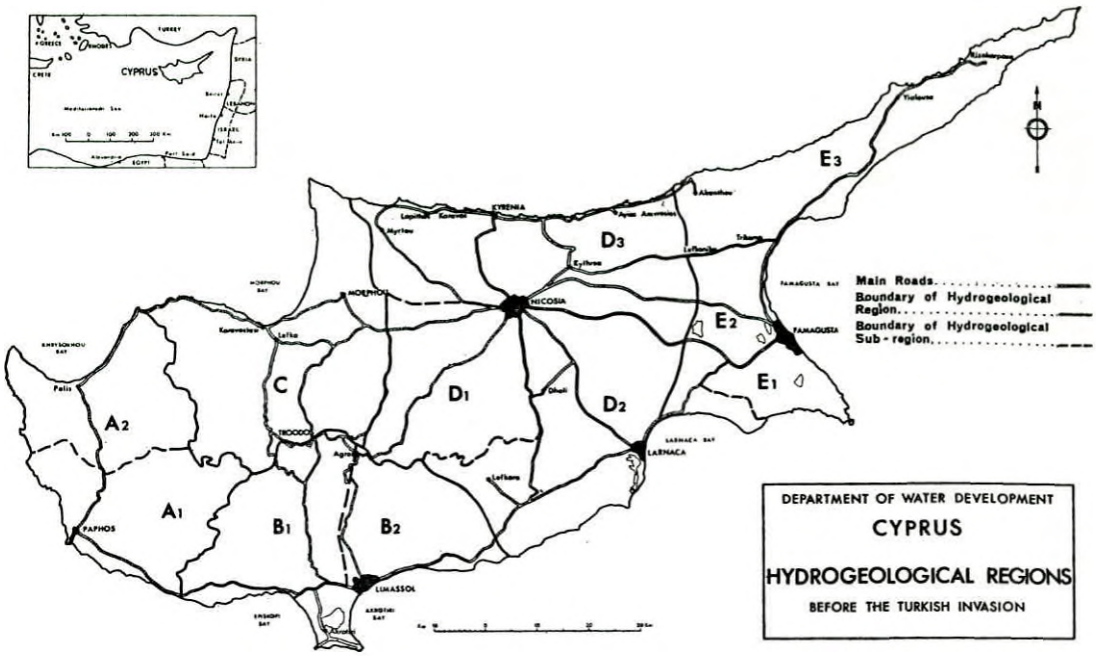
Resulting from the tragic events in Cyprus due to the Turkish invasion, no effort was made to secure a permit from the appropriate authorities for the participation of the Cyprus National Committee of the International Water Supply Association to the 11th Congress of the Association which took place in Amsterdam between 13th – 17th September, 1976.

Activities of the Cyprus National Committee were restricted in the exchange of correspondence with the IWSA.

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, A.R.I., the Geological Department, Meteorological Office, Fisheries Department and the District Administration were also held during the year.

WATER RESOURCES

The year 1976 is referring to the southern Government controlled part of Cyprus receiving 563 mm of rainfall, representing 106 percent of the average. The variation of rainfall ranged between 95 and 105 percent according to the locality with exceptional rainfall on the Troodos reaching 125 percent. The maximum amount of rainfall in 24 hours was 100 mm at Dhora rainfall station on the 26th December 1975.

The temperatures recorded were rather below average with maximum recorded temperature 39.6°C. Normal temperatures recorded in Summer were of the order of 35 to 36°C. Evaporation records from Class A evaporemeter recorded 1.76 m in Nicosia, 1.8 m at Akhelia Paphos, 1.95 m at Yermasoyia Limassol, and 1.2 m at Prodhromos.

Surface flow measurements have been regularly collected from the automatic water level recorders installed on all rivers and in addition flood discharges are being taken on most large streams.

Although rainfall during the hydrological year was above normal, no remarkable floods were observed. The largest flood was observed at Dhiarizos river near Kouklia, being 40 m^3 per second.

The groundwater resources of the Government controlled region are being overpumped in the districts of Nicosia at the areas adjoining the Morphou aquifer and south of Nicosia at the areas of Latsia, Tseri and Dhali. In addition, the well known aquifer

of Famagusta mostly under Government control is being overpumped for the last 20 years. The overpumping in this area has deteriorated due to the inflow of many thousands of displaced people from the north and the consequential increase of farming in the area with additional abstraction of water from the aquifer. The groundwater situation in this particular area may be described as destructive.

In the aquifers of Larnaca, Limassol and Paphos there is no overpumping and the situation on the water levels is rather static. Of course, with the initiation of the Paphos Irrigation Project additional groundwater will be abstracted from the coastal aquifer, but this extraction will be under control. Similarly, additional groundwater will be abstracted from the Vasilikos–Pendaskinos region after the implementation of the Vasilikos–Pendaskinos Project.

PLANNING AND DESIGN OF PROJECTS

During 1976 the major planning work has been concentrated on the Vasilikos–Pendaskinos Project. This project is a double–purpose project to supply domestic water to Nicosia, Famagusta and a great number of regional villages on the one hand and to provide irrigation water for agricultural development of suitable lands lying between Pendaskinos and the Vasilikos rivers mainly in the coastal area.

The project includes the construction of two dams, one on the Vasilikos and the other on the Pendaskinos river, with a diversion on the Maroni river to the dam at Pendaskinos, groundwater development and the necessary irrigation distribution system in the region. Regarding the domestic water supply components, pumping stations at Vasilikos and on the Pendaskinos site are included with an additional treatment plant for Nicosia water supply.

Many alternatives are being considered as regards the sizes and types of projects involved, the conveyance systems, the amounts of water to be taken from each dam and types of crops to be irrigated. In view of the complexity of the system, simulated mathematical models are used on computer. The second important study during 1976 was the Pitsilia integrated rural development project involving one dam at Xyliatos, more than 30 ponds, 20 boreholes, a number of irrigation rehabilitation schemes and village domestic water supply schemes.

The main problems in the study of this project are to find suitable sites for ponds in view of the rugged topography and poor geology which makes such projects rather costly.

A very striking development during the study has been the drilling operations using power rotary drilling rigs which produce very successful boreholes yielding up to 20,000 gallons per hour, the water being struck in weak tectonic zones in the igneous rocks which are being carefully located by geological study and field work carried out by the Geological Department.

In November 1976, a mission of the World Bank arrived in Cyprus and appraised the project. During the discussions it became clear that the chances to finance this project were very high, as the World Bank found this project very interesting.

During the year our Department carried out extensive field investigations and laboratory tests in connection with all our major projects and in addition for other important works carried out outside the Department such as for refugee housing projects, Electricity Authority projects and industrial projects.

As regards the detailed design of domestic water supply and irrigation projects the main projects designed were:

* Yermasoyia – Polemidhia dam irrigation system at Trakhoni, involving powerful pumping stations.
* Mavrokolymbos dam extension of the distribution network.
* An earth dam at Aradhippou.
* Emergency domestic water supply for Nicosia from a number of boreholes drilled near Nicosia.

CONSTRUCTION OF PROJECTS

The construction programme in hand during the year reached an amount of £3,055,000 which makes it a record year of expenditure never experienced before in the history of the Department.

Major Projects

The major irrigation projects undertaken, were of the amount of £715,000, the most important being the Paphos Irrigation Project of which the amount of £585,000 is being mainly spent on the construction of the Main Conveyor Canal.

Other major schemes included the construction of the new mass concrete gravity Lymbia dam constructed just downstream of the old dam built about 25 years ago, which has in the meantime silted up.

Town Water Supplies

For town water supply schemes we spent during the year £621,000 mainly on the new reinforced concrete Engomi reservoir and the new reinforced concrete Strovolos reservoir for Nicosia water supply. The new Engomi reservoir has a capacity of 20,000 m^3 whereas that at Strovolos is 7,600 m^3. Other works included the new Tremithios reservoir for Larnaca water supply of a capacity of 7,700 m^3.

Other important works were the extension of the distribution system of Nicosia, both outside and within the walls of the city.

Village Water Supplies

On village water supplies an amount of £775,000 was spent covering 49 villages. Important schemes included the Galata house-to-house distribution network, the Paphos regional lower villages scheme, the Pitsilia regional scheme and Dhali new distribution system.

Minor Irrigation Schemes

Seventy four minor irrigation schemes were executed during the year at a total cost of £689,000.

The most important minor irrigation schemes were:

Potami groundwater pumping scheme.
Argates reinforced concrete channels.
Orounda groundwater pumping scheme.
Korakou reinforced concrete channels.
Linou reinforced concrete channels.
Episkopi groundwater pumping scheme.
Khoulou groundwater pumping scheme.

Water Supply for Housing Estates for Refugees

During the year, an emergency programme was undertaken by using funds outside our budget for housing the displaced people. These schemes numbered 68 at a total cost of £255,000.

The most important of the schemes were:

The housing estate at Anthoupolis.
The housing estate at Latsia.
The housing estate at Strovolos.
The housing estates at Lakatamia.

LABOUR

The average number of labourers employed by the Department during 1976 was 946 as compared with 880 in 1975.

39% were classed as regulars and 62% were casual labourers. 65% were skilled employees, 13% semiskilled and 22% unskilled. No Turks were employed during 1976.

The approximate daily average of labourers engaged per month was as follows:

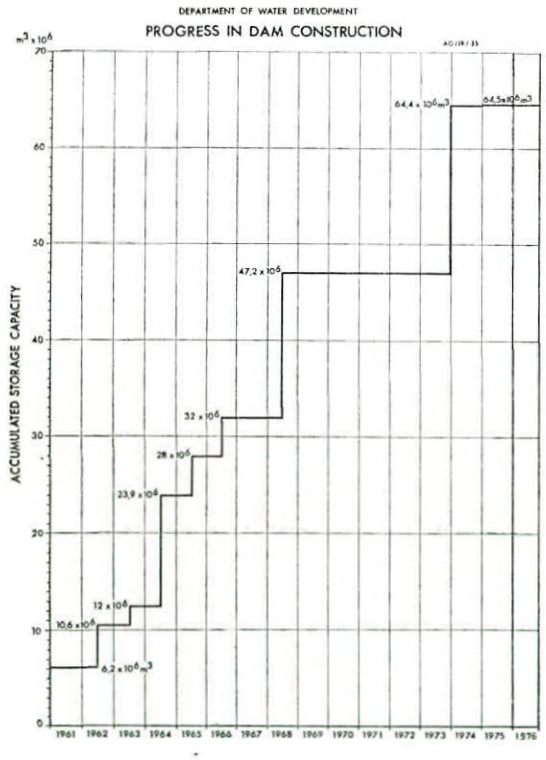
January	935
February	910
March	944
April	895
May	883
June	948
July	1 008
August	1 002
September	1 039
October	944
November	959
December	888
Monthly average	946

OPERATION AND MAINTENANCE OF PROJECTS

For operation and maintenance of projects we are jointly responsible with the district administration of the Ministry of Interior, except on major projects, in particular all major dams and the Greater Nicosia Water Supply and the Famagusta Water Supply for which we are entirely responsible.

Major Irrigation Projects

The year under review was a normal year as regards availability of water in the dams and a lot of land was irrigated using water from dams.



The total water in storage during the year was 28 MCM out of which 8.4 MCM were sold, irrigating an area of 17,375 donums. The gross income from the sale of water was £33,747 compared with £60,600 in 1975. The management cost was £18,627 compared with £12,619 in 1975.

Town Water Supplies

The major town water supplies that this Department is responsible for are Nicosia, Famagusta, Larnaca and Limassol.

* Nicosia Water Supply

The total quantity of water conveyed from all sources during the year was 80.20 MCM.

The highest daily consumption was 31,140 m^3. The revenue from the Greater Nicosia Scheme was £336,000 against an expenditure of £212,000.

* Famagusta – Larnaca Water Supply

The water supply during the year was 2.1 MCM for Larnaca.

For Famagusta the amount conveyed to the Turkish Sector of Famagusta free of charge was 992,816m^3

The revenue from the sale of water was £109,000, whereas the expenses were £60,000.

* Limassol Water Supply

The water supply used in Limassol during the year was 5.3 MCM.

The whole water supply system is under the management of the Town Water Board.

REGIONAL OFFICES

After the Turkish invasion we only have three regional offices.

The regional office of Larnaca which deals with problems of the free part of Famagusta District also.

The regional office of Limassol and the regional office of Paphos.

The responsibility of the regional offices is mostly confined on water resources measurements, evaluation and control, planning of minor irrigation and village water supply schemes and helping in the supervision of the construction works in the district.

Larnaca – Famagusta Regional Office

The problems regarding groundwater in this region are very serious concerning the Famagusta aquifer which has been badly depleted and where the situation has been aggravated by the inflow of refugees from the northern parts of Famagusta.

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	Akraoundo	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	Kofizes	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 6.192 $m^3 \times 10^6$

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. Yeoryios (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 Kavy	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	1115	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	Pratopapas	Earth	6	90	1970

Total Storage Capacity 8.275 $m^3 \times 10^6$

MAJOR DAM PROJECTS FROM 1971-75

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	1976

Total Storage Capacity 16.873 $m^3 \times 10^6$

GRAND TOTAL UP TO END OF 1975: 64.5$m^3 \times 10^6$

(1) Dams constructed up to 1960

(17) Major dam projects from 1960-70

(65) Major dam projects from 1971-75

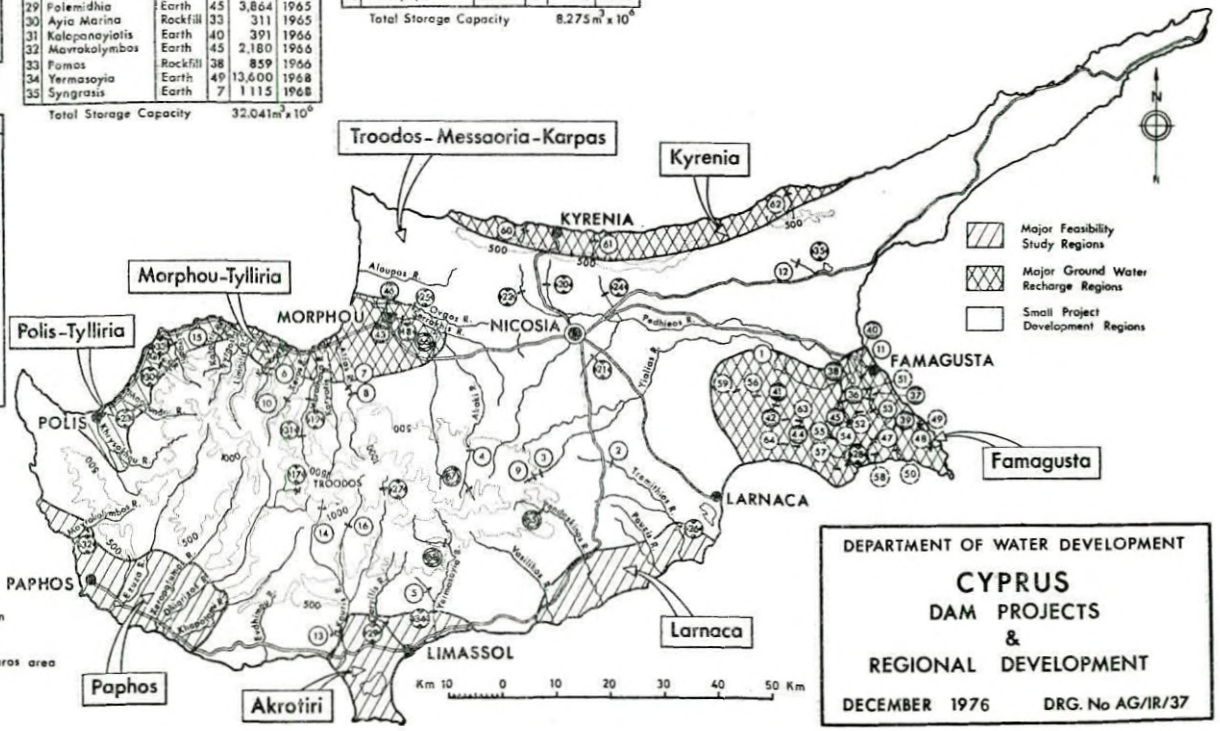
(36) Major recharge dams from 1960-70

(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



DEPARTMENT OF WATER DEVELOPMENT

CYPRUS
DAM PROJECTS & REGIONAL DEVELOPMENT

DECEMBER 1976 DRG. No AG/IR/37

Limassol Regional Office

This office has been very busy in 1976 with construction works more particularly the Yermasoyia dam irrigation scheme, the main conveyor from the dam and extension works at Phasouri and Trakhoni.

Groundwater in this district is satisfactorily controlled and the groundwater levels are fairly constant, above sea level, except near the Zakaki coast adjoining the Salt Lake.

Paphos Regional Office

The Paphos regional office does not deal with the major Paphos Irrigation Project for which a special organization has been set up.

It deals with routine works in the district. The groundwater situation in the district is fairly constant and under good control. The most important work apart from the Paphos Irrigation Project has been the Paphos lower villages domestic water supply.

The organization set up for the Paphos Irrigation Project comes directly under the Director of the Department and has been set up to supervize the construction works which will last for about 5 years and thereafter it will be responsible for the management which will include operation and maintenance of this very important project.

LEGAL MATTERS

On questions of negligence or nuisance caused by the employees of the Department, the percentage of liability of such employees as the Republic is vicariously liable for the civil wrongs of its employees and has to pay compensation when damage is caused as a result of such wrongs. The amount of damages that aught to be paid in each case basing his assessment on previously decided cases.

The Legal Adviser deals with problems connected with water rights with applications for sinking or constructing wells or boreholes, for using surface or underground water by installing machinery. Sometime he deals with applications for division of land into building sites.

Acting under the supervision of the Attorney General he prepares any amendment which may be deemed necessary to be effected on any section of the voluminous laws connected with the commodity of water. In fact during the year 1976 the proposed amendment of the Government Waterworks Law Cap. 341 has been approved and the Government Waterworks (Amendment) Law of 1977 No. 1/77 has brought about the following changes:

The Council of Ministers in addition to determining the waterworks to be undertaken by the Republic shall define the area of water supply as well as the area to be benefited by the construction of the works. For these purposes the Council of Ministers has the power to assign the responsibilities to the Director of the Department of Water Development to execute the construction of the necessary works in order that better development, maintenance regulation, distribution and administration of all the water resources which supply or are situated within the area of water supply and/or in the benefited area, may be achieved.

Notwithstanding the provisions of any other law by section 5A the District Officer or any other appropriate authority cannot issue a permit for sinking or constructing a well or for using underground or surface water or for any other purpose which may for any possible reason this may affect or pollute the underground water resources or the surface waters without seeking first the concurrence of the Director of the Department of Water Development.

The said amending law by section 5B provides the procedure which may be followed in cases where the applicant is not satisfied with the reply given by the District Officer or any other appropriate Authority, to any application submitted for decision.

Again, by special authorization given to the Legal Adviser by the Attorney General, the Legal Adviser represents the Department in all cases in all courts of the Republic and defends and prosecutes in the name of the Republic.

He drafts all pleadings necessary for the court proceedings as well as all necessary notices to be published in the Official Gazette of the Republic from time to time.

FINANCE, EXPENDITURE AND REVENUE

During the year, the total expenditure (Government Ordinary, Development including Loans) was £2,619,500 including all administration costs (1975 Expenditure was £2,163,259).

This is the highest expenditure made ever since the creation of this Department.

The largest item of expenditure was on Town Water Supplies for which the sum of £676,601 was spent (including Loans).

The administration costs, including hydrological observations, Consultants Fees and Major Projects Investigations reached the sum of £561,190 during the year, represents 21.42% of the total Departmental Expenditure. This is only by 0.58% lower than that of 1975 (22%).

The level of the construction works carried out during 1976 was £2,058,310 (1975 was £1,688,113).

During the summer of 1975, the Council of Ministers announced the commencement of the 1975–1976 Emergency Plan for the Reactivation of the Island's Economy thus approving the additional amount of £737,555 1975, for the construction of Major, Minor and Village Water Supply Schemes.

Furthermore, the construction of the Main Canal of the Paphos Irrigation Project started in September 1976.

TABLE I–1 **EXPENDITURE — WATER DEVELOPMENT DEPARTMENT**

	Details	Govt	Village	Total
		£	£	£
1	Administration	373 729	—	373 729
2	Irrigation Drainage Dams	839 136	148 840	987 976
3	Town Water Supplies	56 283	246 487	302 770
4	Village Water Supplies	282 384	99 903	382 287
5	Drilling–Prospecting	11 196	—	11 196
6	Hydrological observation, Research & Weirs	28 750	—	28 750
7	Constructions of wooden moulds	10 331	—	10 331
8	Purchases Machineries, Tools & Equipments	5 914	—	5 914
9	Consultants Fees	91 538	—	91 538
10	Major Project Invest. & Surveys	44 871	—	44 871
11	Govt. Water Supplies	3 628	—	3 628
12	Greater Nicosia scheme	357 203	13 000	370 203
13	Water supply specials meas. Law	250	—	250
14	Stores	6 057	—	6 057
	Total	£2 111 270	£508 230	£2 619 500

Breakdown of Administration

1	Personal Emoluments	216 714
2	Casual Assistance	15 305
3	Technical Assistance	42 540
4	Travelling	30 282
5	M'ce and Operation of Motor Transport	33 911
6	Office Expenses	3 682
7	Leave pay to Regular Employees	31 295
	Total	£373 729

The monthly Development expenditure of the Department, as can be seen from Table I-3 is again very unevenly distributed, ranging from 0.62% in January and increasing to 50.59% in December.

This obviously is very unsatisfactory and it has to be attributed on the institutional set up of the Government in General, and the various Departments and Ministers dealing with water in particular. The formalities to authorize projects obviously take a long time and the first few months of the year are almost wasted as far as construction works are involved.

The sum of £468,016 was collected during the year (1975 £203,927) as revenue, mainly from the sale of water for the Greater Nicosia Scheme, and the Famagusta Water Supply Scheme.

The increase of revenue in 1976 is due to the increase of water rates introduced in 1975.

TABLE I–2 **MONTHLY STATEMENT OF ORDINARY EXPENDITURE FOR THE YEAR 1976**

Head 17A — Water Development

1976 Approved	£432 516
Add special warrants	46 000
Total	478 516

Month	Monthly Expend. £	Expend. to date £	%
January	23 440	23 440	4.90
February	19 781	43 221	9.03
March	37,619	80 840	16.89
April	22 653	103 493	21.63
May	34 174	137 667	28.77
June	34 282	171 949	35.93
July	36 163	208 112	43.49
August	30,292	238,404	49.82
September	28 165	266 569	55.71
October	84 495	351 064	73.37
November	31 234	382 298	79.89
December	71 010	453 308	94.73

Summary

Amount approved	£478 516	100%
Less actual expend.	£453 308	94.73%
Balance	£ 25 208	5.27%

TABLE I–3 **MONTHLY STATEMENT OF DEVELOPMENT EXPENDITURE FOR THE YEAR 1976**

1976 Approved	3 227 079
Add special warrants	50 254
Total	£3 277 333

Month	Monthly Expend. £	Expend. to date £	%
January	20 376	20 376	0.62
February	73 792	94 168	2.87
March	57 925	152 093	4.64
April	69 969	222 062	6.78
May	144 185	366 247	11.18
June	98 030	464 272	14.16
July	74 540	538 817	16.44
August	55 806	594 623	18.14
September	247 132	841 755	25.68
October	57 519	899 274	27.44
November	127 193	1026 467	31.32
December	631 495	1657 962	50 59

Summary

Amount approved	£3 277 333	100%
Less actual expend.	£1 657 962	50.59%
Balance	£1 619 371	49.41%

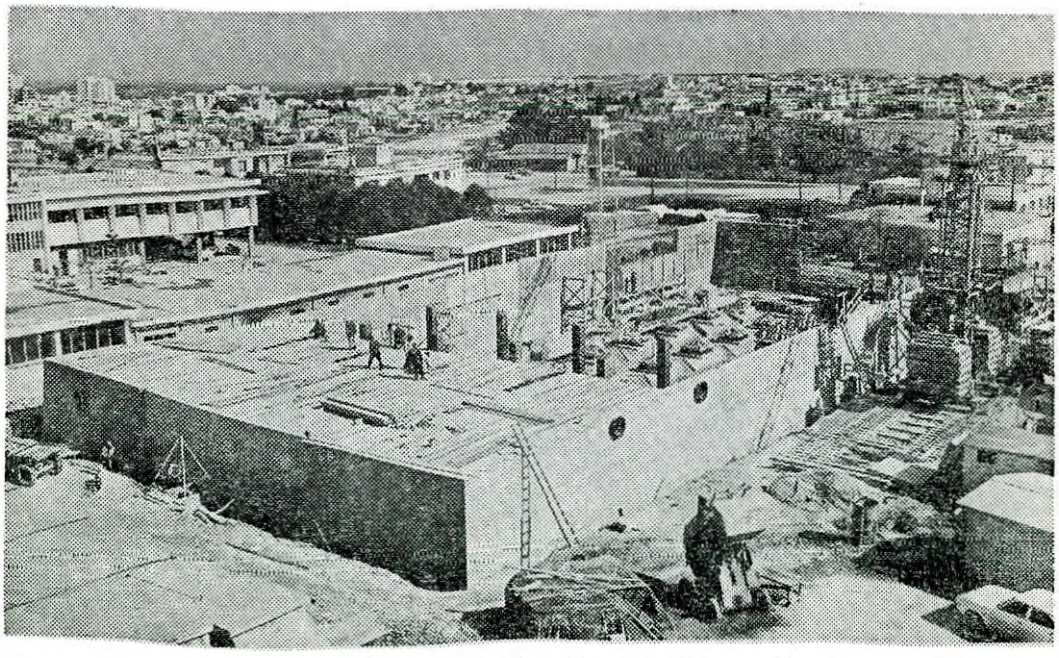
TABLE I–4 **STATEMENT OF EXPENDITURE**

HEAD: 17A — 20 and Loans

No	Description	1976
	Sub-division A	£
1	Administration	373 729
2	Construction	10 331
3	Stores	6 057
4	Purchase of Machinery Tools etc.	5 914
5	Hydrological Observations	28 750
6	Consultants Fees	91 538
7	Major Projects Investigation	44 871
	Sub-total A	£561 190
	Sub-division B	£
8	Drilling and Prospecting	11 196
9	Water Meters, Spec. Meas. Law	250
10	Town Water Supplies	676 601
11	Village Water Supplies	382 287
12	Small Irrigation Projects	400 264
13	Major Irrigation Projects	587 712
	Sub-total B	£2 058 310
	GRAND TOTAL	£2 619 500
	% of A to B	21.42%

TABLE I–5 **STATEMENT OF REVENUE COLLECTED DURING THE YEAR 1976**

Description	£
Greater Nicosia scheme	336 116
F'sta WS scheme	106 581
Khirokitia Reg. WS scheme	2 608
Drilling charges	3 016
Other Fees	19 695
Total	£468 016



New Strovolos Reservoir —Nicosia Water Supply

TABLE I-6 **MAJOR WATER WORKS — YEAR 1976**

Scheme	Estimated Cost – £			Actual Expenditure – £			Balance – £			Remarks
	Govt	Village	Total	Govt	Village	Total	Govt	Village	Total	
	£ mils	£ mils	£ mils	£ mils	£ mils	£ mils	£ mils	£ mils	£ mils	
A. Dams and Distribution										
Mavrokolymbos	2 492 000	—	2 492 000	2 045 350	—	2 045 350	446 650	—	446 650	
Yermasoyia Dam	2 838 000	—	2 838 000	1 603 198	—	1 603 198	1 234 802	—	1 234 802	
Lefkara Dam	11 401 000	—	11 401 000	3 822 558	—	3 822 558	7 578 442	—	7 578 442	
Lefkara–Khirokitia Pipeline	2 139 000	—	2 139 000	1 431 626	—	1 431 626	707 374	—	707 374	
Khirokitia Treatment Plant	4 567 000	—	4 567 000	2 796 665	—	2 796 665	1 770 335	—	1 770 335	
Lymbia (Demolition Existing Dam)	647 000	—	647 000	–353 000	—	–353 000	1 000 000	—	1 000 000	
Argaka–Makounda	32 000	—	32 000	29 433	—	29 433	2 567	—	2 567	
Mavrokolymbos	33 049 000	—	33 049 000	28 382 675	—	28 382 675	4 666 325	—	4 666 325	
Ayia Marina	120 000	—	120 000	—	—	—	120 000	—	120 000	
Yermasoyia Main Conveyor	23 070 000	—	23 070 000	16 750 123	—	16 750 123	6 310 877	—	6 319 877	
" Akrounda–Phinikaria	35 995 000	—	35 995 000	33 840 146	—	33 840 146	2 154 854	—	2 154 854	
" Phasouri	111 961 000	—	111 961 000	94 920 227	—	94 920 227	17 040 773	—	17 040 773	
" Zakaki	35 753 000	—	35 753 000	32 152 103	—	32 152 103	3 600 897	—	3 600 897	
" Trakhoni	62 000 000	—	62 000 000	21 712 970	—	21 712 970	40 287 030	—	40 287 030	
Lefkara Distribution	16 381 000	—	16 381 000	14 610 197	—	14 610 197	1 770 803	—	1 770 803	
Pomos "	378 000	—	378 000	338 498	—	338 498	39 502	—	39 502	
Kiti Dam	5 000 000	—	5 000 000	4 846 304	—	4 846 304	153 696	—	153 696	
Paphos Irrigation Project:										
Model Testing	15 000 000	—	15 000 000	683 300	—	683 300	14 316 700	—	14 316 700	
Main Canal Contr.	116 925 000	—	116 925 000	116 924 400	—	116 924 400	0 600	—	0 600	
Drilling of B/Holes	22 325 000	—	22 325 000	21 997 508	—	21 997 508	327 492	—	327 492	
Investigations	7 760 000	—	7 760 000	7 731 814	—	7 731 814	28 186	—	28 186	
Buildings	25 100 000	—	25 100 000	21 693 997	—	21 693 997	3 406 003	—	3 406 003	
Asprokremmos Dam										
Investigation	15 900 000	—	15 900 000	15 689 482	—	15 689 482	210 518	—	210 518	
Metering Units	7 000 000	—	7 000 000	—	—	—	7 000 000	—	7 000 000	
Furniture & Fittings	3 500 000	—	3 500 000	1 698 565	—	1 698 565	1 801 435	—	1 801 435	
Purchase of Equipment	14 020 000	—	14 020 000	13 236 530	—	13 236 530	783 470	—	783 470	
Advertisements	1 000 000	—	1 000 000	982 487	—	982 487	17 513	—	17 513	
Wages of Drivers	300 000	—	300 000	74 056	—	74 056	225 944	—	225 944	
Electricity	68 850 000	—	68 850 000	68 850 000	—	68 850 000	—	—	—	
Kiti Distribution	1 467 000	—	1 467 000	1 232 429	—	1 232 429	234 571	—	234 571	
B. Contributory Schemes										
Palekhori–Kambi Dam	4 597 000	1 533 000	6 130 000	1 171 126	390 375	1 561 501	3 425 874	1 142 625	4 568 499	P.L.F. 1/4
Palekhori Distribution	18 514 000	6 171 000	24 685 000	16 526 102	5 508 701	22 034 803	1 987 898	662 299	2 650 197	P.L.F. 1/4
Lymbia Dam	28 000 000	14 000 000	42 000 000	22 948 717	11 474 359	34 423 076	5 051 283	2 525 641	7 576 924	P.L.F. 1/3
Arakapas Dam	636 000	212 000	848 000	–22 906	–7 635	–30 541	658 906	219 635	878 541	P.L.F. 1/4
Total	698 717 000	21 916 000	720 633 000	570 346 680	17 365 800	587 712 480	128 370 320	4 550 200	132 920 520	

TABLE I–7 **MINOR IRRIGATION WORKS–YEAR 1976**

Scheme	Estimated Cost			Actual Expenditure			Balance			Remarks
	Govt	Village	Total	Govt	Village	Total	Govt	Village	Total	
	£ mils	£ mils	£ mils	£ mils	£ mils	£ mils	£ mils	£ mils	£ mils	
Ayios Dhimitrios L/sol "Kaloyiros"	3 067 000	1 533 000	4 600 000	2 014 784	1 007 393	3 022 177	1 052 216	525 607	1 577 823	1/3
Ayios Theodhoros "Soleas"	1 333 000	667 000	2 000 000	819 496	409 748	1 229 244	513 504	257 252	770 756	1/3
Ayios Theodhoros "Koufes"	172 075	86 038	258 113	40 514	20 257	60 771	131 561	65 781	197 342	1/3
Ayios Theodhoros "Lois"	109 375	55 188	164 563	38 108	19 055	57 163	71 267	36 133	107 400	1/3
Agros "Anastasia"	4 000 000	2 000 000	6 000 000	3 559 450	1 779 726	5 339 176	440 550	220 274	660 824	1/3
Agros "Kato Enetikos"	1 233 000	617 000	1 850 000	873 021	436 511	1 309 532	359 979	180 489	540 468	1/3
Agros "Kato Erimos"	2 980	3 055	6 035	—	—	—	2 980	3 055	6 035	44%
Agridhia	571 242	286 620	857 862	—	—	—	571 242	286 620	857 862	1/3
Ayios Pavlos L/sol "Dhymma tou Khoriou"	1 533 000	767 000	2 300 000	1 070 767	535 383	1 606 150	462 233	231 617	693 850	1/3
Anayia	5 100 000	2 550 000	7 650 000	3 938 103	1 969 051	5 907 154	1 161 897	580 949	1 742 846	1/3
Astromeritis	5 899 344	5 899 345	11 798 689	4 989 535	4 989 535	9 979 070	909 809	909 810	1 819 619	1/2
Ayios Ioannis L/sol "Teratsia"	1 933 000	967 000	2 900 000	1 247 225	623 613	1 870 838	685 775	343 387	1 029 162	1/3
Ayios Dhimitrios "Kaminia–Krio Nero"	14 400 000	7 200 000	21 600 000	5 120 541	2 560 270	7 680 811	9 279 459	4 639 730	13 919 189	1/3
Akaki	8 334 000	2 083 000	12 500 000	5 689 604	1 422 401	8 534 405	2 644 396	660 599	3 965 595	1/3 1/2
Meniko	—	2 083 000	—	—	1 422 400	—	—	660 600	—	1/2
Dhali "Phtelia"	7 283 466	2 034 277	10 926 199	3 527 471	985 048	5 291 208	3 755 995	1 049 229	5 634 991	1/3 55.85
" "Katevas"	—	1 608 456	—	—	778 689	—	—	829 767	—	44.15
Dhymes "Sykameri"	1 866 000	934 000	2 800 000	1 585 441	792 720	2 378 161	280 559	141 280	421 839	1/3
Dhierona	1 567 015	784 009	2 351 024	—	—	—	1 567 015	784 009	2 351 024	1/3
Argates "Kourtoutzi"	459 145	423 826	882 971	292 649	270 137	562 786	166 496	153 689	320 185	48%
Evrykhou	2 640 159	1 320 579	3 960 738	2 480 608	1 240 305	3 720 913	159 551	80 274	239 825	1/3
Argates Pumping "Fourkismenos"	11 131 845	6 441 423	17 573 268	9 031 781	5 227 423	14 259 204	2 100 064	1 214 000	3 314 064	36.66%
Episkopi	18 240 339	9 120 170	27 360 509	13 916 623	6 958 311	20 874 934	4 323 716	2 161 859	6 485 575	1/3
Erimi–Kolossi	25 927	12 963	38 890	—	—	—	25 927	12 963	38 890	1/3
Goudhi, Kholi, Skoulli	3 365 221	1 682 111	5 047 332	1 484 706	742 354	2 227 060	1 880 515	939 757	2 820 272	1/3
Yialias Recharge	4 220 021	—	4 220 021	4 084 110	—	4 084 110	135 911	—	135 911	Govt. only
Khoulou Pumping Scheme	7 666 000	3 834 000	11 500 000	5 110 135	2 555 069	7 665 204	2 555 865	1 278 931	3 834 796	1/3
Khoulou Irrig.	12 394 341	6 197 670	18 592 011	11 067 953	5 533 975	16 601 928	1 326 388	663 695	1 990 083	1/3
Khandria	92 436	92 437	184 873	—	—	—	92 436	92 437	184 873	1/2
Khandria "Kolymbos"	183 971	92 986	276 957	96 339	48 170	144 509	87 632	44 816	132 448	1/3
Korakou–Phlasou–Linou "Selloshis"	9 993 000	4 997 000	14 990 000	9 801 512	4 900 757	14 702 269	191 488	96 243	287 731	1/3
Kalopanayiotis	571 753	285 877	857 630	394 971	197 485	592 456	176 782	88 392	265 174	1/3
Kambos Irrig. Adj.				2 815 000						

TABLE I-7 MINOR IRRIGATION WORKS–YEAR 1976 (Continued)

Scheme	Govt	Village	Total	Actual Expenditure Golvt.	Village	Total	Balance Govt.	Village	Total	Remarks
	£ mils	£ mils	£ mils	£ mils	£ mils	£ mils	£ mils	£ mils	£ mils	
Kambos	1 333 000	667 000	2 000 000	1 119 135	559 568	1 678 703	213 865	107 432	321 297	1/3
Kaliana–Tembria	3 008 329	1 504 165	4 512 494	2 902 655	1 451 328	4 353 983	105 674	52 837	158 511	1/3
Kakopetria	5 968 866	2 986 433	8 955 299	5 903 441	2 951 720	8 855 161	65 425	34 713	100 138	1/3
Kyperounda "Vasilikos"	422 947	281 965	704 912	—	—	—	422 947	281 965	704 912	40%
Kato Aminatos–Pelendria	2 033 000	1 017 000	3 050 000	1 114 943	557 472	1 672 415	918 057	459 528	1 377 585	1/3
Kyperounda "Halospities"	2 466 000	1 234 000	3 700 000	1 719 386	859 693	2 579 079	746 614	374 307	1 120 921	1/3
Kyperounda "Appis"	850 000	850 000	1 700 000	715 077	715 081	1 430 158	134 923	134 919	269 842	1/2
Korakou	5 379 700	2 690 350	8 070 050	4 946 048	2 473 025	7 419 073	433 652	217 325	650 977	1/3
Kolossi	10 549 924	5 275 962	15 825 886	7 590 717	3 795 358	11 386 075	2 959 207	1 480 604	4 439 811	1/3
Kyperounda "Mavrokolymbos"	267 035	133 519	400 554	241 772	120 886	362 658	25 263	12 633	37 896	1/3
Kato Platres	7 576 194	3 787 597	11 363 791	5 727 326	2 863 663	8 590 989	1 848 868	923 934	2 772 802	1/3
Katydhata "Tziami Mylos"	6 756 977	3 378 488	10 135 465	6 349 973	3 174 987	9 524 960	407 004	203 501	510 505	1/3
Lemithou "Tsangaroudhia"	1 500 000	750 000	2 250 000	1 149 418	574 709	1 724 127	350 582	175 291	525 873	1/3
Lemona	9 171 307	4 586 153	13 757 460	7 869 074	3 934 536	11 803 610	1 302 233	651 617	1 953 850	1/3
Linou, "Linopsas"	10 884 333	5 443 167	16 327 500	10 284 630	5 142 315	15 426 945	599 703	300 852	900 555	1/3
Louvaras	866 000	434 000	1 300 000	830 376	415 189	1 245 565	35 624	18 811	54 435	1/3
Mandria, "Mylavres"	1 333 584	667 293	2 000 877	109 199	54 600	163 799	1 224 385	612 693	1 837 078	1/3
Mandria	1 525 894	762 948	2 288 842	—	—	—	1 525 894	762 948	2 288 842	1/3
Mamonia	407 871	204 935	612 806	13 018	6 510	19 528	394 853	198 425	593 278	1/3
Nikoklia	982 947	491 475	1 474 422	137 701	68 851	206 552	845 246	422 624	1 267 870	1/3
Orounda	11 096 851	5 548 926	16 645 777	8 736 575	4 368 287	13 104 862	2 360 276	1 180 639	3 540 915	1/3
Phlasou–Evrykhou–Korakou	289 827	146 413	436 240	45 594	22 797	68 391	244 233	123 616	367 849	1/3
Polemi	9 866 000	4 934 000	14 800 000	4 204 740	2 102 371	6 307 111	5 661 260	2 831 629	8 492 889	1/3
Peristerona	13 667 000	4 555 000	20 500 000	2 245 149	748 383	3 367 723	11 421 851	3 806 617	17 132 277	1/3 2/3
Astromeritis		2 278 000			374 191			1 903 809		1/3
Peristerona (Morphou)	5 000 000	5 000 000	10 000 000	2 686 429	2 686 428	5 372 857	2 313 571	2 313 572	4 627 143	1/2
Peyia	477 557	239 778	717 335	466 822	233 410	700 232	10 735	6 368	17 103	1/3
Pissouri	846 692	424 349	1 271 041	811 569	405 785	1 217 354	35 123	18 564	53 687	1/3
Potamitissa "Arsoulou"	81 530	41 264	122 794	—	—	—	81 530	41 264	122 794	1/3
Pelendria	430 698	215 350	646 048	—	—	—	430 698	215 350	646 048	1/3
Potami "Kambos"	9 333 000	4 667 000	14 000 000	7 943 143	3 971 570	11 914 713	1 389 857	695 430	2 085 287	1/3
Paleometokho–Ayii Trimithias Recharge	9 993 000	—	9 993 000	8 364 346	—	8 364 346	1 628 654	—	1 628 654	Govt. only
Palekhori "Halkomatas"	212 992	106 496	319 488	206 938	103 470	310 408	6 054	3 026	9 080	1/3

TABLE I-7 **MINOR IRRIGATION WORKS–YEAR 1976 (Continued)**

Scheme	Estimated Cost			Actual Expenditure			Balance			Remarks
	Govt	Village	Total	Govt	Village	Total	Govt	Village	Total	
	£ mils	£ mils	£ mils	£ mils	£ mils	£ mils	£ mils	£ mils	£ mils	
Palekhori "Maroulena"	219 515	172 475	391 990	—	—	—	219 515	172 475	391 990	44%
Paleomylos "Khardji"	11 066 000	5 534 000	16 600 000	10 504 131	5 252 066	15 756 197	561 869	281 934	843 803	1/3
Phlasou "Ayios Epiphanitis"	13 963 273	6 982 137	20 945 410	10 892 866	5 446 433	16 339 299	3 070 407	1 535 704	4 606 111	1/3
Pelendria "Englisis Psilon" ...	2 966 000	1 484 000	4 450 000	2 367 321	1 183 660	3 550 981	598 679	300 340	899 019	1/3
Pelendria "Kato Englisis"	2 933 000	1 467 000	4 400 000	2 123 510	1 061 756	3 185 266	809 490	405 244	1 214 734	1/3
Pelendria "Kountouridhes" ...	613 000	307 000	920 000	488 872	244 437	733 309	124 128	62 563	186 691	1/3
Pelendria "Avlaki-tou-HadjiStylianou"	350 000	350 000	700 000	261 239	261 239	522 478	88 761	88 761	177 522	1/2
Phini "Mylos & Vines"	15 133 000	7 567 000	22 700 000	9 591 773	4 795 888	14 387 661	5 541 227	2 771 112	8 312 339	1/3
Phini	296 292	148 145	444 437	9 067	4 533	13 600	287 225	143 612	430 837	1/3
Pharmakas	2 844 343	2 234 841	5 079 184	2 357 693	1 852 472	4 210 165	486 650	382 369	869 019	44%
Peristerona Paphos	921 506	460 751	1 382 257	579 025	289 511	868 536	342 481	171 240	513 721	1/3
Skoulli, Ayios Andronikos ...	12 533 000	6 267 000	18 800 000	10 038 881	5 019 440	15 058 321	2 494 119	1 247 560	3 741 679	1/3
Saittas, Moniatis	1 180 000	1 867 000	3 300 000	1 051 214	1 663 245	2 939 635	128 786	203 755	360 365	56.58%
		253 000			225 176			27 824		7.66%
Steni pumping Scheme	13 333 000	6 667 000	20 000 000	10 219 041	5 109 521	15 328 562	3 113 959	1 557 479	4 671 438	1/3
Tembria	3 518 047	1 428 689	5 277 571	3 324 464	1 349 732	4 986 696	193 583	78 957	290 875	1/3 81.20%
Korakou		330 835			312 500			18 335		18.80%
Tris Elies	740 856	370 428	1 111 284	154 091	77 046	231 137	586 765	293 382	880 147	1/3
Vyzakia	16 000 000	8 000 000	24 000 000	8 423 361	4 211 680	12 635 041	7 576 639	3 788 320	11 364 959	1/3
Yiolou	2 316 315	1 157 658	3 473 973	1 371 515	685 757	2 057 272	944 800	471 901	1 416 701	1/3
Zoopiyi	147 506	—	147 506	—	—	—	147 506	—	147 506	Govt. only
Totals	365 042 363	185 011 015	550 053 378	263 283 705	131 208 061	391 676 766	104 573 658	753 802 954	158 376 612	

TABLE I-8 IMPROVEMENT OF VILLAGE WATER SUPLLY–YEAR 1976

Scheme	Actual Expenditure			Balance			Remarks
	Govt £ mils	Village £ mils	Total £ mils	Govt £ mils	Village £ mils	Total £ mils	
Ayia Marina Xyliatou	17 866 000	10 584 000	28 450 000	14 212 792	8 419 043	22 631 835	3 653 208	2 164 957	5 818 165	37.20%
Askas	5 266 000	2 634 000	7 900 000	4 310 986	2 155 492	6 466 478	955 014	478 508	1 433 522	1/3
Asproyia	2 425 000	2 925 000	5 350 000	1 426 390	1 720 288	3 146 678	998 610	1 204 712	2 203 322	54.6%7
Avgorou	2 500 000	2 500 000	5 000 000	1 947 002	1 947 002	3 894 004	552 998	552 998	1 105 996	1/2
Ayii Vavatsinias	483 559	483 559	967 118	350 000	350 000	700 000	133 559	133 559	267 118	1/2
Apsiou	79 073	79 074	158 147	—	—	—	79 073	79 074	158 147	1/2
Ayios Theodhoros L/sol	800 000	800 000	1 600 000	—	—	—	800 000	800 000	1 600 000	1/2
Ayia Erini	525 000	765 000	1 290 000	388 527	566 082	954 609	136 473	198 918	335 391	59.30%
Akourdhalia Kato	1 450 000	1 750 000	3 200 000	1 222 391	1 475 448	2 697 839	227 609	274 552	502 161	54.69%
Armou	1 528 845	1 790 237	3 319 082	486 278	569 472	1 055 750	1 042 567	1 220 765	2 263 332	53.94%
Arminou Reg. Scheme										
Kelokedhara		512 331			189 869			322 462		69.26%
Salamiou	17 259 391	155 590	17 999 209	6 395 907	57 680	6 670 047	10 863 484	97 910	11 329 162	4.11% 21.04%
Mesana		71 897			26 591			45 306		9.70%
Akhelia	950 000	950 000	1 900 000	805 032	805 031	1 610 063	144 968	144 969	289 937	1/2
Ayia Marina (Kelokedhara)	811 509	1 137 102	1 948 611	341 889	478 384	820 273	469 620	658 718	1 128 338	58.32%
Ayia Napa	1 142 080	1 142 080	2 284 160	392 564	392 565	785 129	749 516	749 515	1 499 031	1/2
Dhali	20 000 000	20 000 000	40 000 000	11 479 218	11 479 216	22 958 434	8 520 782	8 520 784	17 041 566	1/2
Droushia	241 819	322 578	564 397	—	—	—	241 819	322 578	564 397	57.08%
Argates		2 144 993			1 302 502			842 491		60%
Episkopio	3 574 987	536 247	7 149 974	2 170 835	325 624	4 341 671	1 404 152	210 623	2 808 303	1/2 15%
Kambia		536 248			325 626			210 622		15%
Analiontas		357 499			217 084			140 415		10%
Galata	10 831 925	10 831 926	21 663 851	9 358 853	9 358 851	18 717 704	1 473 072	1 473 075	2 946 147	1/2
Kiti	727 899	727 900	1 455 799	400 936	400 936	801 872	326 963	326 964	653 927	1/2
Kourdhali	1 150 000	1 510 000	2 660 000	1 085 046	1 424 890	2 509 936	64 954	85 110	150 064	56.77%
Kalokhorio L/ssol	930 332	930 333	1 860 665	—	—	—	930 332	930 333	1 860 665	1/2
Kato Moni	2 000 000	2 000 000	4 000 000	1 430 213	1 430 211	2 860 424	569 787	569 789	1 139 576	1/2
Kakopetria		860 000			589 690			270 310		57.33%
	1 500 000		3 000 000	1 028 589		2 057 178	471 411		942 822	1/2
Galata		640 000			438 899			201 101		42.67%
Kallepia		1 464 007		45 436	16 357			1 447 650	—	50%
Letymbou	3 339 577	1 054 445	5 858 029	—	22 719	90 873	3 287 780	1 031 726	5 767 156	1/2 36%
Pitargou		—		6 361	—			—	—	14% Govt

TABLE I-8 IMPROVEMENT OF VILLAGE WATER SUPPLY—YEAR 1976 (Continued)

Scheme	Estimated Cost			Actual Expenditure			Balance			Remarks
	Govt	Village	Total	Govt	Village	Total	Govt	Village	Total	
	£ mils	£ mils	£ mils	£ mils	£ mils	£ mils	£ mils	£ mils	£ mils	
Kellaki	507 897	581 022	1 088 919	—	—	—	507 897	581 022	1 088 919	53.33%
Laxia		1 870 000			818 739			1 051 261		52%
Yeri	3 600 000	1 730 000	7 200 000	1 574 500	755 760	3 148 999	2 025 500	974 240	4 051 001	1/2 48%
Lefkara Reg. Scheme	3 059 862	—	3 059 862	48 482	—	48 482	3 011 380	—	3 011 380	Govt. only
Livadhia	303 279	303 279	606 558	13 106	13 107	26 213	290 173	290 172	580 345	1/2
Lymbia Part 1										
Lymbia		52,579			57 310			–4 731		38.70%
Sha		9 878			12 143			–2 265		8.20%
Kornos	270 177	31 071	405 266	296 187	34 061	444 276	–26 010	–2 990	–39 010	1/3 23.00%
Mosphiloti		14 685			15 550			–865		10.50%
Psevdhas		14 788			15 994			–1 206		10.80%
Pyrga		12 088			13 031			–943		8·80%
Lymbia Part II	1 570 900	785 449	2 356 349	26 001	12 999	39 000	1 544 899	772 450	2 317 349	1/3
Lymbia B3										
Sha		35 588			3 311			32 277		13.70%
Kornos		99 241			9 065			90 176		37.50%
Mosphiloti	529 620	45 321	793 929	48 343	4 109	72 515	481 277	41 212	721 414	1/3 17.00%
Psevdhas		46 912			4 254			42 658		17.60%
Pyrga		37 247			3 433			33 814		14.20%
Lymbia B10	689 591	—	689 591	100 015	—	100 015	589 576	—	589 576	Govt. only
Mamonia	386 178	392 564	778 742	11 325	13 675	25 000	374 853	378 889	753 742	54.70%
Malounda	650 000	1 305 000	1 955 000	479 455	962 517	1 441 972	170 545	342 483	513 028	66.75%
Marathounda	722 480	863 190	1 585 670	–0 585	–0 698	–1 283	723 065	863 888	1 586 953	54.42%
Malia	34 862	34 863	69 725	—	—	—	34 862	34 863	69 725	1/2
Moutayiaka Reg. Scheme										
Ayios Tykhonas		867 000			440 699			426 301		2.82%
Parekklishia		2 050 000			1 042 363			1 007 637		6.67%
Monagroulli		1 261 000			640 733			620 267		4.10%
Ayios Athanasios	32 480 000	7 521 000	63 220 000	16 514 762	3 824 082	32 142 394	15 965 238	3 696 918	31 077 606	48.62% 24.47%
Ayia Phyla		8 821 000			4 485 130			4 335 870		28.70%
Paramitha		4 060 000			2 064 411			1 995 589		13.21%
Palodhia		3 220 000			1 636 212			1 583 788		10.47%
Spitali		2 940 000			1 494 002			1 445 998		9.56%
Neokhorio (P)	2 320 878	2 320 877	4 641 755	—	—	—	2 320 878	2 320 877	4 641 755	1/2
Ormidhia	439 500	439 501	879 001	20 250	20 250	40 500	419 251	419 251	838 501	1/2
Phrenaros	2 037 668	2 037 669	4 075 337	1 659 648	1 659 646	3 319 294	378 020	378 023	756 043	1/2
Pentalia	1 629 477	2 351 268	3 980 745	751 653	1 083 780	1 836 433	877 824	1 266 488	2 144 312	59.07%
Panayia	735 391	956 678	1 692 069	–3 860	–5 020	–8 880	739 251	961 698	1 700 949	56.52%

TABLE I-8 **IMPROVEMENT OF VILLAGE WATER SUPPLY–YEAR 1976 (Continued)**

Scheme	Actual Expenditure			Balance						
	Govt.	Village	Total	Govt.	Village	Total	Govt.	Village	Total	
	£ mils	£ mils	£ mils	£ mils	£ mils	£ mils	£ mils	£ mils	£ mils	
Pissouri	1 450 000	1 450 000	2 900 000	—	—	—	1 450 000	1 450 000	2 900 000	1/2
Paleometokho	1 039 919	1 039 920	2 079 839	259 514	259 515	519 029	780 405	780 405	1 560 810	1/2
Pano Kividhes	283 546	193 723	567 093	28 366	19 340	56 731	255 180	174 383	510 362	1/2)68.13%
Souni–Zanaja		89 824			9 025			80 799		)31.32%
Psathi	680 563	781 006	1 461 569	85 404	98 024	183 428	595 159	682 982	1 278 141	53.44%
Pera	1 774 729	1 774 729	3 549 458	717 646	717 647	1 435 293	1 057 083	1 057 082	2 114 165	1/2
Polis Prodhromi	464 969	464 971	929 940	127 330	127 327	254 657	337 639	337 644	675 283	1/2
Piyenia	2 380 981	1 190 990	3 571 971	1 116 159	558 052	1 674 211	1 264 822	632 938	1 897 760	1/3
Pitsilia B1	6 446 000	2 554 000	9 000 000	—	—	—	6 446 000	2 554 000	9 000 000	28.33%
Pitsilia B5	1 277 000	473 000	1 750 000	—	—	—	1 277 000	473 000	1 750 000	27.03%
Pitsilia B7	6 055 000	2 145 000	8 200 000	6 055 000	2 160 721	8 215 721	—	–15 721	–15 721	26.16%
Pitsilia B2										
Ayia Marina					3 013 211			661 789		}84.78%
	8 665 000	3 675 000	13 000 000	7 103 558		10 657 712	1 561 442		2 342 288	33.35%
Xyliatos		660 000			540 943			119 057		}15.22%
Pyrgos (L/ssol)	1 228 661	1 228 663	2 457 324	356 098	356 098	712 196	872 563	872 565	1 745 128	1/2
Pano Pyrgos (N)	139 780	71 891	211 671	123 856	61 925	185 781	15 924	9 966	25 890	1/3
Phinikaria	547 498	547 498	1 094 996	23 969	23 969	47 938	523 529	523 529	1 047 058	1/2
Simou	167 431	167 431	334 862	162 914	162 913	325 827	4 517	4 518	9 035	1/2
Stroumbi		1 757 949			258 620			1 499 329		}38.03%
	4 622 179		9 244 357	680 039		1 360 077	3 942 140		7 884 280	1/2
Polemi		2 864 229			421 418			2 442 811		}61.97%
Souni–Zanaja	9 250 000	10 690 000	19 940 000	6 425 205	7 425 204	13 850 409	2 824 795	3 264 796	6 089 591	53.61%
Sanidha	950 807	475 904	1 426 711	906 772	453 386	1 360 158	44 035	22 518	66 553	1/3
Tala	1 692 809	2 195 947	3 888 756	790 351	1 024 879	1 815 230	902 458	1 171 068	2 073 526	56.46%
Trakhoni	155 628	216 862	372 490	16 817	23 433	40 250	138 811	193 429	332 240	58.22%
Voroklini	397 856	397 856	795 712	16 589	16 588	33 177	381 267	381 268	762 535	1/2
Xylophagou	12 500 000	12 500 000	25 000 000	7 996 452	7 996 450	15 992 902	4 503 548	4 503 550	9 007 098	1/2
Xylotymbou	3 142 581	3 142 581	6 285 162	650 741	650 740	1 301 481	2 491 840	2 491 841	4 983 681	1/2
Xyliatos	2 333 000	1 552 000	3 885 000	2 293 994	1 526 146	3 820 140	39 006	25 854	64 860	39.95%
Ypsonas		190 135			185 370			4 765		}30%
	633 780		1 267 561	617 900		1 235 800	15 880		31 761	1/2
Polemidhia		443 646			432 530			11 116		}70%
Yiolou	122 188	722 189	844 377	122 188	640 055	762 243	—	82 134	82 134	1/2 £600 Dep.
Raphos Lower Villages										
Phase I	25 734 570	1 024 887	26 759 457	25 734 570	1 024 887	26 759 457	—	—	—	3.83%
" II	119 800 000	—	119 800 000	119 800 000	—	119 800 000	—	—	—	Govt. only
" III	56 859 000	7 561 000	64 420 000	15 736 667	2 093 231	17 829 898	41 122 333	5 467 769	46 590 102	11.73%
Totals	420 146 231	183 549 635	603 695 866	278 772 626	99 902 847	378 675 473	141 373 605	83 646 788	225 020 393	

TABLE I–9 **STATEMENT OF EXPENDITURE AS FROM 1939**

Ser No	Details	1939	1940	1941	1942	1943	1944	1945	1946	1947	1948
		£	£	£	£	£	£	£	£	£	£
1	Administration	4 716	5 652	4 322	4 111	5 157	8 586	9 245	15 974	15 974	19 033
2	W/shops & M'ce of Plant	467	587	500	398	254	284	414	—	350	—
3	Purchase of Machinery, tools etc.	1 970	224	199	—	184	105	196	—	420	—
4	Hydrological Observations	—	—	—	—	—	—	—	—	—	—
5	Consultants' Fees	—	—	—	—	—	—	—	—	—	—
6	Major Project Investigations	—	—	—	—	—	—	—	—	—	—
	Sub–total "A"	7 153	6 463	5 021	4 509	5 595	8 975	9 855	15 974	15 848	19 033
7	Drilling for water	680	952	527	486	642	2 700	3 180	660	360	25 171
8	Water Meters for Wells & Boreholes	—	—	—	—	—	—	—	—	—	—
9	Town Water Supplies	1 169	925	908	1 043	1 169	1 827	2 448	—	—	—
10	Village Water Supplies	8 980	1 613	5 560	4 956	6 887	5 730	3 413	19 000	31 871	42 190
11	Small Irrigation Projects	2 770	7 979	10 252	35 809	74 134	116 334	100 470	166 493	177 144	120 278
12	Major Irrigation Projects	—	—	—	—	—	—	—	—	—	—
	Sub-total "B"	12 599	19 469	17 247	42 294	82 832	126 591	109 511	186 153	209 375	187 639
	Grand Total	19 752	25 932	22 268	46 803	88 427	135 566	119 366	202 127	225 223	206 672
	% of A to B	56.8	33.2	29.1	10.6	6.7	7.0	8.9	8.5	7.5	10.1

TABLE I-9 **STATEMENT OF EXPENDITURE AS FROM 1939 (Continued)**

Ser No	Details	1949	1950	1951	1952	1953	1954	1955	1956	1957	1958
		£	£	£	£	£	£	£	£	£	£
1	Administration	18 156	19 146	26 270	29 991	38 050	52 950	54 350	61 699	80 790	95 256
2	W/Shops & M'ce of Plant	—	—	39 111	10 826	14 150	13 000	13 000	15 688	25 960	20 995
3	Purchase of Machinery tools etc.	—	—	3 339	2 840	17 000	10 050	10 800	91 989	16 700	15 950
4	Hydrological Observations	—	—	—	1 066	1 000	1 500	3 500	19 626	13 000	4 450
5	Consultants' Fees	—	—	—	—	—	—	—	—	—	—
6	Major Projects Investigations	—	—	—	—	—	—	—	—	—	—
	Sub-total "A"	18 156	19 146	68 720	44 723	70 200	77 500	82 150	189 000	136 450	136 651
7	Drilling for Water	27 349	30 666	26 719	24 712	41 100	48 600	58 350	78 641	75 750	45 824
8	Water Meters for Wells and Boreholes	—	—	—	—	—	—	—	—	—	—
9	Town Water Supplies	—	—	155 116	119 481	235 000	303 900	93 200	152 476	417 600	648 350
10	Village Water Supplies	53 410	106 370	100 137	214 732	256 000	255 000	196 850	280 955	215 600	87 225
11	Small Irrigation Projects	111 352	150 980	172 154	166 493	154 500	116 900	150 850	116 100	168 600	81 075
12	Major Irrigation Projects	—	—	—	15 000	15 000	20 000	30 000	35 000	35 000	50 000
	Sub-total "B"	192 111	288 016	454 126	540 418	701 600	744 400	529 250	663 172	927 550	912 474
	Grand Total	210 267	307 162	522 846	585 141	771 800	821 900	611 400	852 172	1 064 000	1 049 125
	% of A to B	9.4	6.6	15.1	8.2	10.0	10.4	15.5	28.4	14.7	14.9

TABLE I-9 **STATEMENT OF EXPENDITURE AS FROM 1939 (Continued)**

Ser No	Details	1959 £	1960 £	1961 £	1962 £	1963 £	1964 £	1965 £	1966 £	1967 £
1	Administration	81 677	64 255	70 527	81 983	151 580	130 164	135 410	145 389	183 927
2	W/Shops & M'ce of Plant & Stores	20 441	28 979	30 238	31 789	14 000	16 150	15 500	14 147	14 848
3	Purchase of Machinery, tools etc.	960	—	—	31 712	120 000	46 030	16 875	10 973	12 927
4	Hydrological Observations	7 090	6 059	10 640	40 520	40 500	43 223	28 200	18 863	20 538
5	Consultant's Fees	—	—	—	—	—	39 378	45 065	51 297	32 040
6	Major Projects Investigations	—	—	—	—	—	10 202	15 290	7 733	20 880
	Sub-total "A"	110 168	99 293	111 405	186 004	326 080	285 147	256 340	248 402	285 160
7	Drilling for Water	45 084	48 837	83 608	82 151	63 700	47 588	40 200	24 253	35 029
8	Water Meters for Wells and B/holes	—	—	—	—	—	—	—	983	2 672
9	Town Water Supplies	113 853	220 370	88 282	97 724	70 900	197 871	178 010	138 390	68 782
10	Village Water Supplies	113 493	137 825	602 436	602 537	486 600	507 679	404 600	108 926	130 340
11	Small Irrigation Projects	68 274	49 288	141 712	253 817	383 052	400 046	95 002	113 636	221 169
12	Major Irrigation Projects	50 000	50 000	120 000	150 000	414 948	369 420	691 349	689 010	941 131
	Sub-total "B"	390 704	506 320	1 036 037	1 204 229	1 418 600	1 522 604	1 409 160	1 075 198	1 399 123
	Grand Total	500 872	605 613	1 147 442	1 390 233	1 744 680	1 807 751	1 665 500	1 323 600	1 684 283
	% of A to B	28.2	19.6	10.7	15.4	22.9	18.7	18.1	23.1	80.3

TABLE I-9 **STATEMENT OF EXPENDITURE AS FROM 1939 (Continued)**

Ser No	Details	1968	1969	1970	1971	1972	1973	1974	1975	1976
		£	£	£	£	£	£	£	£	£
1	Administration	228 902	248 058	257 624	262 688	265 447	334 922	364 212	350 818	373 729
2	W/Shops & M'ce of Plant & Stores	25 594	38 268	24 896	24 200	29 415	28 512	29 589	19 656	16 388
3	Purchase of Machinery tools etc.	5 918	16 910	4 103	4 790	8 597	4 451	3 646	6 405	5 914
4	Hydrological Observations	19 768	22 365	42 393	19 359	21 816	19 984	21 478	26 642	28 750
5	Consultants' Fees	14 676	5 021	12 266	26 299	18 653	19 169	6 156	29 856	91 538
6	Major Projects Investigations	34 801	25 083	22 780	33 349	37 232	36 357	31 320	41 769	44 871
	Sub-total "A"	329 659	355 705	364 062	370 685	381 160	443 395	456 401	475 146	561 190
7	Drilling for Water	49 095	22 938	46 033	50 388	11 168	10 727	9 678	2 920	11 196
8	Water Meters for Wells & B/holes	86	116	—	—	418	20	143	242	250
9	Town Water Supplies	171 190	937 325	265 062	184 804	342 129	275 964	374 604	443 170	676 601
10	Village Water Supplies	232 253	251 805	229 746	374 943	320 436	472 448	393 781	244 737	382 287
11	Small Irrigation Projects	174 065	237 594	151 386	99 178	118 341	159 713	242 662	300 717	400 264
12	Major Irrigation Projects	493 045	263 209	283 499	378 882	1 116 023	1 081 463	695 378	696 327	587 712
	Sub-total "B"	1 119 734	1 717 987	975 726	1 088 195	1 908 515	2 000 335	1 716 246	1 688 113	2 058 310
	Grand Total	1 449 393	2 073 692	1 339 788	1 458 880	2 289 675	2 443 730	2 172 647	2 163 259	2 619 500
	% of A to B	20.3	17.2	37.3	25.0	20.0	22.0	26.0	22.0	21.42

II DIVISION OF WATER RESOURCES

by
D. C. Kypris
Engineer Hydrologist
Head of Division

General

The year under examination is the third year during which 40% of Cyprus land is under occupation of the Turkish troops. In the Turkish occupied zone, no hydrological data could be collected by us, so for a third year the behaviour of both surface runoff and groundwater bodies could not be followed or recorded there.

During the year, the effort for reconstructing our hydrogeological archives, destroyed during the events of July, 1974, or lost in the area occupied by the Turkish troops, continued and 1612 wells/boreholes were plotted again, in an area of 230 km^2, with their relative information recorded.

INTRODUCTION

The Division of Water Resources deals mainly with the collection and interpretation of Hydrological and Hydrogeological data, regarding both ground and surface water, engineering geology problems as connected with the planning and execution of water works projects, carries out ancillary drilling operations and controls groundwater extraction and use.

The original division of Cyprus into eleven hydrological regions based on both hydrogeological and administrative criteria, which has been followed in the past for reasons of better control on the collection of hydrogeological data and thorough hydrogeological studies, was not followed during the year under examination, since the Turkish troops are still occupying part of Cyprus. The new arrangement followed is seen on map page 34.

During 1976, Mr. D. C. Kypris, Engineer Hydrologist, acted as the Head of Division. Mr. N. Chr. Toufexis, Superintendent of Works, was the Assistant Head.

Mr. M. Peppis, Geologist, Class I, was the Head of the Drilling Permits and Water Control Branch. Mr. Peppis acted also as the chairman of the specially formed advisory committee for the issue of well permits.

DRILLING OPERATIONS

Drilling operations 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 5 existing boreholes
* Drilling of 4 boreholes for domestic water supply and animal husbandry. Penetrated depth: 161.0 m.
* Removing of casings from one Government borehole
* Enlarging and casing of 3 boreholes drilled for domestic water supply purposes. Penetrated depth: 409.0 m.
* Drilling of 5 boreholes in the gravels of the Xeropotamos River for engineering purposes. Penetrated depth: 140.0 m.

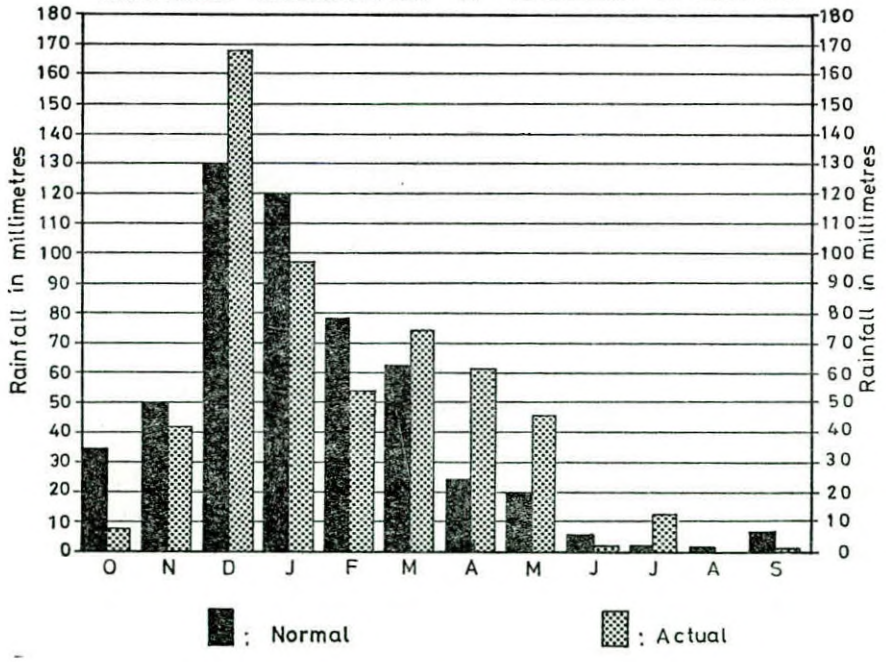
This included percussion drilling and casing

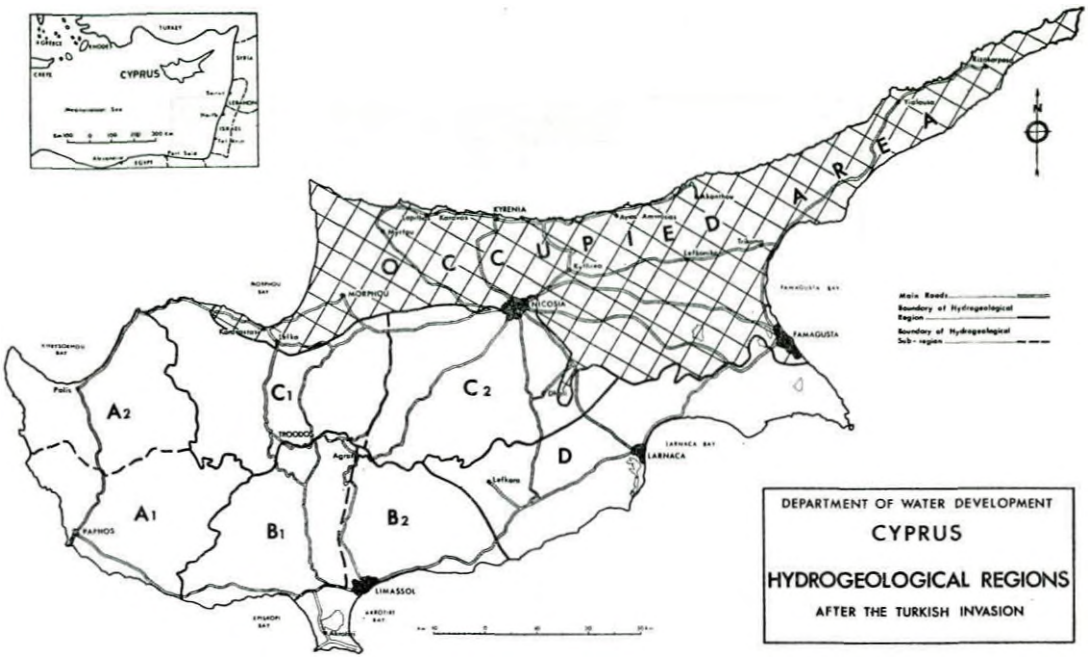
INCIDENCE OF RAINFALL

The incidence of rainfall per month during the hydrometeorological year 1975–1976 was as follows:

Month	Rainfall in mm	Rainfall in inches	Percentage %
October	6.7	0.26	1.2
November	41.8	1.64	7.4
December	167.6	6.60	29.8
January	96.7	3.81	17.2
February	53.6	2.11	9.5
March	73.6	2.90	13.1
April	60.9	2.40	10.8
May	46.2	1.82	8.2
June	2.2	0.09	0.4
July	12.4	0.49	2.2
August	0.0	0.00	0.0
September	1.3	0.05	0.2
Totals	563.0	22.17	100.0

GRAPHICAL PRESENTATION OF INCIDENCE OF RAINFALL





with 12 inch dia. pipes, SPT testing, bulk sampling, permeability testing and test pumping.

METEOROLOGICAL NOTES

The precipitation and other climatological elements recorded at the observing stations of the Cyprus Government Meteorological Service have been analysed. No meteorological information was received from the northern part of the Island, which is under the occupation of the Turkish troops, thus the picture given refers to the southern part of the Island.

PRECIPITATION

The yearly total precipitation, averaged over the southern part of the Island, during the hydrometeorological year October 1975 to September 1976 was 563.0 mm which is 106% of normal (see diagram on page 35) (Normal is considered as the average rainfall over the southern part of the island during the period 1941–1970).

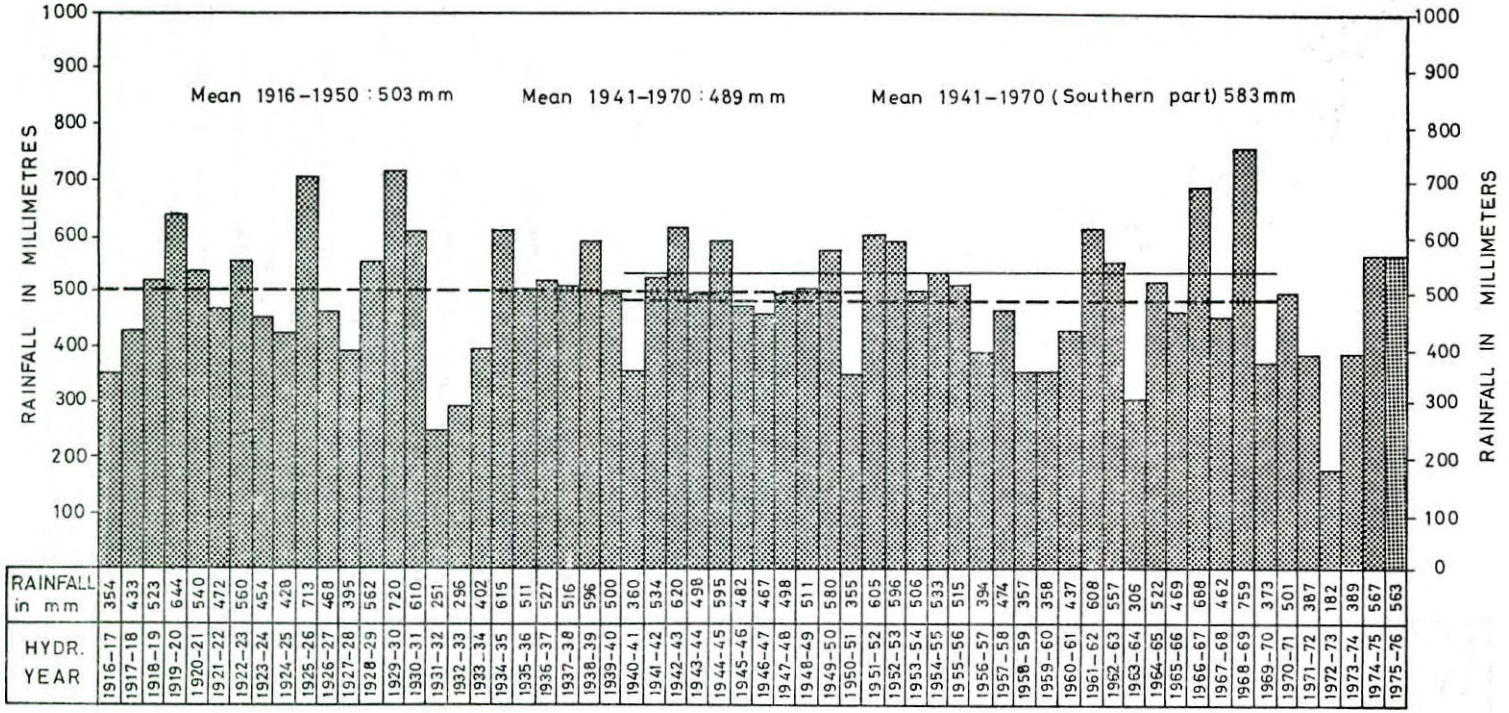
As regards the various parts in particular, the precipitation amounts ranged mainly from 95% to 105% of normal over most areas, except for some scattered localities in the northwestern coastal areas and the southeastern Troodos slopes, where precipitation amounts ranged mainly between 115% and 125% of normal (see Isohyetal map on page 38).

As far as the distribution of precipitation in time is regarded, great variations were experienced. October was much drier that the average, while April and May were well above normal. The good rainfall of December was also very beneficial to both surface and groundwater resources (see diagram page 34).

The maximum amount of rainfall reported in a 24–hour period during the hydrometeorological year was 99.9 mm reported by Dhora Rainfall Station on 26 December 1975.

The first snowfall occurred on Olympus on the 25th November, 1975, about a week

ANNUAL AVERAGE RAINFALL OF CYPRUS
FROM 1916 – 1975



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

Note: Annual average for the year 1975 1976 refers to Southern Cyprus only.

earlier than the mean date. It also occurred at intervals during December, 1975 to March, 1976 and the last fall occurred on 19th March, 1976, 10 to 15 days earlier than the mean date. A noteworthy snowfall occurred on the 9th February, 1976. Snow covered areas down to 500 m in elevation. In addition snow-covered areas on the higher parts of Kyrenia range were visible.

TEMPERATURE

The temperatures during the hydrometeorological year 1975–1976 as a whole were about 1°C lower than normal. In particular, monthly mean temperatures were slightly above normal in October; lower than normal in November, December, February, June, July, August and September; around normal in January, March, April and May as a whole, but great fluctuations above and below normal occurred.

The extreme maximum and extreme minimum temperatures recorded during the hydrometeorological year under review at particular stations were as follows:

INCIDENCE OF RAINFALL

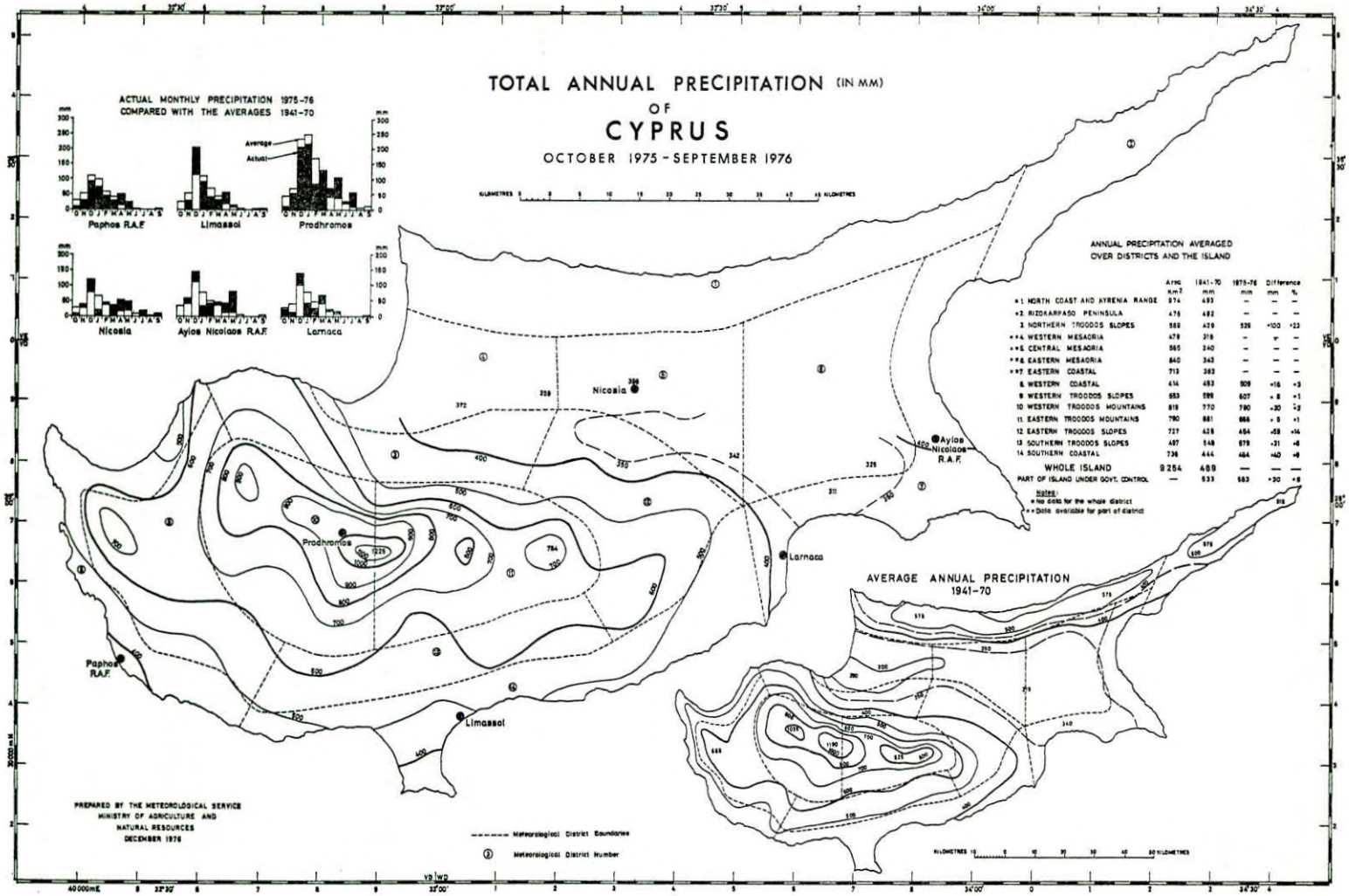
The incidence of rainfall per month during the hydrometeorological year 1975–1976 was as follows:

Month	mm.	inches	%
October	6.7	0.26	1.2
November	41.8	1.64	7.4
December	167.6	6.60	29.8
January	96.7	3.81	17.2
February	53.6	2.11	9.5
March	73.6	2.90	13.1
April	60.9	2.40	10.8
May	46.2	1.82	8.2
June	2.2	0.09	0.4
July	12.4	0.49	2.2
August	0.0	0.00	0.0
September	1.3	0.05	0.2
Totals	563.0	22.17	100.0

INCIDENCE OF MAXIMUM AND MINIMUM TEMPERATURES 1975–76

Station	Extreme maximum temperature and date	Extreme minimum temperature and date
	°C	°C
Nicosia	3 Aug., 39.6	11 Feb., –1.0
Limassol	6 June, 35.8	10 Feb., 0.5
Larnaca Airport	17 Aug., 34.4	11 Feb., 0.2
Ayios Nikolaos (F'sta)	17 Aug., 37.1	2 March, –0.8
Paphos	7 June, 34.5	1 March, 1.0
Panayia Bridge	2 Aug., 36.1	1 March, –3.6
Saittas	3 Aug., & 5 Sept., 36.0	10 Feb., –3.0
Amiandos	3 Aug., 31.5	10 Feb., –6.5
Prodhromos F.C.	6 Sept. 32.4	10 & 11 Feb., –7.0
Stavros–Tis–Psokas	2 & 3 Aug., 35.0	10 Feb., –3.4
Kornos	3 Aug., 36.5	11 Feb., –1.5
Platania	3 Aug., 33.5	10 Feb., –6.0
Phasouri	13 Aug., 34.5	11 Feb., 0.0

N.B. All maximum and minimum temperatures occurred in 1976.


TOTAL ANNUAL PRECIPITATION (IN MM)
OF
CYPRUS
OCTOBER 1975 - SEPTEMBER 1976
ACTUAL MONTHLY PRECIPITATION 1975-76
COMPARED WITH THE AVERAGES 1941-70
Average
Actual
Paphos R.A.F.
Limassol
Prodhromos
Nicosia
Ayios Nicolaos R.A.F.
Larnaca
ANNUAL PRECIPITATION AVERAGED
OVER DISTRICTS AND THE ISLAND
Area km² | 1941-70 mm | 1975-76 mm | Difference mm | %
#1 NORTH COAST AND AYRENIA RANGE 974 693 – – –
#2 RIZOKARPASO PENINSULA 478 482 – – –
3 NORTHERN TROODOS SLOPES 560 478 526 +100 +23
##4 WESTERN MESAORIA 478 319 – – –
##5 CENTRAL MESAORIA 565 340 – – –
##6 EASTERN MESAORIA 840 343 – – –
##7 EASTERN COASTAL 713 383 – – –
8 WESTERN COASTAL 414 483 509 +16 +3
9 WESTERN TROODOS SLOPES 653 599 607 + 8 +1
10 WESTERN TROODOS MOUNTAINS 818 770 790 +20 +3
11 EASTERN TROODOS MOUNTAINS 790 681 686 + 5 +1
12 EASTERN TROODOS SLOPES 727 428 484 +56 +14
13 SOUTHERN TROODOS SLOPES 497 548 579 +31 +6
14 SOUTHERN COASTAL 736 444 484 +40 +9
WHOLE ISLAND 9254 489 – – –
PART OF ISLAND UNDER GOVT. CONTROL – 533 563 +30 +6
Notes:
No data for the whole district
Data available for part of district
AVERAGE ANNUAL PRECIPITATION
1941-70
PREPARED BY THE METEOROLOGICAL SERVICE
MINISTRY OF AGRICULTURE AND
NATURAL RESOURCES
DECEMBER 1976
Meteorological District Boundaries
Meteorological District Number

TOTAL MONTHLY EVAPORATION FOR HYDROMETEOROLOGICAL YEAR 1975-76 EVAPORATION PAN OF THE TYPE U.S.W.B. CLASS "A"

Station	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Yearly Total
Nicosia	136	72	52	51	57	85	129	176	263	274	271	197	1763
Athalassa	151	76	44	48	57	76	120	183	268	262	269	187	1741
Saittas	134	77	49	53	*	*	84	159	227	251	265	185	—
Akhelia	162	104	83	95	74	122	160	178	218	234	201	169	1800
Yermasoyia	164	93	59	63	63	112	147	197	253	302	279	225	1957
Polemidhia	168	100	56	89	67	111	137	137	234	252	233	179	1763
Prodhromos	91	48	21	25	22	63	111	131	169	180	199	138	1198

* No records Values are given in mm.

EVAPORATION

Evaporation is an important constituent in hydrological balances and it has to be taken into account also in planning waterworks. Systematic measurements of evaporation rates are taken at selected places, a monthly summary of which appears on the relative table.

SURFACE WATER

Permanent Stream Gauging Stations

On important streams on 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 winding the clocks, change of charts, velocity measurements of the flowing water with current meter for calibration purposes etc. During wet seasons the visits are more frequent for high flow measurements and the rivers are sampled for suspended sediment and chemical analysis. The condition of the float wells and weirs is 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 the condition of these stations is not known to us.

FLOW GAUGING STATIONS

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	Ezousa	Kannaviou	VD610633
1-4-9-80	Ezousa	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
2-7-2-75	Pyrgos	Phileyia	VD717857
2-8-3-15	Limnitis	Limnitis Saw Mill	VD739830
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- -40	Elea	Vyzakia	WD018806
3-7-1-50	Peristerona	Panayia F.S.	WD075754
3-7-3-90	Akaki	Malounda	WD163783
3-7-5-95	Meniko*	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
3-7-9-50	Serrakhis*	Morphou Dam	WD007948
3-8-6-50	Aloupos*	Aloupos Chiftlik	VE980018
4-2-3-70	Panagra*	Panagra	WE077119

GAUGING STATIONS (Continued)

Stations No	Stream	Location	Co-ordinates
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
6-1-4-20	Tengelis*	Kythrea	WE415010
6-1-4-50	Pedhieos*	Mia Milea	WD376958
6-1-5-50	Vathys	Athalassa	WD345867
6-1-7-40	Ak Sou	Petra-tou-Dhigeni	WE499001
6-5-1-85	Yialias	Kotchati	WD306727
6-5-3-15	Yialias	Nisou	WD359765
6-5-2-95	Alikos*	Ay. Sozo-menos	WD413808
6-5-3-95	Yialias*	Pyroi	WD446824
6-7-1-15	Kefalovrysos Spring*	Kythrea	WE445030
7-1-7-50	Kolopannes*	Kalopsida	WD746842
7-2-3-50	Liopetri	Liopetri Dam U/S	WD806732
7-2-7-05	Paralimni Lake out-flow	Paralimni	WD892801
8-2-1-90	Aradhippou	Nicosia-Larnaca Rd	WD517683
8-2-2-90	Aradhippou	Panayia Yematousa	WD516689
8-4-3-40	Tremithios	Ayia Anna	WD442668
8-4-5-30	Tremithios	Klavdhia	WD490615
8-4-5-40	Tremithios	Kiti Dam	WD510590
8-5-1-90	Pouzis	Mazotos	WD472518
8-7-3-60	Mylou	Kornos	WD332613
8-7-4-80	Syrkatis	Skarinou	WD343535
8-8-2-50	Maroni	Vavla	WD261558
8-8-3-30	Maroni	Khirokitia	WD317503
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
9-6-4-95	Kouris	Khalassa	VD920470
9-6-5-10	Zavos	Khandria	VD994672
9-6-7-75	Zyghos	Khalassa	VD941471
9-6-9-05	Kouris & Kryos	Khalassa	VD921466
9-8-1-95	Evdhymou	Evdhymou	VD780397

* Situated within Turkish occupied areas.

Flow Gauging Stations on Irrigation Intakes

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

FLOW GAUGING STATIONS ON IRRIGATION INTAKES — 1976

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*	Naos	Peristerona	WD075895
7*	Vathys	Mesari Dam	WD077925
8*	Avlona	Avlona	WD091913
9*	Masari	Masari	WD071934
10	Kyra	Kyra	WD057942
11*	Katakrous	Kyra	WD053945
12*	Zavrazis	Morphou Dam	WD023951
13	Elea	Koutraphas	WD978854
14	Asprallou-Linopsas	Kato Phlasou	VD897800
15*	Polemios	Pendayia	VD885888
16*	Kritikos	Pendayia	VD891881
17	Nikoklia	Nikoklia	VD617433
18	Kouklia	Kouklia	VD612419
19	Mandria	Mandria	VD589427
20	Akhelia	Akhelia	VD533449

New Flow Gauging Stations

During the year under review three new flow gauging stations were constructed on the following streams:

* *Kyros River* (Khalassa)

Construction of a 'V' shaped broad crested weir 8 meters wide, slope 1:10.

* *Makedhonitissa*–main stream (Engomi) Installation of a water level recorder using the stabilized section of the stream.

* *Makedhonitissa* – western tributary (Makedhonitissa)

Installation of a water level recorder using the stabilized section of the stream.

Both Makedhonitissa stations have been established for Urban Hydrology Studies.

Repairs and improvements to the existing flow gauging stations

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

* *Khrysokhou River* (Skoulli)

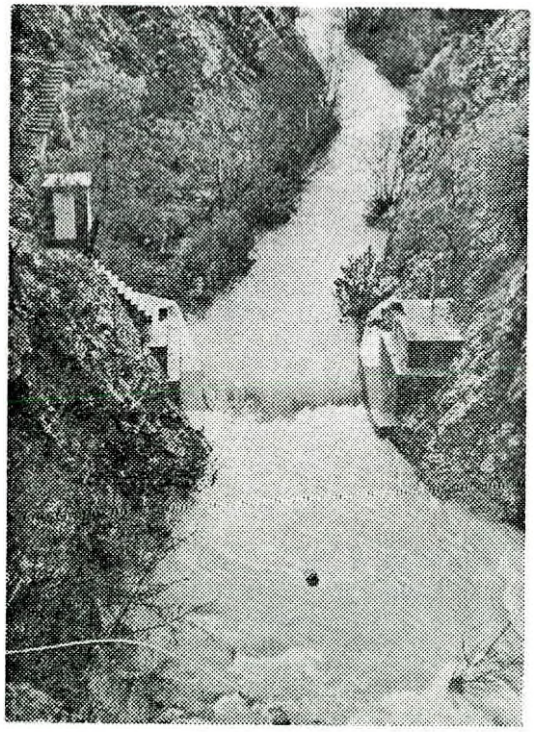
Raising the lower section of the weir, which was drowned, by 30 cm with a half 'V' structure.

* *Kouris River* (Khalassa)

Construction of a new float well close to the notch for the normal recording of the water level on the weir.

* *Akrounda River* (U/S Yermasoyia Dam)

Raising the lower section of the weir, which was drowned by 50 cm with a 'V' shaped structure.



Automatic Water Level Gauging Station on the Peristerona River

Flood Discharges

Although the rainfall during the hydrologic year 1975–1976 was above normal, no remarkable floods were reported.

The most noteworthy floods recorded at the flow gauging stations during the same period were as follows:

* *Dhiarizos river* near Kouklia about 40 m^3 per second on 28th December, 1975 and about 25 m^3 per second on 23rd January, 1976. Its catchment area is 263.7 km^2.

* *Zyghos river* near Khalassa about 25 m^3 per second on 27th December, 1975. Its catchment area is 124.1 km^2.

* *Peristerona river* near Panayia Forest Station about 20 m^3 per second on 27th December, 1975. Its catchment area is 78.5 km^2.

Inflow of Water in Dams

During 1976 out of 47 dams which were the most important in Cyprus and were in previous years under regular observation, only 27 could be attended, the rest remaining in the Northern part of Cyprus, under occupation by the Turkish troops. For another three, in the occupied zone, observations could be made.

The water accumulated in the observed 30 dams was satisfactory, being in volume at its maximum 30.1 MCM or 70% of the total capacity of these dams, being 42.9 MCM.

During this year 21 dams overflowed, most of them during January. In one of them no inflow has been recorded and in one other the inflow was at its maximum less than 3% of its capacity.

Analytically the situation is shown in the following table.

Spring Discharges

Most of the springs 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 1975–76, 2,135 spring discharges were taken on 239 springs; 1,212 discharges were taken on 101 springs which are under regular monthly observations, and 923 discharges were taken on 138 springs for a certain period at various intervals.

As the precipitation during the hydrological year under review was above normal, all the springs had a normal increase of flow during winter and spring time and maintained a normal flow during summer.

VOLUME OF WATER ACCUMULATED AND COMMENCING DATE OF INFLOW FOR VARIOUS DAMS DURING THE YEAR 1976

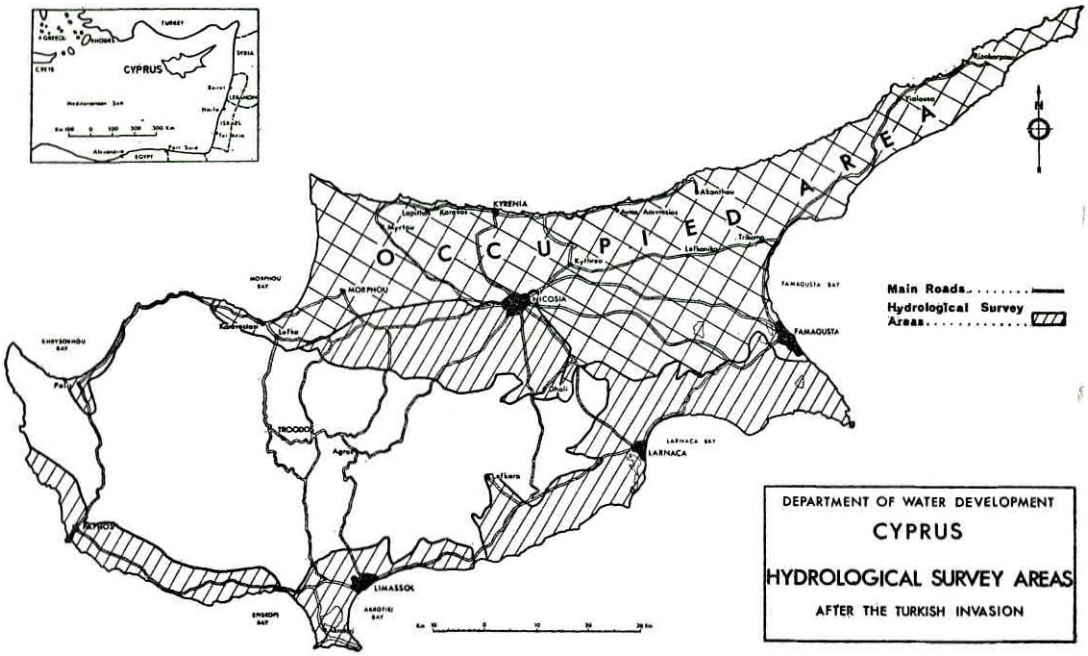
No	Dam	Capacity $10^3 xm^3$	Inflow com/cing date (1976)	Maximum Volume Accumulated $10^3 xm^3$	Date of maximum Accumulation (1976)	Remarks
1	Agros	72	January	59	January	
2	Akrounda	22	January	22	January	Overflowed
3	Arakapas	130	January	130	January	Overflowed
4	Argaka	1150	January	1150	January	Overflowed
5	Athalassa	790	January	24	December	
6	Ayia Marina	300	January	300	March	Overflowed
7	Kalokhorio	81	January	81	January	Overflowed
8	Kalopanayiotis	390	January	390	January	Overflowed
9	Kandou	38	January	38	January	Overflowed
10	Kiti	1600	January	475	October	
11	Kyperounda	60	January	60	March	Overflowed
12	Lefka Marathasa	360	January	360	January	Overflowed
13	Lefka Kafizes*		January		January	Overflowed
14	Lefkara	14000	January	7636	June	
15	Liopetri	340	—	—	—	No inflow
16	Lythrodhonta Upper	32	January	32	January	Overflowed
17	Lythrodhonta Lower	32	January	32	January	Overflowed
18	Mavrokolymbos	2200	January	1512	April	
19	Ormidhia (Vathys)	100	December	3	December	
20	Palekhori (Kambi)	640	January	640	January	Overflowed
21	Paralimni Lake	1365	January	—	—	Gate constantly open for recharge
22	Perapedhi	55	January	55	January	Overflowed
23	Petra Upper*	22	January	22	January	Overflowed
24	Petra Lower*	32	January	32	January	Overflowed
25	Pomos	860	January	860	January	Overflowed
26	Polemidhia	3400	January	1448	April	
27	Prodhromos	110	January	110	May	Overflowed
28	Pyrgos	270	January	270	January	Overflowed
29	Trimiklini	330	January	330	June	Overflowed (Gate open in January)
30	Yermasoyia	14000	January	14000	January	Overflowed

* Situared within Turkish occupied area.

GROUND WATER

Groundwater Hydrological Work

Hydrological Surveys of the groundwater bearing systems were carried out on a 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 above). Due to the destruction of our maps hydrological surveys have been carried out during 1976 in an area of only 1,500 km^2.

As regards the groundwater situation, this was still very grave in the south eastern part of the Island, since the extraction was much more in excess of the recharge. In the other aquifers the water table situation improved slightly than in the previous year, but still the situation cannot be considered satisfactory. Details may be seen in the following table of selected observation boreholes.

Water Conservation Areas (Wells Law Cap. 351)

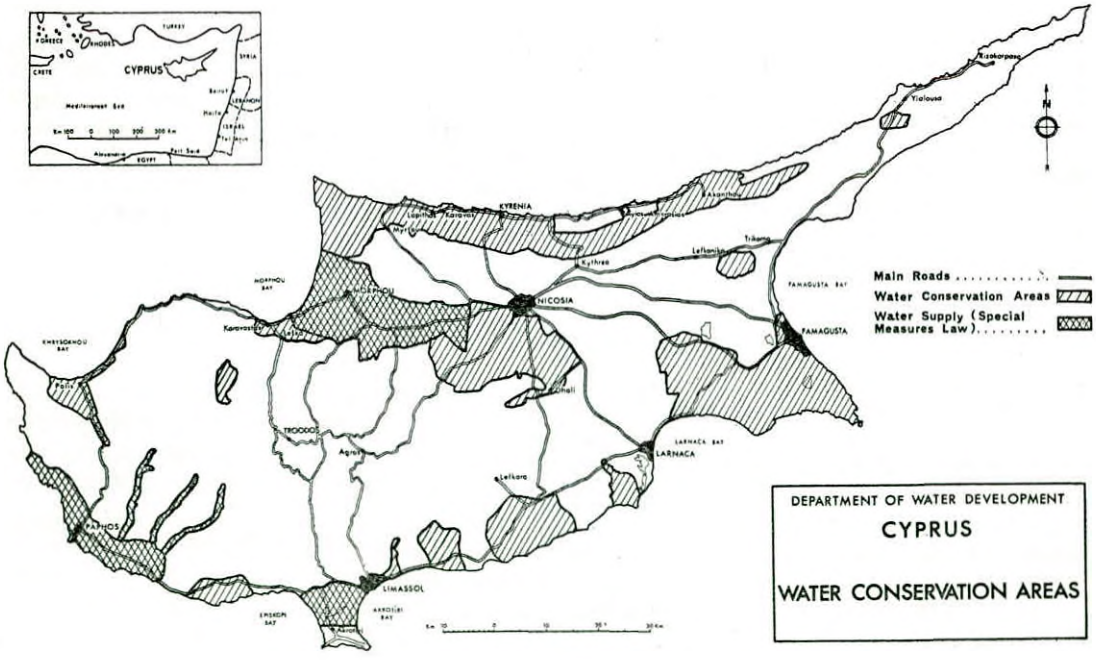
An area is declared as a Water Conservation Area, when the exploitation of its water resources is such, that it may affect the quantity or quality of the water of that area.

On map on page 44 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.

SELECTED OBSERVATION BOREHOLES

Ser No	Hydr. No	Village	Water level a m s l in meters March 1975	Nov 1975	March 1976	Nov 1976	Water level increase (+) or decrease (-) March 75–76	Nov 75–76
55/56	192	Liopetri	+0.34	+0.22	+0.22	+0.07	-0.12	-0.15
20/63	1 516	Paralimni	+19.76	+21.22	+21.70	+20.76	+1.94	-0.46
22/63	1 518	"	+6.93	+6.07	+6.08	+6.03	-0.85	-0.04
51/51	774	Phrenaros	+7.00	+4.97	+5.42	+4.72	-1.58	-0.25
79/56	975	"	+7.93	+7.53	+7.98	+8.06	+0.05	+0.53
88/54	24	Kolossi	+1.20	-0.25	+3.00	+1.25	+1.80	+1.50
51/63	813	Limassol	+0.95	+0.47	+1.18	+0.88	+0.23	+0.41
13/63	807	Zakaki	+0.31	+0.62	+0.17	—	- 0.14	—
107/61	17	Yermasoyia	+4.00	+2.98	+17.23	Working	+13.23	—
180/59	8	"	+20.37	+18.82	+35.95	+19.42	+15.58	+0.60
7/60	22	"	+1.23	+1.25	—	+1.98	—	+0.83
134/59	27	"	+1.56	+1.33	+13.99	+3.16	+12.43	+1.83
161/50	559	K. Trimithia	+187.18	+187.38	+187.34	+187.41	+0.16	+0.03
160/50	150	"	+196.33	+195.77	+196.28	+194.96	-0.05	-0.81



WATER CONSERVATION AREAS

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	Famagusta, 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	Ay. 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, Ay. Marina, Argaka, Polis	359	7. 7.62	168	7. 7.62
17	Yialias River (Potamia, Dhali, Nisou, Mathiatis)	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	25.11.65
23	Ayia Irini	280	19. 5.66	499	2. 6.66
24	Paramali, Evdhymou	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, Evdhymou	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

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 valley, which will be covered by the Paphos Irrigation Project, have also been covered by that Law in 1974 and 1975.

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.

The areas covered by this Law are shown on map page 14 and particulars given in the table below:

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 382 water meters have been installed of which 305 meters in continuous operation. The total volume of water recorded is 11,843,000 m^3. During the year 174 illegal pumpings have been reported to the District Officer out of which 49 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

WATER SUPPLY (SPECIAL MEASURES) LAW AREAS

Ser. No	Area	Order No	Date	Gazette No	Date
1	Western Mesaoria (Pendayia–Morphou–K/Trimithia)	—	—	331	9. 7.64
2	Akrotiri–Peninsula	—	—	331	9. 7.64
3	South Eastern Mesaoria (F'sta–Paralimni–Ormidhia–Akhna), later withdrawn	—	—	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	Ezusa River	196	23. 5.74	1104	21. 5.74
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

Department, after an interested person to become a 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 1976, this Department issued 3 Drillers licences and renewed 29 others. Another 5 persons applied for a drillers licence but their application was turned down since they did not satisfy the examiners. The number of private drilling rigs which drilled for water during 1976 was 54 and this Department has been notified about the drilling or cleaning of 120 boreholes. Information from private drillers has been received by this Department for 162 boreholes.

WATER QUALITY

Chemical Analyses

During the year, 1705 samples of water were sent to the Government Analyst for Chemical Analysis. Of these, 670 samples were taken from springs, wells or boreholes, which are used or proposed as water supply sources. The remaining 1035 samples derived from rivers, springs, observation boreholes and from other miscellaneous sources.

Also, 260 samples of water taken from observation boreholes in the Hydrological survey areas, were analysed by the Water Resources Division for Chloride content.

Bacteriolocial Analyses

Water Supply	No of samples	No of unsatisfactory samples
Nicosia	132	12
Limassol	114	15
Larnaca	79	3
Total	325	30

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, a sediment sampling programme was initiated. 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, approximately 52 samples of river water were taken for suspended sediment analyses.

Cost of Hydrological Studies

Description	Approv. Estimated Cost	Actual Expenditure
	£	£
Hydrological Observations and Research	23 000	23 832
Construction & Maintenance of Measuring Weirs	4 000	3 997
Total	£27 000	£27 829

SPECIAL STUDIES

Use of Computer Techniques for the storage and retrieval of hydrological and hydrogeological data

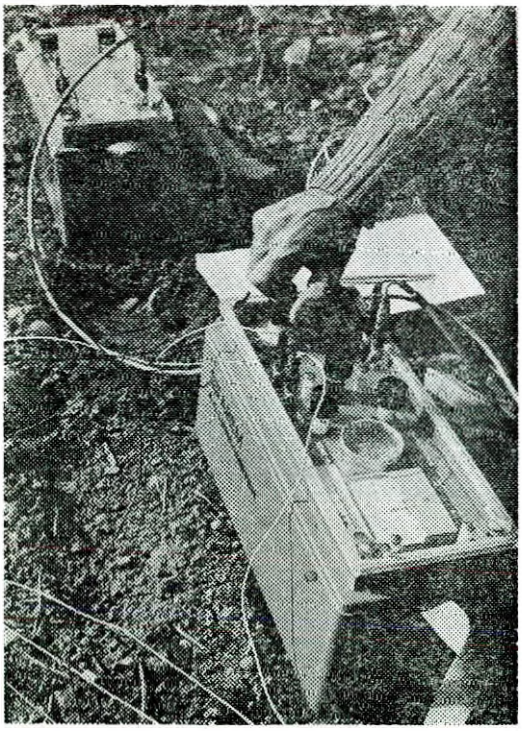
Work was initiated in 1975 for storing and retrieving our hydrological and hydrogeological data in a computer readable form. The purpose and scope was given in last year's Annual Report of this Department.

This year, the work continued on working out details of the organization of the data and decision was taken for certain information that should be inserted in coded form.

The information about the various sources of water has been divided into two main categories, that is the permanent or semi-permanent included on separate cards, called the master cards and the information about

the water sources collected at regular intervals to be included on other cards, called the data cards.

Work also was done on a pilot project. As pilot area the Yermasoyia River catchment has been selected. The permanent and semi-permanent information of all water sources existing in this area has been recorded on special cards, the master cards, prepared for



Electrical Resistivity Survey Equipment being used for Selecting Borehole Sites

this purpose. The above said work covered a total of 873 wells/boreholes, 269 springs and 173 intakes.

Part of this information has been stored on punched cards and two computer programmes have been prepared for a simple retrieval of those data from storage. Both Fortran IV and RPG computer languages have been used. That exercise indicated a number of improvements which were necessary on the cards, for the purpose that storing and retrieval would be more efficient. So, work has been subsequently undertaken on those lines which continued until the end of the year.

Larnaca Salt Lake — Investigations in connection with the modernization of salt production

This study has been undertaken by the Water Development Department after a request made to its Director by the Director-General, Ministry of Commerce and Industry, for providing answers to questions raised in the report " Modernization of Salt Production at Larnaca, Cyprus", prepared by Mr. C. L. Malhotra, Salt Consultant, Expert to the United Nations Industrial Development Organization for the Ministry of Commerce and Industry.

The investigations which started in 1975, ended in the year under examination and certain conclusions have been reached at, for processes and phenomena observed in the Lake which were not well understood before. The work done and the conclusions reached are presented in the report, with the same title, as above the first part of which, prepared by Mr. D. C. Kypris, was issued in October, 1976.

With the investigations carried out, in and around the Lake, answers were sought as to 1) the origin of the salinity in the salt Lake, 2) effect of Hydrological and Hydrogeological factors on the crystallization of the salt especially in the crystallizer area, 3) Engineering aspects relating to the design and construction of the works. To reach conclusions as to the above said matters, geological, hydrological and soil engineering investigations have been carried out.

Larnaca Salt Lake lying at less than one km from the sea and at its lowest by 2.16m below mean sea level, is expected to have a limited hydraulic connection to it. Sea water flow towards the Lake is not expected to be such as to provide the salt collected every year from the Salt Lake. The water, which accumulates there during the rainy season comes mainly from direct rainfall. When the water dries up at about June, a layer of

about 20,000 tons of table salt is left at the bottom of the Lake, out of which 4,000 tons on the average, for recent years, is of an exploitable thickness. This salt comes from the salt reserves that have been accumulated in the past in the strata below the Lake, calculated to over 8 million tons of salt. The way this salt passes into the rainwater is by diffusion through the mud which has been proved, by experiment also, that although impermeable to water, salt is capable to diffuse through it to enrich the rain water accumulating in the Lake.

BRACKISH WATER DESALINATION

During the year 1976 the reverse osmosis project which had started in 1975 continued with tests at Tseri and Athalassa. The specialist from the United Kingdom Atomic Energy Authority who was assigned to the projects left the Island in July as the first phase of the project was completed.

The second phase of the project was then initiated with two of the units put in operation at Athalassa Forest Nursery where the water for irrigation had became too saline and the plants were about to be destroyed. The results after treating the water with the Reserve Osmosis units were extremely satisfactory. The second phase would involve the investigation of the practical application of the units and would continue through 1977.

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 14694 — 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 plant 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, with a transfer of 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–

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

Particulars	Nicosia	Limassol	Larnaca	Paphos	Totals
Applications approved (Number)	23	94	98	60	275
Wells/Boreholes allocated (Number)	23	107	103	60	293
Farmers benefited (Number)	46	534	143	135	858
Area to be irrigated (Donums)	292	6 455	1 225	1 681	9 653
Loans granted (Number)	20	95	86	57	258
Loans granted (pounds £)	8 875	179 282	42 280	36 825	267 262
Loans issued (pounds £)	8 875	177 332	36 276	36 825	259 302
Turkish Cypriot pumping plant allowed to be used (Number)	5	56	22	15	98
Estimated value of T/C pumping plant (pounds £)	1 365	26 050	3 600	6 300	37 315
Amortization rate (Pounds £/Year)	201	4 463	681	955	6 300

operative Development, the Director, Department of Agriculture and the representatives of the Ministry of Agriculture and 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 plant 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 are examined by the Regional Engineer of the Water Development Department, in consultation with 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 Properties — 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 plant and to deliver water for irrigation to the interested farmers, who sign an agreement for the repayment of the loan and the running expenses as well.

The repayment period for the loans has been set to seven years with an interest of 4.5%.

When part of 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 subtracting the residual value which the pumping plant is expected to have after a maximum of seven 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.

During the year under examination, the Committee had 20 meetings during which it approved 275 applications from 858 farmers for the irrigation of 9,653 donums of land. The amount of loans granted is £267,262 and the value of pumping plant of Turkish Cypriot ownership to £37,315.

III DIVISION OF PLANNING

by
Chr. Marcoullis
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 Testing

Due to shortage of qualified personnel the first Branch is usually functioning by assigning the design work to members of the Division of Design. In this regard there is no real organizational distinction between the two Divisions.

The activities of each Branch during 1976 are described below:

RECONNAISSANCE AND FEASIBILITY REPORTING BRANCH

Vasilikos–Pendaskinos Project

The work on the feasibility study of this project continued during 1976, but it was not completed due to the commencement of the Pitsilia Integrated Rural Development Project, which kept this Branch busy during most of 1976.

However the design work, at a feasibility level, on Kalavasos and Dhypotamos Dams and Maroni Diversion Works, was completed and the respective reports were prepared and released in August 1976.

The study on the project surface and underground water resources, has also been completed and a report has been prepared.

By the last quarter of 1976 it was decided, some more alternative solutions to the problem of allocating the water, to be developed by the project, into various uses, to be studied. The new alternatives will involve more water allocation to domestic water supplies, in an attempt to alleviate as much as possible the problem of water supply shortage of Nicosia.

A study on some schemes for the utilization of the groundwater, which has been located in the two confined aquifers of the area was carried out during the year. However, this study, will have to be reconsidered because of the above mentioned changes in the planning of the project and also due to the adverse effects of the poor quality groundwater on the crops to be irrigated. This problem will be dealt with during next year, when these schemes are expected to be implemented as a first phase of the project.

The remaining work on the feasibility study of the project, which, to a great extent, consists of modifications on the already prepared reports, because of the change in the original objectives of the project, will be continued and completed next year.

Pitsilia Integrated Rural Development Project

During 1976 the above new project has been studied by the Government in association with FAO and the World Bank Co-operative Programme.

This project is a multi-purpose one, including development in irrigation, domestic water supplies, dry-land farming, road improvement, agro-industries, education, health and forestry.

The first two fields of development which are by far the most important for the project, were the responsibility of the Water Development Department.

In order to comply with the requirements of the project, a number of 10 damsites have been investigated for checking their suitability for the construction of storage dams. Some 30-40 sites for small storage ponds were also selected for investigation. At the same time the Geological Surveys Department continued the drilling of boreholes, at selected points of the Troodos igneous rocks, most of which proved to be successful.

Few of each type of the above irrigation works were then studied at a feasibility level and the results were included together with the rest of the development fields in a Report prepared in collaboration with the FAO/CP Mission.

In November 1976, a Mission of the World Bank arrived in Cyprus with the view of appraising the project. During the discussions, it became evident that a follow-up study would be necessary for further screening of the proposed works according to the set economic criteria.

The new study which will include individual reports at a feasibility level for only one dam at Xyliatos village, 3 ponds out of 25-30 proposed ones, and 3 boreholes out of 25 proposed, will have to be prepared by middle of February 1977, when a new Appraisal Mission will again visit Cyprus for the same purpose.

By the end of the year, the new work has been considerably advanced and hopefully it will be prepared on time. However the effort for catching up with the requirements of this diverse project, has adversely affected the progress of the study on the Vasilikos-Pendaskinos project as well as the routine works, due mainly to shortage of qualified personnel.

Other projects

No work has been done on other envisaged major projects such as the Southern Conveyor project or the Khrysokhou project, which, as it is elsewhere mentioned, are either in a stage of negotiations, for technical assistance or in a stage of their formulation.

SITE INVESTIGATION, LABORATORIES AND GROUTING SECTIONS

General

In 1976 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 Organisations, a number of projects were undertaken and completed during the year.

The increased volume of work noted in 1975 and in relation to previous years, persisted in 1976 and this led to the full utilisation 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 study or design study stages of projects.

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

(a) Vasilikos-Pendaskinos Project: Dhypotamos dam,

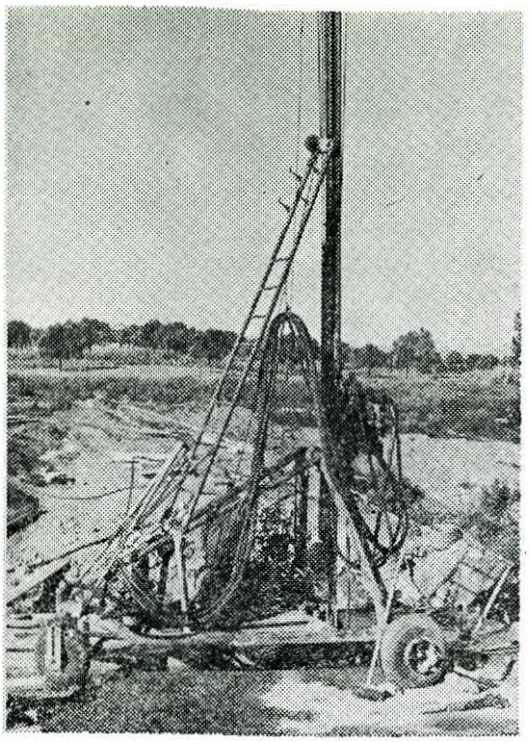
(b) Paphos Irrigation Project: Asprokremmos dam,

(c) Pitsilia Rural Development Project: Panayia-tis-Agapis and Gourri dams, Khandria and Melini ponds,

(d) Yermasoyia-Polemidhia (Distribution) Project: Trakhoni Extension Scheme,

(e) Aradhippou proposed dam, and

(f) Kiti Existing Dam: Remedial works.



Drilling Rig Used for Lymbia Dam Grouting

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

(a) bridge foundation and other investigations for the feasibility study of the New Nicosia to Limassol road, at the request of the Public Works Department,

(b) drilling for anchoring purposes of a road cut, near Kakopetria, at the request of the Public Works Department,

(c) foundations investigation at the Ayios Athanasios Refugee Housing Scheme, at the request of the Department of Housing and Town Planning,

(d) drilling for electricity earthing purposes at Stavros-tis-Psokas, at the request of the Department of Forests,

(e) subsurface investigation in relation to the feasibility study for a salt production factory at the Akrotiri Salt Lake, at the request of the Ministry of Commerce and Industry.

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 the Field Laboratories. In the Main (Soils/Concrete) Laboratories in Nicosia, tests were performed in connection to foundation and construction material investigations relating to Departmental projects. Tests were also performed at the request of other Government Departments. Private Organisations and the Nicosia Municipality.

Field laboratories at 4 No construction sites, aimed at the quality control of materials and workmanship during construction of the New Strovolos and Larnaca Storage Reservoirs, the New Lymbia Dam and the Main Canal for the Paphos Irrigation Project.

The work of the Grouting Section in 1976 included:

(a) test grouting in conjunction with the site investigation work performed at the Asprokremmos damsite,

(b) blanket grouting for sealing an artesian borehole in the Zyyi area,

(c) curtain grouting works at the New Lymbia dam under construction.

Site/Material Investigations, Grouting Works

Table III-1 gives relevant details of all site, construction material and grouting works performed during the year.

Table III-2 is a progress chart showing the order in which these works were performed as well as the time duration for each project.

Laboratories

The work performed in the Soils Laboratory is analysed on Table III-3 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-4.

Personnel

On the 31st December 1976 the total number of personnel employed in the Sections was 34. The number of, title or speciality and function of personnel employed are shown on the following table:

	Function			
Title	Sup.	Lab.	Dril.	Other
Executive Engineer I	1	–	–	–
Inspector of Works	2	–	–	–
Technical Assistant	–	4	–	–
Laboratory Technician	–	6	–	–
Draughtsman	–	–	–	1
Foreman	–	–	2	–
Driller	–	–	6	–
Casual Labour	–	–	12	–
Total	3	10	20	1

Machinery and Equipment

Table III–5 sets out the drilling machinery and accessories which were available at the end of 1975 whilst Table III–6 refers to the laboratory equipment available in 1975.

Tables III–7 and III–8 give details of drilling accessories and laboratory equipment purchased in 1976 at a cost of £3,000 and £1,700 respectively.

Grouting machinery and equipment available in 1976 were as shown on Table III–9.

For equipping the Soils/Concrete Field Laboratory which is presently functioning near Timi village for the Paphos Irrigation Project, an order for the purchase of laboratory equipment, amounting to approximately £7,500, was placed in December 1976. This equipment will be purchased on the basis of the loan agreement between the Cyprus Government and the International Bank for Reconstruction and Development.

Reports

Following the example of previous years, relevant technical reports were prepared on completion of each project. A list of these **Investigation** publications is as follows:

INVESTIGATION PUBLICATIONS

* F/53 *New Lymbia Dam, Site Investigation,* February 1976,

* F/54 *Paphos Irrigation Project, Main Canal,* 1975 *Site and Fill Material Investigations,* March 1976,

* F/55 *Kiti Dam, Remedial Works, Site Investigations,* April 1976,

* F/56 *Aradhippou Dam,* 1976 *Site and Fill Material Investigations,* July 1976,

* F/57 *Trakhoni Scheme, Site Investigations,* September 1976,

* F/58 *New Substation and Building Complex of Electricity Authority of Cyprus, Site Investigations,* September 1976,

* F/59 *Pitsilia Rural Development Project, Melini Reservoir, Fill Material Investigations,* November 1976,

* F/60 *Pitsilia Rural Development Project, Khandria Reservoir, Site and Fill Material Investigations,* November 1976,

* F/61 *Paphos Irrigation Project, Construction of Main Canal, Quarried Concrete Aggregate, Field and Laboratory Investigations,* December 1976,

* *Cyprus Pipes Industries, Short Report on Soil Tests* performed at the W.D.D. Laboratories,

* Report on Laboratory Tests Performed for J. and A Philippou, Architects of Nicosia,

* Short Report on Laboratory Tests performed for the Nicosia Municipality in January 1976,

* *Solar Salt Plant at Akrotiri Salt Lake — Feasibility Study.*

Other reports issued and relating to the work of the Sections are as follows:

* S/11 Instructions Manual, *Concrete Quality Control at the Construction Site,* November 1976.

TABLE III–1 **1976 SITE/FILL MATERIAL INVESTIGATIONS AND GROUTING**

No	Project	Aim of Investigation	Fieldwork as Carried Out	Machinery Used	Expenditure
A.	DEPARTMENTAL PROJECTS				
1	*Kiti Existing Dam*	Subsurface geological investigation for the planning of leakage loss remedial works.	* 10 No boreholes, total depth 167 m * 3 No geophysical (electrical resistivity) traverses, * 1 No trench, 14 m deep * 42 No SPT's	* 1 No Mobile Auger Drill * 1 No Overburden Drill with Flush Pump * 1 No Trench Excavator * Electrical Resistivity Equipment	£450
2	*Aradippou Proposed Dam*	Subsurface geological, foundation and fill material investigations.	* Surface geological mapping, * 4 No boreholes, total depth 63 m * 3 No trial pits, total depth 10 m * 54 No SPT's, * 20 No undistrubed (U4) samples.	* 1 No Mobile Auger Drill * 1 No Backactor Excavator	£472
3	Vasilikos–Pendaskinos Project: *Dhypotamos Proposed Dam*	Subsurface geological investigation of: * Spillway * Proposed Rockfill Quarry	* 5 No boreholes, total depth 163 m * 13 No water–pressure permeability tests	* 1 No Coredrill with Flush Pump, * 1 No Traxcavator for access roads	£2 550
4	Yermasoyia–Polemidhia Project: *Trakhoni Extension*	* Subsurface geological, foundation investigations for Pumping Station and Terminal Storage Reservoir * Excavation conditions for 4 km Pumping Main * Drilling for earthing purposes	* 13 No boreholes, total depth 78 m * 8 No trial pits, total depth 15 m * 107 No SPT's * 3 No undisturbed (U4) samples * 1 No borehole (overburden drilled) 65 m deep	* 1 No Mobile Auger Drill, * 1 No Coredrill with Flush Pump, * 1 No Backactor Excavator * 1 No Overburden Drill & Flush Pump * 1 No Air Compressor	£900

TABLE III–1 **1976 SITE/FILL MATERIAL INVESTIGATIONS AND GROUTING (Continued)**

No	Project	Aim of Investigation	Fieldwork as Carried Out	Machinery Used	Expenditreu
5	Pitsilia Rural Development Project: *Khandria Reservoir*	Subsurface geological investigations of: * Reservoir area * Excavation conditions	* 3 No Trial Pits, total depth of 9.6 m by hand excavation		£150
6	Paphos Irrigation Project: *Asprokremmos Dam*	* Subsurface geological/ foundation investigation of embankment spillway, diversion tunnel, * Foundation/Excavation/ Permeability conditions of alluvial gravels, * Geological investigations of rip–rap quarry site, * Construction material investigations, * Grout testing (grout curtain) * Rock anchor testing (Spillway) * Compactibility of alluvial gravels * Stability of reservoir slopes.	* 11 No core drilled bore holes, total depth 600 m * 5 No 300 mm dia. percussion boreholes, total depth 140 m * 8 No Overburden boreholes drilled total depth 96 m * 2 No trenches, 8 m deep, total length 70 m * 2 No trial embankments * 1 No rock anchor test * Grout testing of 140 m of Rock * 140 No SPT's * 600 No water pressure tests * 42 No trial pits, total depth 120 m	* 1 No Heavy Percussion Rig * 1 No Overburden Drill * 2 No Air Compressors * 3 No Core Drilles * 1 No Mobile Auger Drill * 6 No Flush Pumps * 1 No Dragline Excavator * 1 No Traxcavator * 1 No Vibrating Roller * 2 No Backactor Excavators	£17 500
7	Pitsilia Rural Development Project: *Xyliatos Dam*	* Subsurface geological investigations at the Damsite. * Fill material invest.	Two boreholes of final depth 36 m and 57 m respectively have been started and continued till the end of the year.	* 2 No Coredrills with Flush Pumps. * 1 No Bulldozer	£250

TABLE III–1 **1976 SITE/FILL MATERIAL INVESTICATIONS AND GROUTING (Continued)**

No	Project	Aim of Investigation	Fieldwork as Carried Out	Machinery Used	Expenditure
8	Pitsilia Rural Development Project: *Melini Reservoir*	* Subsurface geological investigations, * Fill material investig., * Investigation of excavations conditions.	* 3 No coredrilled boreholes, total depth 44 m * 8 No water pressure tests. * 1 No trench, 25 m long, 5 m deep. * 13 No trial pits, total depth 28 m	* 1 No Core Drill * 1 No Flush Pump * 1 No Traxcavator * 1 No Packactor excavator	£800
9	Pitsilia Rural Development Project: *Panayia–tis–Agapis Dam*	* Subsurface geological investigations of Damsite * Fill material invest.	* 3 No trenches * 16 No trial pits * 3 No boreholes, total depth 29 m	* 1 No Traxcavator * 1 No Backactor Excavator * 1 No Overburden Drill with Flush Pump * 1 No Air Compressor	£500
10	Pitsilia Rural Development Project: *Gourri Dam*	* Subsurface geological investigations of 2 possible damsites. * Fill material invest.	* 5 No core drilled Boreholes, total depth 113 m * 3 No overburden drilled boreholes, total depth 58.5m * 27 No trial pits. total depth 76m * 13 No permeability tests	* 1 No Overburden Drill with Flush Pump * 1 No Air Compressor * 1 No Coredrill with Flush Pump * 1 No Backactor Excavator	£2 200
B.	NON–DEPARTMENTAL PROJECTS				
1	New Nicosia Limassol Road (PWD)	Subsurface geological/ foundation investigations of: * bridge sites * major cuts * quarry site	* 69 No boreholes, total depth 1,082 m, * 796 No SPT's, * 85 No undisturbed (U4s) samples, * 9 No trial pits, total depth 32.0 m	* 1 No Mobile Auger Drill * 1 No Core Drill * 2 No Overburden Drills * 1 No Light Percussion Rig * 4 No Flush Pumps * 2 No Air Compressors * 1 No Backactor Excavator	£9 000

TABLE III-1 **1976 SITE/FILL MATERIALS INVESTIGATIONS AND GROUTING (Continued)**

B NON-DEPARTMENTAL PROJECTS

2	Ayios Athanasios Housing Scheme (Town Planning & Housing Dept.)	Subsurface geological/ foundations investigations.	* 6 No boreholes, total depth 53 m, * 36 SPT's	* 1 No Overburden Drill * 1 No Flush Pump * 1 No Air Compressor	£680
3	Stavros tis Psokas (Forest Department)	Drilling for earthing purposes	* 6 No boreholes, total depth 90 m	* 1 No Overburden Drill * 1 No Flush Pump * 1 No Air Compressor	£250

C. GROUTING WORKS

1	New Lymbia Dam (Under construction by WDD)	Grout curtain cut-off	* 2 No coredrilled boreholes, total depth 12 m * 11 No overburden drilled boreholes for grouting, total depth 127 m * 38 No grout stages * 10 No water tests * 6,564 kg of cement grout injected	* 1 No Core Drill * 1 No Overburden Drill * 2 No Flush Pumps * 1 No Air Compressor * 1 No Grouting Equipment	£1 000
2	Road-Cut Anchoring, near Kakopetria (PWD)	Drilling and grouting of anchors	* 2 No coredrilled boreholes, total depth 50 m * Installing 55 m of steel rope into the boreholes and cement grouting	* 1 No Core Drill * 1 No Flush Pump * 1 No Traxcavator	£900
3	Sealing of Artesian Borehole at Zyyi	Reducing leakage losses	* 4 No boreholes, rotary-percussion drilled, total depth 30 m * Injection of 2,000 kg of cement grout	* 1 No Rotary Percussion wagon drill * 1 No Air Compressor * 1 No Flush Pump * 1 No Grouting Equipment	£250
	Total Expenditure				£37 852

TABLE III–2 **1976 SITE/FILL MATERIAL INVESTIGATIONS AND GROUTING: PROGRESS CHART**

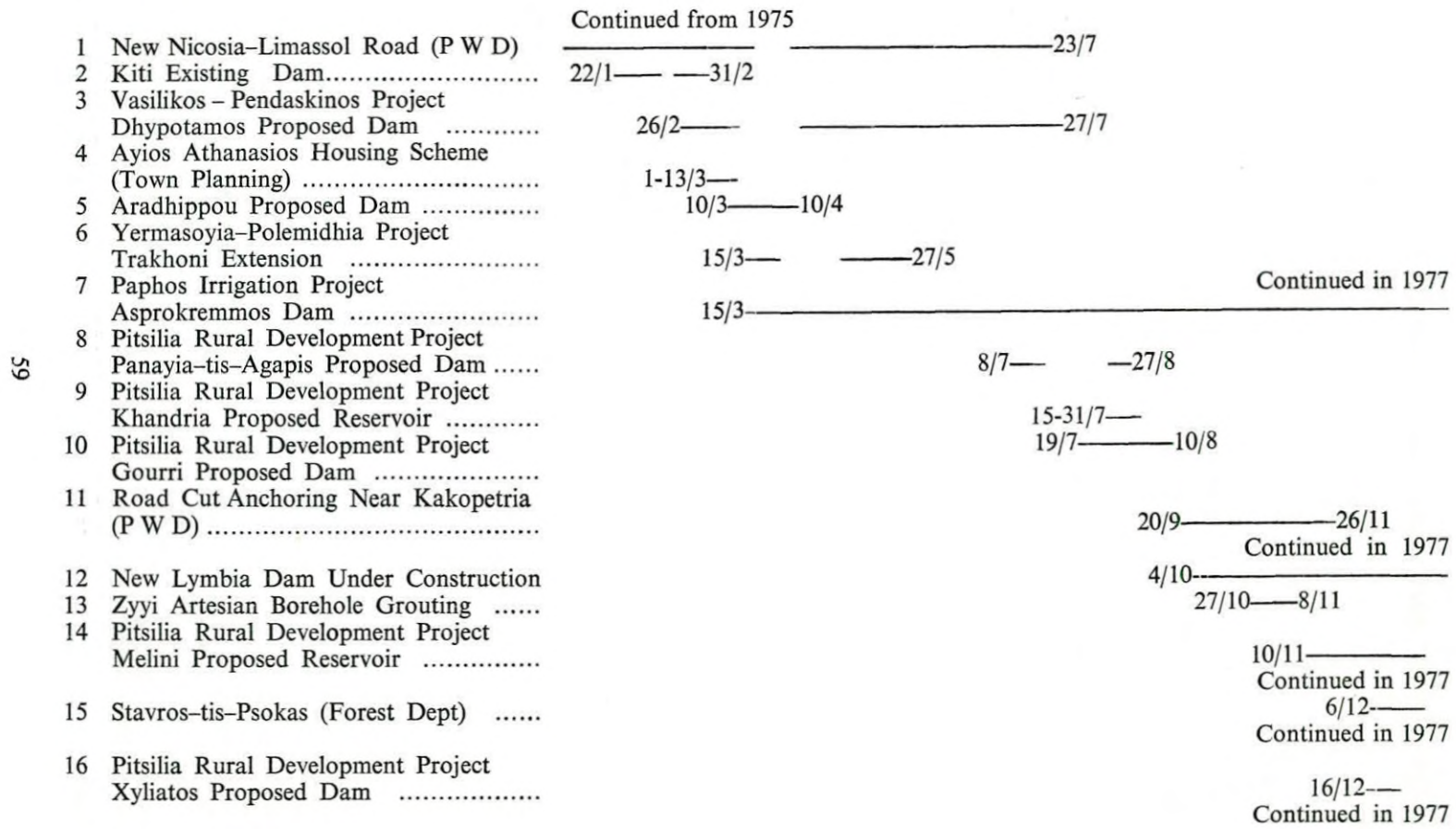


TABLE III-3 **SOILS LABORATORY TESTS DURING 1976**

No	Type of Test	Paphos Project: Aspro-kremmos Dam	Paphos Project: Main Canal	Kalavasos Dam	Aradhippou Dam	Trakhoni Scheme	Pitsilia Rural Development: Gourri Dam	Pitsilia Rural Development: Panayia tis Agapis Dam	Pitsilia Rural Development: Melini Reservoir	Pitsilia Rural Development: Khandria Reservoir	Non-Departmental and Miscellaneous	Total of Each Kind
1	Sieve Analysis (Wet or Dry)	63	12	—	—	—	10	12	—	—	8	105
2	Hydrometer Analysis	43	19	32	30	2	14	14	13	6	16	189
3	Atterberg Limits	50	14	32	23	—	14	14	13	8	12	180
4	Specific Gravity	43	19	32	30	2	14	14	13	6	12	185
5	Bulk Density	—	—	12	14	2	—	—	—	—	5	33
6	Moisture Content	68	18	24	30	2	10	14	13	6	21	206
7	Compaction	16	—	2	8	—	5	5	7	5	8	56
8	Permeability	12	—	—	14	—	5	5	7	2	4	49
9	Undrained Triaxial	—	—	—	14	2	—	—	—	2	2	20
10	Cons. Undrained Triaxial with P.W.P. Measurements	—	—	3	1	—	—	—	—	—	—	4
11	Drained Triaxial	1	—	—	—	—	—	—	—	—	—	1
12	Shear Box (Large)	2	—	1	—	—	—	—	—	1	3	7
13	Consolidation (Oedometer)	1	3	—	6	—	—	—	—	—	—	10
14	Core Crushing Strength	66	—	—	—	—	—	—	—	—	—	66
15	Core Unconfined Compression	6	—	—	—	—	—	—	—	—	—	6
16	Suspended Sediment Analysis	—	—	—	—	—	—	—	—	—	49	49
	Total	371	85	138	170	10	72	78	66	36	140	1 166

TABLE III-4 **CONCRETE AND FIELD LABORATORY TESTS DURING 1976**

No	Type of Test	Concrete Laboratory: Paphos Project Main Canal	Concrete Laboratory: Tenders for Concrete Aggregate	Concrete Laboratory: For Private Sector	Concrete Laboratory: Miscel-laneous	Field Laboratories: New Strovolos Reservoir	Field Laboratories: New Tremithos Reservoir	Field Laboratories: New Lymbia Dam	Total of Each Kind of Test
1	Sieve Analysis (Wet or Dry)	10	35	—	—	50	112	86	293
2	Silt Content	—	17	—	—	50	45	43	155
3	Organic Impurities	—	18	—	—	50	45	43	156
4	Specific Gravity	12	1	—	—	—	18	3	34
5	Water Absorption	12	—	—	—	—	18	3	33
6	Moisture Content	—	—	—	—	163	380	55	598
7	Aggregate Crushing Value	10	5	—	—	—	17	15	47
8	Aggregate Impact Value	5	—	—	—	—	—	—	5
9	Bulking of Sand	—	—	—	—	—	2	2	4
10	Cube Crushing	—	—	5	—	270	948	352	1 575
11	Slump	—	—	—	—	130	474	102	706
12	Sand Replacement	—	—	—	—	10	16	—	26
13	Soundness	9	—	—	—	—	—	—	9
14	Elongation	15	—	—	—	—	—	—	15
15	Flakiness	15	—	—	—	—	—	—	16
16	Los Angeles Abrasion	3	—	—	—	—	—	—	3
17	Core Crushing Strength	—	—	—	67	—	—	—	67
	Total	91	76	5	67	723	2 075	704	3 741

TABLE III–5 SITE INVESTIGATION MACHINERY AND EQUIPMENT

(i) DRILLING AND BORING RIGS

No	Description	Make	No of	W.D.D. Ref. Nos
1	Rotary Percussion (Overburden) Drill	Atlas	3	294, 455, 477
2	Core Drill	Craelius	2	354, 497
3	Core Drill	Boyles	4	459, 460, 555, 557
4	Mobile Auger/Core Drill	Atlas	1	560
5	Wagon Drill	Atlas	1	423
6	Mini Wagon Drill	Atlas	1	587
7	Shell and Auger Boring Machine	Edeco	1	553

(ii) AIR COMPRESSORS

No	Description	Make	No of	W.D.D. Ref. Nos
1	17 m3/min Compressor	Atlas	2	280, 362
2	17 m3/min Compressor	Gardner	1	495
3	17 m3/min Compressor	Cumming	1	668

(iii) FLUSH PUMPS

No	Capacity H. P.	Make	No of	W.D.D. Ref. Nos
1	4.75	Lister	1	354A
2	5.5	Petter	2	102, 103
3	6.5	Lister	2	460A, 554
4	6.5	Craelius	1	564
5	9.5	Simplex	3	499, 628, 629
6	10.0	Petter	2	484, 600
7	11.75	Ruston	1	586
8	19.5	Lister	3	556, 558, 563

TABLE III–6 LABORATORY EQUIPMENT

No	Description	Year Acquired
1	5 No liquid limit apparatus	2 prior to 1967 1 in 1971 2 in 1974
2	Normal and rapid moisture apparatus	prior to 1967
3	2 No shrinkage limit apparatus	prior to 1970
4	Standard and modified proctor apparatus	prior to 1967
5	Sand replacement apparatus	prior to 1967
6	Sieve analysis and hydrometer apparatus	prior to 1967 and in 1973
7	Falling and constant head permeameters	prior to 1967
8	Unconfined compression apparatus	prior to 1967
9	Triaxial shear strength test apparatus (1 ½" diameter specimens)	prior to 1967
10	Small shear box machine (6x6 cm specimen)	prior to 1967
11	3 No consolidation apparatus	1 prior to 1967 2 in 1971
12	1 No 17 inch diameter by 10 inch high constant head permeameter	1967
13	2 No sample extruder	1967 & 1974
14	1 No high capacity triaxial machine for up to 4 inch diam. soil and rock specimens	1968
15	1 No Norwegian type pore pressure apparatus	1968
16	1 No torsion dial balance	1969
17	2 No proctor penetrometer sets	1969

TABLE III–6 **LABORATORY EQUIPMENT (Continued)**

No	Description	Year Acquired
18	Universal hydraulic extruder	1970
19	Large shear box machine (12" x 12" samples)	1970
20	Platform beam scale	1971
21	2 No multispeed, bench mounted, 1 ton, triaxial compression machines	1972
22	1 No multispeed, 5 ton, triaxial machine	1972
23	2 No Bishop type pore pressure apparatus and 1 No volume change indicator	1972
24	6 No Bishop type constant pressure systems	1972
25	1 No infra red drying cabinet	1972
26	2 No Kango vibrating hammers	1972 & 1975
27	2 No Blader type pressure cylinders	1972
28	1 No constant head permeameter for sands	1972
29	Water de-airing unit complete	1973
30	Automatic proctor and modified proctor compactor	1973
31	Automatic (hydraulic-electric) extruder	1973
32	Soil pocket penetrometer	1s73
33	2 No stop clocks	1973
34	2 No geological hammers	1973
35	Paschall ball mill complete	1975
36	Andreassen Pipette apparatus	1975
37	Electrical resistivity geophysical equipment	1975

(ii) CONCRETE LABORATORY EQUIPMENT

No	Description	Year Acquired
1	Aggregate crushing test apparatus	1960
2	Balance capacity 700 lbs	1961
3	Compacting factor apparatus for concrete	1961
4	Oven for drying sands and aggregates	1965
5	Concrete cube crushing machine (hand operated)	1957
6	Sieve shaker	1964
7	Vicant needle for cement test	1966
8	150 ton concrete cube crushing machine (electrically operated)	1966
9	Laboratory concrete mixer	1968
10	Distillation apparatus	1969
11	Large riffle box for coarse aggregate	1969
12	Air entraintment meter	1971
13	Electric concrete vibrator	1971
14	Core cutting machine	1972
15	Portable coring machine	1972
16	3 in. dia. drill bit for portable coring machine	1973
17	4 in. dia. drill bit for portable coring machine	1973
18	Schmidt concrete test hammer (Type N)	1975

(iii) IN SITU TESTING EQUIPMENT

No	Description	Year Acquired
1	Vane shear test unit	1970
2	2 No plate bearing test units	1970 & 1973
3	Well permeability test unit	1972
4	Point load tester unit	1974

(iv) ASSOCIATED EQUIPMENT FOR USE ON SITE

No	Description
1	*Core Drilling Equipment:* to fit available core-drilles and for boreholes of variable diameter and to depths greater than 100 m., including: (i) Casing tubes, (ii) Casing Show bits (diamond, diaborit, T.C.), (iii) Double Tube Core Barrels, (iv) Core bits (diamond, diaborit, T.C., Rock-bit), (v) Central drill rods, (vi) Reaming Shells etc.
2	*Auger Drilling Equipment:* to fit mobile auger drill and for 0.20 m. dia. drilling to 30.0 m. or for 0.25 m. dia. drilling to 12.0m., including: (i) Hollow stem auger flights of 1.5m. length (ii) Hard or soft formation cutters, (iii) Central boring rods, (iv) Head assembly.
3	*Shell and Auger Boring Machine Equipment:* for 0.15 m. or 0.20 m. dia. boring to 25 m. depth in clayey or sandy formations.
4	2 *Sets Standard Penetration Test Equipment Complete With:* (i) 140 lb. automatic trip hammer, (ii) 30 m/set square connecting rods, (iii) open ended Raymond (split spoon) sampler, (iv) 60° cone ended sampler.
5	*Undisturbed sampling equipment complete with:* (i) 10 cm. dia. head assembly, (ii) 10 cm. dia. open drive (U4) tubes, (iii) 10 cm. dia. cutting shoes. (iv) 8 cm. dia. and 7 cm. dia. thin walled (Shellby) tube sampler

TABLE III–7

DRILLING ACCESSORIES PURCHASED IN 1976

Quantity	Description
6	T C Corebits, "T 76"
6	T C Corebits, "T 66"
	Auger Drilling Equipment as follows:
10	(i) 5 in. i.d. x 10 in. o.d. hollow stem Auger flights
10	(ii) 5 ft long, centre rod sections
2	(iii) Hard formation pilot bits
1 set	(iv) Cutter plates
	Standard Penetration Testing Equipment as follows:
2	(i) Automatic trip hammers
4	(ii) 5 ft long, rods
3	(iii) 10 ft long, rods
2	(iv) Split spoon samplers

TABLE III–8

LABORATORY EQUIPMENT PURCHASED IN 1976

Quantity	Description
1	15 kg capacity semi automatic weighing balance
	Consolidation Testing Accessories:
2	(i) 3 in. dia. S/S ring cutters
1 set	(ii) 4 in. dia. cell complete
1	Aggregate impact value apparatus
4	Falling head permeameters
1 set	200 mm dia. test sieves
1 set	Profometer, reinforcement detector
1 set	Crack width measuring unit
1	Concrete temperature measuring instrument

TABLE III–9

GROUTING MACHINERY AND EQUIPMENT

No	Description		
1	1 No Moyno grout pump (pneumatic)		
	Capacity.....	=	50 psi/min
	Pumping pressure	=	200 psi
2	2 No Craelius grout pumps reciprocatins with Diesel engine		
	Capacity.....	=	11 gals/min
	Pumping pressure	=	1000 psi
3	2 No ZA 300 high speed mixers Craelius (pneumatic)		
	Capacity.....	=	66 gallons
4	2 No ZA 600 grout agitators Craelius (pneumatic)		
	Capacity.....	=	132 gallons
5	1 No colloidal grout mixer 'semix 175 type Craelius		
6	1 No grout agitator 'concrete type		
	Capacity.....	=	77 gallons

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 detailed design of all major projects undertaken by the Department, which includes preparation of drawings, specifications and conditions of contract.

Regularly the Division operates through the following Branches:

Domestic Water Supplies
Irrigation
Dams
Small Dams
Hydraulic Structures
Topography
Drawing and Records

During 1976, however, the Engineering staff of the Division was very limited (six civil plus two topographer engineers); furthermore this personnel had to work most of the time with the Planning Division due to its pressing assignments. Therefore the activities of this Division in terms of detailed design work were very limited.

However the last two Branches of the Division, which extend their services to all other Divisions of the Department were very busy. As it is known the *Topography Branch* undertakes all topographical work, mapping etc and the *Drawing and Records Branch* all drawing work of all major and minor projects carried out by the Department.

In particular the work of those Branches which in fact operated during 1976, is described below:-

IRRIGATION BRANCH

An account of the design work done on irrigation works during the year 1976 is given below:

Mavrokolymbos

Detailed design of the open, lined reservoir at the terminal of the main canal and the head of the Khlorakas main was completed. This reservoir which was designed for a capacity of 2000 m^3, has a shape of a natural lake (kidney shape)* and it will be used as a balancing reservoir. The reservoir construction started early in 1976 and was completed and put into operation in June 1976. Actual cost was about £20,000.

Yermasoyia–Polemidhia Project

Trakhoni Extension: This project will be used to irrigate approximately 4390 donums of land in the villages of Ypsonas, Kolossi, Kato Polemidhia and Trakhoni. It is estimated that it will cost about £845,000 and the benefit-cost ratio is about 2.4. The project will be supplied with water from Yermasoyia and Polemidhia dams. The water can be conveyed by gravity upto a point where a pumping station will be constructed. From the pumping station,

* See photo under CONSTRUCTION DIVISION

which consists of two pumps, the water will be pumped through the pumping main to a night storage reservoir, and from there it will be distributed to the farms at the right rate of flow and under the proper regulated pressures.

The following is a description of each project component along with the design work carried out:

* *Pumping Station:* The site of the pumping station was selected and the land acquired. Contract documents for the Pumping Plant were prepared and tenders for the supply of all related equipment were invited. The total estimated cost of the pumping station including pump house, guard house etc. is approximately £100,000. Detailed design works related to the pump house, the guard house and the balancing tank will be carried out in 1977.

* *Pumping Main:* Detail design and working drawings were completed in 1976. International tenders for the supply of pipes and valves were invited and finally they were awarded at a cost of £120,000. The total estimated cost of this component (which includes the purchase and installation of a 700 mm dia. steel pipeline and related valves) is approximately £172,000.

* *Night storage reservoir:* The function of this reservoir is to provide storage during the night hours and balance off differences in supply and demand during normal operation hours. Detailed design and drawings were prepared and construction work started in December 1976. The reservoir capacity will be 20,000 m^3 and its estimated cost about £110,000.

* *Distribution system:* The detailed designs of the system were completed and working drawings were prepared during 1976. The system provides for the installation of A.C. pipes class 15. The system is to command an area of 4390 donums and it is estimated to cost £463,000.

Yermasoyia Irrigation Division: Design work for this scheme was completed in 1976 and working drawings were in the final stage of completion. The scheme will command about 1050 donums all within the above irrigation division area and it is estimated to cost £100,000. The scheme has been accepted by the Irrigation Division and its construction will commence in 1977.

Polemidhia Irrigation Division: The design work for this scheme was completed and the working drawings were under preparation. The scheme is to command an area of 1290 donums and it is estimated to cost £120,000. Construction is expected to begin in 1977.

Land Consolidation

During the year under review land consolidation was in the process of implementation in the following areas: Kissonerga (New Area), Khlorakas, Akrounda, Phinikaria, Palekkori, Ayios Ioannis, Malounda, Pera, Monagroulli and Arsos (Limassol).

SMALL DAMS

Aradhippou Dam

The design of this dam which commenced in 1975 was carried on and completed during 1976.

This dam, the main design features of which were described in the 1975 Annual Report, will be used for the recharge of the downstream aquifer from which numerous boreholes obtain their water.

By the first half of the year under review, the design of the dam as well as the construction drawings and specifications were completed. The estimated cost of the dam was £115,000.

However due to the uncertainties involved in a recharge dam with regard to the uniform distribution of benefits, financial problems were arisen and the scheme had not been set forward for implementation by the end of the year.

Lymbia Irrigation Division Improvement Works

The irrigation improvement works at Lymbia, will be carried out in two phases as follows:

First Phase

* Construction of the New Lymbia dam. Estimated cost £86,000

* Lining of the existing channel. Estimated cost £39,000

Second Phase

* Construction of the secondary distribution system on completion of the land consolidation works. Estimated cost £35,000

By the end of May 1976, all the detail engineering drawings of the dam, bills of quantities, cost estimates and specifications had been completed.

The design of the main channel was reconsidered and a number of take-off structures were provided in order to enable irrigation by 10–12 farmers simultaneously.

Construction of the first phase of the improvement works, started in summer 1976. When all the improvement works are completed about 380 donums of land will be irrigated.

TOPOGRAPHY BRANCH

The Topography Branch has carried out all the survey work required by all the Divisions of the Department. These surveys are of the engineering type and are important and necessary for the investigation, construction and post-construction stages for projects under consideration.

The staff of this Branch is interdepartmentally trained in the use of modern surveying instruments and equipment as well as the methods and procedures employed during and after the field operations. Levelling for profiles and cross-sections tacheometry for contour surveys, setting out of project outlines, instrumental observations for detection of horizontal or vertical movement of constructed dams or the neighbouring slopes are among the types of surveys the staff is assigned to perform.

During the year 1976 the staff of this Branch numbered 21 persons classified as follows: one Senior Inspector of Works (in charge of the Branch), nine monthly paid Technical Assistants, eight hourly-paid Technical Assistants and three regular labourers engaged as Rod-men or Chain-men.

Main areas of action

Pitsilia Rural Development Project, Paphos Irrigation Project and Vasilikos–Pendaskinos Project were, among other routine surveys, the main areas of action during the year under review. A number of surveys were conducted in Pitsilia area for small dams and off-stream storage reservoirs for the needs of the first study and similarly small site surveys were carried out for pumping stations, storage tanks and access roads for the needs of the subsequent study. For the Vasilikos–Pendaskinos Project a detail survey was conducted, for the Dhipotamos supply canal for final design. A list with the names of the Projects dealt with this year is given below in detail:

SURVEY WORK CARRIED OUT DURING 1976

Name of Project	Type of Survey
Vasilikos–Pendaskinos Project	
Dhipotamos Canal	Setting out and levelling
Pitsilia Project	
17 No pond and dam sites	Contour surveys
Paphos Project	
Canaletti at Dhiarizos R.	Levelling
Pumping station sites ...	Survey
Access road	"
Main canal	Setting out and Xsections
Asprokremmos Dam	
Damsite Extension	Survey
EAC pilons	Location survey
Spillway	X sections
Reservoir	Geological X sections
Borrow areas	Survey
Other Projects	
Khirokitia–N'sia pipeline	Setting out – levelling
Kakopetria–Galata	Contour survey
Parekklisha reservoir ...	" "
Lymbia dam	Location of T.W.L.
Zyyi–Ayios Theodhoros	Levelling of B H s
Kiti Dam	Sedimentation check
Mari, Agros, Vizakia ...	Routine contour survey
Anaphotia – Anglisidhes	Diversion contour survey
Kalopanayiotis and Lefkara Dams	Movement detection

DRAWING AND RECORDS BRANCH

The Drawing Branch consists of the following sections:

The Drawing Section
The Plan Reproduction Section
The Photographic Section and Photo Process Laboratory
The Technical Library and Technical Information Section.

The staff of the Drawing Branch during 1976 numbered 21 i.e. 8 Draughtsmen scale 5, 1 Technical Assistant scale 5, 8 daily paid Draughtsmen and 3 hourly paid Assistants. Three of the staff who had been loaned to the Refugee Social Welfare Services returned to the Drawing Office in August of 1976. One Draughtsman scale 5 was on transfer to Paphos Regional Office of the Department for the whole year.

Drawing Section

Apart from the normal drawing office work of the Department, the Drawing Section undertook work for the Vasilikos-Pendaskinos, Pitsilia and Paphos Projects. The printing of the Land Use Map of Cyprus, scale 1:250,000 was completed in 1976.

Work done can be listed as follows:

Ref.	Description	Time spent in hours	Man Months
a	Existing and Proposed Dams	1 686	10.5
b	Irrigation Distribution Systems for Dams	790	4.9
c	Routine Irrigation	957	6.9
d	Domestic Water Supplies	2 128	13.0
e	Recharge Schemes	103	0.6
f	Antiflood Schemes	72	0.5
g	River Training Works	—	—
h	Hydrological Maps	435	2.7
i	Vasilikos-Pendaskinos Project	2 359	14.6
j	Programmes and Organization	524	3.3
k	Completion Plans	1 083	6.7
l	Completion Reports	229	1.4
m	Pitsilia Rural Development Project	3 701	22.9
n	Reports	764	4.7
o	General	1 344	8.3
p	Southern Conveyor	102	0.6
q	Paphos Project	1 874	11.6
r	Morphou Tylliria Project	—	—
s	Auxiliary Services		
	(i) Library	1 350	8.4
	(ii) Plan Registry	416	2.6
	(iii) Plan Reproduction	450	2.8
	(iv) Drawing Materials Store	111	0.7
t	Training of Staff	313	1.9
u	Leave etc.		
	(i) Leave Paid	1 696	10.5
	(ii) Leave Without Pay	148	0.9
	(iii) Sick Leave	1 314	8.1
	(iv) Maternity Leave	976	6.1
	(v) D.C.	363	2.3
Total (hours-man months)		25 290	157.5

Plan Reproduction Section

Plan reproduction continued during 1976 with one continuous process and one still machine. Some 2400 orders were issued to the Reproduction Section for 36,500 prints of various types and sizes.

The Photographic Section and Photo Process Lab

Coverage of construction works of the Department was continued in 1976 with black and white, colour films as well as colour 16 mm cine filming. The process lab continued its work on enlargement, reduction and reproduction of maps in various materials.

Technical Library and Technical Information Section

During 1976 12 new books at a total cost of £120 were purchased for the Technical Library. In addition 38 reports were prepared by Officers of the Department and numerous other books and periodicals were received free of charge.

The Library continued to issue monthly notes on material received and of articles of special interest from periodicals. Following are lists of material registered with the Library.

BOOKS PURCHASED DURING 1976

VEN TE CHOW *Handbook of Applied hydrology* Book No 7598 £26.050 mils

L. D. JAMES & R. R. LEE *Economics of water resources planning* Book No 7599 £11.900 mils

BRITISH STANDARDS INSTITUTION *B.S.*5163: 1974. *Specification for double flanged cast irons wedge gate valves for water-works purposes* Book No 7624 £4.000

BRITISH STANDARDS INSTITUTION *B.S.*4622: 1970. *Specification for grey iron pipes and fittings. Metric Units* Book No 7625 £4.300 mils

BRITISH STANDARDS INSTITUTION *B.S.*1218: 1946. *Sluice valves for waterworks purposes* Book No 7626 £ 2.700 mils

DAN GOLDBERG. BARUCH GORNAT & DANIEL RIMON *Drip Irrigation. principles design and agricultural practices* Book No 7709 £ 11.500 mils

META SYSTEMS, INC *Systems analysis in water resources planning* Book No 7726 £8.000 mils

A. E. WYNN & G. P. MANNING *Design and construction of form work for concrete structures* Book No 7742 £ 4.000 mils

E. C. OZELTON & J. A. BAIRD *Timber designers manual* Book No 7743 £12.000 mils

E. E. SEELYE *Design 3rd edition* Book No 7744 £23.300 mils

H. E. BABBITT, J. J. DOLLAND & J. L. CLEASBY *Water supply engineering* Book No 7745 £11.500 mils

U. S. DPT., OF THE INTERIOR BUREAU OF RECLAMATION *Engineering Monograph No* 14 *Beggs deformeter stress analysis of single barrel conduits* Book No 7788 Free of charge.

DEPARTMENTAL REPORTS 1976

(In the order they were issued)

P. LOUCAIDES *Aradhippou dam.* 1975 *fill material investigations* January 1976. Report No. F/52 Book No 7629

D. PITSILLIDES *Palekhori–Kambi project. Diversion scheme–Completion report.* January 1976 Report No C/129 Book No 7633

P. TH. KAZAMIAS *Ayios Dhimitrios* (*LL*) *water supply. House–to–house scheme. Completion report* January 1976 Report No C/126 Book Nos 7673 & 7674

E. CHR. ELIADES *Nisou regional water supply scheme. Completion report* January 1976 Report No C/128 Books No 7724

V. C. PARTASSIDES *Palekhori–Kambi dam. Contract* 39/71/5. *Completion report* January 1976 Report No C/133 Book Nos 7780 & 7781

P. LOUCAIDES *New Lymbia dam. Site investigation.* February 1976 Report No F/53 Book Nos 7631 & 7632

P. LOUCAIDES *Paphos Irrigation project. Main Canal.* 1975 *site and fill material investigation.* 1) *Report* 2) *Drawings.* March, 1976 Report No. F/54 Book Nos 7688 & 7689

G. PITTAS *Ormidhia water supply. House–to–house scheme. Supplementary supply* March, 1976 Completion report No C/130 Book Nos 7778 & 7779

L. SAVVIDES *Land use in Cyprus.* March, 1976 Book Nos 7757 & 7758

P. LOUCAIDES *Kiti dam. Remedial works. Site investigations.* April 1976 Report No F/35 Book Nos 7696 & 7697

T. N. HAMATSOS *Aradhippou dam. Bill of quantities and cost estimates.* April, 1976 Report No D/15 Book Nos 7857 & 7858

H. MOLKENBOER *Vasilikos–Pendaskinos project. "On rotation" and "On request" irrigation water distribution systems. Comparative study.* May 1976 Report No I/16 Book Nos 7694 & 7695

D. PITSILLIDES *Palekhori–Kambi project. Diversion Scheme–Completion report.* January

G. A. CONSTANTINIDES *Kalavasos irrigation–Kopetra–Syrmata pumping scheme.* June 1976 Completion report No. C/131

N. TSIOURTIS *Yermasoyia–Polemidhia Project. Distribution system. Ayios Nikolaos extension technoeconomic analysis* June 1976 Report No. I/17 Book No 7710

N. TSIOURTIS *Yermasoyia–Polemidhia Project and Akrotiri aquifer. Water resources, land resources and development.* June 1976 Report No I/18 Book Nos 7712 & 7713

N. TSIOURTIS *Yermasoyia–Polemidhia Project Trakhoni extension Ypsonas extension cost estimates and analysis.* June 1976 Report No. 1/19 Book Nos 7714 & 7715

P. LOUCAIDES *Aradhippou dam.* 1976 *site and fill material investigations.* July 1976 Report No F/56 Book Nos 7795 & 7796

P. TH. KAZAMIAS *Phini water supply. House–to–house scheme.* July 1976 Completion report No. C/132 Book No 7750

C. A. C. KONTEATIS *Drinking water standards.* August 1976 Report No L/18 Book Nos 7729 & 7730

N. TSIOURTIS *Yermasoyia–Polemidhia project Trakhoni extension–Pumping station. Contract P1 pumping plant.* August 1976 Report No I/20 Book Nos 7731 & 7732

N. TSIOURTIS *Yermasoyia–Polemidhia project. Trakhoni extension distribution system. Construction document No 1 list of equipment and sizes for construction purposes.* August 1976 Report No I/21 Book No 7733

C. KRIDIOTIS *Electricity authority of Cyprus New district headquarters–Nicosia site investigation.* August 1976 Report No F/58

N. TSIOURTIS *Yermasoyia–Polemidhia project. Trakhoni extension. Night storage reservoir. Construction documents and working drawings.* September 1976 Report No I/22 Book Nos 7735 & 7736

P. LOUCAIDES *Yermasoyia–Polemidhia project. Trakhoni scheme. Site investigations.* September 1976 Report No F/57

B. M. MILINUSIC *Paphos Irrigation Project Progress report No 3 Covering period 1.7.76 to 1.10.76.* October, 1976 Report No D/17 Book Nos 7746 & 7747

N. P. STYLIANOU *Panayia tis Agapis dam Feasibility study.* October 1976 Report No D/18 Book Nos 7761 & 7762

D. C. KYPRIS *Larnaca salt lake. Investigations in connection with the modernization of salt production.* October 1976 Part 1 Report No L/20 Book Nos 7774 & 7775

T. N. HAMATSOS *Pitsilia Rural Development project. Khandria and Melini ponds. Feasibility study.* November 1976 Report No D/20 Book No 7763

P. PANTELIDES *Pitsilia Rural Development Project Rehabilitation of existing small irrigation schemes. Feasibility study.* November 1976 Report No D/21 Book No 7764

P. PANTELIDES *Pitsilia Rural Development Project. Improvement of village water supplies. General report and cost estimate.* November 1976 Report No D/21

P. LOUCAIDES *Pitsilia Rural Development Project. Melini reservoir. Fill material investigations.* November 1976 Report No F/59 Book Nos 7768 & 7769

P. LOUCAIDES *Pitsilia Rural Development Project. Khandria reservoir. Site and fill material investigations.* November 1976 Report No F/60 Book Nos 7770 & 7771

P. LOUCAIDES *Concrete quality control at the construction site. Instructions manual.* November 1976 Report No S/11

C. C. ARTEMIS *Pitsilia Rural Develop. Project. Gourri dam. Feasibility.* Novembe 1976 Report No D/19 Book No 7789

N. TSIOURTIS *Yermasoyia–Polemidhia project. Trakhoni extension pumping main. Construction documents and working drawings.* November 1976 Report No. I/23 Book Nos 7859 & 7860

P. LOUCAIDES *Paphos Irrigation project. Construction of main canal. Quarried concrete aggregate field and laboratory investigations.* December 1976 Report No F/61 Book Nos 7772 & 7773

B. M. MILINUSIC *Paphos Irrigation Project. Progress report No 4 Covering period from* 1.10.76 – 31.12.76. December 1976 Report No D/23 Book Nos 7791 & 7792

L. SAVVIDES *Calculation of the area to be commanded by an irrigation scheme* December 1976 Report No I/24 Book No 7793

V DIVISION OF CONSTRUCTION

by
A. P. Georghiades
Executive Engineer I
Head of Division

Introduction

The Division of Construction which is one of the major Divisions of the Department is sub–divided into four main Branches.

The Planning and Control Branch
The Major Projects Branch
The Minor Projects Branch
The Workshop

The Construction Division deals with the planning, supervision and control of all construction works of the Department, whether carried out by direct labour or by contract.

All the above functions of the Division necessitate adequate highly experienced and able personnel in order to carry out the so many different and complex schemes.

The staff of the Division in 1976 consisted of:

1 No Executive Engineer Class I
Head of Division
1 No Executive Engineer Class I
1 No Mechanical Engineer Class I
Head of the Workshop
3 No Senior Inspectors of Works
9 No Inspectors of Works
1 No Chief Foreman
9 No Assistant Chief Foremen
2 No Technical Assistants
2 No Daily paid Technical Assistants
53 No Monthly paid Foremen
75 No Weekly paid Foremen
157 No Total Staff

Another important fuction of this Branch, is the collection of data regarding actual rates, standard of materials and equipment, the results of which are appraised and utilised for future planning and cost estimating.

The execution of the new schemes commences soon after the Development Estimates are approved by the Council of Ministers and the respective village loans are approved by the Loan Commissioners. These formalities are usually completed in April. Until this time of the year under review the construction activities were confined to the completion of the schemes carried over from the year 1975.

CONSTRUCTION PROGRAMME AND PROGRESS

The execution of most schemes commenced in April and May, and contrary to the previous year, the recruitment of casual labour force was very difficult, with the result, that the progress of the works to be decelerated to a certain degree. In spite of this, the intensity of the execution of schemes was still kept at a high rate, and this is mainly attributed to the zeal shown by Staff of the Division in completing the programme, and the targets set.

The construction programme of the Department for the year under review, included 150 Major and Minor schemes at a total estimated cost of £2,799,701.–

These schemes are divided into 4 main categories as shown on the table below:–

Ser No	No of Schemes	Description	Amount Allocated
			£
1	49	Rural Domestic Water Supply schemes	774 996
2	74	Minor Irrigation schemes	688 814
3	20	Major Irrigation schemes	714 591
4	7	Town Water Supply schemes	621 300
	150	—Total—	£2 799 701

PLANNING BRANCH

This new Branch within the Division deals with the preparation of construction programmes and the planning of the execution of all schemes throughout the Island. It deals with all matters related to:

* The invitation of tenders regarding hiring of machinery, supply of pumping units, pipes and pipe-fittings and building materials.

* The acquisition if immovable property affected by the works.

* The supply of services and installation to water works, such as electricity and telephone.

* The distribution of resources, such as labour force, plant and materials, to the various schemes in the free Districts.

* The checking of the schemes designed by the Small Projects Planning Division, with regard to operation, rates and final estimate.

Planning prior to the execution of the schemes is considered a vital procedure for the construction process, as it contributes to the smooth and economical execution of the works, as well as the proper utilization of available resources in man-power, plant and materials.

CONTROL BRANCH

The staff of this Branch consists of one Executive Engineer Class I, one Senior Inspector of Works, and one Inspector of Works, with a wide experience in supervision and control techniques.

The primary objective of this Branch is to advise the supervising Technical Officers on any problem that might arise, regarding the execution of schemes or on any modifications that become inevitable in the light of actual local conditions with the least repercussions on the cost of the scheme.

Another activity of this branch is to exercise control over the execution of all schemes. It follows up and sees that all construction programmes are adhered to by the supervising officers, that the progress of the works is attained at reasonable standards and as planned and that the estimated cost of the schemes is not exceeded.

The supervision of schemes under construction in Limassol, Paphos and Larnaca — Famagusta Districts was undertaken by the respective Regional Offices, with periodic supervision by the staff of the Division at Head Quarters. The Head of the Division is also kept informed on the progress of the works by relative reports from the Regional Engineers.

By comparison to the previous year the volume of work undertaken by the Division was much greater. This is apparent from Table V-1 below, which shows that the overall expenditure incurred during the year under review was by 25% greater than 1975.

This year the Department had to respond to the urgent need for the execution of 68 water supply schemes for the Housing Estates for the displaced people, at a total estimated cost of £486,662.– The expenditure incurred in 1976 on the schemes was £243,317.– Work on a number of these schemes was not completed by the end of the year and will continue in 1977.

TABLE V-1
SCHEMES UNDERTAKEN DURING 1976

No	Nature of schemes	Number of schemes	Amount allocated in 1976	Expend. incurred in 1976
			£	£
1	Rural domestic water supply schemes	49	774 996	384 828
2	Minor irrigation schemes	74	688 814	395 869
3	Major irrigation schemes	20	714 591	585 021
4	Town water supply including Water Boards	7	621 300	265 009
5	Minor services to Water Boards and Municipalities	4	20 600	20 600
6	Works for other Government Departments	58	97 600	88 500
7	Rural domestic water supply schemes from village funds	95	17 956	17 956
8	Minor irrigation schemes from village funds	19	2 408	2 408
9	Works for private individuals.....	32	9 216	9 216
10	Water supply to housing estates for displaced persons	68	486 662	243 317
	Total	426	3 434 143	2 012 724

The Department also undertook the execution of water supply and irrigation works for other Government Departments, as well as for the Water Boards, the Village Authorities and for private individuals in land development.

The overall expenditure on all construction activities for the year 1976 reached the amount of £2,012,724.– This amount includes expenditure on schemes carried over from the year 1975.

Table V–1 also indicates the number of schemes and the amount spent on each category of schemes, as well as the amount allocated.

LABOUR FORCE

The gangs for the execution of the schemes were composed of the Departmental regular skilled artisans of various trades, and of casual unskilled labourers who are recruited locally, through the Government Labour Office.

It is worth mentioning that great difficulties were encountered in recruiting casual unskilled labourers for the execution of the schemes, due to shortage of such labour in the private sector.

The average daily labour force engaged during 1976 was 946 persons out of which 358 were regular employees of the Department. The total expenditure on wages during 1976 reached the amount of £616,533.–

CONSTRUCTION PLANT

For the execution of the schemes with regard to machinery requirements, priority was given to the use of Government machinery hired from E.M.S. when such machinery was available or from the private sector through open tenders.

During 1976, for the execution of the schemes the Department hired machinery of all types from the E.M.S. for 21,708 working days and the total amount paid was £42,366.–

The types of machinery hired from the E.M.S. as well as from the private sector together with the amount paid is shown on Table V-2 that follows.

PIPES AND BUILDING MATERIALS

As usual, all materials used for the execution of the schemes were purchased through the Government Central Stores. Such materials are cement, pipes and pipe fittings, water meters etc.

This year a shortage of pipes and pipe fittings was experienced as many emergency schemes especially water supply schemes to refugee estates were approved for execution, for which no provision was made in the relevant orders for these materials,

The expenditure on building materials, such as aggregates and cement, used by the Department reached the amount of £93,310.– and on pipes and pipe fittings the amount of £357,005.

In detail the materials and pipes used as well as the expenditure involved is shown on Tables V–2 and V–3 below.

TABLE V–2

MATERIALS AND MACHINERY

Ser No	Description	Quantity	Value
	Materials		£
1	Cement	2 950 tons	30 560
2	Sand	11 190 m3	13 450
3	Shingle	11 550 m3	14 450
4	Aggregate	15 413 m3	9 370
5	Sand for pipe bedding	17 800 m3	8 750
6	Water meters 1/2" dia	3 173 No	11 630
7	Water meters 1"–6" dia	120 No	5 100
	Total		£93 310
	Hired Machinery through open tenders		
1	Heavy machinery ...	850 hrs	3 200
2	Loaders	8 000 hrs	12 350
3	Excavator (Diggers)	9 650 hrs	18 400
4	Lorries	6 500 hrs	7 350
5	Bus	660 days	2 237
6	Land Rovers	2 340 days	5 700
7	Compressors	9 485 hrs	9 520
8	Others	4 500 hrs	4 300
	Total		£63 057
	Hired Machinery from E.M.S.		
1	Heavy machinery ...	134 days	1 602
2	Loaders	94 days	1 692
3	Excavators (Diggers)	187 days	1 120
4	Land Rovers	12 200 days	18 302
5	Compressors	2 050 hrs	8 205
6	Concrete mixers ...	5 593 days	4 475
7	Others	1 450 days	6 970
	Total		£42 366
	Excavation of trenches ...	52 000 metre run	£10 290
	GRAND TOTAL		£209 023

TABLE V–3

PIPES LAID

A. GALVANIZED IRON PIPES — CLASS "B"

Ser No	Dia. inches	Length meters	Value £
1	1/2	20 292	5 027
2	3/4	6 700	2 545
3	1	11 274	4 672
4	1 1/4	8 664	4 982
5	1 1/2	16 620	8 261
6	2	28 284	19 112
7	2 1/2	10 776	9 500
8	3	7 969	9 487
9	4	24 018	40 556
	Total	134 597	104 142

B. STEEL PIPES — CLASS "B"

Ser No	Dia. inches	Length meters	Value £
1	6	1 374	4 080
2	8	98	458
3	10	606	4 456
4	12	8 640	74 605
5	16	42	570
6	18	30	490
7	20	36	660
8	24	30	610
	Total	10 856	85 929

C. ASBESTOS CEMENT PIPES — Class "B"

Ser No	Dia. inches	Length meters	Value £
1	3	5 160	3 260
2	4	19 416	15 911
3	6	20 895	26 728
4	8	4 384	4 420
5	10	3 072	5 356
6	12	711	1 138
7	28	2 100	40 433
8	32	344	
	Total	56 082	97 246

TABLE V-3 **PIPES LAID (Cont'd)**

D. ASBESTOS CEMENT PIPES — CLASS "C"

Ser No	Dia. inches	Length meters	Value £
1	3	2 000	1 252
2	4	4 642	3 722
3	6	6 835	8 515
4	8	2 632	3 180
5	10	—	—
6	12	3 315	16 652
7	20	2 165	27 565
8	28	—	—
9	32	—	—
	Total	21 589	60 886

E. P.V.C. PIPES — 6 ATMS

Ser No	Dia. mm	Length meters	value £
1	90	690	325
2	110	7 760	4 960
3	160	—	—
	Total	8 450	5 285

F. P.V.C. PIPES — 10 ATMS

Ser No	Dia. mm	Length meters	Value £
1	90	84	40
2	110	3 120	3 477
3	160	—	—
	Total	3 204	3 517
Grand Total (A–F)		234 778	357 005

RURAL DOMESTIC WATER SUPPLY SCHEMES

As already mentioned above the construction programme of the Department included 49 No Rural Domestic Water Supply Schemes at an estimated cost of £774 996–. Although the number of schemes approved for 1976 is smaller than 1975, the amount on the approved schemes is higher by about £125,000.–

The extension of all approved schemes could not be completed, because, either the village loan was not available in time, or its magnitude was such that it could not be completed in one year.

Out of the 49 Water Supply Schemes included in the construction programme of 1976, 25 schemes were completed, 15 schemes were put in hand but not completed by the end of the year and carried over for completion in 1977, and 9 schemes could not be put in hand, and carried over for completion in 1977.

The total expenditure incurred on all water supply schemes reached the amount of £384,828.–

For easy reference these schemes are classified as under:

* Rural Domestic Water Supply Schemes completed in 1976.

* Rural Domestic Water Supply Schemes put in hand in 1976 but not completed and carried over for completion in 1977.

* Rural Domestic Water Supply Schemes not put in hand for various difficulties and carried over for execution in 1977.

A detail list for each of the above group is given below:–

Rural Domestic Water Supply Schemes completed in 1976

During 1976, 25 Water Supply Schemes were completed. The amount allocated for 1976 for these schemes was £141,580.– and the expenditure for their completion reached the amount of £91,640.– It is clarified that some of these schemes were carried over from 1975 and amount approved for 1976 does not represent the actual cost of the scheme which is much higher, as expenditure was made for these schemes in 1975.

These schemes are given in detail with a brief description on table V-4:

TABLE V-4 **RURAL DOMESTIC WATER SUPPLY SCHEMES COMPLETED IN 1976**

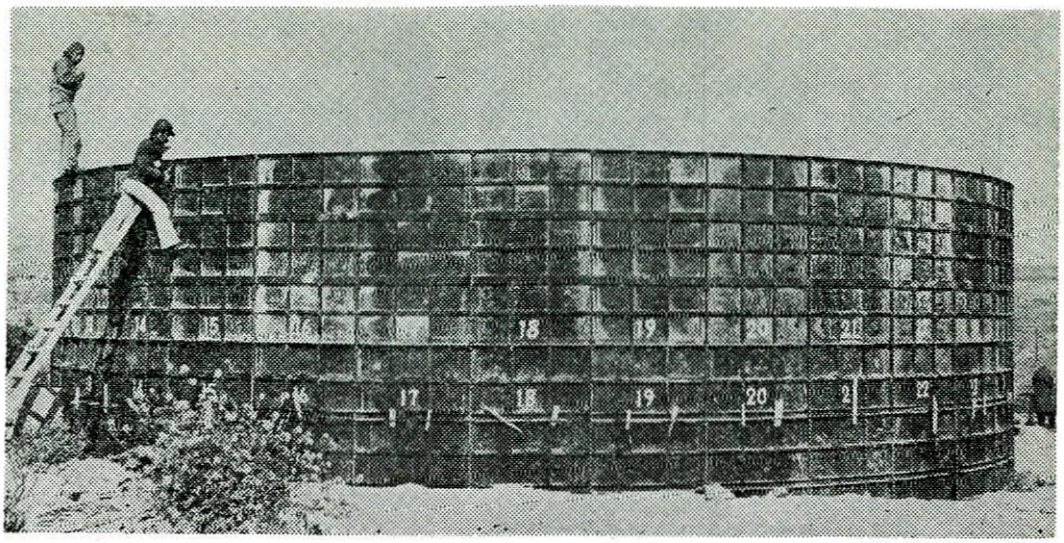
Ser No	Village	Approved amount for 1976 £	Expenditure incurred in 1976 £	Remarks
Nicosia District				
1	Kambia–Analiontas–Episkopio–Argates Regional Scheme	7 149	4 342	Borehole and conveyor
2	Pera	3 550	1 435	Borehole and conveyor
3	Galata	21 664	18 717	Storage tank & House-to-House supply
4	Paleometokho	2 080	519	Storage tank & House-to-house supply
5	Malounda	1 955	1 442	Improvements
6	Kato Moni	4 000	2 860	House-to-house supply
7	Galata–Kakopetria	3 000	2 057	Supplementary supply
Limassol District				
8	Sanidha	1 426	1 360	B.H. and storage tank
9	Ypsonas–Polemidhia	1 267	1 235	Improvements
Famagusta District				
10	Avgorou	5 000	3 894	Supplementary supply
11	Ayia Napa	2 284	785	B.H. and conveyor
12	Phrenaros	4 075	3 319	House-to-house supply
Larnaca District				
13	Voroklini	795	33	House-to-house supply
14	Ayii Vavatsinias	967	700	Compensations
15	Kiti	1 455	801	B.H. and conveyor
16	Xylotymbou	6 285	1 301	Conveyor
Paphos District				
17	Arminou Regional II	18 000	6 670	Supplementary supply
18	Paphos Lower Villages I	26 760	26 760	– do –
19	Tala	3 888	1 815	House-to-house supply
20	Pendalia	3 980	1 836	– do –
21	Psathi	1 462	183	– do –
22	Yiolou	844	762	Storage tank
23	Kato Akourdhalia	3 200	2 698	House-to-house supply
24	Asproyia	5 350	3 146	– do –
25	Akhelia	1 900	1 610	Storage tank
26	Stroumbi – Polemi	9 244	1 360	Borehole, storage tank, conveyor
	Total	141 580	91 640	

TABLE V–5 **RURAL DOMESTIC WATER SUPPLY SCHEMES NOT COMPLETED IN 1976 AND CARRIED OVER FOR EXECUTION IN 1977**

Ser No	Village	Approved amount for 1976	Expenditure incurred in 1976	Remarks
Nicosia District		£	£	
1	Pitsilia Regional I	31 950	19 705	Conveyors, storage Tank
2	Pitsilia Regional II	44 015	33 084	– do –
3	Kourdali	2 660	2 510	Storage tank, & H to H
4	Dhali	40 000	22 958	New distribution system
5	Linou	5 160	250	Storage tank, pumping unit and installation of w.m,
6	Laxia – Yeri	7 200	3 150	Supplementary supply
7	Piyenia	3 572	1 674	Installation of pump
Limassol District				
8	Moutayiaka Regional scheme	63 990	32 142	Suppl. supply and tanks
9	Souni – Zanaja	19 940	13 850	House–to–house scheme
Larnaca District				
10	Xylophagou	25 000	15 993	Storage tank
Paphos District				
11	Paphos Lower Villages II	119 800	119 800	Pumping installation
12	Paphos Lower Villages III	64 420	17 830	Reservoirs, pumps, pipes
13	Kato Akourdhalia	3 200	2 697	House–to–house scheme
14	Armou	3 319	1 055	Supplementary supply
15	Arminou Regional III	17 998	6 670	Conveyors, pumps, tank,
16	Ayia Marina (Kelokedhara)	1 948	820	Supplementary supply
	Total	453 402	293 188	

TABLE V–6 **RURAL DOMESTIC WATER SUPPLY SCHEMES CARRIED OVER FOR EXECUTION IN 1977**

Nicosia District				
1	Pedhoulas – Prodhromos – Moutoullas	50 000	—	Scheme to be revised
2	Kakopetria	33 600	—	Scheme rejected
Limassol District				
3	Pissouri	2 900	—	Acquisition of spring pending
4	Pendakomo	7 200	—	Scheme not ready
Famagusta				
5	Ayia Napa	13 000	—	Loan not available
Larnaca District				
6	Voroklini – Livadhia	6 920	—	Work suspended
7	Avdhellero	7 144	—	Loan not available
Paphos District				
8	Paphos Higher Villages	50 000	—	Administrative difficulties
9	Akoursos	9 250	—	Suspended – Turkish inhabitants left
	Total	180 014	—	



Steel Formwork for 500 m³ Storage Tank for Paphos Lower Villages Water Supply Scheme

Rural Domestic Water Supply Schemes not completed in 1976 and carried over for completion in 1977

Although these schemes were approved for execution in 1976, their completion could not be materialized, and they were carried over for completion in 1977. The reasons can be attributed, on the one hand to the delay in securing the village loan, and on the other hand to the magnitude of the schemes which did not permit their completion in a year's duration.

Such schemes are the Pitsilia Regional Scheme, Moutayiaka Regional Scheme and Paphos Lower Villages.

Another reason is also the delay in supply of electricity to the pumping units. The expenditure on these schemes–15 in number– was £293,188. The estimated cost was £453,402.

The expenditure on each scheme together with a brief description is given on Table V–5 that follows:

Rural Domestic Water Supply Schemes included in 1976 Development Estimates but not put in hand for various reasons and were revoted for construction in 1977

The execution of 9 schemes, at an estimated cost of £180,014.– included in 1976 Development estimates, could not commence during the year because, either the schemes were rejected by the beneficiaries or the village contributions were not available. These difficulties are of an administrative nature and lie beyond the control of this Department.

A list of these schemes is given on Table V–6

MINOR IRRIGATION SCHEMES

The 1976 construction programme for Minor Irrigation schemes included 74 schemes at an estimated cost of £688,814.– and the total expenditure incurred on these schemes was £395,869.–

Out of the 74 schemes included in the 1976 construction programme, 45 schemes were completed by the end of the year under review 22 schemes were still under construction by the end of the year, and work on another 7 schemes could not commence due to various administrative difficulties.

These 74 schemes have been classified, for easy reference, as follows:

* Minor Irrigation Schemes completed in 1976.
* Minor Irrigation Schemes not completed by the end of the year and carried over for completion in 1977, and
* Minor Irrigation Schemes not put in hand for various reasons, and carried over for construction in 1977.

A detail list for each of the above groups is given below:

Minor Schemes Completed in 1976

During 1976, 45 Minor Irrigation Schemes were completed by the end of the year under review. The estimated cost of these schemes was £280.687.– and the expenditure incurred on these schemes was £232,346.–. As some of these schemes were brought forward from the previous year, the approved amount for 1976 shown on table V-7 below, does not represent the actual cost of the schemes, as expenditure was also made in 1975.

TABLE V–7 **MINOR IRRIGATION SCHEMES COMPLETED IN 1976**

Ser No	Village	Approved amount for 1976	Expenditure incurred in 1976	Remarks
Nicosia District		£	£	
1	Potami – Pumping scheme	14 000	11 914	Storage tank, pumping unit and distribution system
2	Astromeritis	1 798	1 798	R C C channels
3	Argates 'Kourtoudhi'.....	882	562	R C C channels
4	Argates 'Fourkismenos'.....	17 573	14 259	R C C channels
5	Paleometokho Recharge	10 000	8 364	Gabbion weirs
6	Yialias Recharge – Nisou	4 220	4 084	– do –
7	Kalopanayiotis	857	592	Scheme completed in 1975. Improvements in 1976
8	Tembria – Korakou	5 277	4 986	Improvements to R C C channels
9	Pharmakas	5 080	4 210	
10	Orounda 'Matsari'	16 645	13 104	Pumping unit and distribution system
11	Tembria I & II	5 277	4 986	Lining of earth channels in R C C
12	Evrykhou I & II	3 960	3 720	– do –
13	Korakou I & II	8 070	7 419	– do –
14	Kakopetria	8 955	8 855	– do –
15	Evrykhou – Phlasou – Korakou I & II	436	68	– do –
16	Kaliana – Tembria	4 512	4 353	– do –
17	Korakou – Phlasou – Linou	14 990	14 702	– do –
18	Katydhata	10 135	9 524	– do –
19	Linou 'Linopsas'	16 327	15 426	– do –
20	Kambos	2 000	1 678	Improvements, pipelines
Limassol District				
21	Episkopi	27 360	20 874	Pumping unit and distribution system
22	Kato Platres	11 363	8 590	– do –
23	Kolossi	15 826	11 386	– do –
24	K. Amiantos – Pelendria	3 050	1 672	Piped distribution system
25	Agros 'K. Enetikos'	1 850	1 310	– do –
26	Pelendria 'Kountouridhes'	920	733	– do –
27	Pelendria 'Avlaki'	700	522	– do –
28	Pelendria 'Psilon Englisis'	4 450	3 550	– do –
29	Kyperounda 'Appis'	1 700	1 430	– do –
30	Kyperounda 'Khalospities'	3 700	2 579	– do –

TABLE V-7 (Continued)

Ser No	Village	Approved amount for 1976	Expenditure incurred in 1976	Remarks
		£	£	
31	Dhymes	2 800	2 378	Piped distribution system
32	Ayios Pavlos	2 300	1 606	– do –
33	Ayios Ioannis (Agros)	2 900	1 870	– do –
34	Lemythou	2 250	1 724	– do –
35	Pissouri	1 271	1 217	Improvements
36	Louvaras	1 300	1 245	Weir, piped distribution system
37	Kyperounda 'Kolymbos'	400	362	Remedial works
38	Tris Elies	1 111	231	Improvements
Paphos District				
39	Goudhi – Kholi – Skoulli	5 047	2 227	B H & pipe network
40	Yiolou	3 473	2 057	– do –
41	Nikoklia	1 474	206	– do –
42	Khoulou	18 592	16 602	Storage tank, B H & pipe network
43	Lemona	13 757	11 803	– do –
44	Peyia	717	700	– do –
45	Peristerona	1 382	868	– do –
	Total	280 687	232 346	

Minor Irrigation Schemes put in hand in 1976 but not completed by the end of the year and carried over for completion in 1976

As already mentioned above, 22 No Minor Irrigation Schemes, included in the 1976 construction programme, at an estimated cost of £274,227.– could not be completed by the end of the year and work continued over the following year.

The expenditure incurred on these schemes during 1976, was £163,523:–

These schemes are given on Table V-8

TABLE V-8 **MINOR IRRIGATION SCHEMES PUT IN HAND IN 1976 BUT NOT COMPLETED AND CARRIED OVER FOR COMPLETION IN 1977**

Ser No	Village	Approved amount for 1976	Expenditure incurred in 1976	Remarks
Nicosia District				
1	Peristerona – Astromeritis	20 500	3 368	R C C channels
2	Dhali 'Ftelia – Katevas'	10 926	5 291	Pending supply of electricity
3	Phlasou	20 960	16 340	R C C channels
4	Palekhori 'Maroulenas'	391	—	Compensations
5	Anayia	7 650	5 907	B H & pipe network

TABLE V–8 (Continued)

Ser No	Village	Appoved amount for	Expenditure incurred in	Remarks
		£	£	
6	Vyzakia	24 000	12 635	R C C channels
7	Akaki – Meniko	12 500	8 534	– do –
8	Peristerona	10 000	5 372	– do –
9	Astromeritis	10 000	8 180	– do –
10	Ayios Theodhoros (Solea)	2 000	1 229	– do –
Limassol District				
11	Saittas – Moniatis	3 300	2 939	Conveyor pipeline
12	Agros 'Anastasia'	6 000	5 339	Pipe distribution network
13	Ayios Dhimitrios 'Kaminia' ...	21 600	7 680	Irr. tank & pipelines
14	Ayios Dhimitrios 'Kaloyiros' ...	4 600	3 022	– do –
15	Pelendria 'Kato Englisis'	4 400	3 185	Distribution pipelines
16	Phini, Phase II	22 700	14 388	– do –
17	Paleomylos	16 600	15 756	Distribution pipelines
Paphos District				
18	Khoulou	11 500	7 665	B H & pipe network
19	Steni	20 000	15 328	– do –
20	Polemi	14 800	6 307	– do –
21	Skoulli	18 800	15 058	– do –
	Total	263 227	163 523	

TABLE V–9 **MINOR IRRIGATION SCHEMES CARRIED OVER FOR EXECUTION IN 1977.**

Ser No	Village	Approved amount for 1976	Expenditure incurred in 1976	Remarks
		£	£	
Nicosia District				
1	Galata 'Esso Galata'	6 000	—	Pending issue of loan
2	Yerakies	60 000	—	– do –
Limassol District				
1	Trimiklini	1 300	—	– do –
2	Perapedhi – Kilani	27 000	—	– do –
Paphos District				
1	Amargeti	6 000	—	– do –
2	Goudhi	22 600	—	Rejected
3	Polis	11 000	—	Loan not available
	Total	133 900	—	

Minor Irrigation Schemes included in 1976 construction programme but not put in hand, and carried over for completion in 1977

Seven schemes out of the overall 1976 construction programme could not be put in hand for administrative difficulties and/or rejected by the beneficiaries, and they were carried over for execution in 1977.

These schemes are shown on Table V-9

WATER SUPPLY SCHEMES FOR SELF HOUSING ESTATES FOR THE DISPLACED PEOPLE

This year the Department had to respond urgently to an influx of emergency Water Supply Schemes for Housing Estates and Self Housing Projects for the refugees.

At a first stage, these schemes provided for the conveyance of water for a temporary supply for building purposes and the permanent supply system following the road construction and other services.

These schemes were not included in the 1976 construction programme although they constituted a substantial amount of construction and demand in plant, labour etc. Being emergency schemes no provision was made in orders for pipes and pipefittings in 1976 estimates with a result that a pipe shortage was encountered. This was overcomed by placing new urgent orders, and by the adjustment of the construction programme according to priorities.

The schemes, 68 in number, were estimated at £485,562.–. The expenditure incurred during 1976 was £255,312.–. Work on some of these schemes was completed by the end of the year, while on others it was at an advanced stage by the end of 1976.

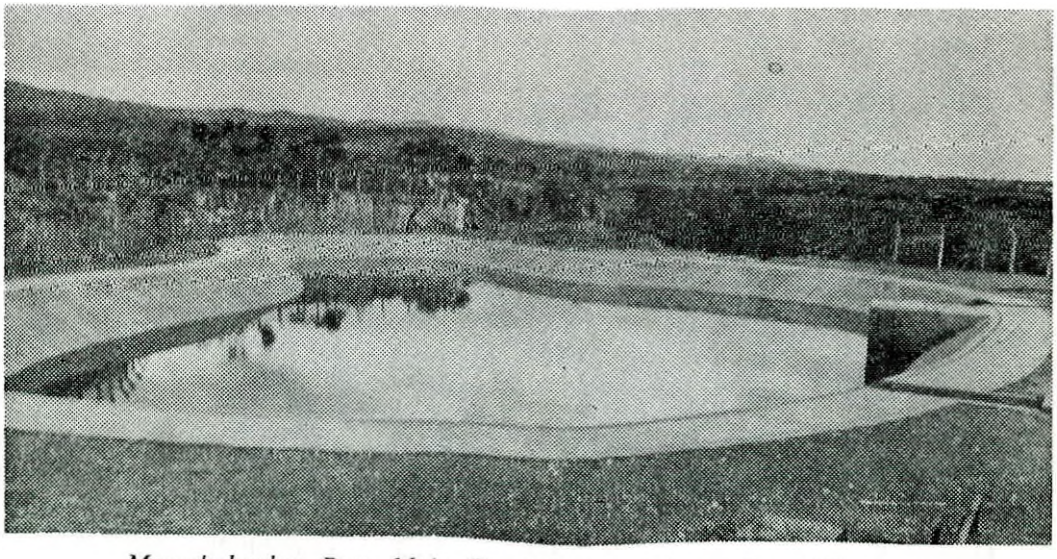
Details of these schemes are given on Table V–10.

MAJOR IRRIGATION SCHEMES

The 1976 construction programme included 20 Major Irrigation Schemes at a total estimated cost of £714,591.–. The total expenditure incurred on these schemes during the year was £585,021.–.

Detail reports on work carried out and progress on each particular scheme executed in 1976 are given further on, and a list of these schemes is given in table V–11.

The amount of £714,591.– included the construction of new schemes as well as the construction and completion of others which have commenced the previous year both in Distribution networks as well as Dam Construction and other structures.



Mavrokolymbos Dam Main Canal Terminal Reservoir at Kissonerga

TABLE V–10 **WATER SUPPLY SCHEMES TO HOUSING AND SELF-HOUSING ESTATES FOR DISPLACED PEOPLE**

Ser No	Village	Approved amount for 1976	Expenditure incurred in 1976	Remarks
		£	£	
For Housing Estates				
1	Anthoupolis	113 000	14 900	In progress
2	Laxia	1 400	1 454	completed
3	Laxia	22 000	19 606	In progress
4	Pano Lakatamia	8 000	6 557	– do –
5	Pano Lakatamia	800	228	– do –
6	Strovolos II	42 000	37 300	– do –
7	Strovolos III	29 218	26 560	– do –
	Total	216 418	106 605	
For Self–Housing Estates				
1	Akaki A	560	500	completed
2	Akaki B	1 400	1 363	– do –
3	Alethriko	4 600	3 396	in progress
4	Analiondas	1 600	259	– do –
5	Anayia	4 020	4 020	completed
6	Anglisidhes	1 250	756	in progress
7	Aredhiou	1 760	1 847	completed
8	Astromeritis	2 600	30	in progress
9	Avgorou A	—	—	suspended
10	Avgorou B	2 750	1 865	in progress
11	Avgorou C	7 850	260	– do –
12	Ayii Anargyri	22 500	12 607	– do –
13	Ayii Trimithias	800	735	completed
14	Ayios Athanasios III	1 780	1 300	– do –
15	Ayios Athanasios	8 000	7 486	– do –
16	Dhali	1 400	818	– do –
17	Dherinia A	3 300	2 960	in progress
18	Dherinia B	6 700	60	– do –
19	Dhromolaxia	5 600	3 133	– do –
20	Argates	2 050	306	– do –
21	Kalokhorio (L'ca) A	1 900	1 820	completed
22	Kalokhorio (L'ca) B	4 000	1 227	in progress
23	Kiti	5 500	260	– do –
24	Kokkini Trimithia	18 500	2 178	completed
25	Kolossi	9 000	730	in progress
26	Kophinou	1 550	1 346	completed
27	Laxia	9 932	10 150	completed
28	Liopetri A	3 200	2 200	in progress

TABLE V–10 **WATER SUPPLY SCHEMES TO HOUSING AND SELF-HOUSING ESTATES FOR DISPLACED PEOPLE (Continued)**

Ser No	Village	Approved amount for 1976	Expenditure incurred in 1976	
For Self–Housing Estates				
		£	£	
29	Liopetri	1 200	690	in progress
30	Livadhia	2 500	210	in progress
31	Malounda	1 000	1 000	completed
32	Mosphiloti	2 250	—	commencing 1977
33	Nikitari	1 600	203	– do –
34	Ormidhia A	4 700	2 578	in progress
35	Ormidhia B	2 500	42	– do –
36	Ormidhia C	900	961	– do –
37	Paleometokho	1 900	1 625	completed
38	Pano Polemidhia	10 300	1 368	
39	Paralimni A	3 300	3 400	in progress
40	Paralamni B	3 800	2 361	– do –
41	Pera	1 500	1 462	completed
42	Perakhorio (Nisou) A	1 200	816	– do –
43	Perakhorio (Nisou) B	1 250	805	– do –
44	Peristerona A	930	673	– do –
45	Peristerona B	750	95	in progress
46	Phrenaros A	2 000	1 502	completed
47	Phrenaros B.....	5 500	4 125	in progress
48	Psevdhas	1 300	1 036	– do –
49	Pyla	1 000	—	commencing 1977
50	Sotira A	2 300	1 600	completed
51	Sotira B	1 600	70	– do –
52	Tersephanou A	4 100	3 205	in progress
53	Trakhoni	5 400	843	– do –
54	Tseri	4 430	4 323	completed
55	Voroklini	1 500	152	in progress
56	Vrysoulles	3 852	3 352	– do –
57	Vrysoulles A .....,	39 300	26 372	– do –
58	Vrysoulles B	3 000	1 360	– do –
59	Xylophaghou A	2 300	2 087	– do –
60	Xylophagou B.....	10 300	4 472	in progress
61	Xylotymbou	6 500	510	– do –
	Total	270 244	136 712	

Grand Total 486,662 / 243,317.

TABLE V–11 **MAJOR IRRIGATION SCHEMES**

Ser No	Schemes	Amount approved for 1976	Expend. incurred in 1976	Remarks
		£	£	
Dams (Government)				
1	Mavrokolymbos Dam	2 492	2 045	
2	Yermasoyia Dam	2 838	1 603	
3	Lefkara Dam	11 401	3 822	
4	Argaka–Magounda Dam	32	30	
5	Ayia Marina Dam	120	—	
6	Kiti Dam	5 000	4 846	Remidial works
Dams (Contributory)				
7	Lymbia Dam	42 000	34 423	
8	Palekhori – Kambi Dam	6 130	1 561	
Distribution Systems (Govt.)				
9	Lefkara – Khirokitia pipeline	2 139	1 431	
10	Mavrokolymbos	33 049	28 382	
11	Yermasoyia Main Conveyor	23 070	16 750	Yermasoyia–Polemidhia Distribution
12	Akrounda – Phinikaria	35 995	33 840	
13	Phasouri	111 961	94 920	
12	Akrounda –Phinikaria	35 995	33 840	
13	Phasouri	111 961	94 920	
14	Zakaki	35 753	32 152	
15	Trakhoni	62 000	21 712	
16	Lefkara	16 381	14 610	
17	Pomos	378	338	
18	Kiti	1 467	1 232	
Distribution Systems (Contr.)				
19	Palekhori	24 685	22 034	
20	*Paphos Irrigation Project**	297 700	269 290	
	Total	714 591	585 021	

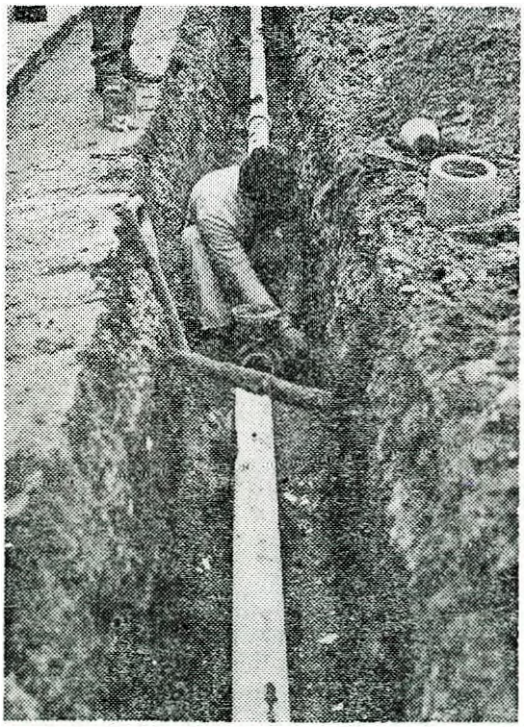
*This is included also under PAPHOS IRRIGATION PROJECT.

MAJOR PROJECTS

by
Ch. Palantzis
Executive Engineer I
Head, Major Projects
Construction Branch

During 1976 the following projects are being executed by the Major Projects Branch of the Construction Division.

1 New Engomi Reservoir
2 New Strovolos Reservoir
3 New Tremithos Reservoir
4 Lymbia Dam
5 Distribution System — Nicosia within the Walls
6 Distribution System — Nicosia Water Supply



Laying of New Water Supply Pipelines within the Walled City of Nicosia

Town Water Supply Schemes

The 1976 construction programme included 7 water supply schemes, at a total estimated cost of £621,300.–. The expenditure incurred on these schemes during the year reached the amount of £265,009.–

These schemes involved the construction of Reservoirs at Larnaca, Strovolos and Engomi and the laying of Major distribution mains for Nicosia Water Supply.

More details of these schemes are given further on while these schemes are listed in Table V–12.

TABLE V–12 **TOWN WATER SUPPLY SCHEMES**

Ser No	Schemes	Amount approved for 1976	Expend. incurred in 1976
		£	£
	Greater Nicosia Scheme		
1	Engomi Reservoir	19 100	16 500
2	Main Conveyors ...	100 000	88 117
3	Supplementary Water Supply	153 200	35 862
	Nicosia Water Board		
1	Extension of Distribution system	80 000	11 820
2	Strovolos Reservoir	112 000	19 970
3	Distribution system within the walls	40 000	36 370
	Larnaca Water Board		
1	Larnaca Reservoir	117 000	56 370
	Total	621 300	265 009

New Engomi Reservoir

For the efficient operation of the Water Supply of Nicosia and for meeting present and future demands by the consumers it was found necessary to construct a new water reservoir by the existing Engomi Reservoir. This New Engomi Reservoir was designed for a capacity of 20,000 m^3.

The structural analysis as well as the Design Drawings for this reservoir were prepared by the Design Division of the Department. It is a reinforced concrete reservoir with free standing cantilevered walls with the roof designed as a flat slab.

The estimated cost for this project was £256,000.

The works started on the 15th of February, 1974 and they were completed in March 1976. The various stages of construction involved:

Mass Excavation

It was all completed in 1974. The total Mass excavated was 13,380 m^3.

Limited Excavation

It was completed during 1974 and 1975 and it included a total excavation of 2,450 m^3. It was managed with the use of pneumatic drills.

Placing of Filter Materials

That involved the placing of filter materials in the drainage systems inside and outside of the reservoir. The total quantity applied was 1,300 m^3.

Concreting

Two mix designs have been used throughout this construction.

(a) Site concrete 1:3:6. Total quantity 1225 m^3

(b) Structural conrete 1:1 1/2 : 3. Total quantity 5050 m^3

Cubes were being taken and crushed so as to control the quantity of the structural concrete. The average crush strength at 28 days for 1:1 1/2 : 3 mix design using chemical additives was about 5500 lb/in^2 (386 kg/cm^2).

Formwork and Reinforcement

The formwork and the reinforcement took a fair portion of time and money in the cost and execution of the whole project.

Shuttering and reinforcement work started in spring 1974 and was completed by the end of 1975.

The formwork used was mainly of timber work with metal sheet lining in the case of walls.

Pipeworks

These works included the placing of the drainage system as well as the completion of all steel pipes and fittings regarding the operation of the reservoir.

The major part of the work on this aspect was completed by the end of 1975 and the rest during the first two months of 1976.

General Remarks

The works on the New Engomi Reservoir started early in 1974. obviously the Turkish invasion and the resulted interruption of the works was a set back as regards the progress of the works. As a result the work was falling behind schedule. It was planned and programmed to be completed by March 1976. Soon though due to increased unemployment, in an effort to assist as many refugees as possible the labour force at the site was increased a lot. This increase in labour force resulted in a proportional increase in the rate of progress and the New Engomi Reservoir was expected to be completed as originally scheduled. The progress rate on the reservoir itself can be considered satisfactory. Inevitably the same rate of progress could not be maintained during the external works. For the positioning of some of the external pipes we had to excavate at a depth of 7 m below ground level, with the use of pneumatic drills. At that depth we also had to place sluice valves, water meters and construct manholes.

As far as the expenditure is concerned and despite the fact that a considerable amount has been spent on items that were not included in the original estimate, the final cost of the Reservoir was £262,000.

New Strovolos Reservoir (See photo on p. 21)

The Nicosia Water Board in an effort to improve the Nicosia Water Supply System, has undertaken the construction of the New Strovolos Reservoir by the Existing reservoir. The capacity of this new reservoir is 7600 m^3 and the estimated cost £154,000.

The financing of the project was undertaken by the Nicosia Water Board while the design as well as the construction and supervision were all undertaken by the Water Development Department.

Work started on the New Strovolos Reservoir on the 2nd of June 1975 and they were completed in October 1976. The various stages of construction involved:–

Mass Excavation

The Mass excavation was completed by the end of August 1975. The total mass excavated was 4300 m^3.

Limited Excavation

The limited excavation was mainly carried out by hand and with the use of pneumatic drills. The total limited excavation reached the quantity of 800 m^3.

Placing of Filter Materials

In order to achieve the required filter grading the natural material had to be sieved and graded. A total amount of 200 m^3 filter has been placed and this operation was completed during 1975 as regards the internal draining system and early in 1976 as regards the externally placed filters.

Concreting

Structural concreting 1:1 1/2 :3 started at the end of July 1975. The initial rate was very slow because we were waiting for the erection of the tower crane. After that concreting proceeded very satisfactorily.

During 1975 most of the column footings, wall footings and cantilever walls were completed with the rest of the above and in addition the Floor Slabs and Roof Slabs were completed in 1976. Cubes were being taken and crushed so as to control the quality of the structural concrete. The average crush strength at 28 days for 1:1 1/2 :3 mix design using chemical additives was about 5500 lb/m^2 (386 kg/cm^2).

Formwork and Reinforcement

The formwork and reinforcement took a fair portion in time and money in the cost and execution of the whole project.

About 80% of the shuttering and reinforcement work was completed in 1975 and the rest, shuttering and reinforcement of floor slabs and roof slabs, were completed in 1976. The formwork used was mainly of timber work with metal sheet lining in the case of the walls.

Pipeworks

These works included all internal and external placing of pipes for drainage which was included in 1975 and also all the steel pipes and accessory fittings regarding the operation of the reservoir, which was completed in 1976.

General Remarks

The overall progress of the works was satisfactory and no unexpected difficulty has been met. During 1975 about 65% of the work has been completed and the rest 35% of the whole project was completed in 1976. The fact that a tower crane was used for the first time in such structures, has accelerated the works very much.

As far as the expenditure is concerned the final cost of this Reservoir was £150,000.– compared with the originally estimated amount of £154,000.

NEW TREMITHOS RESERVOIR

The Larnaca Water Board in order to meet present and future water supply demand in the town of Larnaca, has undertaken the construction of the Tremithos Reservoir.

The type of this reservoir is similar to that of Engomi and Strovolos reservoirs.

Both Design and Construction have been undertaken by the Water Development Department.

The capacity of this reservoir is 7700 m^3 and the estimated cost is £180,000.

The works commenced early in August 1975.

The various stages of the works involve:–

Earthworks

The Mass Excavation of the reservoir was carried out by a bulldozer and a traxcavator. The total excavated quantity was 15500 m^3 and it was done by mid November 1975.

The limited excavation which was carried out by hand and with the use of pneumatic drills was partly done in 1975 and completed in 1976. The total quantity excavated was 1355 m^3.

Placing of Filter Materials

In order to achieve the required filter grading the natural material had to be sieved and graded. A total amount of 500 m^3 of filter was placed in 1975 and another quantity of 600 m^3 was placed in 1976.

Concrete

Site concreting 1:3:6 commenced in October 1975 and continued in 1976 too.

Structural concreting 1:1½:3 commenced in December 1975 and continued till the end of 1976.

During 1975 a total amount of 250 m^3 had been cast while an additional quantity of 2050 m^3 was cast in 1976. The crushing strength is 5500 lb/cm^2 (386 kg/cm^2) and the resulted rate for structural concrete is £12/m^3.

Formwork and Reinforcement

The Tremithos Reservoir being the same type as Engomi and Strovolos Reservoirs and therefore the same formwork has been used here as well. By the end of 1975 700 m^2 of formwork and about 60 tons of reinforcement had been used. During 1976 another 5800 m^2 of formwork and another 180 tons of reinforcement had been applied.

As far as formwork and reinforcement work is concerned, the reservoir construction has been completed, and there are only external works such as manholes yet to be done in 1977.

Pipeworks

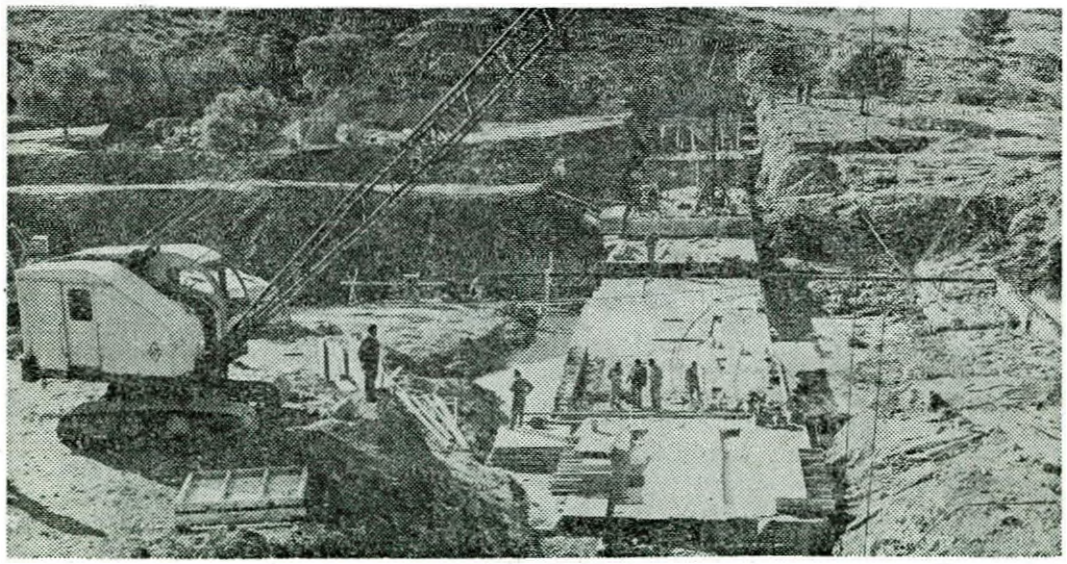
Most of the pipes for the internal and external drainage system were placed during 1976. Also some fittings were placed late in 1976. The rest of the external pipes, connection and fittings for the complete operation of the reservoir are to be positioned early in 1977.

General Remarks

The overall progress of the works was satisfactory and no unexpected difficulty has been met. About 90 % of the actual work has been done during 1976.

The whole project is anticipated to be completed by June 1977.

Regarding the financial aspect, the project will be completed at the total cost of about £165,000 compared with the approved £180,000.



New Lymbia Dam under Construction

LYMBIA DAM

This is a project concerning:

* The construction of a Concrete Gravity Dam approximately 5 km Southwest of Lymbia Village.
* The construction of a Concrete Irrigation Channel 5 km long.

Concrete Gravity Dam

The dam under construction is a mass concrete gravity type. It has a maximum height of 12 m above lowest foundation. The length of the crest is 121 m. It consists of 15 vertical blocks extending over the entire height of the Dam. The capacity is 220,000 m^3 and the estimated cost is £86,000.

Irrigation Channel

This is a concrete channel of 5000 m length and of rectangular cross section, 60 cm wide and 40 cm height. Along this concrete channel there will be a number of outlets for irrigation purposes.

General Remarks

The works for the construction of this Dam started in June 1976. The excavation, which started after completion of all necessary survey work, consisted of two parts. The mass excavation, which was done with the use of a traxcavator and the limited excavation which was done with the use of pneumatic drills. The total excavated volume was 4600 m^3.

The concreting started on the 28th of September 1976. The total volume of concrete is estimated to be 5000 m^3 and by the end of 1976 around 2000 m^3 have been cast. The average cube crushing strength for each mix design is as follows:

1:2:4 3250 lb/in^2 (228 kg/cm^2) (28 days)
1:2½:5 2800 lb/in^2 (197 kg/cm^2) (28 days)
1:1½:3 4200 lb/in^2 (295 kg/cm^2) (28 days)

Drilling and grouting started on the 28th of September 1976 and was scheduled to be completed in the second quarter of 1977.

In general the works are proceeding according to the original programme and no technical or financial problems are anticipated. The Dam is expected to be completed by July 1977 while the Irrigation Channel is scheduled to start early in 1977 and will also be completed within 1977.

NICOSIA WITHIN THE WALLS DISTRIBUTION SYSTEM

During 1973 and 1974 the Nicosia Water Commission was working on the installation of a pressurised water supply system in the within the walls area of Nicosia. Unfortunately these works stopped in 1974 because of the Turkish Invasion and the resulted situation. By then only 40% of the whole project was completed. Towards the end of 1975 the Nicosia Water Commission decided to complete this New System. The Water Development Department undertook the construction and the works started on the 12th of January 1976.

The various stages of this project involved:

Excavation

Where there were no other utility lines running along or crossing our trenches the excavation was being done relatively easy with the use of the 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 12" above the top 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 ¾" to 1" dia. P.V.C. (Polyvinic Chloride) pipes, also class "B".

After laying the pipes and backfilled to grade, all newly laid pipes were subjected to leakage test at 120 p.s.i. The water mains were being tested in sections never exceeding 400m. 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, within six months we had installed about 30% of the whole system.

For the work performed during the period of January–July 1976, the expenditure was as follows:

*	Purchasing of pipes and specials	£11,087
*	Construction of Water Supply System	£13 400
*	Cost of Asphalting	£11 000

Unfortunately the project was again interrupted in July 1976. The reason this time was due to the fact that the Nicosia Sewage Board had decided to complete their system in the within the walls area. The coordination of the construction works for the two systems in some of the remaining streets was advisable and since the Sewage Board was going ahead early in 1977 the completion of the new pressurised water system was postponed.

NICOSIA WATER SUPPLY DISTRIBUTION SYSTEM

For the efficient operation of the Nicosia Distribution System it was found necessary to reinforce the system so as to increase its capacity. Among others it was necessary to install a pipeline from New Engomi Reservoir to Kalypso Street through Grigori Afxentiou Avenue and then onwards, from Kalypso Street to Solomos Square. The purpose of this pipeline is to provide sufficient capacity of water to areas 9 and 5 and to the within the walls city of Nicosia. At the same time it relieves the existing ring main which supplies areas 9, 10, 11, 12, 13, 14 and 15.

In installing this new trunk main there are two parts: One from the New Engomi Reservoir to Kalypso Street which is a pipeline of 700 mm and 500 mm and is estimated to cost £130,000 and one from Kalypso Street to Solomos Square which is a pipeline of 500 mm, 400 mm and 250 mm and is estimated to cost £84,000.

Excavation and Pipelaying

Excavation is being done relatively easy with the use of diggers, except in cases where there was any difficulty or possibility of damaging other utility lines where hand excavation was carried out with the use of air compressor and pneumatic drills. After the excavation and the bedding the pipes are positioned and tested to a pressure of 120 p.s.i. (8.5 kg/cm^2) before backfilling and flushing.

Remarks

The works started in August 1976 and were scheduled to be completed in August 1977. During 1976 about 50% of the work was completed and about £100,000 was spent.

W D D WORKSHOP

In 1976 the W D D Workshop carried out the following work at a total cost of £61,969.

1	Pumping installations for 47 W S and irrigation schemes ...	£32 620
2	Pumping installation repairs for 90 W S and irrigation schemes.....	£ 9 912
3	Electrical installations, masonry and carpentry works, erection of tower tanks at refugee estates etc.	£15 757
4	Despatching of materials and stores.....	£ 3 680
	Total	£61 969

The Workshop keeps on stand by for emergency problems of water supply the following equipment:

9	mobile electric generators
14	diesel engines
6	turbine pumps
12	centrifugal pumps
11	electrosubmersible pumps

PAPHOS IRRIGATION PROJECT

by
K. Spanos
Executive Engineer II
Deputy Project Manager

General

The Paphos Irrigation Project is the largest and most important project ever undertaken by this Department. It will irrigate about 38,000 donums, mainly by sprinkler or drip irrigation method, situated along the coastal strip some 38 km long between Khapotami river to the east and Ayios Yeoryios to the west by some 3 to 4 km wide. The water requirements for the irrigation of this area are calculated to be 36 MCM/year which will be provided from the dam reservoir planned at Asprokremmos on the Xeropotamos river and 24 boreholes in the gravel aquifers of the rivers Ezuza, Dhiarizos and Xeropotamos.

The estimated cost of the Project in December 1973 was £14 million and by now should be considered over £18 million. The foreign component of the project was estimated to be £7 million of which £5 million will be financed by the World Bank under a loan agreement which was first signed between the Bank and the Government of Cyprus in January 1974 but due to the Turkish invasion the works were delayed and the said agreement became effective from October 1975. In 1976 the sum of £113,232 was withdrawn from the loan. According to this agreement the Water Development Department were to receive the services of well recognised Consulting Engineering Firms for the final design work and contract documents and supervision of the construction works. Towards this effect two contracts for Consultants were awarded:

Sir M. MacDonald and Partners in association with Howard Humphreys Ltd of London who will be responsible for the preparation of the working drawings and specifications of Asprokremmos Dam and the supervision of its construction. The dam will be of rock fill type with a vertical rolled-clay core in the middle and will have a storage capacity of 51 MCM. The cost of consultants fees was fixed to be £181,101.

SOGREAH Consulting Engineers of Grenoble, France, who will be responsible for the design of the whole Distribution System. This includes the Main Canal, the wellfield conveyance system and wellpumps, a main supply pipe conveyor, the pumping stations and reservoirs and all irrigation networks. The consultants fees were agreed to be £265,669.

PROGRESS OF THE WORKS

Engineering design and Contract Documents

During the year under review the main activities of the project were the preparation of the working drawings and specifications for the various contracts by the two foreign Consultants who have been working in close collaboration with various sections of WDD through Mr. B. Milinusic the Project Manager. The works performed by the two Consulting Engineering Firms were as follows:

SOGREAH Consulting Engineers, Grenoble France

It has been decided that the implementation of the Distribution System will be carried out through several supply and construction contracts which will involve altogether 9 separate tendering proceedures. A list of the Tender Documents for these contracts which were under preparation by SOGREAH during 1976 is given in the table overleaf:

With regard to the design of the future road network for the Project area which will serve both the irrigation network and the future land consolidation in the area, SOGREAH, through the Project, has been continously in contact with L.C.A. in order to achieve an optimum solution for the above two purposes.

It is expected that for the completion of the last tender document there will be a delay of about 2 months, on the target date 1.3.77 fixed by the Agreement. Generally all delays to the above tender documents were due to the larger scope of studies and investigations WDD has contributed in the work of the Consultants in the following way:

a) Carrying out site/material investigations, hydrological studies and survey works details of which are given elsewhere.

b) Participation in the preparation of the detailed designs and tender documents by sending Mr. K. Spanos Executive Engineer to the Consultants' main offices at Grenoble where he worked with the Service of Irrigation Division of Sogreah on the Project from 17.11.75 till 25.6.76.

c) Reviewing all contract documents completed in draft form so far and preparing whenever required necessary modifications.

For that purpose in the case of the main canal a mission to Grenoble consisting of Mr. K. Hassabis, Assistant Director of WDD and Mr. B. Milinusic, Project Manager, was carried out between the 22nd and 12th of May 1976. During this mission some important issues and main lines of the project were also agreed and fixed.

INFORMATION ON THE PREPARATION OF TENDER DOCUMENTS

No	Tender document	Target for completion Date of TD	Completed to end of 1976 %
1	Main Canal	1. 4.76	100
2	Supply and installation of well pumps	1. 1.76	95
3	Supply of canaletti, pipes and valves for wellfield conveyance	1. 1.76	95
4	Installation of wellfield conveyance	1. 2.76	95
5	Supply of pipes and fittings for irrigation networks	1. 3.77	50
6	Main Contract: Supply and installation of Pumping Stations, Rising Main and Western Main pipeline	1.11.76	40
7, 8 & 9	Construction of Irrigation Networks	1. 7.76 to 1. 3.77	50

INVITATIONS FOR TENDERING

The first contract for the construction of the Main Canal was advertised on 18.4.76 and the offers were publicly opened two months later. After a careful analysis and examination of all the offers the contract was finally awarded to GENERAL CONSTRUCTION Co. Ltd. on 14.9.76 for the sum of £992,826.

In November 1976 invitations for prequalification for the rest of the future contracts were announced and by the end of the year the proceedure was still in progress.

Sir M. Macdonald and Partners, Cambridge, U.K.

During the year under review the Consultants have been working on the detailed design of the dam and the preparation of the final working drawings and specifications. Their work is expected to be completed within the first few months of the year 1977.

In order to be able to carry out correctly their design work the Consultants requested on February 1976 for site and laboratory investigations which were undertaken by the laboratory section of WDD in close cooperation with Geological Survey Department. All the investigations, details of which are given elsewhere, were completed by the end of October 76 and the obtained results which were generally satisfactory were sent to the offices of the Consultants.

In addition to the above a contract has been placed with the British Hydromechanics Research Association (BHRA) to carry out model tests on the spillway and tunnel at the cost of £19,000. WDD sent in September 1976 Miss K. Maratheftou, laboratory technician to BHRA to follow the works on modelling and be trained in model testing.

Prequalification procedure for the Dam Main Contract and its Geotechnical Contract has been completed by the end of the year 1976. Construction works on the Dam is scheduled to start by the end of the year 1977.

ORGANIZATION AND MANAGEMENT

The organization and management of the project is described in detail in the Project report No. 4 (Libr. No D/13) by Mr. B. Milinusic which was finalised

and approved by the Government in January 1976. This report presents as well in a way a provisional budget for the Project Administration, building facilities, equipment and machinery, engineering and supervision and training of officers. The complete project organization including the concerned committees with their composition is as follows:-

Project Policy and Coordination Committee

In order to coordinate the activities of concerned Departments at the highest executive level and to lay down policies that would ensure a timely completion of the project the Project Policy and Coordination Committee (PPCC) was set up under the chairmanship of the Minister of Agriculture and Natural Resources.

During the year 1976 PPCC held three meetings on 16.2.76, 8.6.76 and 10.11.76 during which the progress of works, land consolidation problems, engagement of staff, distribution of chiftliks land to farmers, water needed for industrial development, organization of marketing for agricultural crops, etc., were discussed.

Project Advisory Committee (PAC)

This committee was established under the chairmanship of the Paphos District Officer and with members people who are directly involved with the Project developments as shown on the above said chart. The aim of this committee is to maintain a contact among all the people concerned with the Project in order to have everybody's view for achieving the best results from the Project operation. During the year 1976 PAC held two meetings on 28.5.76 and 19.12.76 which were proved very useful as they offer the chance for explaining to the farmers the Project objectives and hearing the farmers' opinion on the various problems they are facing.

Offices and Personnel

The temporary offices for the project at Yeroskipos which consist of 2 barracks were put in operation in November 1976. A soil and concrete laboratory was also built at Timi for the control of the construction works and it started functioning just before the end of the year.

On the 3rd December 1976 the total number of personnel employed permanently in the Paphos Project was 20 as shown analytically in the table below:

PAPHOS PROJECT PERSONNEL		Administration	Supervision	Laboratory	Survey	Other
No	Title					
1	Executive Engineer (I & II)	3	2	–	–	–
2	Technical Assistant	–	5	–	2	–
3	Laboratory Technician (hourly)	–	–	2	–	–
4	Draughtsman	–	–	–	–	2
5	Secretary	2	–	–	–	–
6	Drivers (hourly paid)	–	–	–	–	2
	Total	5	7	2	2	4

It is expected that by the end of the year 1977 about 28 No new staff will be employed for the Paphos Project.

The permanent Central Project Offices will be also built at Yeroskipos. The working drawings and specifications for their construction which will begin in March 1977 have been prepared by the Architects P.A.C. Ltd of Limassol and submitted to WDD in December 1976. In the same month Tenderers were invited to submit their offers for the construction of the Offices and by the end of the year tendering procedure was still in progress.

CONSTRUCTION AND SUPPLY WORKS

These works are divided in four types

by WDD	by EAC
by GSD	by Contract

By Water Development Department

After the departure of U.N. Forces from Paphos the Government took over their military camp St. Patrick and made available to WDD all existing premises for the needs of the Project. The operation of dismantling, transporting and erecting of the required

barracks was undertaken by WDD. During 1976 the following number of barracks and relevant works were completed:

For the Yeroskipos temporary offices:

Dismantling and erection of 42 No barracks

two for Project offices	550 m²
one for Paphos Regional Office	250 m²
one for Farmer's Education Centre	125 m²
Dismantling and erection of one Garage	295 m²
Dismanting and erection of one Nissen Hut	85 m²

Construction of access road asphalted 340 m

Electricity supply and telephone installation

For Agriculture Research Institute, Akhelia Sub - Station:

Dismantling and erection of one barrack of 126 m²

For soil/concrete labaratory at Timi:

Dismantling and erection of one Nissen Hut 140 m²

Part of this was given to the Contractor of Main Canal as Store.

By Geological Survey Department

The G.S.D. has undertaken the drilling, casing and water pressure tests of all the Project boreholes in the three river gravel aquifers ot Dhiarizos, Ezuza ond Xeropotamos.

Drilling operations started from the year 1974 and works continued thonghout the years 1975 and 1976. Altogether 32 No successful boreholes were drilled, cased and tested at the cost of £82,500.

Out of this number 24 boreholes (13 No in Dhiarizos, 8 No in Ezouza and 3 No in Xeropotamos) will be equiped with electrical submersible pumps and used by the project. From the remaining 8 boreholes 6 are in the Xeropotamos river bed upstream of the dam site and will not be used, 1 is already equiped and used by the Department of Agriculture and 1 will be kept as stand-by.

By Electricity Authority of Cyprus

The EAC has prepared in cooperation with the Project the necessary planning for the supply and installation of electrical equipment in order to be able to give the required power supply to each pumping unit in the time needed according to our schedule of works. The EAC has received all necessary information prepared by Sogreah regarding the power supply at different points of the Project works. The total maximum load will be 6,575 KVA for the 16 pumping stations and 24 boreholes. In order to meet the above power requirements the EAC has built during 1976 a 66/11 KV Sub–station near Xeropotamos river at the cost of £68,850.

By Contract

Supply of machinery and equiqment

During 1976 3 international tenders were called for the supply of machinery and equipment of the Project. The Tender Board awarded to various suppliers the supply of the requested items the cost of which was as follows:

Contract No	Description	£
S.20	Soil–Concrete laboratory equipment	5 544
	Soil–water laboratory equipment	4 671
S.21	Survey equipment	4 920
S.22	11 Truck, 1 Mobile Crane 4 Pick-ups, double cab 2 station wagons 8 Land Rovers	51 467
	Total	£66 602

At the end of the year the delivery of the above equipment and machinery was still in progress.

CONSTRUCTION OF MAIN CANAL

The Contractor for the construction of the Main Canal started works towards the end of October 1976 but their progress during the remaining two months of the year was very slow due to some difficulties with the mobilization of the Contractor.

The amount of work carried out up to the 15th December 1976 was as follows:

Work carried out during 1976

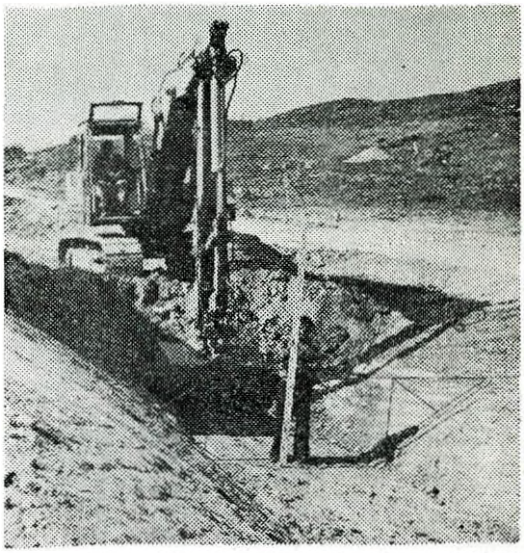
Description	Quantity	Unit
Canal		
Stripping	26 380	m^2
Normal excavation	11 000	m^3
Ripping "	50	m^2
Blasting "	150	m^2
Culverts		
Normal excavation	1 100	m^3
Blinding Concrete	302	m^2
Concrete 350/25	15	m^3
Reinforcement	2 000	Kg
Formwork	60	m^2

The total amount paid to the main canal Contractor up to the end of the year is given below:

Financial information

The table below shows the actual expenditure which incurred during 1976 for the various project works.

No	Description	Expend. £
1	Engineering and admin.:-	
	Project organization	39 800
	Consulting Firms	122 000
2	Buildings	20 700
3	Machinery and Equipment	14 000
4	Civil Works	
	Wellfield	82 500
	Main Canal	114 500
	Power Supply	75 400
	Total	468 900



Excavation of Paphos Irrigation Project Main Canal

Compaction Tests Carried out at Asprokremmos Damsite

VI DIVISION OF OPERATION AND MAINTENANCE

By
N. Tsiourtis
Executive Engineer II
and
G. Charalambous
Superintendent of Works

Introduction

This Division includes the branches dealing with:

* *The management, operation and maintenance of Major Irrigation Projects.*
* *The maintenance of contributory irrigation projects, and*
* *The operation and maintenance of Town Water Supplies.*

MANAGEMENT AND OPERATION OF MAJOR IRRIGATION PROJECTS

The management and operation of major irrigation projects is carried out by Waterworks Committees set up according to cap. 341 in cases of Government Waterworks and by Irrigation Division Committees in the case of a project constructed according to the Irrigation Division Law (cap 342). For Government Waterworks Irrigation Projects the Waterworks Committee is usually composed of the following officers and persons.

* District Officer of the District in which the project is situated: Chairman
* Director of the Water Development Dept or his representative: Member
* Director of the Department of Agriculture or his representative: Member
* Land Surveys' Department District Officer: Member
* Two or more farmers elected by the beneficiary farmers.

The duties and responsibilities of the waterworks Committee are, to see that the project is functioning according to the regulations set up by the Government, and taxes and dues are collected on a consideration of the water provided by the Republic.

SUMMARY OF MANAGEMENT AND OPERATION DATA FOR 1976

General

The year under review was a normal year and most of the major dams, Yermasoyia, Ayia Marina, Pomos, Argaka–Magounda, Kalopanayiotis and Palekhori were filled to spillway crest whereas the rest, such as Polemidhia, Mavrokolymbos, Kiti and Lefkara collected smaller quantities.

TABLE VI–1 **MAJOR IRRIGATION PROJECTS – DATA FOR 1976**

No	Project	Capacity $m^3 \times 10^3$	Area command. donums	Water in storage $m^3 \times 10^3$	Water utilized $m^3 \times 10^3$	Area Irrigated donums	*Water Ut.* Stor. cap. %	*Area Irr.* Area com. %	Evaporat. Losses $m^3 \times 10^3$	Leakage Losses $m^3 \times 10^3$
1	Argaka – Magounda	1 150	2 340	1 150	1 200	2 207	104.3	94.3	90	8
2	Ayia Marina	300	1 500	300	325	570	108.3	38.0	25	50
3	Kalopanayiotis	390	435	390	133	435	34.0	100.0	10	247
4	Kiti	1610	6 200	250	211	500	13.1	8.0	16	23
5	Lefkara* ...	13 850	615	7 637	16	30	62.7	4.9	(1 600)	N
		(400)[2]		(400)[2]					32	
6	Mavrokolymbos	2 180	3 335	1 874	1 462	1 983	67.0	59.1	100	N
7	Palekhori ...	620	1 000	620	400	1 000	64.5	100.0	50	N
8	Pomos	860	2 050	860	946	597	110.0	20.9	70	330
9	Polemidhia	3 430		1 730					176	740
			11 050		3 696	10 054	21.70	91.0		
10	Yermasoyia	13 500		13 500					1 508	324
	Total ..	37 890		28 311						
			29 345		8 389	17 375	34.3	59.2	2 077	1 722
		(24 440)[2]		(21 074)[2]						

* This project is mainly for D.W.S. 2 Quantity allocated for irrigation
N Negligence

As major irrigation projects are considered those listed in Table VI–1.

Table VI–1 also shows the project reservoir capacities, the area commanded, the water utilized and the area irrigated during the year under review. It also indicates the evaporation and leakage losses.

Water availability and its use

During the year under review the total quantity in storage in all ten major dams in Cyprus amounted to 28,311,000 m^3. Of this quantity only 21,074,000 m^3 was allocated for irrigation purposes. After deducting leakages and evaporation losses the net water available for irrigation was reduced to 17,275,000 m^3. From this water only 8,388,000 m^3 (48.5%) was used for irrigation purposes and another 816,000 m^3 was used for recharge purposes.

The total quantity of 8,388,000 m^3 was used for the irrigation (either fully or partly) of 17,376 donums of permanent and seasonal crops. Details of the crops irrigated are given in Table VI–2.

TABLE VI–2

CROPS AND AREAS IRRIGATED

No	Crops	Area in Donums
1	Citrus	5 420
2	Bananas	761
3	Vines	1 932
4	Deciduous	789
5	Vegetables	6 892
6	Potatoes	523
7	Cereals	1 040
8	Olives	19
	Total	17 376

Of the total water utilized for irrigation 6,624,000 m^3 (or 79% of the quantity utilized) was sold to the farmers at the nominal rates given in Table VI–3. The

remaining 1,764,000 m³ was allowed free of charge as water rights.

The gross income from the sale of water from the 9 major dams (excluding Palekhori Dam which is constructed according to the Irrigation Division Law) increased this year to £73,747 compared with £60,600 for 1975. This rise is due mainly to the completion of the Zakaki and Phassouri Extensions which increased the area commanded of the Yermasoyia–Polemidhia Project. The average price of water sold amounted to 11.13 mils/m³. The management costs (energy requirements, waterguards and other personnel) amounted to £18,627 compared with £12,619 for 1975. The increase was due to the high cost of the energy requirements in the Akrounda–Phinikaria Extension (£2272/year). The average cost of management and operation expences per m³ of water sold (excluding power cost) was 2.47 mils. In some projects where the networks consist of channels and pipes the costs are considerably higher than those with closed networks.

The maintenance expenses were around £4496 which is near the average for the last 9 years. The average maintenance cost per m³ of water sold is 0.40 mils.

The net income after deducting management operation and maintenance expenses (£23,123) was £50,264 which is the higher ever achieved. See Table VI–4 for details and for records of the past nine years.

TABLE VI–3
WATER CHARGES IN MILS/m³ VALID FOR 1976

No	Project	Overflow	Vegetables	Vines	Deciduous	Citrus	Flat Rate
1	Argaka–Magounda	Free	—	—	—	—	10
2	Ayia Marina	5	—	—	—	—	10
3	Kalopanayiotis	–	—	—	—	—	18
4	Kiti	3	—	—	—	—	10
5	Lefkara	–	—	—	—	—	10
6	Mavrokolymbos	–	10	15	15	15	—
7	Palekhori	Contributory Scheme					Free
8	Pomos	5	10	15	15	15	10
9	Polemidhia	3	10	15	15	15	—
10	Yermasoyia						

Evaporation losses from the ten major dams during the year 1976 amounted to 2,077,000 m³ (9.85% of the total water allocated for irrigation). Leakages, through, under or from the abutments amounted to 1,722,000 m³ or 8.4% of the water allocated for irrigation. A big quantity of this water amounting to 1 MCM was intercepted and utilized for irrigation purposes. The rest was used to recharge the aquifers downstream. Details about each project separately are given in the following sections of this report. A summary of data for each project is given in Table VI–5.

TABLE VI–4 DATA ON WATER USAGE FOR 1976

No	Data	Year 1968	1969	1970	1971	1972	1973	1974	1975	1976
1	Capacity 1000 m³	23 420	23 420	23 420	23 420	23 420	23 420	37 890	37 890	37 890
2	Water in storage	NA	NA	6 160	5 352	3 777	1 858	6 367	27 612	28
3	Water Utilized for irrigation ...	NA	NA	NA	NA	NA	NA	NA	7 776	8 388
4	Water sold 1000 m³	1 185	1 038	1 961	2 467	2 757	971	2 544	5 522	6 624
5	Water given free	NA	NA	NA	NA	NA	NA	NA	NA	1 764
6	Water utilized for recharge ...	NA	NA	NA	NA	NA	NA	NA	NA	6 016
7	Gross income £	15 363	21 241	22 594	26 891	29 391	11 137	26 138	60 600	73 747
8	Operational Cost £	3 507	5 911	5 849	7 688	7 282	6 450	11 048	12 619	18 627
9	Maintenance Cost £	858	7 582	5 328	3 342	4 849	4 278	4 603	3 174	4 496
10	Total Expenses £	4 365	13 493	11 177	11 030	12 131	10 728	15 651	15 793	23 123
11	Net income £	10 998	7 748	11 417	15 861	17 260	409	10 487	44 808	50 264

NA – Not available

TABLE VI–5 **DATA ON MANAGEMENT, OPERATION AND MAINTENANCE OF MAJOR IRRIGATION PROJECTS**

Ser No	Project	Capacity m^3x10^3	Max. Water Stored m^3x10^3	Water Used m^3x10^3	Water Sold m^3x10^3	Gross Income	Expenditure Oper.	Maint.	Total	Net
						£	£	£	£	
1	Argaka – Magounda ...	1 150	1 150	1 200	583	5 830	868	277	1 145	4 685
2	Ayia Marina	300	300	325	325	2 805	1 539	183	1 722	1 083
3	Kalopanayiotis	390	390	133	133	2 398	1 140	433	1 573	825
4	Kiti	1 610	250	211	211	2 116	486	2 729	3 215	-1 099
5	Lefkara	13 850	7 637	16	16	159	—	—	—	159
6	Mavrokolymbos	2 180	1 874	1 462	1 275	15 364	2 595	74	2 669	12 695
7	Palekhori ...	620	620	400	NIL	NIL	—	—	—	—
8	Pomos	860	860	946	946	7 939	3 218	294	3 512	4 427
9	Polemidhia	3 430	1 730				6 509	648		
				3 696	3 135	37 131			9 747	27 384
10	Yermasoyia	13 500	13 500				+2 272	318		
	Total ..	37 890	28 311	8 389	6 624	73 747	18 627	4 496	23 123	50 624

ARGAKA MAGOUNDA PROJECT

General

The Argaka Magounda Irrigation Project consists of a dam reservoir of maximum capacity 1.15 MCM and a distribution system made of closed distribution networks commanding an area of 2340 donums.

Irrigation in the project area started early in January 1976 and continued throughout the year until the end of December 1976. An area of 2207 donums was irrigated by utilizing about 1.20 MCM of water. The area irrigated was planted with Citrus, Bananas, Vines, Deciduous, Vegetables and Cereals.

Part of the water utilized for irrigation was released and charged to the farmers at the nominal rates whereas the overflow was taken by the farmers free of charge as per their water rights.

Out of the 1.2 MCM of water utilized, 583,000 m^3 was sold to the farmers at the normal rates whereas the remaining 617,000 m^3 was taken from the overflow. The total gross income from the sale of water was £5,830. The expenditure for maintenance works was £277 where the expenditure for operation and management amounted to £868. Net income to the Project was £4,685.

Project Hydrology

The project hydrologic data as recorded during the year are tabulated on Table VI–6.

TABLE VI–6

ARGAKA MAGOUNDA DAM HYDROLOGY FOR 1976

Item No	Description	Quantity in m^3	% of Storage capacity
1	Initial amount in storage	665 000	57.8
2	Inflow during the year	3 300 000	286.9
3	Total release	583 000	50.7
4	Leakages	8 000	0.7
5	Evaporation	90 000	7.8
6	Overflow	2 600 000	226.0
7	Final amount in storage	684 000	59.0
8	Minimum quantity in storage (November 1976)	405 000	35.0
9	Storage capacity	1 150 000	100.0

The dam reservoir was filled to spillway crest on January 24th and continued to overflow till May 31st 1976. During this period a total quantity of 2,600,000 m³ had over-spilled. The minimum level of water in storage ever reached was in November 1976 with total quantity in storage around 405,000 m³.

Water utilization and crops irrigated

The Project is built mainly for the supply of irrigation water for the project area.

During the year 1976 a total quantity of 1.20 MCM of water was utilized for the irrigation of 2207 donums planted with various crops as indicated in Table VI–8.

Further to the quantity of water used for irrigation directly from the dam an additional quantity of 150,000 m³ overflowing the spillway crest had recharged the aquifer downstream the dam. Water from this aquifer is pumped by the Limni Mines to satisfy the mine's demand and by the local farmers to irrigate their fields not within the Argaka Magounda Project area.

Table VI–7 shows the utilization of project water and Table VI–8 shows the crops irrigated.

TABLE VI–7

ARGAKA MAGOUNDA DAM: WATER UTILIZATION

Item No	Water Utilization	Quantity in m³	% of Stor. Cap.
1	Water Used for Irrigation	1 200 000	104
2	Water Used for Recharge	150 000*	13
	Total Water Utilized	1 350 000	117

* Rough Estimate

TABLE VI–8

ARGAKA MAGOUNDA DAM: CROPS IRRIGATED IN DONUMS

No.	Crop	1st period donums	2nd period don.	Area Irrigat. donums
1	Citrus	143	151	151
2	Bananas	140	140	140
3	Vines	30	—	30
4	Deciduous	12	12	12
5	Vegetables	577	391	968
6	Potatoes	—	—	—
7	Cereals	906	—	906
	Total	1 808	694	2 207

Water sale, income, operation and maintenance costs

The water utilized for irrigation amounted to approximately 1.2 MCM. Out of this only 583.000 m³ was sold to the farmers at the nominal rates. The rest was utilized free of charge because of water rights. From the sale of water a total of £5,830 was collected.

For the operation of the project an amount of £868 was paid to the water guards and bill collectors where for the maintenance of the project another £277 was spent.

Net income for the benefit of the project is calculated at £4,685.

All the data concerning water sale, operation and management cost are shown on Table VI–9.

TABLE VI–9

ARGAKA MAGOUNDA DAM. INCOME EXPENDITURE DATA

Item No	Item Description	Quantity in m³ x 10³	Amount in £
1	Water sold at nominal rates	583 000	5 830
2	Water sold at reduced rates	NIL	NIL

TABLE VI–9 (Continued)

3	Water given free of charge	617 000	NIL
	Total quantity and gross income ..	1 200 000	5 830
4	Operation cost ...	—	868
5	Maintenance cost	—	277
	Total Costs ..	—	1 145
	Net Income ..	—	4 685

AYIA MARINA PROJECT

General

The Ayia Marina Irrigation Project consists of a dam reservoir of maximum capacity to spillway crest of 300,000 m3 and a distribution system commanding an area of 1500 donums. The distribution system consists of a main canal from which tertiary pipes branch–off to deliver water to each individual plot.

Irrigation in the project area started early in February 1976 and continued throughout the year until late in November 1976. An area of 570 donums was irrigated by utilizing more than 325,000 m3. The area irrigated was planted with Citrus, Bananas, Vines, Deciduous, Vegetables and Cereals.

The water utilized was sold to the farmers according to the nominal rates. Out of the 325,000 m3 utilized 236,850 m3 were sold at the nominal rates whereas the remaining 87,225 m3 were taken from the overflow and were paid at reduced rates.

The total gross income from the sale of water amounted to £2,805. The expenditure for the operation amounted to £1,539 and that for maintenance to £183. Net income to the project was £1,083.

Project Hydrology

The project hydrologic data as recorded during the year are tabulated on Table VI–10.

TABLE VI–10

AYIA MARINA DAM. HYDROLOGY FOR 1976

Item No	Description	Quantity m3	% of Storage capacity
1	Initial amount in storage	120 000	39.99
2	Inflow during the year	478 000	159.33
3	Total release	237 000	79.00
4	Leakages	50 000	16.66
5	Evaporation	25 000	8.33
6	Overflow	210 000	69.99
7	Final amount in storage	164 000	54.66
8	Minimum amount in storage (November 1976)	94 000	31.33
9	Storage Capacity	300 000	100.00

The dam reservoir was filled to spillway crest on March the 14th 1976 and remained at this level until June the 8th 1976. Minimum ever quantity stored was 94,000 m3 and this occurred in November on the 10th.

Water utilization and crops irrigated

During the year 1976 a total quantity of 325,000 m3 of water was utilized for irrigation of approximately 570 donums planted with various crops. Details about the water utilized and the crops irrigated and their area extent are shown on Tables VI–11 and VI–12.

Further to the water used for irrigation some quantity of the overspilled water recharged the small acquifer, downstream of the dam. Water is pumped from this aquifer for areas not within the project area.

TABLE VI–11

AYIA MARINA DAM: WATER UTILIZATION

Item No	Description	Quantity m3	% of Storage capacity
1	Water used for Irrigation	324 000	108.33
2	Water used for Recharge	50 000*	16.66
	Total Quality Utilized	374 000	125.00

* Rough Estimate

TABLE VI–12

AYIA MARINA DAM: CROPS IRRIGATED IN DONUMS

Item No	Crop	1st Period donums	2nd Period donums	Total
1	Citrus	65	65	65
2	Bananas	13	13	13
3	Vines	12	—	12
4	Deciduous ...	8	8	8
5	Vegetables ...	237	135	372
6	Potatoes	—	—	—
7	Cereals	100	—	100
	Total	431	221	570

Water sale, income, operation and maintenance costs

About 325,000 m³ of water was utilized for irrigation of various crops in the project area. From the sale of water as indicated in detail in Table VI–13 the gross income amounted to £2,805 whereas after deducting operation and maintenance expenses the net income was only £1,083.

TABLE VI–13

AYIA MARINA DAM: INCOME AND EXPENDITURE DATA

Item No	Description	Quantity m³	Amount £
1	Water sold at nominal rates	236 850	2 369
2	Water sold at reduced rates	87 225	436
3	Water given free of charge	None	NIL
4	Total quantity and gross income	324 075	2 805
5	Operational Costs	—	1 539
6	Maintenance Cost	—	183
7	Total Expenditure	—	1 722
	Net Income .. .	—	1 083

KALOPANAYIOTIS PROJECT

General

The Kalopanayiotis irrigation project consists of a dam reservoir of capacity 390,000 m³ and a distribution system of closed conduits commanding an area of approximately 435 donums.

Irrigation in the project area started late in April and stopped late in October 1976. During the period April to October a total quantity of 133,241 m³ of water was utilized for the irrigation of an area approximately 435 donums, planted mainly with deciduous. All the water was sold to the farmers at a fixed rate of 18 mils/m³ and the total gross income was £2,398. The operation expenses were £1,140 where the maintenance cost spent on routine works and emrgency repairs was £433. The net income to the project was £825.

Project hydrology

The project hydrologic data as recorded during the year are tabulated in Table VI–14.

TABLE VI–14

KALOPANAYIOTIS DAM: HYDROLOGY FOR 1976

Item No	Description	Quantity m³	% of storage capacity
1	Initial amount in storage	Empty	—
2	Inflow	6 000 000	1 538
3	Total release ...	—	—
4	Leakage	600 000	153
5	Evaporation	10 000	25.6
6	Overflow	5 000 000	1 282
7	Minimum quantity in storage (October)	186 000	47.7
8	Final amount in storage	390 000	100
9	Storage capacity	390 000	100

The reservoir was filled in 10 days after the scouring gate was closed (31st March–10th April). It continued overflowing from April the 10th to July 29th. Most of the irrigation water was taken from the collection weir downstream of the dam.

Water utilization

During the year under review a total quantity of 133,241 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.

Water sale, income, operation and maintenance cost

From the sale of water the gross income during the year under review was £2,398. After deducting maintenance and operation expenses the net income reduced to £825. Operation expenses include the wages of the dam attendant and travelling expenses and amounted to £1,140. The maintenance expenses amounted to £433.

KITI DAM

The Kiti dam irrigation project consists of a dam reservoir of storage capacity 1.61 MCM and a distribution system (open canals) commanding an area approximately 6200 donums in the Kiti, Pervolia and Tersephanou villages. Irrigation in the project area started in March 1976 and continued until late in June when all the water available was utilized. A total of 211,660 m^3 was utilized for the irrigation of approximately 500 donums of permanent and seasonal crops. The operation expenses amounted to £486 whereas the maintenance expenses for works carried out on the distribution system and on the maintenance of dam structures, was £2,729. Total gross income amounted to £2,116. After deducting the management and maitenance costs there is a net loss amounting to £1,099.

LEFKARA DAM

The project consists of a dam constructed mainly for domestic water supply purposes of maximum capacity 13.85 MCM. A small quantity of water, around 400,000 m^3 is released from the dam annually for the irrigation of approximately 615 donums of land commanded by the Lefkara dam distribution system. The distribution system was under construction during 1976.

Irrigation in the project area started late in August and continued until the end of November. A total of 15,913 m^3 were utilized to irrigate seasonal and permanent crops. The gross income from the sale of water amounted to £159.

More details about the Management and Operation of the project are given under a separate heading.

MAVROKOLYMBOS PROJECT

General

The Mavrokolymbos irrigation project consists of a dam reservoir of capacity 2.18 MCM and a distribution system of canals and pipes and commands an area of about 3,355 donums.

Irrigation in the project area commenced early in January 1976 and continued throughout the year and stopped late in December of 1976. An area close to 1983 donums planted with bananas, citrus, vines, vegetables and potatoes was irrigated by utilizing 1,462,000 m^3. Of the 1,462,000 m^3 of water utilized 186,750 m^3 was given free of charge to the Potamia Chiftlik as water rights whereas the rest was sold at the nominal rates.

Total gross income from the sale of water was £15,364 where after deducting operational and maintenance expenses (£2,595 and £73 respectively) the net income to the project was £12,696.

Project hydrology

The project hydrologic data as recorded during the year are tabulated on Table VI–15.

TABLE VI–15

MAVROKOLYMBOS DAM: HYDROLOGY FOR 1976

Item No	Description	Quantity m^3	% of storage capacity
1	Initial amount in storage	1 294 000	59.36
2	Inflow during the year	580 000	26.60
3	Total release ...	1 462 000	67.06
4	Leakages	—	—
5	Evaporation ...	100 000	4.56
6	Overflow	—	—
7	Final amount in storage	312 000	14.31
8	Minimum quantity in storage (November 1976)	210 000	9.60
9	Storage capacity	2 180 000	100.00

In the year 1976 inflow to the dam reservoir was not enough to fill the reservoir to spillway crest. The inflow amounted only to 26.60% of the reservoir storage capacity. Minimum quantity in storage ever remained was 210,000 m3 and this occurred in November.

Water utilization and crops irrigated

During the year under review a total quantity of 1,462,000 m3 of water was utilized for the irrigation of 1983 donums of land planted with bananas, citrus, vegetables, potatoes and vines. Details about the water utilization, percentages and the crops irrigated are shown on Tables VI–16 and VI–17.

TABLE VI–16

MAVROKOLYMBOS DAM: WATER UTILIZATION

Item No	Description	Quantity in m3	% of storage capacity
1	Water used for irrigation	1 462 000	67.06
2	Water used for recharge	NIL	NIL
	Total water utilized	1 462 000	67.06

TABLE VI–17

MAVROKOLYMBOS DAM: CROPS IRRIGATED

Item No	Crop	Area in Donums
1	Citrus	20
2	Bananas	380
3	Vines	200
4	Deciduous	—
5	Vegetables	1 260
6	Potatoes	123
7	Cereals	—
	Total	1 983

Water sale, income, operation and maintenance costs

From the sale of water the gross income during the year under review amounted to £15,364. The operation expenses were £2,595 whereas the maintenance expenses were £73.

TABLE VI–18

MAVROKOLYMBOS DAM: INCOME AND EXPENDITURE DATA

Item No	Description	Quantity m3	Amount £
1	Water sold at nominal rates ...	1 275 147	15 364
2	Water sold at reduced rates ...	NIL	—
3	Water given free of charge	186 750	—
	Total quantities and gross income	1 461 897	15 364
4	Operational cost	—	2 595
5	Maintenance cost	—	73
6	Total Costs	—	2 668
7	Net Income ...	—	12 696

PALEKHORI DAM

The Palekhori irrigation project was not constructed under the Government Waterworks Law but under the Irrigation Division Law. The project consists of a concrete gravity dam whose reservoir has a capacity of 620,000 m3 and a distribution system of canals and pipes commanding an area of about 1000 donums.

Irrigation in the project area started early in March and continued through the year until the end of November 1976. The dam was filled to spillway crest and about 400,000 m3 was used for the irrigation of about 1000 donums of Deciduous, Fruit Trees, Potatoes and Vegetables. Evaporation losses were estimated at 50,000 m3.

All costs for the operation and management of the project are paid by the Palekhori - Sklydros Irrigation Division.

POMOS PROJECT

General

The Pomos Irrigation Project is composed 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 closed conduits as secondary and tertiary conduits commanding an area of 2850 donums.

Irrigation in the project area started early in January 1976 and continued throughout the year until late in December 1976. An area of 597 donums of good land was irrigated by utilizing about 946,000 m3 of water. The area irrigated was planted mainly with Bananas, Citrus, Vegetables, Deciduous and Cereals.

From the total water utilized 641,000 m3 was taken directly from the dam whereas 306,000 m3 was taken from the overflow.

Both the release from the dam and the overflow were charged according to the approved rates. The dam release was charged 10 mils/m3 and the overflow was charged 5 mils/m3.

The total gross income from the sale of water amounted to £7,939. The expenditure for the maintenance amounted to £294,000 where the operational costs paid to the water guards and bill collectors was £3,218. Net income to the project for the year 1976 was £4,427.

Project hydrology

The project hydrologic data as recorded during the year are tabulated in Table VI–19.

TABLE VI–19

POMOS DAM: HYDROLOGY FOR 1976

Item No	Description	Quantity in m3	% of storage capacity
1	Initial storage ...	860 000	100.00
2	Inflow during the year	3 551 000	413.27
3	Total release ...	641 000	74.85
4	Leakages	330 000	38.42
5	Evaporation ...	70 000	8.10
6	Overflow	2 617 000	304.66
7	Final storage ...	752 000	87.54
8	Minimum quantity in storage (November 1977)	370 000	43.07
9	Storage capacity	860 000	100.00

The reservoir was filled to spillway crest during the period January the 1st to June the 7th 1976.

Minimum amount of water ever remained in storage was 370,000 m3 and this occurred in November 1976.

Water utilization and crops irrigated

The 949,000 m3 utilized was used for the irrigation of 597 donums in the project area. Details about the water utilized and the crops irrigated are shown on Tables VI–20 and VI–21.

TABLE VI–20

POMOS DAM: WATER UTILIZATION

Item No	Description	Quantity in m3	% of storage capacity
1	Water used for irrigation	949 000	110.47
2	Water used for recharge	—	—
	Total quantity utilized	949 000	110.47

TABLE VI–21

POMOS DAM: CROPS IRRIGATED IN DONUMS

Item No	Crop	1st Period donums	2nd Period donums	Total
1	Citrus	81	81	81
2	Bananas	228	228	228
3	Vines	—	—	—
4	Deciduous	3	3	3
5	Vegetables	205	46	251
6	Potatoes	—	—	—
7	Cereals	34	—	34
	Total ..			597

Water sale, income, operation and maintenance costs

From the sale of water (see details on Table VI–22) the total gross income amounted to £7,939 whereas the operational and maintenance expenses were £3418. Net income to the project for the year amounted to £4,427.

TABLE VI–22

POMOS DAM: INCOME AND EXPENDITURE DATA

Item No	Description	Quantity in m^3	Amount £
1	Water sold at nominal rate	641 242	6 412
2	Water sold at reduced rate	305 400	1 527
3	Water given free of charge	—	NIL
4	Total Gross Income.....	946 642	7 939
5	Operation Cost ...	—	3 218
6	Maintenance Cost	—	294
7	Total expenditure	—	3 512
8	Net Income	—	4 427

YERMASOYIA–POLEMIDHIA PROJECT

General

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 a reservoir capacity of 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 4390 donums within the project perimetry.

Irrigation in the project area started in January and continued throughout the year until late in December 1976. A total quantity of 3,696,000 m^3 of water was utilized from both dams for the irrigation of 10,050 donums in the Zakaki, Phasouri, Akrounda, Phinikaria areas and Yermasoyia and Polemidhia Irrigation Divisions. Of the 3,696,000 m^3, 561,702 was given free of charge, 195,048 was given at reduced rates as overflow and the rest was sold at the nominal rates.

Overspill occurred only from the Yermasoyia dam and the total quantity amounted to 13,746,000 m^3. Part of this quantity was recharged into the Yermasoyia aquifer and a quantity of 816,000 m^3 was used to recharge the Garyllis aquifer.

Total gross income from the sale of water was £37,131 whereas the maintenance cost was £966. The operation and management cost was £6510 whereas another £2,272 was paid for the power consumed by the Akrounda–Phinikaria pumping station. The net income to the project after deducting operation, maintenance and power cost was £27,383.

Project Hydrology

The project hydrologic data as recorded during the year is tabulated in the following Tables. The data for each dam is given separately in Tables VI–23 and VI–24.

TABLE VI–23

POLEMIDHIA DAM: HYDROLOGIC DATA

Item No	Description	Quantity in m^3	% of storage capacity
1	Initial storage ...	550 000	16.03
2	Inflow	1 180 000	34.40
3	Total release ...	295 000	8.60
4	Leakages	740 000	21.50
5	Evaporation ...	176 000	5.13
6	Overflow	—	—
7	Minimum quantity in storage (November) ...	460 000	13.41
8	Final storage ...	519 000	15.13
9	Storage capacity	3 430 000	100.00

TABLE VI–24

YERMASOYIA DAM: HYDROLOGIC DATA

Item No	Description	Quantity in m^3	% of storage capacity
1	Initial storage	13 175 000	96.87
2	Inflow	17 740 000	130.44
3	Total release ...	3 949 000	29.04
4	Leakages	324 000	2.38
5	Evaporation ...	1 508 000	11.08
6	Overflow	13 422 000	98.69
7	Minimum quantity in storage (November) ...	9 345 000	68.71
8	Final amount in storage	10 565 000	77.68
9	Storage capacity	13 500 000	100.00

POLEMIDHIA DAM

General

The inflow to the Polemidhia dam reservoir during the year under review was 1.18 MCM representing 34.4% of the reservoir capacity. The minimum quantity ever remained in storage was 460,000 m³ and this occurred in November 1976.

YERMASOYIA DAM

The inflow to this dam was around 17 MCM out of which 13.422 MCM overspilled. The minimum quantity of water ever remained in storage was 9.345 MCM and this occurred in November 1976. The overflowing water was seeping through the gravels of the Yermasoyia river and it may be assumed that large quantities reach the aquifer gravels and recharge the groundwater.

Water utilization and crops irrigated

During the year under review a total quantity of 3.696 MCM was utilized for the irrigation of 10,050 donums of permanent and seasonal crops in the project area. Another 816,000 m³ were used for recharging the Garyllis aquifer. Details about the water utilized from each of the dams and together are shown on the following Tables.

TABLE VI–25

POLEMIDHIA DAM: WATER UTILIZATION

Item No	Description	Quantity in m³	% of storage capacity
1	Water used for irrigation	563 000	16.41
2	Water used for recharge	NIL	—
3	Total water utilized	563 000	16.41

TABLE VI–26

YERMASOYIA DAM: WATER UTILIZATION

Item No	Description	Quantity in m³	% of storage capacity
1	Water used for irrigation	3 133 000	23.04
2	Water used for recharge of Garyllis river ...	816 000	5.99
3	Water overspilled and recharged Yermasoyia aquifer	5 000 000	36.76
4	Total water utilized	8 949 000	65.79

TABLE VI–27

YERMASOYIA–POLEMIDHIA DAMS: WATER UTILIZATION

Item No	Description	Quantity in m³	% of storage capacity
1	Water used for irrigation (Y+P)	3 696 000	21.70
2	Water used for recharge of Garyllis aquifer(Y)	816 000	4.79
3	Water used for recharge of Yermasoyia aquifer	5 000 000	29.36
4	Total water utilized	9 512 000	55.85

The crops irrigated from the released water in the Zakaki–Phassouri area, the Akrounda–Phinikaria area and the Yermasoyia and Polemidhia Irrigation Division areas are shown on Table VI–28.

TABLE VI–28

YERMASOYIA–POLEMIDHIA PROJECT: IRRIGATED CROPS

Item No	Crop	Area in donums
1	Citrus	5 103
2	Vines	1 690
3	Deciduous	131
4	Vegetables	3 111
5	Olive trees	19
	Total	10 054

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 water given at the reduced rates are given in Table VI–29.

From the sale of water the total gross income was £37,131. The operation cost, power cost for Akrounda–Phinikaria pumping station and the maintenance costs totalled £9,748. A breakdown of the costs is shown on Table VI–29.

TABLE VI–29

YERMASOYIA-POLEMIDHIA PROJECT: INCOME AND EXPENDITURE DATA

Item No	Description	Quantity in m^3	Amount in £
1	Water sold at nominal rates ...	2 939 687	36 546
2	Water sold at reduced rates ...	195 048	585
3	Water given free of charge as water rights to:		
	Yermasoyia Irrigation Division	394 422	NIL
	Polemidhia Irrigation Division	167 280	NIL
4	Total quantity and income	3 696 431	37 131
5	Operational Cost	—	6 510
6	Power Cost	—	2 272
7	Maintenance Cost	—	966
8	Total Cost	—	9 748
9	Net Income	—	27 383

MAINTENANCE OF GOVERNMENT IRRIGATION PROJECTS

General

During the year under review routine maintenance work was carried out in all major and minor government irrigation project structures. Routine works include the,

- painting of metal structures
- removing of wild vegetation from embankment
- maintenance of access roads
- cleaning of channels and their structures
- oiling and repairing of sluice valves

For the maintenance of the major and minor government irrigation projects listed in Table VI–30 a total of £4,882 was spent £3,209 for the dams structures and £1,673 for the distribution systems and auxiliary works.

Table VI–30 gives the expenditure by irrigation project and a breakdown of maintenance cost between dam structures and the distribution system.

Details of maintenance works for each individual project are given elsewhere in this report.

TABLE VI–30 **GOVERNMENT IRRIGATION PROJECTS MAINTENANCE EXPENSES**

No	Project	Dam Maint. Cost £	Distr. system maint. cost. £	Total maint. cost. £	Remarks
1	Argaka – Magounda...	65	212	277	
2	Athalassa	—	—	—	No works
3	Ayia Marina	100	83	183	—
4	Kalopanayiotis	227	206	433	
5	Kiti	2 190	539	2 729	
6	Lefka	—	—	—	No works
7	Lefkara	—	—	—	– do –
8	Masari	—	—	—	Under Turkish occupation
9	Mavrokolymbos	—	—	74	
10	Polemidhia	101	547	648	—
11	Pomos	208	86	294	
12	Syngrasi	—	—	—	Under Turkish occupation
13	Yermasoyia	318	—	318	
	Total	3 209	1 673	4 882	

CONTRIBUTORY DAM PROJECTS MAINTENANCE EXPENSES

General

These projects are constructed under the Irrigation Division Law (Cap. 342). The irrigation works belong to the Disivions and all management and operation expenses are born by the members of the Division.

The maintenance of the distribution systems and headwork of such projects is the responsibility of the Water Development Department. To this effect the Government contributes $^2/_3$ of the maintenance cost whereas the Irrigation Division has to pay $^1/_3$.

The total expenditure for maintenance of the contributory dams in 1976 amounted to £814, of which £548 was paid by the Government and the rest £266 was paid by the respective benefited Irrigation Divisions.

Details regarding the maintenance costs and contributions are shown on Table VI-31.

DETAILS OF MAINTENANCE WORKS—GOVERNMENT DAMS

Argaka

Painting of all metal structures (i.e. rails, manhole covers etc.).

Treating of bridge woodwork with solignum. Removing of wild vegetation from embankment.

Replacing of 10 No, 6" dia. AC pipes. Repairing and maintaining of 150 sluice valves, 25 air valves and replacing of one 4" dia. sluice valve.

Expenditure:	Dam	£ 65
	Distribution	£212
Total		£277

Athalassa

No works carried out.

Ayia Marina

Constructing of a 12.19 m x 1.52 m x 0.45 m protective wall.

Painting of ladder rails. Cleaning of embankment from wild vegetation.

Painting of 70 No manhole covers. Replacing of 7 No, 4" dia. sluice valves.

Expenditure:	Dam	£100
	Distribution	£ 83
Total		£183

Kalopanayiotis

Desilting of collector weir. Installing of a ½" dia. pipe tap in guard house yard for irrigation purposes.

Repairing of 3 No breakages of the 12" dia. distribution main. Anchoring of the 12" dia. main in riverbed by constructing 3 anchor blocks. Re-laying of 30 m x 4" dia. irrigation pipeline due to road works at Akamatis locality.

Expenditure:	Dam	£227
	Distribution	£206
Total		£433

Note: Further to the above works a major length of the ½ dia. water supply main for the guard house from Nikos village was relayed and part of the guard house yard boundary was re-fenced because of the Lefka-Prodhromos road works. The entire expenditure for these works was covered by the PWD.

Kiti

Remedial works on Bekir Pasha chain-of-wells. Cleaning and repairing of canals.

Expenditure:	Dam	£2 190
	Distribution	£ 539
Total		£2 729

Kouklia

Under Turkish occupation.

Lefkara

Repairing of access road. Installing of light poles. Dynamiting of loose rocks near road. Removing of soil avalanches near dam crest and access road. Completing of installation of permanent telephone line.

Re-laying of 1400 m x ½" dia. W.S. main. Repairing of shed and store room. Planting of 200 No trees. Constructing of a portable ladder for spillway. Constructing of a "trestle ladder" for the maintenance of the light poles. Constructing of a concrete barbecue fire place. Painting of M/H covers. Repairing of crack on roof slab of control house. Opening of a window in guest room of guard house. Installing of a road block mast on crest.

Note: The 1976 allotment for Dam Maintenance (2D–13) did not include the Lefkara works as above which were charged on 17A–11.

Masari

Under Turkish occupation.

Mavrokolymbos

Painting of guard house. Repairs to access road. Constructing of an R.C.C. bridge 4.57 m x 0.9 m x 0.9 m. Maintaining of all the sluice valves and water meters. Cleaning of canals.

Note: All the above expenses were charged on construction funds except the sum of £74 which was charged on 2D–13.

Polemidhia

Painting of guard house. Painting of bridge railings and diesel engine house.
Painting of all air valves, water meters, sluice valves with asphaltine. Repairing of 10 No sluice valves. Painting of all manhole covers.

Expenditure:	Dam	£102
	Distribution	£547
Total		£648

Pomos

Painting of all metal structures. Treating of bridge timber with creosote. Removing of wild vegetation from embankment. External painting of windows of guard house. Repairs to access road. Painting of 60 No manhole covers. Maintaining of 50 No 3" dia. sluice valves.

Expenditure:	Dam	£208
	Distribution	£ 86
Total		£294

Syngrasi

Under Turkish occupation.

Yermasoyia

Painting of guard house. Painting of railings, electric poles, main sluice valves and water meters. Maintaining of diesel and penstock winch.

Expenditure: £318

TABLE VI–31
CONTRIBUTORY DAM PROJECT MAINTENANCE EXPENSES

No	Project	Expenditure Govt.	Contr.	Total	Remarks
		£	£	£	
1	Kyperounda	—	—	—	Patching up of polythene film. Repairs to eroded embankment. Unblocking of overflow and underpinning of inlet M/H. (All the above expenses of £150 were charged on construction funds.)
2	Lythrodhonda Dams	10	5	15	Maintaining of gate of upper dam
3	Palekhori	17	—	17	Repairs to shaft doors (special case)
4	Prodhromos	270	135	405	Repairing and painting of guard house—Laying of a second 6" dia. main from break pressure tank to reservoir. Repairing of distribution main at Vrysha locality.
5	Pyrgos	251	126	377	Re-construction of the 'leakage collector system.
	Total ..	548	266	814	

OPERATION AND MAINTENANCE OF TOWN WATER SUPPLIES

INTERNATIONAL WATER SUPPLY ASSOCIATION

Resulting from the tragic events in Cyprus due to the Turkish invasion, no effort was made to secure a permit from the appropriate authorities for the participation of the Cyprus National Committee of the International Water Supply Association to the 11th Congress of the Association which took place in Amsterdam between 13th - 17th September, 1976.

Activities of the Cyprus National Committee were restricted in the exchange of correspondence with the I.W.S.A.

Management of Water Supplies

Management and operation of schemes supplying water to Nicosia, Famagusta, Larnaca and villages in Famagusta and Larnaca Districts and Refugee Camps were the main tasks of the Town Water Supplies Maintenance and Operation.

Water supply demands could be made efficiently in all towns except for Nicosia and suburbs where shortage was experienced and restrictions to the supply were imposed during summer months. Details of various schemes are given below:

Greater Nicosia Scheme

It has recently been proposed that the Greater Nicosia Water Supply Scheme serving mainly the suburban area of Nicosia is amalgamated with that of the Nicosia Water Board. The scheme is now administered by this Department.

The sources of this scheme were operated in full not only to suffice demand in its "area of supply" but to provide also water in "bulk" to Nicosia Water Board so that water shortage in Nicosia may be minimized. Considering, however, that water supply for the whole of Nicosia and suburbs is faced commonly, particulars in this respect are given under heading " Nicosia and suburbs water supply".

The highest daily consumption in 1976 for Greater Nicosia Scheme "area of supply" was 13,580 m^3 on 13th August 1976 (under restrictions).

During the year under review, the distribution system of Greater Nicosia Scheme was extended by 525 m of 12" dia. 1755 m of 10" dia. 3110 m of 8" dia. 6440 m of 6" dia. 445m of 4" dia. of asbestos pipes laid mostly in Government Housing Estates in Strovolos village area. In addition 1,001 house connections were made, thus bringing the number of consumers to 13,458 by the 31st December 1976.

A statement showing expenditure and revenue for 1976 is given on Table VI–32.

Nicosia Town and Suburbs Water Supply

It has been stated that the water supply for Nicosia and suburbs including the Turkish Sector is faced commonly by the three Authorities existing for the purpose. Due to the heavy inhabitation of Nicosia Area by Greek refugees and the increased consumption by the Turkish Sector, the water supply demand could not be met and restrictions were imposed on 5th May 1976. The restrictions applied, provided a supply of 20 hours in every 48 hours to all consumers.

Maintenance work on Morphou Pumping Station — the main source of supply for Nicosia and suburbs — which started late in 1975 ended early in 1976 with beneficial results. Operation of this Station was almost regular all through the year and an average quantity of 10,000 m^3/day of water was delivered to Engomi Reservoir. Maintenance work was arranged at a meeting between Government Officials and Turkish representative and was undertaken by two service engineers of Weirs Pumps Ltd., at Government expenses.

The total quantity of water conveyed from all sources during the year 1976 reached the figure of 8,203,959 m^3 and was distributed as follows:

*	Greater Nicosia Scheme area of supply	3 441 819 m^3
*	Nicosia Water Board area of supply	4 335 534 m^3
*	Nicosia Water Commission "town within walls" ...	774 227 m^3
	Total	8 551 580 m^3

Note: The difference observed between quantities pumped and consumed should

be considered as water pumped from sources situated in Turkish occupied area, records of which could not be obtained.

The highest daily consumption for all "areas of supply" as described above was 31,140 m^3 (supply under restrictions) on 21/8/1976.

With a view to supplementing water supply for Nicosia and suburbs, as much as possible two minor "emergency" schemes were carried out, in places where existing conveyors provided extra carriage capacity. Evidently, such schemes cannot respond towards the ever increasing demand in water of this area and obviously a new long-term reliable scheme is indispensable to give a solution to the problem.

Water Supply to Government Residences and Institutions

An independant scheme, supplying water for domestic use and irrigation for Government Residences and Institutions exists in Nicosia. Its sources lie within residential area and their water is considered to be of low quality. Respective supply, however, from this scheme was regular throughout the year.

TABLE VI–32 **GREATER NICOSIA SCHEME (INCLUDING MORPHOU BAY SCHEME)**
Revenue and Expenditure Account for 1976

Expenditure	£
Pumping Charges	
(i) Wages	18 835
(ii) Electricity	10 420
(iii) Materials	3 407
Total	32 662
Morphou Running Expenses	
(i) Wages	10 242
(ii) Electricity	100 144
(iii) Materials	611
Total	110 997
Tseri Running Expenses	
(i) Wages	4 627
(ii) Electricity	11 689
(iii) Materials	113
Total	16 429
Maintenance Charges	
(i) Wages	6 307
(ii) Materials	2 145
Total	8 452
Purchase of water	5 789
Collection fees	38 018
Grand Total	212 347

Revenue	£
Sale of water	
(a) In bulk	72 672
(b) To consumers	251 843
Connection fees	1 588
Usage of pipelines	2 950
Other revenue	7 063
Total	336 116

Note:

This statement *does not include* for the amortization of the installations and equipment of scheme. The cost of the existing installations was approximately £1,976,000 and the amortization was calculated to be £169,000 per year. Thus there is in fact a deficit between revenue and actual annual cost amounting to £45,231 for 1976.

Famagusta Water Supply Project

Water to Famagusta and Larnaca Town, Village Authorities and Refugee Camps of the homonymous Districts is supplied by the installations of this Scheme against a fixed price per cubic metre.

This scheme provides both underground water being pumped from " Vasilikos" source and boreholes in the area and surface water impounded into Lefkara dam after treatment at the Khirokitia Treatment Plant. Operation of the Treatment Plant starts soon after the sources of underground water cannot satisfy demands in Summer.

During the year under review such operation started on 28th June 1976 and by that time the water impounded into the dam was of the order of 7.622,000 m^3 representing 55% of the dam's capacity.

The total amount of water pumped and/or treated by this Project was 2,624,577 m^3 including losses and was distributed as follows:

Famagusta	992,816
Larnaca Water Board	623 850
Regional Village Water Supplies	332 393
Local Irrigators	93 731
Refugee Camps.....	231 724
Total	2 274 514 m^3

A statement showing expenditure and revenue of the Famagusta Water Supply Project for the year 1976 is given on Table VI–33.

Technical Advice

Technical Advice is offered by this Branch to several Government and Semi-Government Departments mainly to Water Boards, the meetings of which are regularly attended.

Facts about each of the existing Water Boards and brief description of their water supplies are outlined below:

Nicosia Water Board

Supplementation of its water supply is absolutely necessary. In the meantime, improvements of the distribution system as recommended by the Consultants Messrs

TABLE VI–33 **FAMAGUSTA WATER SUPPLY PROJECT**
Expenditure and Revenue Account for 1976

Expenditure	£
Pumping Charges	
(i) Wages	9 392
(ii) Electricity	26 824
(iii) Materials	3 767
Total	39 903
Running Expenses Khirokitia and Lefkara Installations	
(i) Wages	7 031
(ii) Electricity	351
(iii) Materials	3 186
Total	10 568
Regional Scheme Water Supply Running Expenses Khirokitia Area	
(i) Wages	1 176
(ii) Electricity	2 346
Total	3 522
Maintenance Charges	
(i) Wages	2 479
(ii) Materials	3 076
Total	5 555
Grand Total	59 628

Revenue	£
Sale of water	108 989
Outstanding payments 1976	143 979
Total amount	252 968

Note:

The cost of the Government financed "Famagusta Scheme" up to the end of 1976 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 1976 amounts to £55,870.

McLaren International Ltd. are in progress. The construction of a new Reservoir of 7,600 m3 capacity has been completed and has already been put into commission.

Other useful data are given below:

* The total quantity of water supplied was 2,698,592 m3
* The total quantity of water consumed as registered by area meters was 5,109,761 m3 (including Nicosia Water Commission).
* The total maximum consumption per day (including Nicosia Water Commission) was 18,750 m3 on 21/8/76 (under restrictions).
* The total number of consumers on 31/12/76 was 15,439.
* Extension of distribution system in 590 m of 4" dia.
* Total length of distribution system including extensions for 1976:

3688 m of 12" dia
7620 m of 10" dia
3940 m of 8" dia
25197 m of 6" dia
194725 m of 4" dia

* The total number of fire hydrants installed in 1976 was 3.
* The total number of fire hydrants installed up to 31/12/76 was 879.

Limassol Water Board

A new supplementary water supply scheme for Limassol was completed but it was not operated so far, the demand in water having been met by existing sources on a continuous basis.

Additional information on the activities of Limassol Water Board are as stated under:

* Total quantity of water supplied from all sources 5 353 337 m3
* Total quantity of water consumed as registered by area meters 5 181 567 m3
* Highest maximum daily consumption..... 20 719 m3
* Total number of consumers as at 31.12.76 ..... 20 305 m3
* Extension of distribution system during 1976

3330 m of 4" dia
107 m of 6" dia
4 m of 8" dia

* Total length of distribution system ..... 292 140 m
* Number of hydrants installed during 1976 11
* Total number of hydrants installed as at 31/12/76 ... 1 049

Famagusta Water Board

Though no records can be offered to serve the purpose of this report since Turkish occupation of the Town, yet it should be stated that water is made available by the Cyprus Government, free of charge, to meet requirements of the Turkish people and the Turkish troops in the area.

Larnaca Water Board

Water Supply of this Town being supplemented throughout the year by the Famagusta Water Supply Project was regular and undisturbed. The new reservoir 8,000 m3 capacity has practically, been completed and will be put into commission soon.

The following data is also collected:

* Water supplied during the year 1976 = 2,093,070 m3
* Water consumed during the year 1976 as registered by area meters = 2,015,900 m3
* Maximum summer consumption = 8090 m3 per day
* Total number of consumers at 31/12/76: 7,512 No.
* Extension of distribution system during the year 1976:

98 m of 8" dia
3,237 m of 6" dia
3,164 m of 4" dia

* The total length of distribution system is not available.
* Hydrants installed during 1976: 23
* Total number of hydrants installed within water supply area: 389

Paphos Water Supply

No Water Board has been established for this Town and administration of its water supply is the responsibility of the Municipal Corporation. Water is supplied from three boreholes situated in Xeros River area. Requirements were met satisfactorily and a regular supply was maintained. The maximum daily consumption was of 3,200 m3. During the year a total amount of 777,800 m3 was pumped. By 31/12/76 the number of consumers was 2,500.

VII DIVISION OF SMALL PROJECTS PLANNING

by
Y. Serghides S.I.W.
Head, Village WS Branch

Introduction

During the year of 1976 the Division of Small Projects Planning proceeded with the design of a number of schemes for:-

A. *Village Water Supplies*

B. *Routine Irrigation Schemes*

A. VILLAGE WATER SUPPLIES

Apart from normal work, schemes have also been prepared for supplying domestic water to many housing estates built for displaced persons in various parts of the free zone of the Island.

As a result of the good rainfall in 1975–1976 the number of villages with satisfactory piped supply has improved.

The general water supply situation in summer 1976 is described in Tables VII–1 and VII–2 whereby it is shown that:

* There are no villages in Cyprus without piped supply.

* With the completion of 11 house–to–house supply systems in 1976 only 76 out of a total number of 619 villages still remain with public fountains i.e. 12.28% or 2.44% of the total village population.

* Out of 543 villages with house–to–house systems 476 enjoyed a per capita daily rate at over 90 litres or 20 gallons.

WATER SUPPLY SCHEMES PREPARED IN 1976

A total of 39 new schemes were prepared and submitted to the District Officers in 1976, at a total estimated cost of £425,150 as per table VII–3.

Another 11 schemes were in the course of preparation at the end of the year, as per table VII–4.

Brief Description of Important Village Water Supply Schemes Prepared in 1976

Pedhoulas – Moutoullas

Scheme for providing additional supply to Pedhoulas and Moutoullas villages from a new Borehole drilled in the area at a total estimated cost of £29,400.

Episkopi (Limassol)

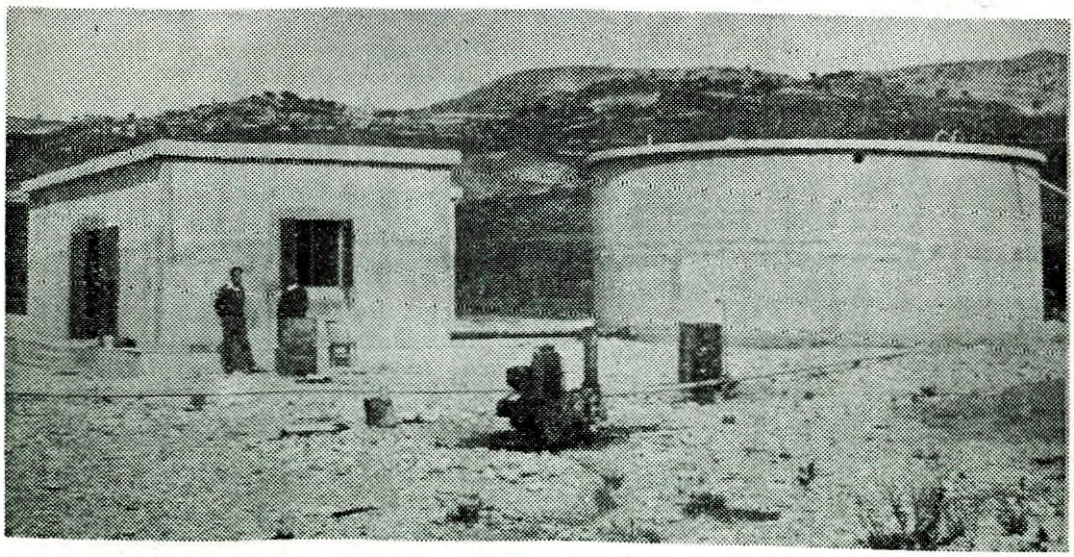
A scheme for the installation of a new pumping unit, the construction of an additional storage tank and general improvements to the village distribution system, at a total estimated cost of £28,500.

Paralimni – Ayia Napa

A scheme for providing additional supply to these two villages from the Famagusta Main Pipeline at a total estimated cost of £100,000.

TABLE VII–1 **VILLAGE WATER SUPPLIES**

Year	Villages with House-to-house distribution system				Villages with Public Fountains			Villages without a piped supply			
	Schemes completed	Total No of Villages	Village %	Population %	Total No of Villages	Villages %	Population %	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



Pumping Station and Storage Tank for Paphos Lower Villages Water Supply

TABLE VII–2 **WATER SUPPLY SITUATION AT THE END OF 1976**

District	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 fountains					
	No	%	Pop.	%	No	%	Pop.	%	No	%	Pop.	%	No	%	Pop.	%		
Nicosia	134	79.29	110.547	88.94	11	6.51	1 658	1.33	16	9.47	10 908	8.78	8	4.73	1 183	0.95	169	124 296
Kyrenia	39	82.98	30.869	93.76	2	4.25	55	0.16	1	2.13	540	1.64	5	0.64	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	97	85.08	71.018	95.83	5	4.38	269	0.37	9	7.90	2 701	3.64	3	2.64	120	0.16	114	74 108
Paphos	74	56.06	31.507	60.88	17	12.88	2 407	4.65	32	24.24	16 677	32.22	9	6.82	1 164	2.25	132	51 695
Larnaca	51	86.44	38.173	94.17	3	5.09	402	1.00	2	3.38	1 674	4.13	3	5.09	285	0.70	59	40 534
Total..	376	76.90	365.104	88.34	41	6.62	4 891	1.18	67	10.83	38 193	9.24	35	5.65	5 149	1.24	619	413 277

TABLE VII–3
WATER SUPPLY SCHEMES PREPARED IN 1976 AND SUBMITTED TO DISTRICT OFFICERS.

No	Village	Nature of scheme	Estimat. cost £
	Nicosia District		
1	Kalokhorio (Or.)	Extensions to the distribution system	420
2	Evrykhou	Extensions to the distribution system	350
3	Kochati	Improvements to the distribution system	5 000
4	Kakopetria	New house-to-house scheme	32 400
5	Perakhorio (N)	Additional storage and improvements to the distribution system	23 600
6	Dhali	Extensions to the distribution system	1 500
7	Kakopetria } Galata }	Improvements to the existing springs ...	3 000
8	Military Camp in Pano Zodhia ...	Water supply scheme for the U.N. Forces	2 600
9	Northern Pitsilia	Additional supply from Kannoures & Pikromiloudhi springs (supplementary scheme)	8 740
10	Galata	New main pipeline & improvements to the existing water supply scheme	14 000
11	Pedhoulas } Moutoullas }	Supplementary supply from New BH	29 400
12	Lakatamia	Extensions to the distribution system	2 900
13	Kambos	Supplementary supply from New BH	4 500
14	Kato Koutraphas	Supplementary supply from New spring ...	3 000
16	Anayia	New pumping plant	2 400
16	Margi	Improvements to the existing scheme.....	800
17	Klirou	Improvements to the existing scheme.....	6 700
		Total	£141 310

No	Village	Nature of scheme	Estimat. cost £
	Limassol District		
1	Prodhromos Forest College...	Water supply scheme from "Kannoures" spring	3 730
2	Pano Platres ...	Supplementary supply from New BH	21 000
3	Episkopi	New pumping plant & additional storage	28 500

TABLE VII–3 (Continued)

4	Lophos	House–to–house scheme	6 060
5	Sanidha	House–to–house scheme	1 060
6	Kyperounda ...	Extensions to the Distribution system	2 900
		Total	£63 250

Paphos District

No	Village	Nature of scheme	Estimat. cost £
1	Kilinia	House–to–house scheme	6 125
2	Galataria	House–to–house scheme	5 825
3	Arkhimandrita	House–to–house scheme	5 800
4	Ayia Marinoudha	House–to–house scheme	2 600
		Total	£20 350

Famagusta District

No	Village	Nature of scheme	Estimat. cost £
1	Sotira	Supplementary supply from Famagusta main	10 000
2	Paralimni, Ayia Napa	Supplementary supply from Famagusta main	100 000
		Total	**£110 000**

Larnaca District

No	Village	Nature of scheme	Estimat. cost £
1	Khirokitia	Improvements to existing spring	1 500
2	Kornos	Extentions to the Distribution system	1 500
3	Kophinou	Police Station Water Supply	200
4	Odhou	Supplementary supply from New spring and house–to–house scheme	7 840
5	Kophinou	Supplementary supply from New BH	9 000
6	Klavdhia	House–to–house scheme	13 000
7	Ayia Anna	Additional storage	2 50
8	Anglisidhes, Anaphotia, Menoyia, Aplanda	Supplementary supply from New BH	27 000
9	Mazotos, Kivisil	Supplementary supply and house–to–house scheme for Kivisil village	15 000
10	Voroklini	Extentions to the Distribution system	4 200
11	Xylotymbou ...	Extensions to the Distribution system	8 500
		Total	£90 240

WATER SUPPLY SCHEMES PREPARED IN 1976 AND SUBMITTED TO DISTRICT OFFICERS *SUMMARY OF TABLE VII* 3

District	No of schemes	Estimated Cost £
Nicosia	17	141 310
Limassol	5	63 250
Paphos	4	20 350
Famagusta	2	110 000
Larnaca	11	90 240
Kyrenia	—	—
Total	39	£425 150

TABLE VII–4

SCHEMES UNDER PREPARATION

Nicosia District

No	Village	Nature of scheme
1	Nicosia Water Board/Kokkini Trimithia	Additional supply from New BH
2	Moutoullas	House–to–house scheme
3	Phikardhou	Additional storage and house–to–house scheme
4	Argates, Episkopio, Kambia, Analiondas	Improvements to the existing W.S. system
5	Psomolophou	House–to–house scheme
6	Kannavia	Supplementary supply
7	Lazania	House–to–house scheme

Limassol District

1	Kyperounda, Khandria	Supplementary supply from New BH
2	Agros	Supplementary supply from New BH
3	Pelendria	Supplementary supply from New BH

Famagusta District

1	Dherinia	Supplementary supply from Famagusta main

B ROUTINE IRRIGATION SCHEMES

The main objective of this programme is to increase the irrigated area near the sources for self-employed farming organisations such as village Irrigation Divisions and/or Associations.

The main target which is being pursued is to extend permanent irrigation by 1000 to 1500 donums annually, by planning small irrigation projects which can be implemented with financial participation by the farmers.

As the main principles underlying the programme is the quick and effective use of water at or near the source combined with intensive agricultural methods, design considerations are always based on land and water use data furnished by the District or Regional Agricultural Officers; project evaluation is undertaken by a joint Inter-Department a! Committee.

The advantages of the Small Project 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.

Planning for this particular programme 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; nevertheless a lot depends on the personal drive, dedication and a certain measure of imagination by the planner himself.

The main types of schemes included in this programme postulate water conservation either by the improvement of the old established obsolete intake and distribution system, the construction of small reservoirs for night or seasonal storage, the exploitation of new boreholes and the artificial recharge of depleted aquifers.

In November 1976 an agreement was signed between the Republic of Cyprus and the Federal Republic of Germany for financing Irrigation Schemes in the Rural Areas. The amount of the Loan is 8 Million D. Marks. There were no withdrawals from the loan during the year 1976.

SCHEMES PREPARED IN 1976

All the schemes which were ready for implementation at the end of the year appear on Table VII-5 estimated at a total cost of £256,000. The schemes which have been budgeted for implementation in 1977 are at a total cost of about £200,000.

Some of the more important schemes prepared in 1976 and submitted to the District Officers, or in the course of preparation are briefly described here.

Borehole Pumping Schemes

A total of two irrigation pumping schemes from Government boreholes in equal numbers of villages have been finalised namely for:-

Ayios Theodhoros (L'ca)	seasonal crops
Tokhni	permanent crops

Small Storage Reservoirs

A small earth pond and distribution system at Dhrousha Paphos is under study.

Inter-Departmental Committee for Small Irrigation Projects

The Committee is functioning in conformity with directions by the Director General of the Ministry of Agriculture for the purpose of assessing project viability for budgeting purposes, and coordinates the activities of the District Agricultural Services for the supply of agroeconomic data in the preparatory stages of the projects.

Some 21 schemes were considered and approved by this Committee as per table VII-5.

A general catalogue of villages where schemes were in the course of preparation or still under investigation is given on table VII-6.

TABLE VII-5 **LIST OF SMALL IRRIGATION SCHEMES**
(Ready for Construction at the end of 1976)..

No	W D D Reference	Village	Division or Assoc.	Locality	Nature of Proposed Works	Estim. Cost £	Village Contr. %	Irrigation Perm. don.	Irrigation Seas. don.
Nicosia District									
1	127/40/3	Alona	Division	Kolymbos Papa Michael Arkaka-koudhia	Distribution pipes and lining of channels	1700	1/3		
2	70/40/II	Ayii Trimithias	Division	Sheromilias	Retaining wall	2 200	1/3	—	—
3	106/70	Mosphili	Division	—	Replacing pumping unit	5 500	1/3	—	—
4	27/39/III	Argates	Division	Dhimma Potamou	Lining of hcannels	18 000	1/3	50	200
5	42/42/II	Pera (Orinis)	Division	K. Vouno–Vizakia	Pumping & distribution from B Hs 2/64 & 49/64	17 500	1/3	65	40
6	70/73	Potamia	—	Yialias River	Recharge works...	15 000	—	—	—
7	127/40/130	Spilia-Kourdhali	Division	Mosphilin	Irrigation Tank and Distribution pipes	1 700	1/3	7	—
8	127/40/130	" "	"	K. Arkondou	" "	2 000	1/3	70	—
9	127/40/40	Kambi–Pharmakas	Division	Yerambela	Distribution pipes	1 300	1/3	80	—
10	103/44	Xyliatos	Division	Alestos–Potima–Kaiseli	Irrigation tank and Distribution pipes	17 000	1/3	324	—
11	22/39/III	Galata–Sina Oros	Division	Esso Galata	Construction of Pond.	10 000	1/3	—	—
12	43/44	Gourri	Division	Yerakia	Repairs to weir and channel	800	1/3	—	—
13	127/40/138	Ayios Theodh. (Soleas) Ph. II	Division	—	Lining of channels	2 200	1/3	—	—
14	127/40/41	Palekhori	Division	Milouri	Irrigation tank and distribution pipes	10 600	1/3	—	—
15	28/41	Pakhyammos	Division	Avgousta	Irrigation tank and distribution pipes	56 000	1/3	—	—
16	50/43	Kalokhorio (Klirou)	Division		Repairs to Dam gate	200	1/3	—	—

TABLE VII-5 **LIST OF SMALL IRRIGATION SCHEMES (Continued)**
(Ready for Construction at the end of 1976)

No	W D D Reference	Village	Division or Assoc.	Locality	Nature of Proposed works	Estim. cost £	Village contr. %	Irrigation Perm. don.	Irrigation Seas. don.
Limassol District									
1	127/40/59	Louvaras	Division	P. Pervolia	Improvement of Spring	930	44	17	—
2	127/40/22	Dhymes	Division	K. Livadhia	Distribution pipes	1 050	46	6	—
3	110/44	P. Platres	Division	—	Distribution pipes	13 500	1/3	90	—
4	127/40/95	Potamitissa	Division	K. Potami	Distribution pipes	830	1/3	5	—
5	127/40/16	Kakolhorio	Division	Marammenos	Improvement of spring	650	1/3	—	—
6	127/40/18	Agridhia	Division	Panayia	Distribution pipes	3 300	1/3	25	—
7	31/45/H	Prodhromos	Division	Platania–Antonidhes	Distribution pipes	2 000	1/3	50	—
8	127/40/134	Pelendria	Division	Vrisi tou Arkhangelou	Distribution pipes	1 037	1/3	8	—
9	127/40/134	Pelendria	Division	Livadhia	Distribution pipes	500	1/3	6	—
10	127/40/59	Louvaras	Division	Koutroutsou	Distribution pipes	420	40	8.5	—
11	127/40/105	Ayios Yeoryios (Sylikou)	Division	Syrkas	Irrigation tank and distribution pipes	1 350	1/3	—	—
12	127/40/52	Ayios Ioannis–Kato Mylos	Division	Angoulos–Dhipotamia	Distribution pipes	7 800	1/3	30	—
13	127/40/49	Kyperounda	Division	Kardhama–Potistron	Irrigation tank and distribution pipes	2 450	1/3	6	—
14	127/40/99	Agros	Division	Vournes	Distribution pipes	900	1/3	—	—
15	80/69	Trimiklini	—	—	Improvement to the Distr.	1 100	—	—	—
16	71/41	Potamiou	Division	Hapotami	Distribution pipes	1 000	1/3	14	—
17	103/52	Mathikoloni	Division	Paleomylos–Esso Pervolia	Distribution pipes	600	1/3	24	—
18	84/52	Kouka	Division	Arniaes	Improvement of spring and distribution pipes	700	1/3	6	—
Paphos District									
1	51/42/III	Ayia Marina (Khrysokhou)	Division	—	Distribution pipes	25 500	40	—	—
Larnaca District									
1	38/44	Alaminos	Division	Latourou	Recharge Dam	28 800	1/4	—	—

Note: All above are included in the 1977 estimates.

TABLE VII–6

SMALL IRRIGATION SCHEMES APPROVED BY THE INTER-DEPARTMENTAL COMMITTEE IN 1976

	Village	*Scheme*
1	Louvaras	Pano Pervolia
2	Dhymes	Kato Livadhia
3	Pano Platres	
4	Potamitissa	Kato Potami
5	Kalokhorio (Limassol)	Marammenos
6	Agridhia	Panayia
7	Prodhromos	Platania Antonidhes
8	Pelendria	Vrisi tou Arkhangelou
9	Pelendria	Livadhia
10	Ayii Trimithias	Sheromilias
11	Mathikoloni	Paleomylos–Esso Pervolia
12	Louvaras	Koutroutsou
13	Kouka	Arniaes
14	Ayios Yeoryios Sylikou	Sirkas
15	Ayios Ioannis – Kato Mylos	Angoulos – Dhipotamia
16	Kyperounda	Kardhama – Potistron
17	Agros	Vourves
18	Spilia – Kourdhali	Mosphilin
19	Spilia – Kourdhali	Kato Arkondou
20	Tokhni	Pumping scheme
21	Ayios Theodhoros (Larnaca)	Pumping scheme

TABLE VII–7

SCHEMES IN THE COURSE OF PREPARATION OR WATER INVESTIGATION AT THE END OF 1976

NICOSIA DISTRICT	
Nisou	Orounda
Kambos – Chakistra	Sha
Dhali	Nikitari
Kato Pyrgos	Ayii Trimithias
Vizakia	Ayios Ioannis (Malounda)
Ayios Yeoryios (Kafkalou)	Kakopetria
Ayios Epiphanios	Argates
Klirou	Kochati
Tembria	Spilia
LARNACA DISTRICT	
Klavdhia	Athienou
FAMAGUSTA DISTRICT	
Ayia Napa	Paralimni
LIMASSOL DISTRICT	
Pissouri	Trimiklini
Prodhromos	Khandria
Pyrgos	Potamitissa
Ayios Ioannis	Yerasa
Yermasoyia	Ayios Dhimitrios
Ypsonas	Tris Elies
Pelendria	Phini
Kyperounda	Kaminaria
Agridhia	Zoopiyi
Louvaras	
PAPHOS DISTRICT	
Khrysokhou	Yiolou
Dhrousha	Kholi
Kedhares	Kato Akourdhalia
Kritou Terra	

VIII REGIONAL OFFICES

PAPHOS REGIONAL OFFICE

by
A. Lambrou
Executive Engineer II
Regional Engineer

General

By the end of the year the staff of the Paphos Regional Office was composed of the Regional Engineer, Mr. A. Lambrou, Head of the Paphos Regional Office, 5 Monthly paid Technical Assistants, 4 Daily Technical Assistants, 2 Hourly paid Employees and one Secretary–Typist.

The above personnel were divided in two groups, the first one was occupied with the *Water Resources Branch* and the second with the *construction works and investigations.*

WATER RESOURCES BRANCH

The staff of Water Resources Branch was engaged on the collection of Hydrological and Hydrogeological Data as follows:

Stream gauging and rainfall observing stations in operation.

The following number of permanent stream gauging and rainfall observing stations were in operation during the year under weekly visits for observations, measurements and maintenance.

* 14 stream gauging stations equipped with automatic water level recorders.
* One rainfall observing station with automatic Raingauge Recorder.
* 9 observation boreholes equipped with automatic water level recorders.

Surface hydrology

Regular visits were made during the year to the stream gauging stations or to the Observation Boreholes equipped with automatic water level recorders for observation and for calibration purposes by the use of current meters.

A total number of 810 current meter measurements were taken during the year for calibration purposes. Also samples for Boron, Ionic and suspended sediment analysis were taken regularly.

Also 55 springs were under observation during the year and a total number of 420 spring discharges were gauged volumetrically or by current meter, while 160 spring flow measurements were taken from the village water supplies.

Ground Water Hydrology

Ground water conditions in southwestern Paphos and Polis Khrysokhou areas, were observed with the help of 226 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

(November) when it is expected to be at the lowest level.

In addition monthly or weekly measurements of the ground water level were taken from 156 wells/boreholes during the year for special studies.

Chemical Analyses

A total number of 435 samples for analysis were taken from wells/boreholes and springs, 170 of which were sent to the Government Laboratory for Ionic and Nitrates analyses and 265 were analysed in the Regional Office for Chloride content.

Suspended Sediment Analyses

A total number of 260 samples of stream water were taken at the permanent gauging stations and analysed by the Soil Laboratory for suspended sediment.

Questioning

The annual questioning was carried out on 3788 wells/boreholes in southwestern Paphos and Polis Khrysokhou areas during summer for determinating the ground water extracted, area irrigated and kind of crops planted.

Well sinking permits etc.

A total number of 160 applications for sinking and covering permits of wells/boreholes were examined and submitted to the District Office of Paphos.

These applications were finally examined and approved or not by the Advisory Committee of the Ministry of Agriculture and Natural Resources.

The applications examined are as follows:

Approved		
S.M.L. area	W.C.A. area	Non W.C.A. area
26	15	66
Not Approved		
S.M.L. area	W.C.A. area	Non W.C.A. area
25	17	19

S.M.L. – Special measures law
W.C.A. – Water conservation area

Encroachments on Governmeut Land and Quarries

17 applications regarding encroachments on Government land were investigated and reports were submitted to the Director of the Department.

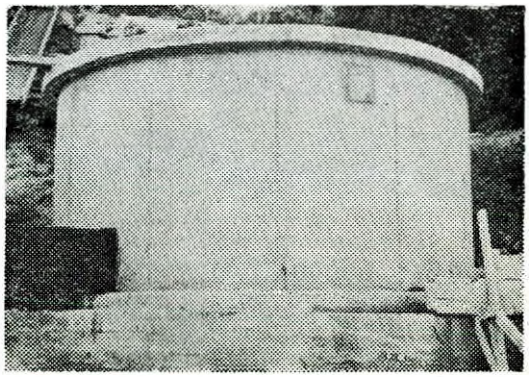
Also 49 cases for Quarry licence were examined.

Court Cases

A total number of 6 illegal drilling of boreholes were presented to Court according to our request to the District Officer.

Water supply (Special Measures) Law

The survey in S.M.L. area started and continued during the year and a total area of 70 km^2 was covered.



Reinforced Concrete Tank for Pano Akourdhalia Irrigation

CONSTRUCTION AND INVESTIGATION BRANCH

The staff of the above branch were engaged on the following works.

Investigations

32 applications and complaints regarding small water supply and irrigation problems were investigated and reports submitted to the District Officer Paphos.

Also 23 applications for removing water supply and irrigation pipelines from certain

fields that might be levelled were investigated and relevant action was taken by the staff of this office.

Small Projects Investigations

7 cases were investigated and reports were submitted to the District Officer Paphos or to the Director of the Department. Where necessary schemes were designed and bills of quantities with the estimated costs were submitted to headquarters.

Pumping schemes on Turkish boreholes

55 applications regarding improvement of Turkish B/Hs were received by this Office and relevant investigations were carried out. Where necessary pumping schemes were prepared and reports were submitted to headquarters.

Plotting and Levelling

90 new wells were plotted and 66 new B/Hs were levelled, while the settlement marks of Paphos Dams were levelled as follows.

Mavrokolymbos Dam	Every month
Pomos Dam	Every other month
Ayia Marina Dam	" " "
Argaka Dam	" " "

Operation and Maintenance of Paphos Dams

The operation and maintenance of Paphos Dams was carried out by the staff of this office and routine visits were carried out for this purpose. Detailed reports were prepared separately and submitted to the Director of the Department.

Construction Works

The construction of 11 schemes was carried out properly and completed during 1976. The construction of another 5 schemes was carried over to 1977. Details of all these schemes are given under CONSTRUCTION DIVISION.

LIMASSOL REGIONAL OFFICE

by
A. P. Protopapas
Executive Engineer I
Regional Engineer

General

This Office is responsible for the activities of the Department in the District of Limassol.

Its functions are divided into three main categories as follows:

* Surface and groundwater hydrological measurements and studies.

* Design of Minor Irrigation and Water Supply Schemes.

* Construction of Major Water Works Projects, 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 twenty five officers and draughtsmen who serve in the above three functions as follows:

– *Hydrology*	10 *No*
– *Design*	5 *No*
– *Construction*	8 *No*
– *Secretaries*	2 *No*

For the execution of the construction works 20 foremen and 200 workers were engaged.

Hydrology

Hydrological measurements were carried out in the Special Measures Law or Conservation Areas.

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.

Twelve Gauging Stations equipped with automatic water level recorders are established on main rivers of Limassol District, including two on Vasilikos river, in Larnaca District. All are listed in the general Table for gauging stations under WATER RESOURCES DIVISION.

Current meter measurements were taken at weekly intervals during base flow. At times of flood additional measurements were taken and at the same time water samples were taken for suspended sediment analysis. Water samples were also taken twice a year for chemical analysis.

Kouris and Yermasoyia rivers had a flow throughout the year.

The total discharges calculated for each river are given in the 'Hydrological Year Book' of the Department.

A new V shaped measuring weir constructed in October 1976, on Kryos river Khalassa and installed an A. OTT automatic water level recorder, for the continuous recording of the river flow.

The automatic water level recorder at Kouris river (Khalassa) has, been relocated above the weir in order to alleviate observed error in recording.

Springs

The discharges of 96 springs were measured at monthly intervals for the benefit of village water supplies, Limassol water supply, the design of minor irrigation projects and for hydrological purposes.

Water samples from all springs were taken once during the year for chemical analysis.

Ground Water Hydrology

Akrotiri Aquifer

Hydrological observation and control is exercised by means of 243 wells or boreholes strategically situated in the area.

Water level measurements are taken twice a year from the above wells or boreholes except from 44 wells or boreholes where water levels are observed monthly, so that the behaviour of the water table in the aquifer is observed more closely.

Sea intrusion in the Aquifer is observed and studied by means of 60 wells or boreholes at Zakaki–Cherkez and 23 wells or boreholes at Akrotiri.

Water pumped from the Aquifer for irrigation, domestic and industrial purposes is noted monthly for each individual licenced well or borehole by means of water meters (total 382) 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 necessary to preserve the citrus plantations in good and productive condition and at the same time ensuring that the aquifer is not irrevocably damaged.

At places such as Zakaki where the water salinity is higher than 1000 p.p.m. pumping was prohibited and water for irrigation was supplied from Yermasoyia and Polemidhia Dams.

Water extracted from Akrotiri Aquifer

Purpose	Quantity MCM
Irrigation	9.48
Domestic	1.54
Industrial	0.83
Total	11.85
Water supplied from Dams	2.43
Total supplied for irrigation	11.91

Water for irrigation was also obtained from Kouris river up to June 1976, especially by Phasouri and Lanitis Farms.

Water Conservation Areas

The water situation within the Water Conservation Area is observed by means of a number of wells and boreholes, the water level of which is measured twice a year and the total extraction is estimated by the method of questioning.

Salinity is also observed by taking samples for analysis twice a year.

The number of observation wells/boreholes in the Water Conservation Areas is distributed as follows:

Area	No of wells/boreholes
Yermasoyia	55
Moni–Pyrgos	73
Parekklisha	22
Kalavasos–Zyyi–Tokhni	68
Paramali–Evdhimou	37
Pissouri–Evdhimou	28
Total	283

Applications for well sinking

Applications for well sinking, transfer of water to other plots for irrigation, installation

of engine and turbine or adjustment of pumping permits were investigated as follows:

Area	No investigated	No of permits recommended
Special Measures Law Area		
Akrotiri Aquifer	40	9
Conservation Areas		
Yermasoyia	4	2
Moni–Pyrgos	12	8
Parekklisha	32	27
Paramali–Evdhimou	9	3
Pissouri–Evdhimou	2	—
Rest of Limassol District	207	181
Total	306	230

Limassol Water Supply

Water supplied to Limassol from the springs and boreholes is gauged and frequent samples are taken both at the water source and at the two reservoirs for chemical and bactiriological analyses.

The total quantity of water supplied to Limassol from all sources was 5,353,337 m^3 (See also information under Limassol Water Board).

Village Water Supplies

The water supply of 108 villages was checked during the period September–November when springs and boreholes are at their minimum output or maximum draw down respectively.

All villages in the District of Limassol had adequate water supply throughout the year.

Eighty Seven water samples were taken from village water supply springs and boreholes for chemical analysis.

Meteorological Observations

Daily records were kept for rainfall (Max. 51 mm 26/11/76), wind velocity, temperature (Max. 36.7°C, 18/8/76) humidity, sun reflection and water evaporation (Max. 10.2 mm 26/6/76, at Yermasoyia Dam).

Daily records were kept for rainfall (Max. 50 mm 26/11/76) and water evaporation (Max. average for ten days period 6.9 mm from 11/8/76 - 20/8/76) at Polemidhia Dam.

Quarry and Gravel Pits Permits

Forty two applications for quarries and gravel pits permits were examined.

Also five cases for land encroachment in rivers and streams were examined.

Irrigation schemes

Surveying, laying out and design for the following projects was carried out.

Erimi–Kolossi Irrigation Division

Pumping scheme which includes drawing water from 10 No Boreholes in the Akrotiri aquifer and boosting to storage reservoir. Gravity conveyor and distribution system to serve on area of 3000 donums. Cost estimated to £620,000.

Lania Irrigation Division

Pumping scheme which includes two earth reservoirs and boosting of water to three balancing reservoirs. Gravity conveyors and distribution system to irrigate 1,000 donums of vines. Cost estimated to £308,000.

Ayios Nikolaos Extension

An extension of the Polemidhia–Yermasoyia Project water to be conveyed to Ayios Nikolaos farm, south of the salt lake to irrigate 1,500 donums of citrus. Cost estimated to £140,000.

Ayios Pavlos Dam

Surveying of dam and reservoir site.

Trakhoni Extension

An extension of Polemidhia–Yermasoyia Project for the irrigation of 4,000 donums of citrus and vines. Surveying and laying out of the following:

Pumping Station
Pumping Main
Night Storage Reservoir
Distribution System

Forty two applications for the development of minor irrigation systems were examined and designs were prepared for thirteen of them.

No	Village	No of applications	No of Boreholes	Area benefited donums	Estimated cost £
1	Episkopi	169	12	2 374	44 990
2	Alektora	102	7	1 230	45 660
3	Kato Polemidhia ...	93	22	908	28 257
4	Evdhimou ...	62	21	862	28 002
5	Kandou	57	3	578	24 535
6	Paramali	22	12	285	9 008
7	Trakhoni ...	9	3	69	1 830
8	Asomatos ...	5	3	51	950
9	Chifflikoudhia	7	5	46	600
10	Plataniskia ...	3	1	35	1 050
11	Armenokhori	1	1	9	1 000
12	Moutayiaka...	2	1	8	40
13	Anoyira	2	1	—	320
	Total ..	534	92	6 455	£186 242

Water Supply Schemes

Fifteen applications were examined and designs were prepared.

Also five applications were given advice upon and designs for other four to be prepared on completion of sufficient hydrological data.

Refugee Emergency Irrigation Schemes

Six hundred applications for the irrigation of land given to refugees were examined. The schemes involved the utilization of boreholes of people who moved to the North and thus reactivation of the agricultural economy by the people who moved to the South.

Essentially all schemes were pumping schemes and are as follows:

CONSTRUCTION WORKS

In the construction works twenty foremen fifty three skilled and a hundred and seventeen unskilled workers were engaged.

Construction of Major Water Works

Zakaki Extension

This is an extension of the distribution system of the Polemidhia–Yermasoyia Project for the irrigation of 1,120 donums of citrus.

Pipe network consisted of 'HELLENIT' AC pipes 150–450 mm dia and the total piping layed was 11,000 m. The cost of the works came to £73,000.

Phasouri Extension

An extension of the distribution system of Polemidhia–Yermasoyia Project for the irrigation of 4,000 donums at Phasouri area.

Conveying and distributing pipes 600–150 mm dia consisted of AC pipes supplied by HELLENIT. Total length of piping layed was 9,000 m. The cost of the works came to £171,000.

Construction of Minor Irrigation Projects and Water Supply Schemes

Several works were executed as shown on tables under CONSTRUCTION DIVISION.

Materials Used*		Major Works	Minor Projects	Total
Asbestos Cement Pipes	Km	20	13	33
Cast Iron Specials and Joints	Ton	37	13	50
Galvanised Iron Pipes	Km	0.9	45.2	46.1
Victaulic Pipes	Km	0.2	2.3	2.5
Cement	Ton	85	265	350
Concrete Aggregates	m^3	900	1 500	2 400
Steel Reinforcing Bars	Ton	10.6	9.4	20
Sluice Valves	No	174	2 514	2 688
Water Meters	No	149	891	1 040
Double Air Valves	No	9	4	13

Machinery Employed*		Major Works	Minor Projects	Total
Concrete Mixers ...	(hrs)	590	1 200	1 700
Diggers	(hrs)	2 037	2 224	4 261
Excavators	(hrs)	963	—	963
Trascavators	(hrs)	—	50	50
Loaders	(hrs)	1 827	—	1 827
Wheel Loaders	(hrs)	1 562	50	1 612
Dumper Trucks	(hrs)	2 267	—	2 267
Compressors	(hrs)	472	2 809	3 281
Welding Machines	(hrs)	675	—	675
Mobile Cranes	(hrs)	727	—	727
Land Rovers	(hrs)	4 605	6 120	10 725

* Materials used and machinery employed in Limassol District are included also under DIVISION OF CONSTRUCTION on lists covering the whole of Cyprus.

Major repairs and installations were carried out in the following villages

Paramali, Alekhtora	£ 500
Evdhimou, Ayios Thomas, Plataniskia	£ 380
Total ..	£ 880

Water supply to land division for building sites

Pyrgos	£ 600
Ayia Phyla	£ 100
Ayia Phyla	£ 100
Yermasoyia	£ 600
Total ..	£1 400

Committee Meetings

In the following committee meetings the Regional Engineer expresses the policy of the Department and gives his advice on matters concerned.

Limassol Water Board
Joint Water Committee
Special Measures Law Committee
Land Consolidation Committee
District Coordination Committee
Polemidhia–Yermasoyia Government Water Project Managing Committee.

LARNACA-FAMAGUSTA REGIONAL OFFICE

by
C. Andreou
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 No Executive Engineer I, Head of the Office
1 No Senior Inspector of Works
1 No Inspector of Works
3 No Monthly paid Technical Assistants
1 No Daily paid Technical Assistant
1 No Foreman Grade I
2 No Regular Employees
3 No Casual Employees
1 No Secretary-Typist

The Technical staff of the office was engaged in *Hydrology, Investigations and Designs, Construction and maintenance.*

HYDROLOGICAL INVESTIGATIONS

Stream Gauging

During the year two permanent stream gauging stations equipped with automatic water level recorders were in operation and weekly or monthly visits were paid for observation and maintenance. These two were Liopetri and Paralimni Lake Outfall.

Ground Water Hydrology

The groundwater conditions of the Famagusta–Larnaca Region were observed by means of 400 well/boreholes.

Water levels were taken twice this year i.e. in March before the irrigation period and in November after the irrigation period.

In addition, monthly measurements of the ground water level as well as sampling of water for chemical analyses were taken from 60 Government Boreholes.

Chemical Analyses

A total number of 360 samples were taken mainly from Government boreholes and sent to the Government Laboratory for chemical analysis.

Also a large number of samples were taken from wells/boreholes and were analysed in the Regional Office for Chloride content.

Plotting of Boreholes

During the year the plotting of the boreholes in the Hydrological area of Famagusta–Larnaca was continued.

Up to the end of the year 1000 wells/boreholes were plotted in Akhyritou, Drhomolaxia, Meneou, Phrenaros, Dherynia, Xylotymbou, Akhna, Liopetri, Ormidhia.

Questioning

The annual questionnaire was carried out in the areas where the plotting was completed.

Well Sinking Permits

A total number of 655 applications for sinking and covering permits of well/boreholes in the conservation areas and 53 applications in the non–conservation were examined and submitted to the District Officers of Larnaca and Famagusta.

These applications were finally examined and approved or not upproved by the Advisory Committee of the Ministry of Agriculture and Natural Resources.

The applications examined per district are as follows:

	Conservation Area		Non–Conservation Area	
District	Approved	Not Approved	Approved	Not Approved
Famagusta	243	232	–	–
Larnaca	72	55	49	4
Total ..	315	287	49	4

Application to install pumping units on T/Cypriot wells

A total number of 102 applications were submitted to the Larnaca Regional Office for installing pumping units on abandoned Turkish Cypriot wells/boreholes. These applications, after on the spot examination, were submitted to the Central Committee for approval.

INVESTIGATIONS AND DESIGN

Salt Lake

The observations on the Larnaca salt lake continued up to June 1976, and all records were submitted to the Water Resources Division for evaluation.

Designs of Village Water Supplies and Irrigation Schemes

During 1976 several designs were completed and submitted for inclusion in the budget of next year. These are shown on tables, under SMALL PROJECTS PLANNING DIVISION.

CONSTRUCTION

Domestic Water Supplies

During the year the regional office undertook the construction of village water supply schemes in Famagusta and Larnaca Districts as numerous schemes for the water supply of refugees camps and housing Estates for displaced people. All these schemes are included in the general tables of works constructed under the Division of Construction. For details about the construction of the new Tremithos Reservoir for Larnaca Water Supply see under DIVISION OF CONSTRUCTION also.

Labour Force involved

Due to the large number of projects to be carried out, during the year, three regular employees were temporarily assigned as foremen.

The total number of Foremen employed for the execution of the works were 7.