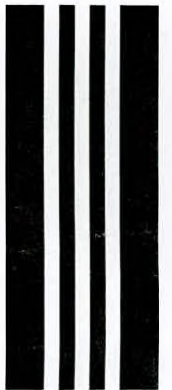


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REPUBLIC OF CYPRUS



MINISTRY OF AGRICULTURE AND NATURAL RESOURCES
DEPARTMENT OF WATER DEVELOPMENT

ANNUAL REPORT
OF THE
DEPARTMENT
OF
WATER DEVELOPMENT
FOR THE YEAR
1974

By
C. A. C. KONTEATIS
Director of the Department of Water Development
NICOSIA — CYPRUS
July, 1975

REPUBLIC OF CYPRUS
MINISTRY OF AGRICULTURE AND NATURAL RESOURCES

A N N U A L R E P O R T
O F T H E
D E P A R T M E N T O F W A T E R D E V E L O P M E N T
F O R T H E Y E A R
1 9 7 4

By
C.A.C. KONTEATIS
Director
of the Department of Water Development
Nicosia - CYPRUS
July, 1975

CONVERSION TABLE

One Meter	=	3.281 feet
One Kilometer	=	3281 feet or 0.621 Statute mile
One Millimeter	=	0.039 Inches
One Square Kilometer	=	0.386 Square Statute mile
One hectar	=	10000 Square meters (7.5 Donums)
One cubic meter per second	=	35.315 cubic feet per second
One Liter	=	0.224 gallon

ABBREVIATIONS USED

mm	=	Millimeter
MCM	=	Million cubic meter
m ³ /s	=	Cubic meter per second
m ³ /h	=	Cubic meter per hour
ha	=	Hectar

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Remnants of the Water Resources, the Small Projects Planning Division and the Library of the Department. Forty years of drilling and hydrological records and some 7000 volumes of Library books have been destroyed by fire in July, 1974.



The Famagusta District Office housing also the Water Development Department Regional Office was destroyed by the Turkish airplanes in July, 1974.

I. GENERAL

1.1 Introduction

1974 has been a tragic year for Cyprus following the Turkish invasion of 20th July 1974. With the invasion of the Island a catastrophe of the first order befell upon Cyprus with immense losses and damages incurred to our staff and their relatives, to our Department and to our Water Resources and Projects.

Regarding the losses to our staff we can mention the following:

Although no deaths of Government Servants themselves have not as yet been verified, yet 10 of our staff are now missing, and we have not been able to trace them. These are:

Costas Zachariades, Clerk in the Accounts Office

Pantelis Nicolaou, Technical Assistant

Vasos Viras, Technical Assistant

Antonios Korelis, Technical Assistant

Artemis Frangopoulos, Technical Assistant

Nicos Demetriou, Technical Assistant

Andreas Zevlaris, Driller

Nicos HjiStavrou, Electrician

Georghios HjiChristodoulou, Artisan

Costas Assiotis, Artisan

A great loss to the Department's staff was the verified death of 10 close relatives including sons and brothers. Also of very grave concern to a number of our staff is the 38 missing close relatives who are mainly sons or brothers of the various Officers.

Nine of our staff and 30 very close relatives have been seriously wounded but fortunately are now out of danger. Another serious situation for our staff, is the fact that 3 of our staff with their families and close relatives are still enclaved in some villages held by the Turks. These officers are:

Savvas Yerocostas Artisan

Andreas Koutsoulis "

Savvas Andreou "

We should also mention here that another 54 close relatives of our staff are also enclaved in Turkish held areas.

During the period of the invasion and for a few months subsequently, a number of people were held as prisoners at various prisons and some of them were lucky to be held in houses. From our staff 15 were held as prisoners, but one of them only, Chief Foreman Erricos Ioannou was unlucky to be held in four different prisons in Nicosia. In addition 30 close relatives of our staff have been held as prisoners in various prisons including prisons in Turkey.

The most extensive loss to our Department's staff is the displacement of 150 officers and regular artisans of the Department from their villages and their homes, and include another about 600 of their close relatives. As a consequence of this fantastic displacement of our staff, it has been estimated through enquiry that they left behind in their villages following their pursuit to freedom about 250 of their own private houses worth two million pounds including the cost of the land, extensive agricultural land and a great number of building sites estimated at a value of about three million pounds and a movable property which includes cars, furniture, jewellery, animals and cash money, estimated at about £700,000 worth.

As regards the buildings of the Department, the wing which housed all the Hydrological records and the Library has been burned down. As a result of this, valuable records collected over many years have been lost for ever.

Also we lost the Regional Offices of Famagusta and Kyrenia with the result that valuable documents and records have been lost for ever. In the case of the Famagusta office it was destroyed by bombs thrown during the bombardment of the town by Turkish aeroplanes.

As regards our Water Resources, the effects have been tremendous. Many of the groundwater basins, rivers and springs are now occupied. The whole aquifer of Morphou with its extensive citrus plantations, a part of the aquifer of Famagusta with its citrus plantations, the northern coastal and limestones aquifers with their springs irrigating extensive citrus plantations and the big cereal growing plain of Messaoria are now under foreign occupation.

It is estimated that about 30% of our water resources are occupied with 32% of the irrigated area of an income of about 40% of the total islandwide. Also 20% of the domestic water supplies are occupied.

The above short description of the calamity gives only an indication of the extensive damage of the Island's water resources, irrigated agriculture, as well as, on the staff of my Department. With this gloomy background, we have ended the year 1974, and we are now looking ahead into the year 1975 still with uncertainty, but at least hoping that the worse events have happened.

1.1 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 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 16.

1.2 Departmental Organization

The Departmental Organization is shown on page 17 and is made up of:

1.2.1 Division of Water Resources

This Division groups together all services required for the collection, study and interpretation of hydrological and hydro-geological data both for ground and surface water, control of ground-water extraction and engineering geology problems as connected with

MISSING PERSONS

MEMBERS OF THE STAFF OF THE WATER DEVELOPMENT DEPARTMENT



COSTAS ZACHARIADES of Kythrea.
Accounting Clerk. Aged 52.
He is married and has 3
children. He and his son,
aged 16, were taken hostages
by the Turkish invaders.



VASOS VYRAS of Kythrea.
Technical Assistant.
Aged 36. He is married
and has 2 children.



ANDONIOS KORELLIS of Kythrea.
Technical Assistant. Aged 30,
is married and has 2 children.



ANDREAS ZEVLARIS of Strovolos.
Driller. Aged 63. He is married.



PANDELMIS NICOLAOU of Pera.
Technical Assistant.
Aged 29. Engaged.



ARTEMIS FRANGOPOULOS of Asha.
Technical Assistant. Aged 29.
He is married and has 1 child.

MISSING PERSONS



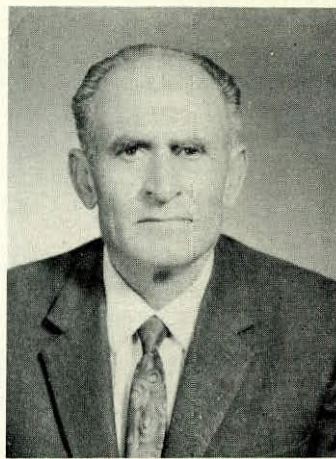
NICOS HJI STAVROU of Eylendja.
Electrician. Aged 26. He is
married and has 2 children.



NICOS DEMETRICU of Strovolos.
Technical Assistant. Aged 22.



GEORGHIOS HJI CHRISTODOULOU of
Angastina. Artisan. Aged 45.
He is married and has 2 children.



COSTAS ASHIOTIS of Asha.
Artisan. Aged 56. He is
married and has 4 children.

the planning and execution of water works projects.

1.2.2 Division of Planning

This Division deals with the preparation of reconnaissance 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.

1.2.3 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.

1.2.4 Division of Construction

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

1.2.5 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.

1.2.6 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 procedures.

1.2.7 Regional Offices

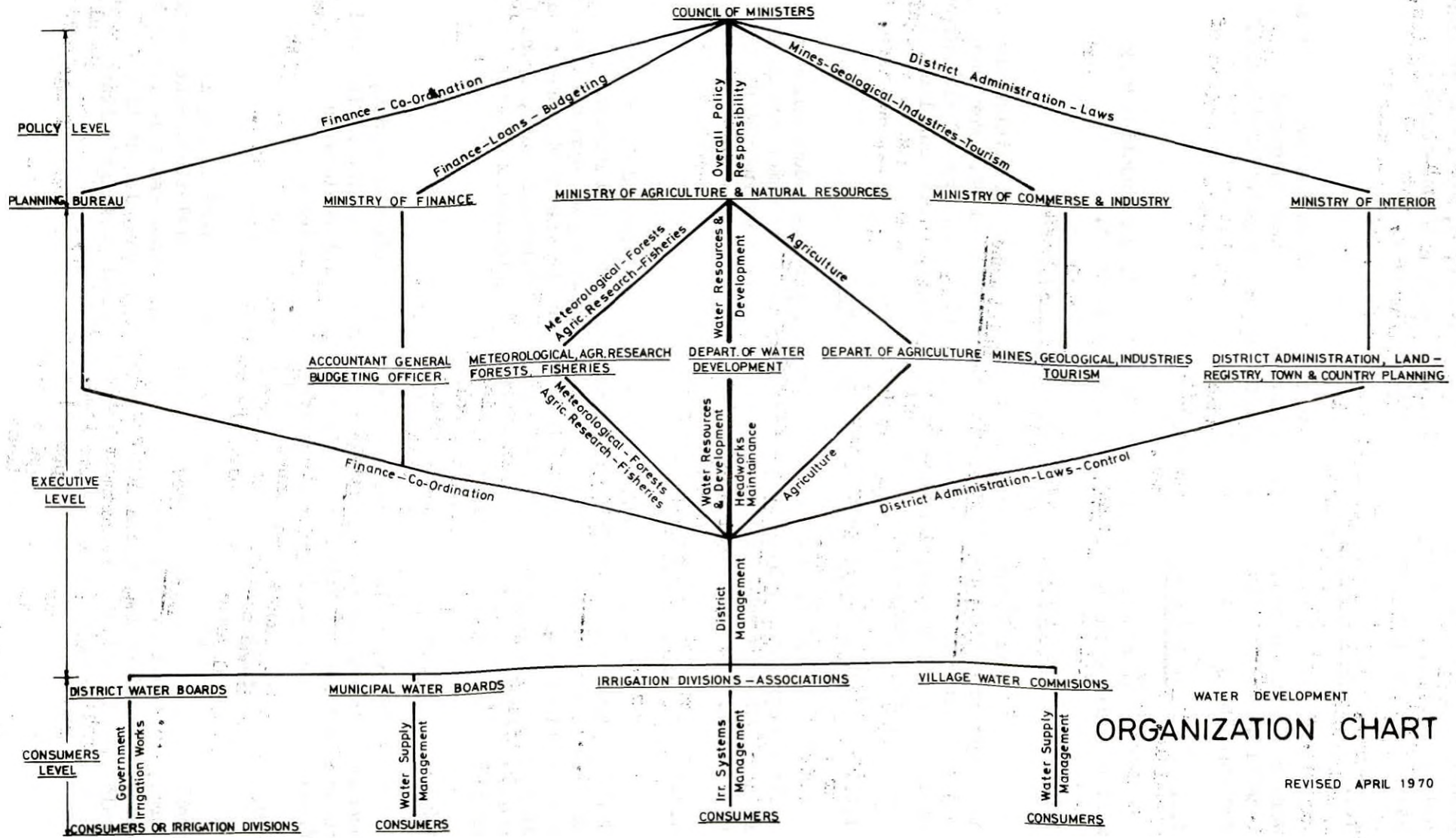
The Regional Offices have this year changed due to the Turkish invasion. These now are Larnaca, Limassol and Paphos. Of course, for the first six months both Famagusta and Kyrenia offices were functioning. In these regional offices the main work carried out is hydrological measurements, collection of engineering data, operation and maintenance of projects investigation and planning for small projects and control of construction work.

1.2.8 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.

1.2.9 Legal Advisor

The Legal Advisor gives advice on the various legal problems of the Department which include water legislation, contractor's works, and water right problems. Also he drafts new water legislation whenever required for approval by the Attorney General. He also deals with important legal matters of the Ministry of Agriculture and Natural Resources whenever requested to do so.



ORGANIZATION CHART

REVISED APRIL 1970

C. Konteatis
Director

C. Lytras AD

K. Hassabis AD

C. Lytras AD

DIVISION OF WATER RESOURCES D. Kypris G1 Head N. Toufexis SW	DIVISION OF SMALL PROJECTS PLANNING P. Pantelides SW Head	DIVISION OF PLANNING C. Christodoulou SWE Head C. Marcoullis* EE1	DIVISION OF DESIGN C. Christodoulou SWE Head	DIVISION OF CONSTRUCTION A. Georghides EE1 Head N. Yiannakou SIW	DIVISION OF OPERATION AND MAINTENANCE G. Charalambous SW Head	OFFICE MANAGEMENT C. Lytras AD Head	REGIONAL OFFICE FAMAGUSTA C. Andreou EE1 Head	REGIONAL OFFICE LIMASSOL A. Protopapas EE Head	REGIONAL OFFICE PAPHOS Ch. Kridietis EE Head	REGIONAL OFFICE MORPHOU M. Dymiotis EE Head
SURFACE WATER RESOURCES BRANCH Ch. Phanartzis H1 Head	IRRIGATION BRANCH S. Giragosian SIW	RECONNAISSANCE & FEASIBILITY REPORTING BRANCH C. Marcoullis EE1 Head	DOMESTIC WATER SUPPLIES BRANCH H. Lapas EE1 Head D. Nicolaides EE	CONSTRUCTION CONTROL BRANCH V. Partasides EE Head G. Constantinides SIW	IRRIGATION BRANCH E. Kambourides IE Head	LEGAL BRANCH Ch. Kyriakides CA Head	WATER RESOURCES BRANCH G. Frangopoulos IW Head	WATER RESOURCES BRANCH N. Mavrommatis TA Head	WATER RESOURCES BRANCH G. Saporillas TA Head	WATER RESOURCES BRANCH A. Nicolaides IW Head
SURFACE WATER HYDROLOGY SECTION P. Alexandrou IW	SPECIAL IRRIGATION PROBLEMS SECTION S. Giragosian SIW Head	HYDRAULIC STRUCTURES SECTION K. Spanos EE Head	IRRIGATION BRANCH D. Patsalides IE E. Kambourides IE	KYRENIA - MORPHOU SECTION S. Georghiou IW Head	IRRIGATION OPERATION SECTION E. Kambourides IE Head	FINANCIAL CONTROL AND CO-ORDINATION BRANCH A. Sophocleous SSA Head	INVESTIGATIONS BRANCH V. Zenias TA Head	INVESTIGATIONS BRANCH A. Kokkinides TA Head	INVESTIGATIONS BRANCH G. Andreou TA Head	INVESTIGATIONS BRANCH A. Klitou TA Head
GROUND WATER RESOURCES BRANCH I. Iacovides H1 Head	ROUTINE IRRIGATION SECTION S. Giragosian SIW Head	IRRIGATION SECTION N. Tsiourlis IE Head	DAMS BRANCH C. Artemis EE1 Head N. Stylianou EE A. Lambrou EE	NICOSIA SECTION V. Ioannou IW Head	IRRIGATION MAINTENANCE SECTION A. Josephin SIW Head	OFFICE SERVICES BRANCH G. Michaelides CC Head	OPERATION & MAINTENANCE BRANCH A. Makis TA Head	OPERATION & MAINTENANCE BRANCH A. Kokkinides TA Head	OPERATION & MAINTENANCE BRANCH A. Shellis TA Head	OPERATION & MAINTENANCE BRANCH A. Nicolaides IW Head
GROUND WATER HYDROLOGY SECTION Ch. Ioannou H	RURAL DOMESTIC WATER SUPPLY BRANCH I. Serghides SIW Head	INVESTIGATIONS AND TESTING BRANCH P. Loucaides EE Head	SMALL DAMS BRANCH A. MacLaughlan Head M. Zachariou EE N. Michael IE	LIMASSOL SECTION P. Kazamias IW Head	DOMESTIC WATER SUPPLIES BRANCH G. Charalambous SW	FILING & COMMUNICATIONS SECTION G. Demosthenous C Head				
DRILLING PERMITS & CONTROL BRANCH M. Peppis G1 Head	NICOSIA-KYRENIA SECTION C. HjiLoizou IW Head	WATER RIGHTS, WATER USE SECTION A. K. Savva IW Head	HYDRAULIC STRUCTURES BRANCH T. Hamatsos EE C. Papadakis SIW	PAPHOS SECTION L. Savva IW Head	DOMESTIC WATER SUPPLIES OPERATIONS SECTION G. Charalambous SW	TYPING STENOGRAPHY DUPLICATING SECTION G. Michaelides CC Head				
DRILLING PERMITS SERVICES SECTION M. Antoniaides IW	FAMAGUSTA-LARNACA SECTION A. Makrides IW Head	SITE INVESTIGATIONS SECTION Ph. Stavrou TA Head	TOPOGRAPHY BRANCH A. Evripidou IW Head D. C. Pitsillides IW	FAMAGUSTA LARNACA SECTION E. Eliades IW Head	DOMESTIC WATER SUPPLIES MAINTENANCE S. HjiPavlou IW Head	PERSONNEL & EMPLOYMENT SECTION E. Vogazianos C Head				
WATER RESOURCES MEASUREMENTS BRANCH N. Toufexis SW Head	LIMASSOL-PAPHOS SECTION P. HjiPakkos IW Head	SOILS LABORATORY SECTION G. Makkoulas TA Head	DRAWING & RECORDS BRANCH S. C. Pitsillides ED Head	MAINTENANCE BRANCH A. Josephin SIW Head		LABOUR & EMPLOYMENT SECTION N. Chrysostomou C Head				
SURFACE WATER MEASUREMENTS SECTION P. Neophytou IW		CONCRETE & MATERIALS LABORATORY SECTION J. Karaglanian IW Head	DRAWING SECTION E. HjiKyriakou Head	WORKSHOPS FACILITIES AND INSTALLATIONS BRANCH S. Theodosiou ME Head St. Kypris CF		ACCOUNTS BRANCH Th. Mavromoustakis SA Head				
GROUND WATER MEASUREMENTS SECTION G. Nicolaou IW		HYDRAULIC LABORATORY M. Zachariou EE Head	PHOTOGRAPHIC SECTION P. Andreou	CONSTRUCTION PLANNING BRANCH Ch. Palantzis EE Head C. Georghiou SIW		ACCOUNTS SECTION C. Zachariades C Head				
DESALINATION BRANCH S. Theodosiou ME Head		ENGINEERING GEOLOGY BRANCH D. Kypris G1 Head	LIBRARY & RECORDS SECTION P. Maratheftou	TENDERS, LABOUR, MATERIALS EQUIPMENT SAFETY A. K. Savva IW G. Michael CF		STORES SECTION A. Hangoudis S Head				
KYRENIA SUB-REGION BRANCH E. Ioannou CF Head		ENGINEERING GEOLOGY D. Kypris G1 Head		WORKS PROGRAMMES ESTIMATES-SPECIFICATIONS SECTION S. Georghiou IW Ph. Hjiannou IW		TENDERS & PROCUREMENT BRANCH A. K. Savva IW Head				
		FOUNDATION'S TREATMENT SECTION I. Kastanas IW Head		MAJOR PROJECTS BRANCH Ch. Artemis EE1 Head A. Eleftheriou IW		U.N. STUDIES COUNTERPARTS PERSONNEL SECTION A. Armaganian Head				

- ⊗ Vacant. Two Posts occupied by the same person.
- ⊙ Vacant. Post Reserved for higher grade.
- x Now seconded as Co-Manager Morphou-Tylliria Feasibility Project.

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

DEPARTMENT OF WATER DEVELOPMENT

ORGANIZATION CHART

JUNE 1974 D.O. DRG. No. BM/G/27

The legal adviser during the year 1974 in the course of his duties executed the following:-

Dealt with all legal proceeding for and against the Department in civil cases before the District Courts as well as recourses before the Supreme Court.

Attended the various interdepartmental meetings held from time to time by the Director of the Department.

Attended the regular meetings of the Advisory Committee which deals with the applications for sinking wells and/or boreholes.

Gave both verbal as well as written advices on legal matters and problems connected among other laws with the Law of Contracts, the Law of Torts, the Law of Compulsory Acquisition, the Immovable property (Tennure Registration and Valuation) Law, the Sale of Goods Law, the Administrative and Constitutional Law.

With the approval of the office of the Attorney General prepared and submitted amendments of the following legislation:

The Government Waterworks Law Cap 341 sections 2 and 5

By this amendment it is proposed that the Council of Ministers upon deciding and defining the area to be benefited by the construction of the Government waterworks, should proceed to appoint the Director of the Department of Water Development as the person responsible for the execution of all the functions in that area. The District Officer to seek for the Director's concurrence when dealing with applications to sink or construct a well or abstract ~~and use~~ any water whether underground or surface water.

The Water Supply (Special Measures) Law 32/64 and 35/65 section 4 subsection (1) (2), 5(6), 9(4).

The object of these amendments are to facilitate the prosecution to successfully prosecute and convict owners of land on which illegal wells or boreholes are sunk or constructed and to increase the penalty for the violation of the provision of these Laws.

Furthermore the legal adviser brought upto date the Wells Law Cap 351, the Water Supply (Special Measures) Law, 32/64 and 35/65, the Government Waterworks Law Cap 341 and the Irrigation Division (Villages) Law Cap 342.

1.3 Staff

A list of the Senior Technical Staff is given on page 50.

1.3.1 Appointments

The numbers of staff by post are given on page 53.

1.3.1.1 On a Monthly (Unestablished or Temporary) Basis.

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

Mr. Christos Papamichael, Executive Engineer, Class II with effect from 2.9.1974.

Mr. Charalambos Hji Stavrou, Technical Assistant, with effect from 1.6.1974.

Mr. Andreas D. Hji Pakkos, Technical Assistant, with effect from 1.6.1974.

Mr. Costas Mattheou, Foreman, 2nd Grade, with effect from 1.6.1974.

Mr. Ioannis K. Metaxakis, Foreman, 2nd Grade, with effect from 1.6.1974.

Mr. Alexandros Avgousti, Foreman, 2nd Grade, with effect from 1.6.1974.

1.3.1.2 On a Permanent Basis

Mr. Andreas Lambrou, Executive Engineer, Class II, with effect from 1.6.1974.

Mr. Theodoros N. Nicolaidis, Executive Engineer, Class II, with effect from 1.6.1974.

Mr. Andreas Sofocleous, Technical Assistant, with effect from 15.5.1974.

Mr. Michael Michaelides, Technical Assistant, with effect from 15.5.1974.

Mr. Antonios A. Papageorghiou, Technical Assistant, with effect from 15.5.1974.

Mr. Andreas Chr. Tsiakouris, Technical Assistant, with effect from 1.6.1974.

Mr. George Char. Dicomitis, Technical Assistant, with effect from 1.6.1974.

Mr. Panos V. Antoniadis, Technical Assistant, with effect from 1.6.1974.

Mr. Panayiotis Skordis, Technical Assistant, with effect from 1.6.1974.

Mr. Costas N. Papallis, Foreman, 2nd Grade with effect from 1.6.1974.

Mr. Kyriacos G. Nicolaidis, Foreman 2nd Grade, with effect from 1.6.1974.

Mr. Ioannis Athinodorou, Foreman, 2nd Grade, with effect from 1.6.1974.

1.3.1.3 On Contract

The contract of Mr. Charalambos Kyriakides, Legal Adviser, was renewed for one more year, with effect from 1.7.1974.

1.3.1.4 Promotions, Secondments

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

1.3.1.4.1 Promotions

Mr. Nicos P. Stylianou, from Executive Engineer, Class II, to the permanent post of Executive Engineer, Class I, with effect from 1.4.1974.

Mr. Pantelis Loucaides, from Executive Engineer, Class II, to the permanent post of Executive Engineer, Class I, with effect from 1.7.1974.

Mr. Christos Ioannou, Hydrologist Class II, to the Temporary (Development) post of Hydrologist, Class I, with effect from 1.7.1974.

Mr. Andreas K. Savva, from Inspector of Works, (on secondment), to the permanent post of Inspector of Works, with effect from 1.6.1974.

1.3.1.4.2 Secondments

Mr. Loucas P. Savvides, Assistant Agricultural Officer, Water Use Section, Department of Agriculture, was seconded to the Temporary post of Topographer/Irrigation Engineer, Class II, with effect from 15.4.1974.

Mr. George N. Lanitis, from the Temporary (Development) post of Inspector of Works, (on secondment), was seconded to the permanent post of Inspector of Works, with effect from 1.6.1974.

1.3.2 Resignations, Transfers, Retirements

1.3.2.1 Resignations

The following Officers resigned their posts during the year under review.

Mr. Saverios Vrachimis, Executive Engineer, Class II, tendered his resignation, with effect from 5.1.1974.

Mr. Marcos G. Dymiotis, Executive Engineer, Class I, tendered his resignation, with effect from 3.8.1974.

Mr. Georghios Koumidis, Technical Assistant, tendered his resignation, with effect from 17.10.1974.

1.3.2.2 Transfers

Mr. Iacovos Tsimitti, Technical Assistant, was transferred from Famagusta to Kyrenia Sub-Office, with effect from 2.1.1974.

Mrs. Eleni Hji Kyriacou, Drayghtsman, was transferred from Nicosia to Morphou Regional Office, with effect from 2.1.1974.

Mr. Charalambos Geroudis, Accounting Officer, 3rd Grade, was transferred to this Department from the Office of the Accountant-General, with effect from 15.7.1974.

Mr. Andreas Lambrou, Executive Engineer, Class II, was transferred from Nicosia to Paphos Regional Office, with effect from 15.9.1974.

Mr. Kyriacos Spanos, Executive Engineer, Class II, was transferred from Nicosia to Paphos Regional Office, with effect from 1.10.1974.

Mr. Theodoros Nicolaidis, Executive Engineer, Class II, was transferred from Nicosia to Limassol Regional Office, with effect from 1.10.1974.

Mr. George Michael, Chief Foreman, was transferred from Nicosia to Limassol Regional Office, with effect from 11.10.1974.

Mr. Antonis Nicola, Assistant Chief Foreman, was transferred from Nicosia to Limassol Regional Office, with effect from 3.10.1974.

Mr. Vassos Zenios, Technical Assistant, was transferred from Famagusta to Limassol Regional Office, with effect from 1.10.1974.

Mr. George Constantinides, Senior Inspector of Works, was transferred from Nicosia to Larnaca Regional Office, with effect from 1.10.1974.

Mr. Costakis Andreou, Executive Engineer, Class I, was transferred from Famagusta to Larnaca Regional Office, with effect from 15.10.1974.

Mr. Erricos Ioannou, Chief Foreman, was transferred from Kyrenia to Nicosia, with effect from 15.10.1974.

Mr. Andreas Nicolaidis, Inspector of Works, was transferred from Morphou to Nicosia, with effect from 15.10.1974.

Mr. George Frangopoulos, Inspector of Works, was transferred from Famagusta to Larnaca Regional Office, with effect from 15.10.1974.

Mr. Athanassios Klitou, Technical Assistant, was transferred from Morphou to Limassol Regional Office, with effect from 15.10.1974.

Mr. Antonakis Hji Ioannou, Technical Assistant, was transferred from Famagusta to Limassol Regional Office, with effect from 15.10.1974.

Mr. George Pittas, Technical Assistant, was transferred from Famagusta to Larnaca Regional Office, with effect from 15.10.1974.

Mr. Iacovos Tsimittis, Technical Assistant, was transferred from Kyrenia to Larnaca Regional Office, with effect from 15.10.1974.

Mrs. Eleni Hji Kyriacou, Draughtsman, was transferred from Morphou to Nicosia with effect from 15.10.1974.

Mr. Andreas Maki, Technical Assistant, was transferred from Famagusta to Limassol Regional Office, with effect from 15.10.1974.

Mr. Iacovos Kastanas, Inspector of Works, was transferred from Nicosia to Limassol Regional Office, with effect from 1.11.1974.

Mrs. Androulla Matsa, Machine Operator, 1st Grade, was transferred to this Department from the Office of the Accountant-General, with effect from 21.10.1974.

Mrs. Chrystalla Koursoumba, Machine Operator, 2nd Grade was transferred from this Department to the Office of the Accountant-General, with effect from 28.10.1974.

Mrs. Androulla Damianidou, Clerical Assistant, G.C.S., was transferred to this Department from the Department of Forests, with effect from 1.11.1974.

1.3.2.3 Retirements

Mr. Charalambos Karakannas, Engineer Hydrologist, retired from the Government Service, with effect from 1.2.1974.

Mr. Styllis Kypri, Chief Foreman, retired from the Government Service, with effect from 1.3.1974.

Mr. Kyriacos Demetri, Foreman, 1st Grade, retired from the Government Service, with effect from 1.4.1974.

Mr. Yiannakos Michael, Foreman, 1st Grade, retired from the Government Service, with effect from 1.9.1974.

Mr. Avgoustos Ioannou, Foreman, 1st Grade, retired from the Government Service, with effect from 1.9.1974.

Mr. Kyriacos Soteriou, Foreman, 1st Grade, retired from the Government Service, on Medical grounds, with effect from 1.11.1974.

Mrs. Panayiota Lymboussi, Clerical Assistant, G.C.S., retired from the Government Service, on grounds of marriage, with effect from 1.11.1974.

1.3.3 Scholarships - Fellowships - Duty Abroad

During 1974 a number of Officers were granted scholarships, others were sent on short courses or attended Congresses. All the Officers who have participated derived the maximum of benefit.

1.3.3.1 Scholarships - Fellowships

The officers thus concerned are the following:

Mr. Costas Andreou, Executive Engineer Class I, was awarded a scholarship by the Government of Japan for the Post graduate Course in the "Information on Group Training Course in Water Works Engineering", from 13th April, 1974, to the 19th July, 1974.

Mr. Charalambos Kridiotis, Executive Engineer, Class II, was awarded a scholarship, by the U.K. Programme of Technical Assistance, in Engineering Geology, at the University of Leeds for the purpose of obtaining the M.Sc. He left Cyprus at the end of September, 1974, and the duration of his scholarship is for two years.

1.3.3.2 Conferences and Duty Abroad

Mr. C.A.C. Konteatis, Director, Water Development Department, participated at the 42nd Executive Committee Meeting of the International Commission for Large Dams, held in Greece from the 12th May, to 18th May, 1974.

Mr. K.C. Hassabis, Assistant Director, participated in a Conference on Drinking Water Distribution Techniques, held at Noordwijkerhout, Netherlands, from the 10th June, 1974 to the 12th June 1974. The Conference was organized jointly by the Water Research Centre (U.K.) and the Dutch K.I.W.A. (The Testing and Research Institute of the Netherlands).

Mr. George Charalambous, Superintendent of Works, visited the Egyptian Company for Pipes and Cement Products "Siegward", following an invitation from the said Company, in order to see the production of Asbestos Cement Pipes. His stay lasted from the 4th March to the 8th March, 1974.

1.4 Foreign Technical Assistance

Technical assistance received by the Department during the year was:

1.4.1 United Nations

The following technical assistance from the United Nations was provided during 1974:

1.4.1.1 Morphou-Tylliria Feasibility Study

This project officially called "Feasibility Studies for Irrigation Development in the Morphou-Tylliria Area", (SF CYP 513-1/AGL) was undertaken by Electro-Watt Engineering Services Ltd., of Zurich Switzerland, acting as contracted consultants employed by UNDP with the participation of the Food and Agriculture Organization of the United Nations as the executing Agency. The study commenced in June 1972.

The main objectives of the Project, as set in the plan of operation, include the provision of adequate supply of water for the Morphou area by the diversion of excess water from Pendayia and Tylliria rivers and through the control of ground water utilization, and the irrigation development of the Pendayia-Tylliria area up to Pyrgos River.

Practically all individual studies had been completed by the end of 1973. Early in 1974 the consultants prepared an Interim Report, containing several alternative proposals for achieving the above objectives. In general all alternatives were based on two phases of implementation of the works.

The first phase included the diversion of excess water from Xeros, Marathasa and Karyotis river through a conveyor canal to a major off-channel storage reservoir to be built near Prastio village. From there the water would be pumped into a pipe distribution system to cover the Morphou area. An average of about 19 M.C.M. of water could be diverted for use through Prastio Reservoir every year.

The main purpose of the first phase was the immediate relieve of the depleted Morphou aquifer and the survival of the already developed area of Morphou. This phase proved to be the most economic one with an internal rate of return of about 20%.

The second phase included further mobilization of surface water by the construction of two dams, one on Xeros River and another one on Pyrgos depending on the area which would be served on the way to Morphou. Several alternative solutions were proposed each providing for different quantity of water for diversion to Morphou area and different quantity for the Nicosia water supply.

The second phase is not as economic as the first phase and brings the overall internal rate of return down to about 12%. The total quantity of surface water mobilized for use by both phases is on the average about 37 M.C.M. per year.

After Certain suggestions and modifications proposed by the Government the Consultants undertook to prepare their final report elaborating the most promising alternative proposal of development. In the meantime this Department started the preparation of investigations and designs for the implementation of the works.

Everything stopped in Summer after the invasion and the occupation by the Turkish troops of the whole of the project area.

Officially the project was ended in December 1974 when the Resident Engineer of FAO Mr. E. W. Latham left the Island.

1.4.1.2 Technical Assistance

1.4.1.2.1 Mr. Branco Millinussic, FAO Senior Irrigation Engineer continued his services with us in the design of various irrigation projects, merely that of Paphos and Morphou Irrigation Studies. He was proposed by us and accepted by the IBRD as the Project Manager of the Paphos Irrigation Project when it will start.

1.4.1.2.2 Mr. Martin Poolman, Associate Expert, completed his services with the Morphou Feasibility Study in August and left the Island.

1.4.1.2.3 As a replacement FAO sent to us Mr. Molkenboer, again from the Netherlands, who came here in May and started work as an assistant to Mr. Millinussic.

1.4.2 British Technical Assistance

During 1974 British Technical Assistance was continued in the field of studying the Southern Conveyor Project and brackish water desalination.

1.4.2.1 Southern Conveyor Project

In April a four-member team from the Water Resources Center London and from the Overseas Development Agency arrived in Cyprus and discussed with us the terms of reference for undertaking the Stage I study of the Southern Conveyor envisaging a start on this Project in October 1974.

Stage II, which would include more advanced studies was scheduled to be undertaken after the successful completion of Stage I studies.

In the meantime, the Water Development Department continued throughout the year to collect hydrological and agro-economic data as well as carrying out the necessary investigations to be used as inputs for the said study.

Due to the Turkish invasion in July it was not possible to undertake this study which was postponed by the British Government.

1.4.2.2 Brackish Water Desalination

During May a two-member team from the United Kingdom Atomic Energy Commission arrived in Cyprus and concluded a programme for initiating a pilot project for the use of four reverse osmosis mobile plants offered by the British Government for the desalting of

various types of groundwater. These four plants would use four different techniques in reverse osmosis and it would have been an one-year project experimenting on different qualities of ground-water.

The project would have started in July, but again due to the Turkish invasion it was not possible to start this project although all the plants arrived on the Island. One of the plants was lost in Famagusta Harbour after the Turkish occupation and it has not been possible to be recovered by the British Authorities.

1.5 Desalination Studies

During the year negotiations with the IBRD in connection with the financing of an $1\frac{1}{2}$ million cu.m. per annum sea water distillation plant which would have been established at Dhekelia in conjunction with a new generating power station proposed there by the Electricity Authority and which would have been operative between the years 1978-1980.

The IBRD has been concerned with this aspect and during the year they requested further information, explanations and justification as to the necessity of the desalting plant. Their questionnaire has been answered by the Department during the year.

The Turkish invasion of July stopped all such contacts with the Bank and undoubtedly now with the conditions prevailing on the Island the necessity for such a plant has been deferred for the later future.

1.6 Cyprus National Inter-Departmental and Departmental Committees

1.6.1 International Hydrological Decade

This Committee was set up on 19th August, 1964 for U.N.E.S.C.O's Hydrological Decade (1965-1974) and is composed of the following persons:

<u>Chairman</u>	Mr. C.A.C. Konteatis, Director, Water Development Department
<u>Secretary</u>	Mr. N. Chr. Toufexis, Assistant Head of Water Resources Division
<u>Members</u>	Mr. Y.Hji Stavrinou, Director, Geological Survey Department
	Mr. A. Papasolomontos, Director, Agricultural Department
	Mr. Th. Christou, Director, Agricultural Research Institute
	Mr. G. Seraphim, Director, Forest Department
	Mr. C. Philaniotis, Meteorologist, Meteorological Office

The main activities during the year were the hydrometeorological observations taken in the Representative basin of Limnitis and Vasilikos rivers, as well as the evaporation observations taken at Athalassa. The results are reported to the Secretary, Co-ordinating council of the I.H.D., Paris.

1.6.2 International Commission on Large Dams

The Cyprus National Committee on Large Dams (CNCOLD) was elected to full membership of the International Commission on Large Dams in 1969. During 1973 the National Committee was composed of the following members:

Chairman Mr. C.A.C. Konteatis,
Director, Water Development Department

Secretary Mr. C.C. Artemis,
Executive Engineer, Division of Design

Members Mr. R. Michaelides,
Director-General, Ministry of Agriculture and
Natural Resources

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

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

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

The 42nd Executive Meeting of the International Commission on Large Dams was held in Athens from 8th to 16th May 1974 and was followed by Study Tours in Greece from 17th to 22nd May. The Cyprus National Committee was represented by Mr. R. Michaelides, Director General of the Ministry of Agriculture and Natural Resources and member of the Cyprus Committee, Mr. C.A.C. Konteatis, Chairman and Messrs A. Papadopoulos and P. Christophorou, members.

The Cyprus National Committee organized Study Tours in Cyprus on May 23rd to 27th after the end of the Study Tours in Greece. These Study Tours proved a great success. They were attended by over 100 people at least 50 of whom came from abroad and included the President of the International Commission on Large Dams Mr. C.F. Gröner. Many letters of congratulations and thanks were received by the Organizing Committee after the Study Tours. The Study Tours offered participants a well balanced variety of visits to places of technical and tourist interest as well as social functions. The dams visited were Lefkara, Palekhoris-Kambi, Yermasoyia, Massari, Kalopanayiotis and Prodormos. In addition the Tours included visits to the archeological sites of Curium and Salamis and attendance at the Morphou orange festival.

1.6.3 International Commission on Irrigation and Drainage

The International Commission on Irrigation and Drainage is a non-profit organization whose objectives are to stimulate and promote the development and application of the science and techniques of irrigation, drainage, flood control and river training in the engineering, economic and social aspects.

DAMS CONSTRUCTED UP TO 1960

No	DAM	TYPE	HT	1000m ³	YEAR
1	Kouklia	Earth	6	4,545	1900
2	Lymbia	Gravity	5	18	1945
3	Lythrodhonda	Gravity	11	32	1945
4	Kalokhorio (K1)	Gravity	9	82	1947
5	Akrounda	Gravity	7	23	1947
6	Galini	Gravity	11	23	1947
7	Petra	Gravity	9	32	1948
8	Petra	Gravity	9	23	1951
9	Lythrodhonda	Gravity	10	32	1952
10	Kafizes	Gravity	23	113	1953
11	Ayios Loucas	Earth	3	455	1955
12	Gyposos	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 m³ x 10⁶

MINOR RECHARGE DAMS FROM 1960-70

No	DAM	TYPE	HT	1000m ³	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 m³ x 10⁶

- ① Dams constructed up to 1960
- ①⑦ Major dam projects from 1960-70
- ⑥⑤ Major dam projects from 1971-73
- 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

MAJOR DAM PROJECTS FROM 1960-70

No	DAM	TYPE	HT	1000m ³	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 Keuy	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	Palemidhia	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	Syngراسis	Earth	7	1,115	1968

Total Storage Capacity 32,041 m³ x 10⁶

MAJOR RECHARGE DAMS FROM 1960-70

No	DAM	TYPE	HT	1000m ³	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	Protapapas	Earth	6	90	1970

Total Storage Capacity 8,275 m³ x 10⁶

MAJOR DAM PROJECTS FROM 1971-73

No	DAM	TYPE	HT	1000m ³	YEAR
65	Lefkara	Earth Rockfill	74	13,850	1973
66	Massari Recharge dam	Earth	15	2,273	1973
67	Palechori-Kambi	Gravity	33	620	1973

Total Storage Capacity 16,743 m³ x 10⁶

GRAND TOTAL UP TO END OF 1973 : 64,4 m³ x 10⁶

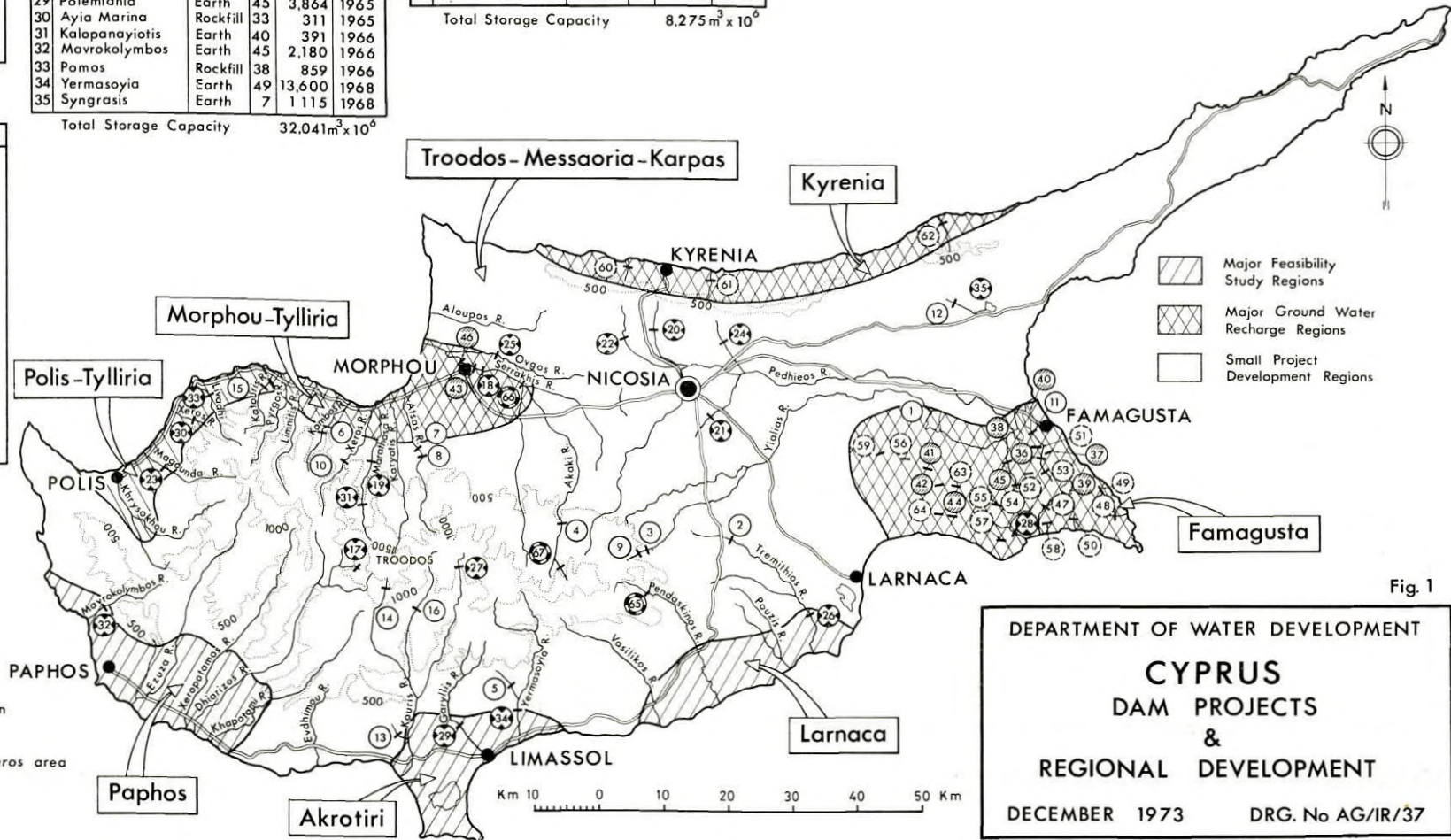


Fig. 1

DEPARTMENT OF WATER DEVELOPMENT
CYPRUS
 DAM PROJECTS
 &
 REGIONAL DEVELOPMENT
 DECEMBER 1973 DRG. No AG/IR/37

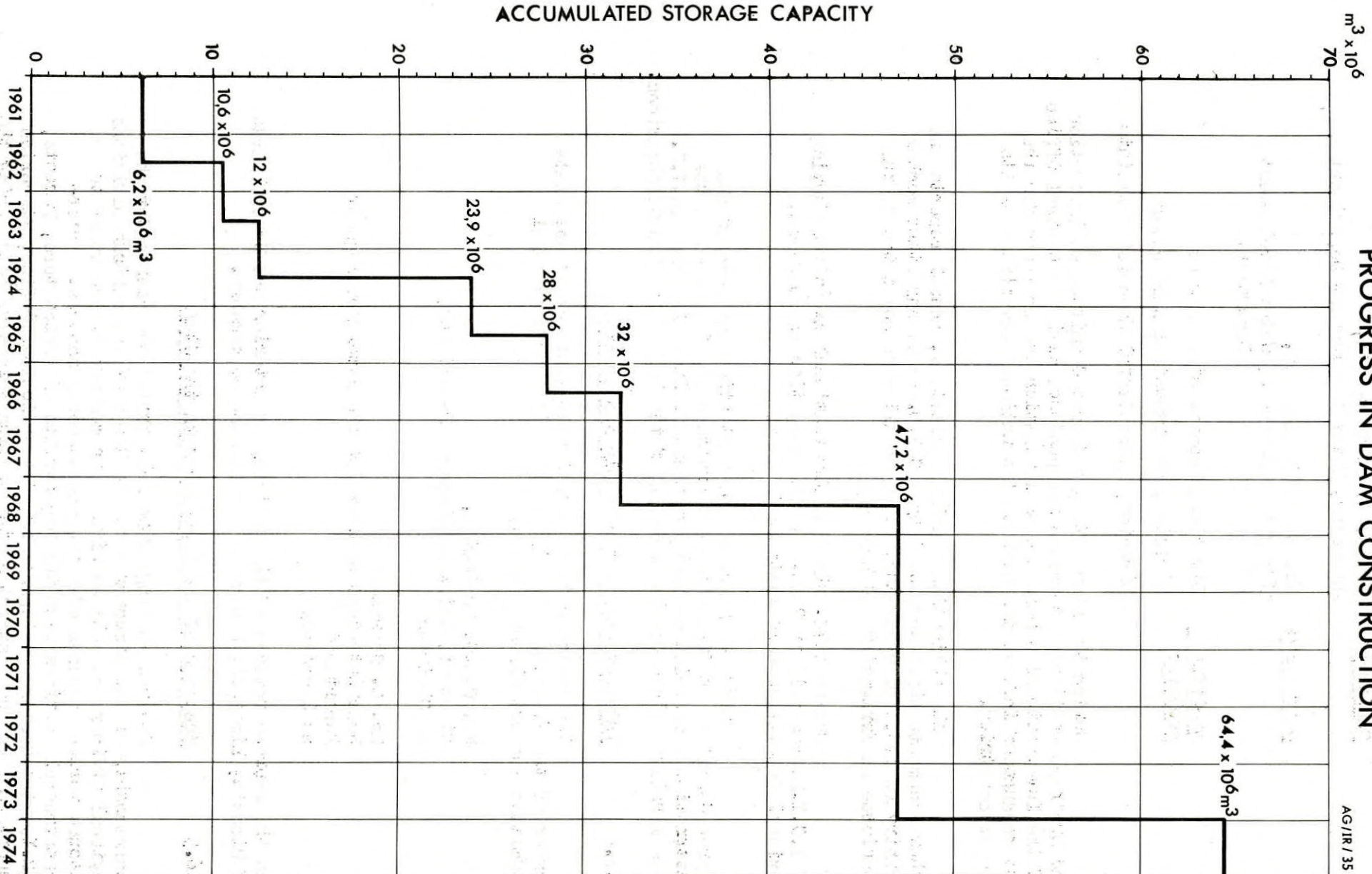
REGISTRE DES BARRAGES EN CHYPRE

REGISTER OF DAMS IN CYPRUS

L I N E N O	NOM DU BARRAGE NAME OF DAM	ANNEE D'ACHEVEMENT YEAR OF COMPLETION	SITUATION LOCATION			T Y P E	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 ⁶ m ³)	CAPACITE TOTALE DU RESERVOIR GROSS CAPACITY OF RESERVOIR (10 ⁶ m ³)	D E P U R T O N A T I O N	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	L I N E N O
			COURS D'EAU RIVER	VILLE LA PLUS PROCHE NEAREST CITY	ETAT OU DEPARTEMENT STATE PROVINCE OR COUNTY												
1	KAFIZES	1953	Xeros	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	(Morphou) Kouris	Limassol	Limassol	PG	15	53	2	34	I	59	L	Kandou Irrigation Division	Department of Water Development	Department of Water Development	2
3	PERAPEDEHI	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	PRODRHOMOS	1962	off stream	Limassol	Limassol	TE	10	756	73	122	I		L	Prodrhoms 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	Tremithios	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	OVOS	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	Energoproject of Yugoslavia	Mediterranean Constructors Greece.-G.P. Zachariades Cyprus	18
19	POLEMIDHIA	1965	Garylhis	Limassol	Limassol	TE	45	196	215	3 864	I	581	L	Government	Energoproject 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	Energoproject of Yugoslavia	Cybarco of Cyprus	21
22	POMOS	1966	Livadhi	Paphos	Paphos	ER	38	302	153	859	I	300	L	Pomos Irrigation Division	Energoproject 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	Energoproject of Yugoslavia	Cybarco of Cyprus	23
24	LEFKARA	C (1973)	Pendaskinos	Larnaca	Larnaca	TE/ER	7.4	240	800	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	C (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	C (1973)	Akaki	Nicosia	Nicosia	PG	33	131	27	620	I	65	L	Government & Palekhori Irrigation Division	Department of Water Development	Ioannou & Paraskevaides Ltd.	26

DEPARTMENT OF WATER DEVELOPMENT
PROGRESS IN DAM CONSTRUCTION

AG/IR/35



Cyprus is a member country of the International Commission on Irrigation and Drainage, which was set up in 1950, since 1954. The Cyprus Committee on Irrigation and Drainage was formed in 1964 and it is now composed of the following:

Chairman: Mr. C. A. C. Konteatis,
Director, Water Development Department

Secretary: Mr. E. M. Kambourides,
Irrigation Engineer, Water Development
Department

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

During the year 1974 the Cyprus Committee on Irrigation and Drainage continued to keep correspondence with the Central Office of the International Commission on Irrigation and Drainage for the interchange of information between the national committees of its member countries.

All publications such as bulletins, annual reports and other documents which were sent by I.C.I.D. or by any other member country of I.C.I.D. were distributed to all members of the Cyprus Committee on Irrigation and Drainage.

During 1974, the 25th International Executive Meeting of I.C.I.D. was held in Bonn. At the same time the European National Committees held meetings in Bonn.

A message by Mr. C.A.C. Konteatis, Chairman of the Cyprus Committee on Irrigation and Drainage was forwarded to the International Commission on Irrigation and Drainage for the I.C.I.D. Commemorative volume on the occasion of the Silver Jubilee Celebrations.

1.6.4 International Water Supply Association

The Department of Water Development was an associate member of the I.W.S.A. until 1969. Late in 1969 a National Committee was established made by:

Mr. C.A.C. Konteatis,
Director, Water Development Department,
as Chairman

Mr. G. Charalambous
Superintendent of Works of the Water Development
Department
as Secretary

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

1.6.5 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 Officers as well as with other members of the staff to discuss various aspects of works and personal matters. Inter-departmental 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.

1.7 Water Resources

1974 was about 80% of the normal regarding precipitation on the whole of the Island having reached 490 mm. The rainfall varied between 60% of average over the part of the western Troodos mountains and some areas of Paphos and Limassol Districts and reached upto 140% around Halefka in the northern range.

Because of the low rainfall on the central mountainous mass the flow of the rivers was well below normal and the amount of water accumulated in all the dams was only 10 million cu.m. being about 80% of the total available dam capacity.

The groundwater depletion through overpumping in the Pendayia-Morphou region continued through the year, and further sea intrusion has been observed. However, due to the Turkish invasion in July, not enough records are being kept and the exact condition of the northern occupied aquifers is not possible to assess accurately.

1.8 Planning and Design of Projects

During the year the major planning works were the Morphou-Tylliria study which has been completed before the Turkish invasion and the work carried Departmentally regarding the Southern Conveyor Project. Also, the design of the extension of the Engomi reservoir in Nicosia was continued whilst design was started on the Dhyptomamos dam and the diversion of the Khirokitia river in connection with the proposed Vasilikos-Pendaskinos Project. In addition, a number of small dams were investigated at Pera-Pedhi, Lymbia, Psevdas and Ayia Anna.

Inspite of the Turkish invasion, the routine planning and design of rural water supply and small irrigation projects continued with greater emphasis in order to enable many of such projects to be put under construction mainly for employment purposes.

Field and laboratory investigations and tests have also been continued for the first half of the year but have been seriously interrupted after the Turkish invasion.

1.9 Construction of Projects

For the year 1974, 519 different projects were approved for construction at a total value of £3,084,000 against which £1,679,000 were actually spent.

Of the 519 different schemes 203 were village water supplies, 90 minor irrigation, 7 town water supply, 12 schemes for town water boards, 73 for other Departments and 109 for private developers.

1.9.1 Major Projects

The major irrigation schemes included 25 projects valued at £1,468,000 out of which the actual expenditure reached £705,000.

The greatest expenditure incurred on a single project was on the Yermasoyia Conveyor System being an asbestos cement pressure pipeline of upto 1 meter diameter conveying the water from the Yermasoyia dam to the Akrotiri plantations on the western side of Limassol. The expenditure incurred on this project during the year was £340,000.

During the year the construction of the Massari dam, the Lefkara dam and the Palekchori dam were completed.

A new dam came under construction during the year at Arakapas for the irrigation of important citrus tangerine plantations which had been under stress of water shortage for the last 10 years at least. This dam is of mass concrete gravity of a maximum height of 20 meters from riverbed level to the crest of the dam and of a capacity of 130,000 cu.m. During the year £78,000 were spent on this project which is estimated to cost by the time of its completion in 1975 about £150,000.

Also during the year important work was carried out for the pipeline distribution systems at Arkaga-Magounda, Mavrokolymbos and Ayia Marina dams. The total amount of money spent on these distribution systems during the year was £89,000.

An important domestic water supply scheme undertaken during the year was the extension of the Engomi reservoir of 20,000 cu.m. capacity. The design of this reservoir is of external mass concrete walls, internal reinforced concrete walls and flat roof construction. It is the first time that the flat roof design without beams is introduced by the Department, and it will be of some interest from the engineering point of view. The estimated cost of this reservoir is £266,000 and during the year an expenditure of £116,000 was spent. The whole work is scheduled to be completed in 1975.

1.9.2 Rural Domestic Water Supplies

As mentioned previously 203 of these projects were executed during the year. Twenty of these schemes which were in the northern part of the Island occupied by the Turkish Army have been interrupted some of them having been largely completed before occupation. On village domestic water supplies £451,000 were spent during the year.

Of the villages interrupted or otherwise affected by the Turkish invasion, important schemes were the Tripimeni regional scheme at £52,000, the Karavas scheme at £27,000 and the Lapithos scheme at £23,000.

Other important schemes executed during the year were the Lymbia regional scheme at £54,000, the Kividhes regional scheme at £50,000 and the Kalepia-Letymbou in Paphos at £8,000.

1.9.3 Routine Irrigation Works

During the year 90 such schemes were undertaken all over the Island at an actual expenditure of £256,000.

Seventeen schemes of an estimated cost of £73,000 were interrupted due to the Turkish invasion being situated in the northern part of the Island. The expenditure incurred during the year on these effected projects was about £10,000 before occupation.

Of the various irrigation schemes undertaken during 1974 important schemes were completed for an intake and conveyance system at Erimi-Kolossi, the Pissouri Pumping scheme and distribution system at £54,000, the Kalavastos pumping scheme and distribution system at £19,000, the Peyia pumping irrigation scheme at £15,000, the Goudhi, Holi, Skouli pumping irrigation scheme at £31,000 and the Mamonia pumping irrigation scheme at £13,000.

The daily average number of labourers employed by the Department during 1974 was 884 as compared with 936 in 1973. 43% were classed as regulars whilst approximately 61% were skilled employees, 9% semiskilled and 30% unskilled. 3% of the labourers employed until July 1974 were Turks.

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

January	843
February	813
March	823
April	828
May	842
June	938
July	750
August	634
September	854
October	1075
November	1144
December	1066

Monthly average 884

1.10 Operation and Maintenance of Projects

The Department has been undertaking during the year the operation and maintenance of major irrigation and domestic water supply projects for which it takes an active part and responsibility. Regarding minor irrigation and rural domestic water supplies the maintenance works are only carried out on demand of the Irrigation Divisions or village water supply Commissions.

1.10.1 Major Irrigation Projects

From the irrigation projects a quantity of 2,544,000 cu.m. of water was sold and a gross income of £26,138 was received, giving an average selling price of 10.27 mils/cu.m. The total operation costs reached £11,048 whilst maintenance costs were £4,603.

1.10.2 Town Water Supplies

The main water supply operation and maintenance administered by the Department has been for the Nicosia and Famagusta water supply schemes.

1.10.2.1 Nicosia Water Supply

During the year a total of 7,532,363 cu.m. of water were supplies with a maximum of 28,090 cu.m. per day during Summer giving 42 gallons/day/capita. The total revenue from the sale of water by the Department for the Greater Nicosia scheme only has reached £160,834 against an expenditure of £130,730.

During the year the distribution system of the Greater Nicosia scheme was extended by 7,545 meters of 6" and 4" diameter asbestos cement pipes.

In addition to the above described work and supply of water, the Nicosia Water Board carried out similar work.

1.10.2.2 Famagusta Water Supply

Pumping of water was continued from a number of boreholes and the Vasilikos sub-surface dam of the Famagusta water supply scheme and water was delivered to the Famagusta and Larnaca Water Boards as well as to the Lefkara village regional scheme. The total quantity of water sold amounted to 2,283,818 cu.m., giving a revenue from the sale of this water of £103,456 against an expenditure of £60,395.

1.11 Finance, Expenditure and Revenue

During the year, the total expenditure (Government and Loans) was £2,172,647 including all administration costs (1973 Expenditure was £2,443,730).

The largest item of expenditure was on Major Waterworks Projects for which the sum of £695,378 was spent.

The administration costs, including hydrological observations, Consultants' Fees and Major Projects Investigations, reached the sum of £456,400 during the year, represents 26% of the total departmental expenditure. This, as can be seen from Table 3, is only by 4% higher than that of 1973 (22%). The level of the construction works carried out during 1974 was £1,716,250. (1973 was £2,000,350.)

The Construction programme during 1974 was revised as a result of the Turkish Invasion in July 1974. No works could be put in hand or completed in areas occupied by the invaders.

In an effort to increase irrigation in areas controlled by Government and give at the same time employment to a number of refugees, funds were approved for the construction of a number of minor irrigation schemes as well as for the improvement of a number of village water supply schemes for potable water.

The monthly expenditure of the Department as can be seen from Table 2 is again very unevenly distributed ranging from 1% in January, and increasing to 61% 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 Ministries 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 £219,000 was collected during the year (1973 £347,900) as revenue, mainly from the sale of water for the Greater Nicosia Scheme and the Famagusta Water Supply Scheme.

Table 1 - 1974 Expenditure - Water Development Department

	Details	Government Funds £	Contribution by Beneficiaries £	Total
1	Administration	364,212	-	364,212
2	Irrigation Drainage of Dams	828,754	109,286	938,040
3	Town Water Supplies	69,088	25,000	94,088
4	Village Water Supplies	238,789	154,992	393,781
5	Drilling and prospecting	9,678	-	9,678
6	Hydr.Obs.Research and Weirs	21,478	-	21,478
7	Workshops (Maintenance)	23,318	-	23,318
8	Purchase of Machinery Tools and Equipment	3,646	-	3,646
9	Consultants' Fees	6,156	-	6,156
10	Govt. Water Supplies	2,509	-	2,509
11	Major Projects Investigations and Surveys	31,320	-	31,320
12	Greater Nicosia Scheme	278,007	-	278,007
13	Water Supply Special Measures Law	143	-	143
14	Stores	6,271	-	6,271
	Total	1,883,369	289,278	2,172,647
	<u>Breakdown of Administration</u>			
1	Personal Emoluments	210,573	-	210,573
2	Casual Assistance	14,650	-	14,650
3	Technical Assistance	45,259	-	45,259
4	Travelling	21,936	-	21,936
5	M'ce and Operation of Motor Transport	37,408	-	37,408
6	Office Expenses	3,406	-	3,406
7	Leave pay to Reg. Empl.	30,980	-	30,980
	Total	364,212	-	364,212

Table 2 - Monthly Statement of Development Expenditure for the year 1974

1974 Approved	£2,474,511
Additional Special Warrants	£ 8,940
Total	£2,483,451

Month	Monthly £	Expenditure up-to-date £	Balance £	% to date Expended
January	25,973	25,973	2,457,478	1%
February	50,625	76,599	2,406,852	3%
March	57,842	134,441	2,349,010	5%
April	120,230	254,671	2,228,780	10%
May	197,338	452,009	2,031,442	18%
June	92,927	544,936	1,938,515	21%
July	78,259	623,195	1,860,256	25%
August	75,631	698,826	1,784,625	28%
September	202,707	901,533	1,581,918	36%
October	76,277	977,810	1,505,641	39%
November	185,299	1,163,109	1,320,342	46%
December	352,800	1,515,909	967,542	61%

Summary:

Approved amount	£2,483,451 = 100%
Less Actual Expenditure	£1,515,909 = 61%
Unspent Balance	£ 967,542 = 39%

Table 3 - Statement of Expenditure

Serial No.	D e t a i l s	1 9 7 4
1	Administration	364,212
2	Workshops' M'ce of Plant and Stores	29,589
3	Purchases of Machinery Tools etc.	3,646
4	Hydrological Observations	21,478
5	Consultants' Fees	6,156
6	Major Projects Investigations	31,320
Sub-Total "A"		456,401
7	Drilling and Prospecting	9,678
8	Water Meters Special Measures Law	143
9	Town Water Supplies	374,604
10	Village Water Supplies	393,781
11	Small Irrigation Projects	242,662
12	Major Irrigation Projects	695,378
Sub Total "B"		1,716,246
Grand Total		2,172,647
% of "A" to "B"		26%

Table 4 - Statement of Revenue Collected during the Year 1974

	£
Greater Nicosia Scheme	160,809
Famagusta Water Supply Scheme	36,229
Regional Village Water Supply Schemes	1,269
Drilling Charges	3,805
Other Fees	16,869
Total	<u>£218,981</u>

Table 5 - 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 of 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

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	13,500	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 of 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

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

Ser. No.	Details	1966	1967	1968	1969	1970	1971	1972	1973
1	Administration	145,389	183,927	228,902	248,058	257,624	262,688	265,447	334,922
2	W/Shops & M'ce of Plant & Stores	14,147	14,848	25,594	38,268	24,896	24,200	29,415	28,512
3	Purchase of Machinery tools etc.	10,973	12,927	5,918	16,910	4,103	4,790	8,597	4,451
4	Hydrological Observations	18,863	20,538	19,768	22,365	42,393	19,359	21,816	19,984
5	Consultants' Fees	51,297	32,040	14,676	5,021	12,266	26,299	18,653	19,169
6	Major Projects Investigations	7,733	20,880	34,801	25,083	22,780	33,349	37,232	36,357
	Sub-total "A"	248,402	285,160	329,659	355,705	364,062	370,685	381,160	443,395
7	Drilling of Water	24,253	35,029	49,095	22,938	46,033	50,388	11,168	10,727
8	Water Meters for Wells & B/holes	983	2,672	86	116	-	-	418	20
9	Town Water Supplies	138,390	68,782	171,190	937,325	265,062	184,804	342,129	275,964
10	Village Water Supplies	108,926	130,340	232,253	251,805	229,746	374,943	320,436	472,448
11	Small Irrigation Projects	113,636	221,169	174,065	237,594	151,386	99,178	118,341	159,713
12	Major Irrigation Projects	689,010	941,131	493,045	263,209	283,499	378,882	1,116,023	1,081,463
	Sub-total "B"	1,075,198	1,399,123	1,119,734	1,717,987	975,726	1,088,195	1,908,515	2,000,335
	Grand Total	1,323,600	1,684,283	1,449,393	2,073,692	1,339,788	1,458,880	2,289,675	2,443,730
	% of A to B	23.1	80.3	20.3	17.2	37.3	25.0	20.0	22.0

STATEMENT OF EXPENDITURE FOR THE YEAR 1974

Major Irrigation Works (2D-11)

Scheme	Amount		Estimated Cost			Actual Expenditure		
	Dedaggered £ mils	Government £ mils	Village £ mils	Total £ mils	Government £ mils	Village £ mils	Total £ mils	
<u>CONTRIBUTORY SCHEMES</u>								
Arakapas Dam	63,877,000	63,877,000	21,292,000	85,169,000	59,360,275	18,599,707	77,959,982	
Arakapas Distribution	11,625,000	11,625,000	3,875,000	15,500,000	7,910,352	2,636,783	10,547,135	
Palekchori Distribution Sklidros	1,572,000	1,572,000	786,000	2,358,000	1,540,832	779,415	2,311,247	
Palekchori - Kambi Dam	11,300,000	11,300,000	3,766,000	15,066,000	4,333,605	1,444,534	5,778,139	
Palekchori - Kambi Diversion	21,518,000	21,518,000	7,172,000	28,690,000	14,463,787	4,821,262	19,285,049	
Agros Blanket	3,495,000	3,495,000	538,000	4,033,000	3,301,954	507,846	3,809,800	
Agros Dam	3,317,000	3,317,000	1,658,000	4,975,000	3,253,292	1,626,645	4,879,937	
Famagusta Dherynia	1,116,000	1,116,000	558,000	1,674,000	333,333	166,667	500,000	
Morphou Recharge	2,321,000	2,321,000	1,160,000	3,481,000	1,560	0,780	2,340	
Ovgos Dam	175,000	175,000	-	175,000	-	-	-	
<u>DAMS - GOVERNMENT ONLY</u>								
Lefkara	56,061,000	56,061,000	-	56,061,000	38,341,080	-	38,341,080	
Lefkara - Khirokitia Pipeline	15,845,000	15,845,000	-	15,845,000	14,115,841	-	14,115,841	
Khirokitia Treatment	43,067,000	43,067,000	-	43,067,000	34,323,111	-	34,323,111	
Massari Dam	35,588,000	35,588,000	-	35,588,000	34,816,748	-	34,816,748	
Yermasoyia Dam	5,818,000	5,818,000	-	5,818,000	1,637,857	-	1,637,857	
Paphos Irrigation Project	17,425,000	17,425,000	-	17,425,000	17,352,874	-	17,352,874	
Mavrokolymbos Compens.	1,009,000	1,009,000	-	1,009,000	1,009,000	-	1,009,000	
<u>DISTRIBUTION</u>								
Mavrokolymbos	8,977,000	8,977,000	-	8,977,000	7,131,909	-	7,131,909	
Yermasoyia Main Conveyor	260,500,000	260,500,000	-	260,500,000	259,444,960	-	259,444,960	
Yermasoyia - Akrounda - Phinikaria	94,630,000	94,630,000	-	94,630,000	80,654,164	-	80,654,164	
Argaka - Makounda	60,536,000	60,536,000	-	60,536,000	57,287,242	-	57,287,242	
Ay. Marina	25,000,000	25,000,000	-	25,000,000	23,729,617	-	23,729,617	
Lefkara	10,000,000	10,000,000	-	10,000,000	-	-	-	
Polemidhia Compens.	4,036,000	4,036,000	-	4,036,000	465,100	-	465,100	
Total	758,808,000	758,808,000	40,805,000	799,613,000	664,805,333	30,573,079	695,378,452	

Minor Irrigation Works (2D-12)

STATEMENT OF EXPENDITURE FOR THE YEAR 1974

S c h e m e	Estimated Cost			Actual Expenditure			
	Government	Village	Total	Government	Village	Total	
Ayia Marinoudha	75.563	64.368	139.931	74.143	63.158	137.301	
Akanthou	5,614.356	2,807.179	8,421.535	1,022.603	511.302	1,533.905	
Ay. Georghios K.	879.427	440.715	1,320.142	9.263	4.632	13.895	
Anglissides	1,600.000	800.000	2,400.000	1,249.837	624.918	1,874.755	
Askas "Pano Ambelia"	185.000	135.000	320.000	129.141	94.248	223.389	
Ergates	7,020.000	6,480.000	13,500.000	1,787.671	1,650.158	3,437.829	
Erimi - Kolossi	7,667.000	3,833.000	11,500.000	6,882.630	3,441.316	10,323.946	
Episkopi P.	1,700.000	850.000	2,550.000	1,422.730	711.364	2,134.094	
Goudhi - Kholi - Skoulli	27,056.628	13,527.814	40,584.442	19,941.239	9,970.620	29,911.859	
Idhalias River	9,000.000	-	9,000.000	6,540.235	-	6,540.235	
Kalavasos	8,834.000	4,416.000	13,250.000	5,753.951	2,876.976	8,630.927	
Kambos	533.000	267.000	800.000	451.665	225.832	677.497	
Kazaphani	1,042.647	521.824	1,564.471	861.496	430.749	1,292.245	
Khandria	1,075.000	1,075.000	2,150.000	714.091	714.090	1,428.181	
Kilani	57.313	29.158	86.471	10.000	5.000	15.000	
Klirou	4,200.000	2,800.000	7,000.000	2,456.317	1,637.544	4,093,861	
Kyperounda } Earth		1,086.473			1,008.831		
C.A. Mines } Reservoir	1,086.476	1,086.474	3,259.423	955.000	1,008.830	2,972.661	
Mandria	9,100.000	4,550.000	13,650.000	5,422.497	2,711.248	8,133.745	
Mamonia	11,810.000	5,906.000	17,716.000	8,971.033	4,485.517	13,456.550	
Maroni	2,341.033	1,171.519	3,512.552	2,000.247	1,000.124	3,000.371	
Mosphili	763.511	254.505	1,018.016	702.891	234.298	937.189	
Makrasyka	964.876	482.438	1,447.314	364.021	182.010	546.031	
Moniatis	2,241.568	1,121.286	3,362.854	1,792.593	896.297	2,688.890	
Paliomylos	254.208	127.104	381.312	254.208	127.104	381.312	
Pera - Politiko	3,666.000	1,834.000	5,500.000	3,249.415	1,624.707	4,874.122	
Peristerona P.	10,333.000	5,167.000	15,500.000	7,468.702	3,734.352	11,203.054	
Pissouri	42,958.061	21,480.032	64,438.093	35,064.206	17,532.102	52,596.308	
Pedhoulas	857.094	428.548	1,285.642	799.074	399.538	1,198.612	
Phini	4,800.000	2,400.000	7,200.000	2,877.783	1,438.891	4,316.674	
Prodromos "Chartzi"	5,600.000	2,800.000	8,400.000	5,408.004	2,704.002	8,112.006	
C/F	£						
		173,315.761	87,942.437	261,258.198	126,636.686	62,049.758	156,686.444

Minor Irrigation Works (2D-12) Contd.

S c h e m e	Estimated Cost			Actual Expenditure		
	Government	Village	Total	Government	Village	Total
	B/F	£				
Peyia P.	173,315.761	87,942.437	261,258.198	126,636.686	62,049.758	156,686.444
Silikou	11,666.000	5,834.000	17,500.000	9,770.034	4,885.017	14,655.051
Skarinou	2,306.000	1,154.000	3,460.000	2,257.627	1,128.814	3,386.441
Skarinou Phase II	744.542	726.489	1,481.031	743.615	725.979	1,469.594
Saittas)	4,600.000	300.000	4,900.000	3,289.824	214.462	3,504.286
Moniatis (		697.469			444.071	
Styllos Limnia	3,251.975	929.519	4,878.963	2,072.681	592.269	33,109.021
Spilia	133.000	67.000	200.000	110.596	55.298	165.894
Tris Elies	3,246.000	1,624.000	4,870.000	2,095.395	1,047.697	3,143.092
Thermia	10,000.000	5,000.000	15,000.000	5,917.914	2,958.957	8,876.871
Vasilias "Paliokastro"	90.602	45.301	135.903	90.602	45.301	135.903
Vitsada	560.000	840.000	1,400.000	493.027	739.539	1,232.566
Voroklini	4,148.570	2,074.787	6,223.357	2,733.903	1,366.953	4,100.856
Zoopiyi	4,333.000	2,167.000	6,500.000	4,211.424	2,105.712	6,317.136
Plus Adjust. 208	500.000	250.000	750.000	495.019	247.509	742.528
Less Amount Debited to 2D - 13	- -	- -	- -	697.093	- -	- -
	- -	- -	- -	955.000	- -	- -
Total	£ 218,895.450	109,652.002	328,547.452	160,570.440	78,607.336	237,525.683

Village Water Supplies (2D-21)

STATEMENT OF EXPENDITURE FOR THE YEAR 1974

Scheme	Estimated Cost			Actual Expenditure		
	Government £ mils	Village £ mils	Total £ mils	Government £ mils	Village £ mils	Total £ mils
Akhelia	350.000	620.000	970.000	335.968	595.465	931.433
Armou	1,852.451	2,169.205	4,021.656	171.722	201.098	372.820
Amarketis	1,102.872	1,102.871	2,205.743	821.130	821.129	1,642.259
Apsiou	1,150.000	1,150.000	2,300.000	1,066.663	1,066.662	2,133.325
Arminou	18,950.000	150.000	19,100.000	10,021.954	79.804	10,101.758
Ay. Georghios Lefk.	27.093	13.547	40.640	19.358	9.679	29.037
Ay. Amvrosios L.	418.907	530.837	949.744	302.283	382.857	685.140
Ayii Vavatsinias	3,400.000	3,400.000	6,800.000	3,055.354	3,055.354	6,110.708
Ayios Constantinos L.	35.348	47.515	82.863	16.595	22.405	39.000
Ayia Marina)		602.500			309.153	
Nea Dhimata (	665.510	63.009	1,331.019	341.493	32.339	682.985
Aradippou	3,611.313	3,611.313	7,222.626	2,404.512	2,404.510	4,809.022
Ashia	7,750.000	7,750.000	15,500.000	3,734.861	3,734.860	7,469.721
Droushia P.	2,725.000	3,625.000	6,350.000	2,502.986	3,328.761	5,831.747
Drymou	1,133.948	1,285.660	2,419.608	284.378	322.790	607.168
Elia	821.318	859.066	1,680.384	774.215	810.019	1,584.234
Eftagonia	3,614.577	3,614.577	7,229.154	2,697.746	2,697.746	5,395.492
Fterycha		949.841			692.605	
Elia	4,115.979	1,266.455	6,332.275	3,001.289	923.474	4,617.368
Fterycha	257.984	104.247	362.231	74.197	29.968	104.165
Innia	5,000.000	6,080.000	11,080.000	4,905.111	5,963.738	10,868.849
Kambi Pharmaka	841.616	878.010	1,719.626	2.450	2.550	5.000
Karavas Phase I	6,079.211	7,430.150	13,509.361	6,079.211	7,430.150	13,509.361
Karavas Phase II	18,000.000	28,000.000	46,000.000	5,399.558	6,088.469	11,488.027
Kalogrea	2,350.000	2,350.000	4,700.000	1,930.885	1,930.885	3,861.770
Kili	1,204.705	1,461.237	2,665.942	1,019.821	1,236.918	2,256.739
Kiti	1,149.600	1,149.600	2,299.200	300.000	300.000	600.000
Kouklia	429.547	385.244	814.791	183.563	164.357	347.920
Kondea	1,418.294	1,711.456	3,129.750	1,292.355	1,556.752	2,849.107
Koracou	4,291.454	4,822.546	9,114.000	4,215.197	4,734.265	8,949.462
Kellaki	4,200.000	4,800.000	9,000.000	3,238.347	3,700.470	6,938.817
Kolossi	468.764	468.763	937.527	157.236	157.235	314.471
C/F	97,415.491	92,452.649	189,868.140	59,988.226	54,452.839	114,441.065

Village Water Supplies (2D - 21) Contd.

S c h e m e	Estimated Cost			Actual Expenditure		
	Government £ mils	Village £ mils	Total £ mils	Government £ mils	Village £ mils	Total £ mils
B/F						
Kaliana	97,415.491	92,452.649	189,868.140	59,988.226	54,452.839	114,441.065
Klirou)	716.023	962.053	1,678.076	701.471	941.702	1,643.173
Kalo Khorio (Part I	76.742	538.005		75.459	509.350	
Mitsero)	939.271	364.522	1,918.540	943.243	358.431	1,886.483
Klirou) Part II	987.337	849.109		859.055	738.787	
K. Khorio (	138.227		1,974.673	120.268		1,718.110
Mitsero Part IV	1,869.202	1,869.201	3,738.403	1,844.493	1,844.494	3,688.987
Klirou Part VI	561.522	561.522	1,123.044	539.883	539.882	1,079.765
Klirou) Part B2	2,600.000	2,236.000		2,577.778	2,216.845	
K. Khorio (		364.000	5,200.000		360.932	5,155.555
K. Khorio Part B3	1,450.000	4,450.000	5,900.000	1,353.454	4,152.870	5,506.324
Mitsero Part B4	3,150.000	350.000	3,500.000	3,148.055	349.783	3,497.838
Kambos Part A3	1,069.898	1,069.897	2,139.795	922.635	922.634	1,845.269
Kambos) A4	670.110	335.055		473.639	236.821	
Tsakkistra(	335.053		1,340.218	236.821		947.281
Kambos A6	86.906	86.905	173.811	81.382	81.382	162.764
K. Platres	300.000	300.000	600.000	283.885	283.884	567.769
Kondemenos	185.849	204.769	390.618	28.595	31.555	60.150
Katydhata	771.884	946.057	1,717.941	764.835	936.688	1,701.523
Kannaviou	1,666.000	984.000	2,650.000	1,324.764	782.719	2,107.483
K. Khorio L/sol	3,100.000	3,100.000	6,200.000	781.000	781.000	1,562.000
Lapithos	11,205.708	16,808.563	28,014.271	7,356.910	10,727.857	18,084.767
Lemona	232.373	288.597	520.970	18.753	23.247	42.000
Letymbou)	825.000	2,250.000			1,872.437	
Kallepia (	3,675.000	1,620.000	9,000.000	3,744.876	1,348.155	
Pittarkou)	630.000			524.283		7,489.751
Lysi	388.650	388.649	777.299	3.750	3.750	7.500
Lefkara Reg. Scheme	4,152.750		4,152.750	886.610		886.610
C/F	139,198.996	133,379.553	272,578.549	89,526.933	84,434.934	173,961.867

Village Water Supplies (2D - 21) Contd.

S c h e m e	Estimated Cost			Actual Expenditure			
	Government £ mils	Village £ mils	Total £ mils	Government £ mils	Village £ mils	Total £ mils	
	B/F	139,198.996	133,379.553	272,578.549	89,526.933	84,434.934	173,961.867
Lymbia (1,413.385		1,035.649		
Shia (298.215		219.440		
Kornos) Part I	7,302.759	839.817	10,954.140	5,352.182	615.501	8,028.274	
Mosphiloti (		383.895			280.989	
Psevdhas)		394.549			289.019		
Pyrga (		321.520			235.494	
Lymbia Part II	3,964.138	1,982.069	5,946.207	1,228.072	614.037	1,842.109	
Shia)		191.511			128.049		
Kornos (		526.034			350.495	
Mosphiloti) B3	2,805.848	238.802	4,208.273	1,869.305	158.892	2,803.960	
Psevdas (		247.219			164.498	
Pyrga)		198.859			132.721		
Shia B4		887.659	887.659		758.123	758.123	
Kornos)		326.349			316.376		
Mosphiloti (B5	1,505.874	150.956	2,259.812	1,461.990	146.491	2,192.986	
Psevdas)		152.779			148.100		
Pyrga (		123.854			120.029	
Kornos B6		2,599.010	2,599.010		2,560.460	2,560.460	
Mosphiloti)		115.531			107.862		
Psevdas (B7	658.561	116.446	986.342	612.856	109.089	919.284	
Pyrga)		95.804			89.477		
Mosphiloti B8		300.000	300.000		241.930	241.930	
Psevdas B9		2,306.215	2,306.215		2,282.475	2,282.475	
Pyrga B10		3,767.000	3,767.000		3,763.314	3,763.314	
Shia B4 New	2,623.000	407.000	3,030.000	2,620.877	406.588	3,027.465	
Lymbia B6 New	6,866.000		6,866.000	6,853.112		6,853.112	
Mosphiloti B8 New	2,367.000	833.000	3,200.000	2,352.291	827.770	3,180.061	
Psevdas B9 & 9A New	8,367.000	133.000	8,500.000	7,690.784	121.877	7,812.661	
Lymbia B10 110A New	6,733.000		6,733.000	5,453.394		5,453.394	
	C/F	182,392.176	152,730.031	335,122.207	125,021.796	100,659.679	225,681.475

Village Water Supplies (2D - 21) Contd.

S c h e m e	Estimated Cost			Actual Expenditure		
	Government £ mils	Village £ mils	Total £ mils	Government £ mils	Village £ mils	Total £ mils
B/F	182,392.176	152,730.031	335,122.207	125,021.796	100,659.679	225,681.475
Mamonia	1,157.000	1,397.000	2,554.000	976.103	1,178.649	2,154.752
Marathourda	3,400.000	4,060.000	7,460.000	2,495.412	2,979.384	5,474.796
Malia	400.000	400.000	800.000	359.135	359.134	718.269
Myrtou)	2,350.000	1,958.000	4,700.000	60.000	49.980	120.000
Karpashia (		392.000			10.020	
Marathovounos	3,500.000	3,500.000	7,000.000	369.187	369.186	738.373
Neokhorio P.	2,450.000	2,450.000	4,900.000	129.123	129.122	258.245
Nikitas	6,650.000	6,650.000	13,300.000	3,447.016	3,447.015	6,894.031
Pano Kyvidhes)	8,700.000	5,932.000	17,400.000	6,492.962	4,426.901	12,985.923
Souni Santzia (		2,768.000			2,066.060	
Pyrgos I/sol	5,750.000	5,750.000	11,500.000	2,411.952	2,411.951	4,823.903
Pano Pyrgos	1,303.118	653.561	1,956.679	776.797	388.398	1,165.195
Polis Prodromi	4,300.000	4,300.000	8,600.000	3,312.640	3,312.640	6,625.280
Prastio (Kellaki)	2,100.000	2,100.000	4,200.000	1,387.020	1,387.019	2,744.039
Pyroi	249.234	393.303	642.537	229.480	361.812	591.292
Phini L/sol	2,605.890	3,374.722	5,980.612	2,544.860	3,293.315	5,838.175
Pachna	1,700.000	1,700.000	3,400.000	1,699.844	1,699.844	3,399.688
Potami)	987.278	410.810	1,974.556	765.875	344.644	1,531.751
Vyzakia(		576.468			421.232	
Panayia	1,556.019	2,023.418	3,579.437	814.947	1,059.356	1,874.303
Phinikaria	425.000	425.000	850.000	270.272	270.273	540.545
Potami Part II	1,304.366	1,709.408	3,010.774	184.260	241.874	426.134
Piyenia	4,225.933	2,113.467	6,339.400	1,604.461	802.231	2,406.692
Polemi)	5,000.000	2,982.000	10,000.000	3,147.447	1,877.137	6,294.893
Stroumbi(		2,018.000			1,270.309	
Simou	3,625.000	4,225.000	7,850.000	3,573.878	4,173.878	7,747.756
Skarinou)		405.419			269.456	
Ay. Theodoros (	3,236.134	2,103.487	6,472.266	1,796.377	1,167.645	3,592.754
Alaminos)		647.226			359.276	

Village Water Supplies (2D - 21) Contd.

Scheme		Estimated Cost		Actual Expenditure	
Government	Village	Government	Total	Government	Village
£	£	£	£	£	£
mils	mils	mils	mils	mils	mils
249,364.148	220,228.320	469,592.468	163,870.844	140,787.420	304,658.264
Skarinou Part II	28.313	79.414	107.727	46.418	63.000
Ay. Theodoros) III	29.622	22.513	59.243	19.000	50.000
Alaminos	7.108	154.677	281.334	27.247	49.622
Skoulii	126.657	10.451.029	3,587.482	3,587.481	7,174.963
Tsadha	5,225.515	52.611.382	52.263.045		52.263.045
Tripiment	1,163.834	1,163.834	399.653		399.653
Trakoni I/sol	3,750.000	4,470.000	3,594.560	4,284.791	7,879.351
Xylotymbou	2,550.000	5,100.000	1,600.268	1,600.267	3,200.535
Vyzakia	1,047.359	1,237.875	2,285.234	371.712	439.177
Meloushia)	158.638	370.154	3.262	11.199	810.889
Tremetoushia (	2,628.386	343.720	5,287.981	10.399	159.984
Part I		1,448.442	82.392	46.395	
Vatyli	369.911	338.641	150.485	4.799	
Yerasa	15,000.000	462.830	3,085.307	188.369	338.854
Ypsonas)	10,500.000	30,000.000	3,085.307	925.592	6,170.613
Polemihia (	850.000	1,700.000	845.889	2,159.714	1,691.778
Zakaki "Tserkez"	334,903.765	252,789.208	587,692.973	154,991.695	384,910.551
TOTAL			229,918.856		
Plus Adjust. Alona	6.178	3,388.687	6.178		
Aradipou	600.400	2,150.000	600.400		
Kiti	39.000	1,486.500	39.000		
Vatyli	899.750	300.000	899.750		
Potamos Yermasoyias					
K. Mylos					
					238,789.371
					TOTAL

List of Senior Technical Staff

Name	Post	Qualifications
Christos A. Konteatis	Director	B.Sc. (Civil Eng.) University of London, F.I.C.E., F.I.W.E.
Constantinos Lytras	Assistant Director	Dipl. (Natural Science) University of Athens, M.Sc. (Geology) University of London, D.I.C. Engineering Geology.
Kyprianos C. Hassabis	Assistant Director	B.Sc. (Civil Eng.) University of London, M.E., M.I.C.E., M.A.S.C.E.
Haralambos Karakannas	Engineer Hydrologist	M.A.S.C.E., F.I.P.H.E., F.R.S.H. (London) Registered Civil Engineer
Christodoulos Christodoulou	Senior Water Engineer	Dipl. (Civil Eng.) National Technical University of Athens
Christos Marcoullis	Executive Engineer Class I	M.Sc. in Agricultural and Irrigation Engineering Dipl. (Civil Eng.) National Technical University of Athens.
Andreas P. Georghiades	Executive Engineer Class I	Dipl. Tech. (Civil Eng.) University of London, M.Sc. University of Birmingham, M.I.C.E., M.I.W.E.
Costas Andreou	Executive Engineer Class I	Dipl. (Civil Eng.) University of Dresden, Diploma in Hydraulic Engineering, Delft.
Charis Lapas	Executive Engineer Class I	B.Sc., (Civil Eng.) University of Glasgow
Christodoulos Artemis	Executive Engineer Class I	B.Sc., (Civil Eng.) (Hons) University of London, A.C.G.I., M.Sc. (Soil Mechanics) D.I.C., Assoc. Memb. I.C.E. - F.G.S.
Markos Dymiotis	Executive Engineer Class I	Dipl. (Civil Eng.) National Technical University of Athens, Diploma in Hydraulic Engineer, Delft
Nicos Stylianou	Executive Engineer Class I	Dipl. (Civil Eng.) The Polytechnic London, M.Sc. (Foundation Eng.) University of Birmingham, C. Eng., M.I.C.E.
Pantelis Loucaides	Executive Engineer Class I	B.Sc. (Eng.) Civil Engin. London University, M.Sc. (Foundations) Birmingham University.
Vlasis Partassides	Executive Engineer Class II	Dipl. (Civil Eng.) University of Moscow, M.Sc. (Civil and Industrial Eng.) University of Moscow.
Andreas Protopapas	Executive Engineer Class II	B.Sc. (Civil Engineering) University of Newcastle

Name	Post	Qualifications
Charalambos Palantzis	Executive Engineer Class II	B.Sc. (Civil Eng.) University of London, Assoc. Member I.C.E.
Maria Zachariou	Executive Engineer Class II	B.Sc. (Eng.) Civil Eng. London University, Member of Institute of Civil Engineers and Architects
Andreas Lambrou	Executive Engineer Class II	M.Sc. (Water Building Engineering) Dipl. (Civil Eng.) University of Budapest.
Charalambos Kridiotis	Executive Engineer Class II	B.Sc. (Civil Eng.) University of London
Theodoros Nicolaidis	Executive Engineer Class II	B.Sc. (Eng.) University of London, Kings College, A.K.I. (Associate of Kings College)
Kyriacos A. Spanos	Executive Engineer Class II	B.Sc. (Civil Eng.) University of Southampton U.K. (M.Sc. (Irr. Eng.) University of Southampton U.K.)
Tassos N. Hamatsos	Executive Engineer Class II	B.Sc. (Civil Eng.) M.Sc. (Dipl. Eng.) Water and Hydraulic Engineering, University of Dresden, East Germany
Christos Papamichael	Executive Engineer Class II	B.Sc. (Hons.) (Civil Engin.) University of Manchester M.Sc. (Concr. Structures of Technology) University of London, D.I.C.
Dedalos Kypris	Geologist Class I	Dipl. (Natural Science) University of Athens, D.I.C. Applied Geophysics
Michalakis Peppis	Geologist Class I	B.Sc. (Geology) American University of Beirut, M.Sc. (Geology) American University of Beirut.
Iacovos Iacovides	Hydrologist Class I	B.Sc. (Hydrology) University of Arizona
Christos Phanartzis	Hydrologist Class I	M.Sc. (Hydrology) B.Sc. (Hydrology) University of Arizona, A.M.A.G.U.
Christos Ioannou	Hydrologist Class I	Diploma (Natural Science) University of Salonica, Dipl. (Hydrogeology) University of London, Dipl. (Groundwater Research) University of Jerusalem.
Savvas Theodossiou	Mechanical Engineer Class II	B.Sc. (Mechanical Eng.) University of Manchester, M.Eng. in Desalination Technology University of Glasgow.

Name	Post	Qualifications
Demosthenis Patsalides	Topographer/Irrigation Eng.	B.Sc.(Agricultural Eng.) Technion Israel Institute of Technology, M.A.E.A.I., Assoc. Memb. I.C.E. Diploma in Hydraulic Engineering, Delft
Nicos Tsiourtis	Topographer/Irrigation Eng.	M.Sc. (Civil Engineering) B.Sc. (Agricultural Eng.) Technion Israel Inst. of Technology, M.A.E.A.I., Assoc. Memb. I.C.E.
Elias Kambourides	Topographer/Irrigation Eng.	B.Sc. (Agricultural Eng.) Technion Israel Inst. of Technology M.A.E.A.I. Assoc. Memb. I.C.E.
Loucas P. Savvides	Topographer/Irrigation Eng.	B.Sc. (Agricultural) Salonica University, M.Sc. Irrig. Davis University, California
P. Neophytides	Topographer/Irrigation Eng.	Dipl.(Rural and Topography Engineering) National Technical University of Athens
Niki Michael	Topographer/Irrigation Eng.	Dipl. (Rural and Topography Eng.) National Technical University of Athens
Panos Pantelides	Superintendent of Works	
Nicos Toufexis	Superintendent of Works	
George Charalambous	Superintendent of Works	

TECHNICAL STAFF OF W.D.D. ON 31.12.74

DRG. No. BM/G/26

MONTHLY AND DAILY PAID TECHNICAL STAFF		D	AD	SWE	EH	EE	ME	Geo	H	QS	TIE	LA	SW	SIW	EDR	IW	CF	ACF	TA	DR	F	Total Nos	REFERENCE	
1	Permanent staff	1	2	1	1	15	1	2	2				3	6	1	17	4	8	45		42	151	D Director	
2	Temporary staff					5			1	1	4	1		2		5		4	22	8	15	68	AD Assistant Director	
3	Daily paid staff					2					2								38			42	SWE Senior Water Engineer	
TOTAL NUMBERS		1	2	1	1	22	1	2	3	1	6	1	3	8	1	22	4	12	105	8	57	261	EH Engineer Hydrologist	
DISTRIBUTION OF STAFF																								
3	Divisions	i	Water Resources						2	3			1			4			20		2	32	EE Executive Engineer	
		ii	Planning				1	1								1			9		1	13	ME Mechanical Engineer	
		iii	Design					5				6		1	1	1			23	8		45	Geo Geologist	
		iv	Construction					5	1						2		9	2	10	3		38	H Hydrologist	
		v	Small Projects Planning											1	2		4	1	1	4			13	QS Quantity Surveyor
		vi	Operation & Maintenance											1	1		1		1	2		2	8	TIE Topographer/Irrigation Engineer
4	Administration (Head Office)		1	2							1											4	LA Legal Adviser (on contract)	
5	Regional Offices (Limassol Famagusta Paphos & Morphou)					6								1		2			26		2	37	SW Superintendent of Works	
6	Turkish Officers absent from duty					2													11		2	15	SIW Senior Inspector of Works	
7	On scholarship					1																1	EDR Engineering Draughtsman	
8	Vacancies					1	2			1				1			1		7*		10	23	IW Inspector of Works	
TOTAL NUMBERS		1	2	1	1	22	1	2	3	1	6	1	3	8	1	22	4	12	105	8	57	261	CF Chief Foreman	

*7 monthly paid

II. DIVISION OF
WATER RESOURCES

By
D. Kypris
Head of Division

2.1 Preface

The tragic events in Cyprus and the invasion of the Turkish Forces on July of the year under examination, having as a result still the occupation of about 40% of Cyprus land, had a destructive impact on the work which this Division carried out so far in the field of the collection of hydrogeological and hydrological data. The fire that started at the offices of the Division in Nicosia and the destruction of Famagusta Regional Office of Water Development Department during bombing by the Turkish aeroplanes, deprived the Department from invaluable information which has been collected for years and was carefully kept in the archives of the Water Resources Division of this Department. Other information was also lost since another two of our Regional Offices, namely of Morphou and Kyrenia, have been occupied by the Turkish troops. The officers in charge of the above could not save anything but their lives.

Hydrological and hydrogeological investigations and measurements are of course discontinued in the zone occupied by the Turkish troops but continue in the other regions.

2.2 Introduction

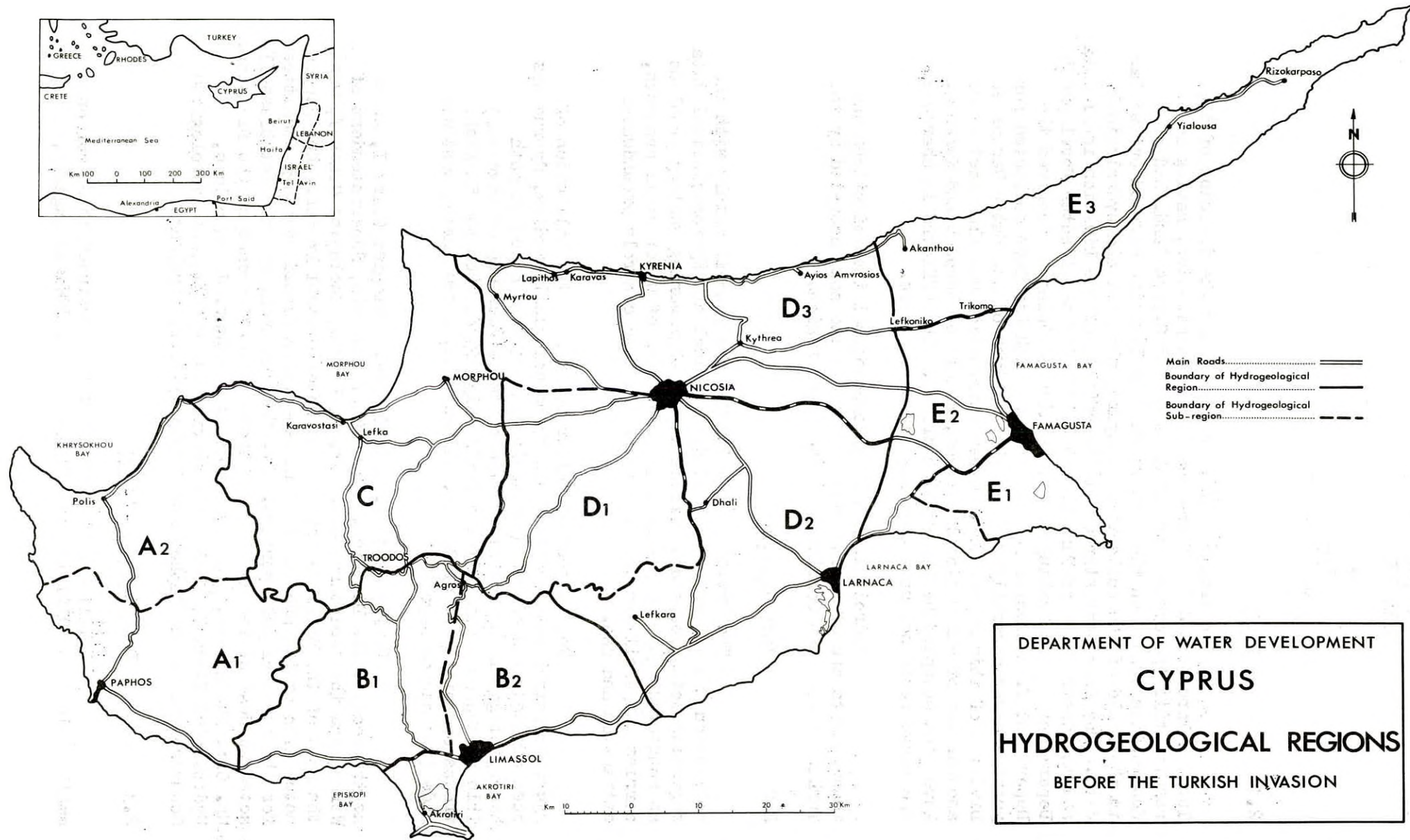
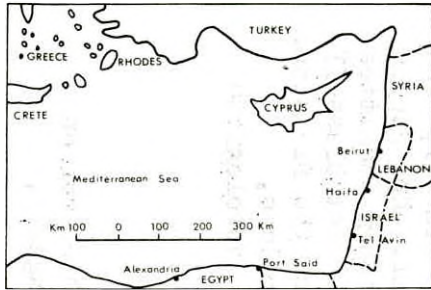
The Division of Water Resources deals mainly with the collection and interpretation of Hydrological and Hydrogeological data regarding both ground and surface water, engineering geology problems as connected with the planning and execution of water works projects, carries out ancillary drilling operations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

For reasons of better control on the collection of hydrogeological data and thorough hydrogeological studies, Cyprus has been divided into eleven hydrogeological regions based on both hydrogeological and administrative criteria (See map on page 56.) This arrangement was followed until July, 1974, when the Turkish troops occupied part of Cyprus. Since then, a new arrangement was made (see map on page 57).

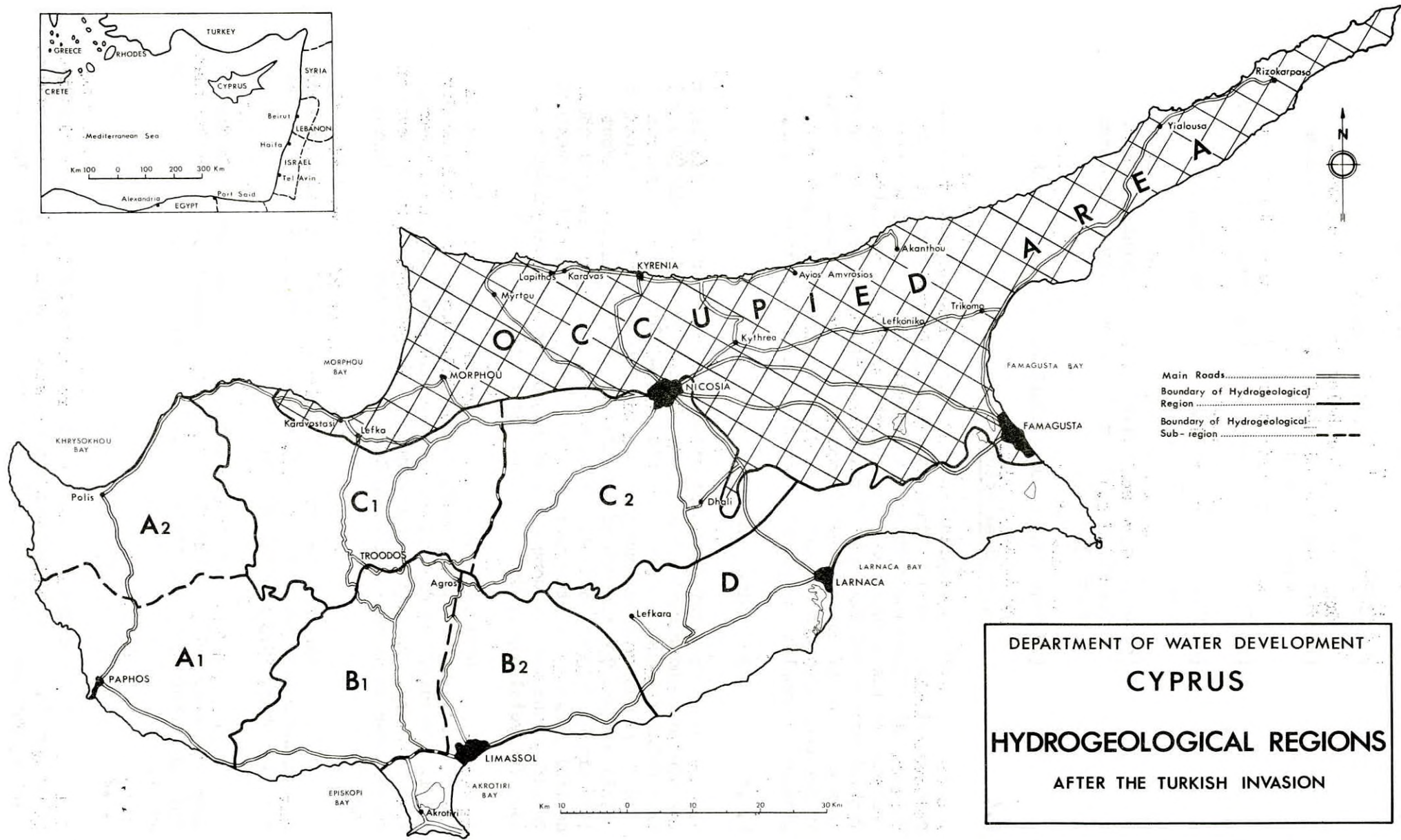
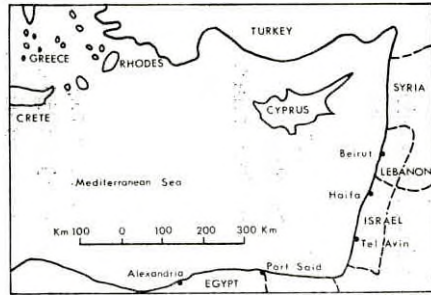
During 1974 Mr. D.C. Kypris, Geologist Class I, acted as the Head of the Division. Mr. N.Chr. Toufexis, Superintendent of Works, was the Assistant Head. Mr. M. Peppis, Geologist Class I, was the Head of the Drilling Permits and Water Control Branch. Mr. Peppis acted also as the president of the specially formed advisory committee for the issue of well permits. Mr. Chr. Ioannou, Hydrologist Class II, acted as Head of the Surface and Ground Water Branches of the Division. Mr. Chr. Phanartzis, Hydrologist Class I and Mr. J. Jacovides, Hydrologist Class I, were still serving during 1974, as Hydrologists Counterparts in the Paphos and Morphou-Tylliria Projects.

2.3 Drilling Operations

Drilling operation for water continued this year on a small scale; one drilling rig Ruston Bucyrus 22W was engaged,



DEPARTMENT OF WATER DEVELOPMENT
CYPRUS
 HYDROGEOLOGICAL REGIONS
 BEFORE THE TURKISH INVASION



DEPARTMENT OF WATER DEVELOPMENT
CYPRUS
 HYDROGEOLOGICAL REGIONS
 AFTER THE TURKISH INVASION

with which the following operations were carried out:-

- (a) Cleaning of 27 existing boreholes
- (b) Drilling of 3 boreholes for Domestic Purposes penetrated depth 144.0 m.
- (c) Removing of casings from 3 Government boreholes
- (d) Cleaning and sealing one private artesian borehole at Maroni
- (e) Deepening of a private well affected by the Collective well at Vasilikos river (penetrated depth 3.7 m.)
- (f) Removing of pumps stuck or broken in boreholes

2.4 Meteorological Notes

The precipitation and other climatological elements recorded at the observing stations of the Cyprus Government Meteorological Service have been analysed. It must be noted here that due to the occupation of the Northern part of the Island by Turkish troops and the lack of measurements for July-August-September from a number of Meteorological Stations situated within this area, it has been necessary to extrapolate results so as to produce a picture as complete as possibly could be under the circumstances.

2.4.1 Precipitation

The total precipitation averaged over the whole island for the year under review was 389 mm which is 80% of normal (489 mm) this being the average for the period 1941-1970. (See diagram on page 59) Over the various parts of the Island precipitation ranged mainly between 70% and 85% of normal with extreme values of about 140% around Halefqa, a little above normal over small areas of the central plain and north coast and less than 60% over part of western Troodos mountains and some areas of Paphos and Limassol districts. (See Isohyetal map of Cyprus for the year under review.)

Distribution of precipitation over the months was rather good. October, November, January and March were wetter than usual. February was drier than normal while December, April and May were very dry. As regards the summer months, June and August were wetter than usual while July and September were dry. (See diagram on page 61.)

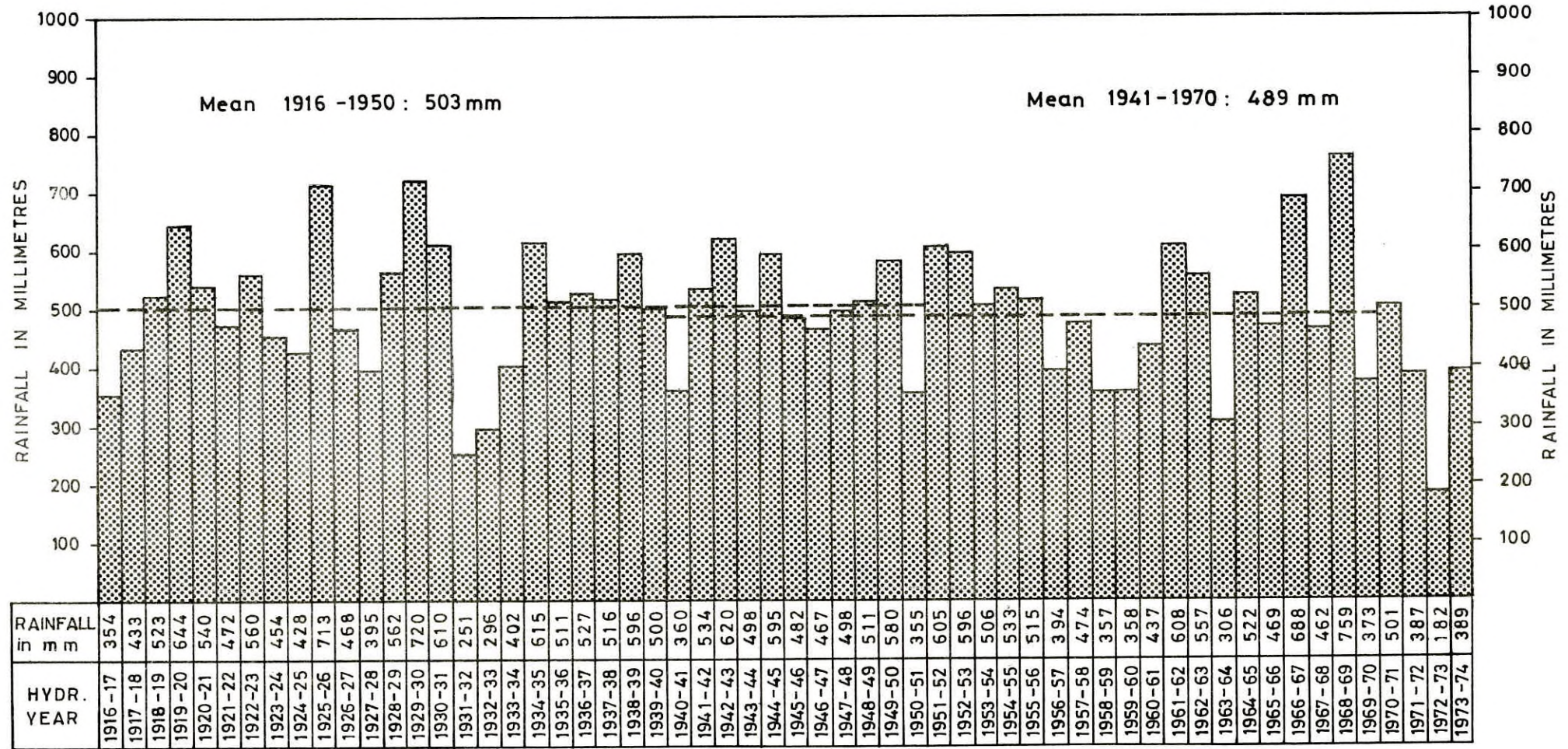
The highest amount of rainfall in 24 hours during the year under review was recorded at Sisklipos, Kyrenia District, on the 12th November, 1973 and was 168 mm.

The first snowfall occurred on Mount Olympus on the 22nd November, 1973, earlier in the season than usual. The last snowfall occurred on the 17th March, 1974, which is again earlier than usual.

2.4.2 Temperature

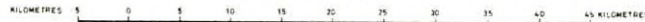
For the year as a whole temperatures averaged slightly below normal. November and January were much colder than normal while October, February, March and July were warmer than usual. In December

ANNUAL AVERAGE RAINFALL OF CYPRUS FROM 1916 -1974

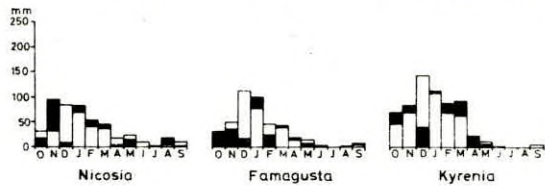
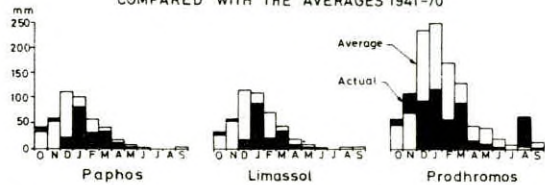


TOTAL ANNUAL PRECIPITATION (IN MM) OF CYPRUS OCTOBER 1973 - SEPTEMBER 1974

I: 750 000



ACTUAL MONTHLY PRECIPITATION 1973-74
COMPARED WITH THE AVERAGES 1941-70

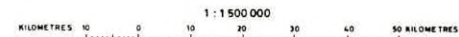
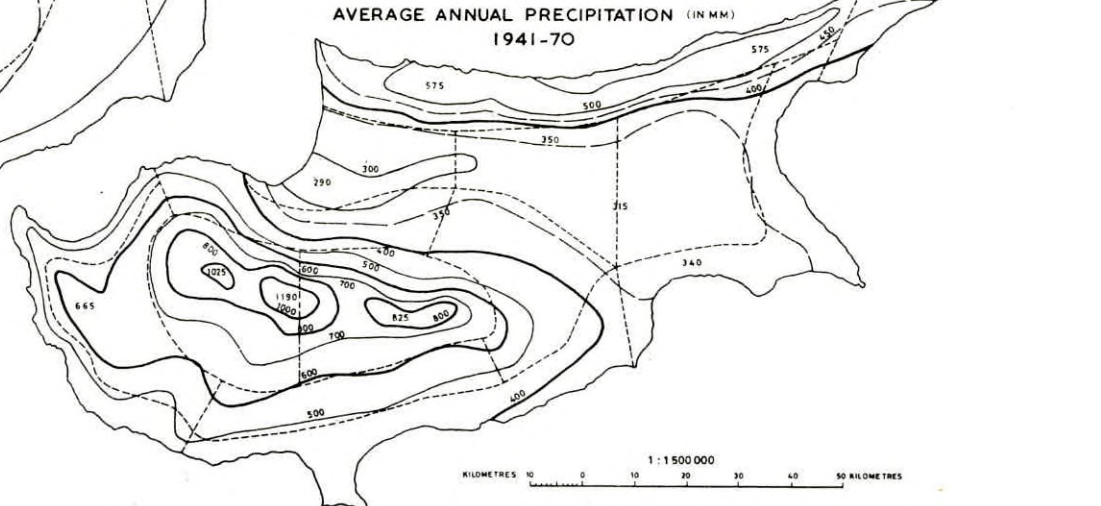


ANNUAL PRECIPITATION AVERAGED
OVER DISTRICTS AND THE ISLAND

	Area km ²	1941-70 mm	1973-74 mm	Difference mm	%
* 1 NORTH COAST AND KYRENIA RANGE	974	493	489	- 4	- 1
* 2 RIZOKARPASO PENINSULA	476	432	422	- 70	- 14
3 NORTHERN TROODOS SLOPES	569	429	329	- 100	- 23
* 4 WESTERN MESAORIA	479	318	298	- 20	- 6
* 5 CENTRAL MESAORIA	565	340	354	+ 14	+ 4
* 6 EASTERN MESAORIA	840	343	301	- 42	- 12
* 7 EASTERN COASTAL	713	363	287	- 76	- 21
8 WESTERN COASTAL	414	493	336	- 157	- 32
9 WESTERN TROODOS SLOPES	653	599	418	- 181	- 30
10 WESTERN TROODOS MOUNTAINS	819	770	553	- 217	- 28
11 EASTERN TROODOS MOUNTAINS	790	681	520	- 161	- 24
12 EASTERN TROODOS SLOPES	727	425	338	- 87	- 20
13 SOUTHERN TROODOS SLOPES	497	548	393	- 155	- 28
14 SOUTHERN COASTAL	738	444	297	- 147	- 33
WHOLE ISLAND	92 54	489	389	- 100	- 20

Note
For parts or the whole of Meteorological Districts marked with * precipitation amounts for August and September 1974 were estimated because data were missing

AVERAGE ANNUAL PRECIPITATION (IN MM)
1941-70



----- Meteorological District Boundaries

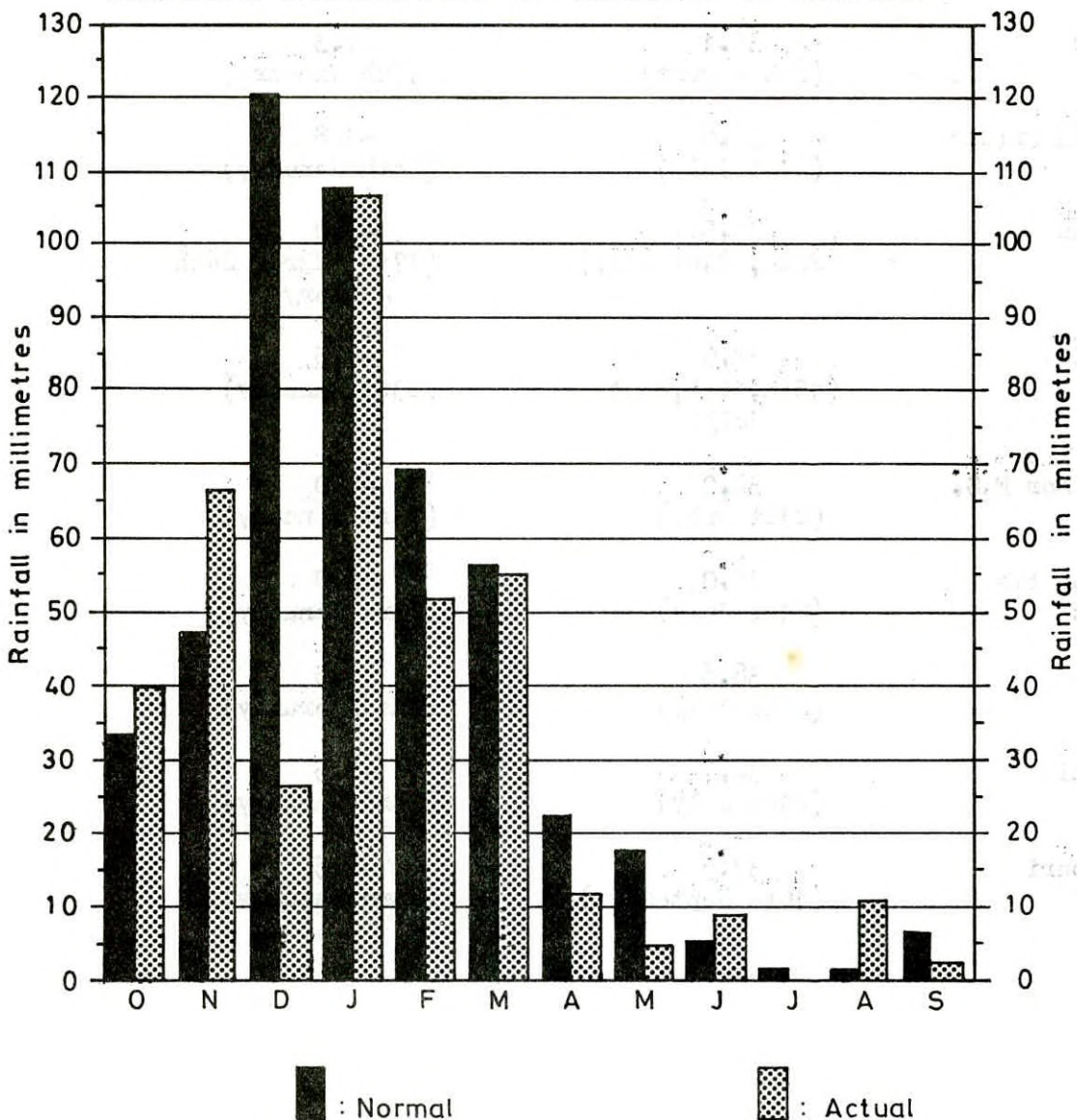
⑤ Meteorological District Number

INCIDENCE OF RAINFALL

The incidence of rainfall per month during the hydrological year 1973-74 is given as under:

Month	Rainfall		Percentage %
	in millimetres	in inches	
October	40	1.59	10.4
November	68	2.66	17.4
December	27	1.06	6.9
January	107	4.22	27.6
February	52	2.05	13.4
March	55	2.17	14.1
April	12	0.48	3.1
May	5	0.20	1.3
June	9	0.35	2.3
July	0	0	0.0
August	11	0.42	2.7
September	3	0.12	0.8
Totals	389	15.32	100.0

GRAPHICAL PRESENTATION OF INCIDENCE OF RAINFALL



April, June and September temperatures fluctuated around normal while May and August were slightly cooler than usual. The extreme maximum and minimum temperatures recorded during the year under consideration at various Meteorological Stations are given below:-

Station	Extreme maximum temperature and date	Extreme minimum temperature and date
Nicosia	41.8 (20th July)	-0.3 (24th January)
Limassol	37.1 (30th July)	-0.3 (1st February)
Larnaca	No Records	-1.4 (24th January)
Ay. Nicolaos (Famagusta)	39.5 (22nd July)	-1.4 (2nd February)
Paphos	34.1 (8th August)	1.3 (17th January)
Panayia Bridge	38.8 (21st July)	-3.8 (24th January)
Saltas	36.5 (20th, 21st July)	-2.0 (17th, 23rd, 24th January)
Amiandos	32.0 (15th, 16th, 21st July)	-7.5 (23rd January)
Prodromos P.S.	32.0 (21st July)	-8.0 (23rd January)
Stavros tis Psokas	36.0 (21st July)	-3.0 (23rd January)
Kornos	38.6 (20th July)	0.5 (2nd February)
Platania	34.7 (21st July)	-5.5 (23rd January)
Phassouri	37.5 (10th September)	-2.5 (23rd January)

2.4.3 Evaporation

Evaporation is an important constituent in hydrological balances and it has to be taken into account also in planning water-works. Systematic measurements of evaporation rates are taken at selected places, a monthly summary of which appears on the relative table on page 66.

2.5 Surface Water

2.5.1 Permanent Stream Gauging Stations

On important rivers at selected places permanent flow gauging stations have been established equipped with automatic recorders, from the records of which the volume of flowing water may be deduced. In order that the recorders are kept operating properly, weekly or monthly visits are necessary to these for the rewinding of the clocks, the changing of charts and cleaning of the measuring weirs. It is also necessary to carry out velocity measurements of the flowing water for calibration purposes during floods. Unfortunately due to the occupation of the Northern part of Cyprus by the Turkish troops, we have been unable to attend a number of these gauging stations, those marked in the table with an asterisk, after the Turks invaded the Island.

Gauging 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	Ezouza	Kannaviou	VD610633
1-4-9-80	Ezouza	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
3-2-1-85	Marathasa	U/S Kalopanayiotis Dam	VD842733
3-2-1-95	Marathasa	Kalopanayiotis Dam	VD841739
3-2-2-90	Marathasa	U/S Lefka Dam	VD852795
3-2-4-95	Marathasa*	Karavostasi	VD863895
3-3-1-70	Ay.Nicolaos	Kakopetria	VD900707
3-3-2-60	Platania	Kakopetria	VD927698
3-3-3-95	Karyotis*	Evrykhon	VD906773
3-3-5-95	Karyotis	Pendayia	VD883902
3-4-2-90	Atsas	Evrykhon	VD931810
3-5-4-40	Elea	Vizakia	WD018806
3-7-1-50	Peristerona	Panayia F.S.	WD075754
3-7-3-90	Akaki	Malounda	WD163783
3-7-5-95	Merika*	Avlona	WD093924

Gauging Station No.	Stream	Location	Co-ordinates
3-7-7-85	Skyloura*	Ay. Vasilios	WD156969
3-7-8-60	Ovgos*	Kyra	WDO50964
3-7-8-65	Ovgos*	Ovgos Dam	WDO34973
3-7-9-50	Serakhis*	Morphou Dam	WDO07948
3-7-8-90	Ovgos*	Morphou	VD973974
3-8-6-50	Aloupos*	Aloupos Chiftlik	VE980018
4-2-3-70	Panagra*	Panagra	WE077119
4-3-3-32	Kephalovrysos Spring	Kythrea	WE077119
4-4-2-50	Boghazi*	Kyrenia Road Forest	WE296077
5-2-3-50	Melini*	Ay. Trias	XE125337
5-3-4-85	Laris*	Rizokarpaso	XE218405
5-9-4-90	Kharangas*	Boghaz (F'sta)	WE883100
6-1-1-80	Ay. Onoufrios	Kambia	WE225735
6-1-1-85	Pedhieos	Kambia	WD224741
6-1-4-20	Tengelisis*	Kythrea	WE415010
6-1-4-50	Pedhieos*	Mia Milia	WD376958
6-1-5-50	Vathys	Athalassa	WD345867
6-5-3-15	Yialias	Nisou	WD359765
6-5-2-95	Alikos*	Ay. Sozomenos	WD413808
6-5-3-95	Yialias*	Pyroi	WD446824
7-1-7-50	Kolopames*	Kalopsidha	WD746842
7-2-3-50	Liopetri	U/S Liopetri Dam	WD806732
7-2-7-05	Paralimni Lake Out Flow	Paralimni	WD892801
8-2-1-90	Aradhippou	Nicosia-Larnaca road	WD517683
8-2-2-90	Aradhippou	Panayia Yematousa	WD516689
8-4-3-40	Tremithos	Ayia Anna	WD442668
8-4-5-30	Tremithos	Klavdhia	WD490615
8-4-4-40	Tremithos	Kiti Dam	WD510590
8-5-1-90	Bouzis	Mazotos	WD472518
8-7-3-60	Mylou	Kornos	WD332613
8-7-4-80	Syrgates	Skarinou Station	WD343535
8-8-2-50	Maroni	Vavla	WD261558
8-8-3-30	Maroni .	Khirokitia Station	WD317503
8-9-7-50	Vasilikos	Kalavassos	WD275472
8-9-7-95	Vasilikos	Vasilikos	WD292425
9-2-3-85	Yermasoyia	Phinikaria	WD093475
9-2-4-95	Akrounda	U/S Yermasoyia Dam	WD078460
9-4-3-82	Garyllis	U/S Polemidhia Dam	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	Evdhimou	Evdhimou	VD780397

Note: * Stream gauging stations in the Turkish occupied area.

2.5.2 Other Gauging Stations

Besides the permanent stream gauging stations, which are situated on main streams, a number of other gauging stations have been realized that it was necessary to be established, for measuring the amount of water abstracted from the streams from various intakes.

The following table shows the gauging stations established on intakes. Asterisk marks those stations that remained unattended due to the Turkish invasion in Cyprus.

Flow Gauging Stations on Irrigation Intakes
for 1974

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	Masari 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	Kato Koutraphas	WD978854
14	Episkopi-Kandou	Kandou	VD914394
15	Erimi-Kolossi	Erimi	VD919392
16	Erimi	Erimi Bridge	VD925370
17	Asprallou-Linopasa	Kato Phlasou	VD897800
18	Petrasis	Skouriotissa	VD895836
19*	Ayios Nicolaos	Skouriotissa	VD892837
20*	Polemios	Pendayia	VD885888
21*	Kritikos	Pendayia	VD891881
22	Akrotiri Lake	Akrotiri	VD982304

2.5.3 Flood Discharges

Although rainfall during the hydrological year 1973-74 was well below average, some floods have been reported.

The most remarkable floods recorded on flow gauging stations, during the hydrological year 1973-74 were as follows:-

- (a) Maroni river near Khirokitia 100 cubic meters per second on 5th June, 1974, the catchment area of which is 53.5 square kilometers.
- (b) Yialias river near Pyroi 80 cubic meters per second on 30th October 1973, the catchment area of which is 213.7 square kilometers.
- (c) Yialias river near Nisou 75 cubic meters per second on 30th October, 1973, 57 cubic meters per second on 15th November, 1973, the catchment area of which is 93.3 square kilometers.

Total Monthly and Yearly Evaporation (in mm)

from U.S.W.B. Class "A" Pan

Hydrometeorological Year 1973-1974

Station \ Month	Oct.	Nov.	Dec.	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Annual Total
Nicosia	136	70	50	41	52	80	150	210	255	314	249	211	1818
Athalassa	*	*	*	37	57	75	143	198	257	225	207	198	
Saittas	152	74	52	35	51	82	154	181	243	312	247	168	1751
Akhelia	149	107	81	77	88	95	149	187	205	238	207	200	1783
Yermasoyia	154	85	59	65	74	98	164	219	265	319	262	220	1984
Polemidhia	**	**	**	48	69	92	165	206	271	**	229	221	
Prodromos	103	30	27	**	64	68	114	169	225	262	183	145	
Galata	167	21	38	16	70	74	110	172	228	280	200	152	1528

* Unreliable Record

** No records

- (d) Skylloura river near Ayios Vasilios, 52 cubic meters per second on 13th November 1973, the catchment area of which is 76.1 square kilometers.
- (e) Alykos river near Ayios Sozomenos, 50 cubic meters per second on 30th October 1973, the catchment area of which is 80.4 square kilometers.
- (f) Vathys river near Athalassa, 32 cubic meters per second on 15th November 1973, the catchment area of which is 30.3 square kilometers.

2.5.4 Inflow of Water in Dams

The hydrological year of 1972-1973 had a rainfall well below the average. The amount of water accumulated in the most important dams in Cyprus, 45 in number under regular observation, was not satisfactory. The maximum volume of water accumulated in all the dams under regular observation was only 10 mill. m³ which is about 18% of the 56 mill. m³ of their total capacity.

This year at sixteen small dams mainly on mountainous areas there was an overflow. In five dams there was no inflow. In ten dams the maximum water accumulated was less than the 20% of their capacity.

Analytically the situation is shown on the table. Asterisk indicates dams in the area of Cyprus occupied by the Turkish army.

Table showing volume of water accumulated and commencing date of inflow for various dams during the year 1974.

No.	Dam	Capacity 10 ³ m ³	Inflow Commencing date 1974	Maximum Volume Accumulation 10 ³ m ³	Date of Maximum Accumulation 1974	Remarks
1	Agros	100	January	7	March	
2	Akrounda	22	"	10	January	Reservoir partly silted up-Overflow
3	Akanthou Recharge Dams*	-	"	-	March	All the dams partly filled up
4	Akhna Recharge Dams	100	"	-	January	Only 3 dams collected some water
5	Aloa*	18	"	18	March	Overflowed
6	Argaka	1150	"	874	April	
7	Athalassa	790	"	73	"	
8	Ayia Marina	300	"	117	May	
9	Ayios Loucas*	450	-	-	-	No inflow
10	Famagusta Recharge Dams*	-	January	-	January	Most of the dams collected some water. The Kamara dam of Ay. Napa overflowed

Contd.

No.	Dam	Capacity 10 ³ m ³	Inflow Commencing date 1974	Maximum Volume Accumu- lation 10 ³ m ³	Date of Maximum Accumu- lation 1974	Remarks
11	Galini*	22	January	22	January	Overflowed
12	Geynyeli	1000	"	160	March	
13	Gypsos*	113	"	50	"	
14	Kalo Khorio (Klirou)	81	"	81	"	Overflowed
15	Kalopanayiotis	390	"	390	"	Overflowed
16	Kandou	38	"	27	"	
17	Kanli*	1100	"	180	"	
18	Kiti	1600	"	120	November	
19	Kouklia*	4800	-	-	-	No inflow
20	Kyrenia range Recharge Dams*	-	January	-	February	Collected small quantities
21	Lefka Marathasa*	360	"	360	March	Overflowed
22	Lefka Kafizes	110	"	110	"	Overflowed
23	Lefkara	14000	"	960	June	
24	Liopetri	340	-	-	-	No inflow
25	Lythrodhontas upper	32	January	32	March	Overflowed
26	Lythrodhontas lower	32	"	32	"	Overflowed
27	Makrasyka*	196	"	20	January	
28	Massari	2400	-	-	-	No inflow (open tunnel)
29	Mia Milia*	330	January	330	February	Overflowed
30	Mavrokolymbos	2200	"	395	December	
31	Morphou-Serra- khis	2000	-	-	-	No inflow
32	Ormidhia(Vathy s)	100	-	-	-	No inflow
33	Ovgos*	850	January	240	March	(Overflowed in October 1973)
34	Palekhori(Kambi)	640	"	640	"	Overflowed
35	Paralimni	65	-	-	-	No inflow
36	Pera Pedhi	55	January	55	February	Overflowed
37	Petra upper*	22	March	22	March	Overflowed
38	Petra lower*	32	"	32	"	Overflowed
39	Pomos	860	January	860	"	Overflowed
40	Polemidhia	3400	"	390	April	
41	Prodromos	110	"	32	March	
42	Pyrgos	270	"	250	April	
43	Syngrassis*	1100	"	540	January	
44	Trimiklini	330	"	330	February	Overflowed
45	Yermasoyia	14000	"	2640	April	

* Dams in Turkish occupied territory

2.5.5 Spring Discharge

Most of the springs under observation are gauged on a routine basis while a number of them are gauged for a short period after the request of another Departmental Division.

Although the exact number of spring measurements for 1974 is not available due to the loss of the information during the war, approximate figures may indicate the volume of work carried out by this Division on this subject. So, it is estimated that about 3,000 measurements were taken during the hydrological year under consideration for about 140 springs gauged at monthly intervals and about 170 gauged less frequent.

Since the precipitation during the year was in comparison to the average low, the flow of the springs during the year in general was lower than the average.

2.6 Ground Water

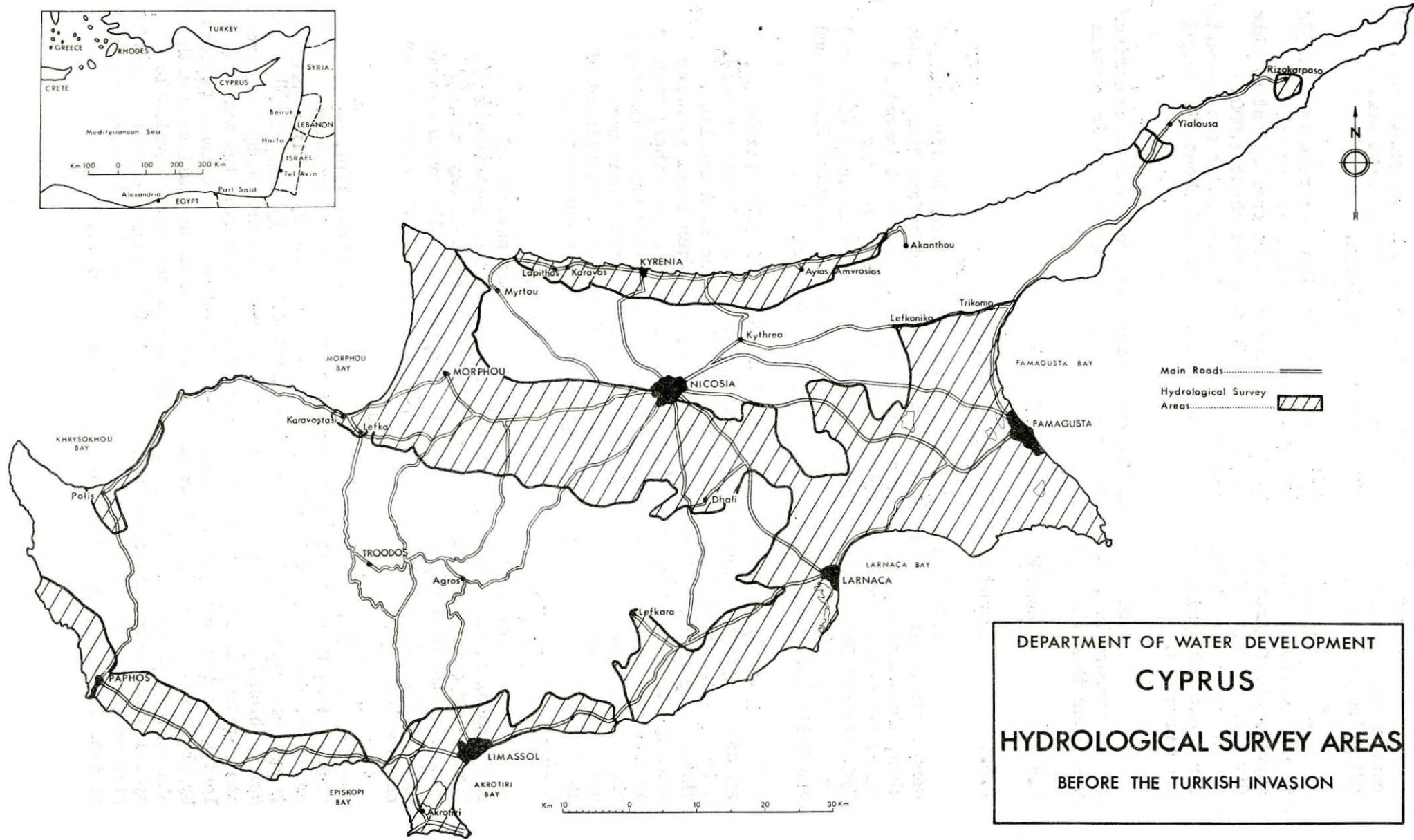
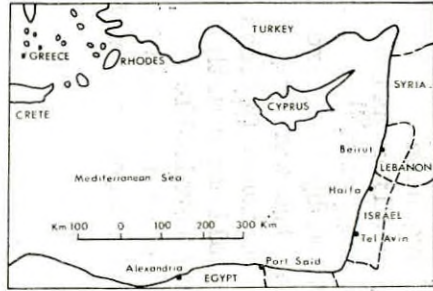
2.6.1 Groundwater Hydrological Work

Hydrological Surveys of the ground water bearing systems were carried out on small scale by this Department before 1960. Since then, they were rapidly amounting in scale until the most important known aquifer systems were brought in a few years time under Hydrological Observation. During 1973-74 the areas of Arsos (Larnaca) and Lefkara-Khirokitia have been brought under Hydrological Survey and the Polis Khrisokhou Hydrological area has been extended.

Through the Hydrological Surveys all wells boreholes, springs and chain-of-wells have been registered and plotted on maps. A dense network of observation boreholes, has also been 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 covered by hydrological surveys is about 3,700 km² and they are shown on map on page 70.

From the observations carried out during 1974, on groundwater, water table and isochloride contour maps have been prepared, for the most important aquifers and where the aquifer had a reasonable extent to justify such work. Unfortunately most of this work, which has been prepared for March has been destroyed by the fire that occurred in the Nicosia and Famagusta offices during the war or lost after the occupation of Kyrenia-Morphou-Famagusta regional Offices by the Turkish forces. But it is most unfortunate that all maps with the well locations and the hydrological books containing invaluable hydrological data collected for years have been destroyed by the said fire or lost except the recent ones kept in Limassol and Paphos regional offices for the aquifers situated in their Districts.



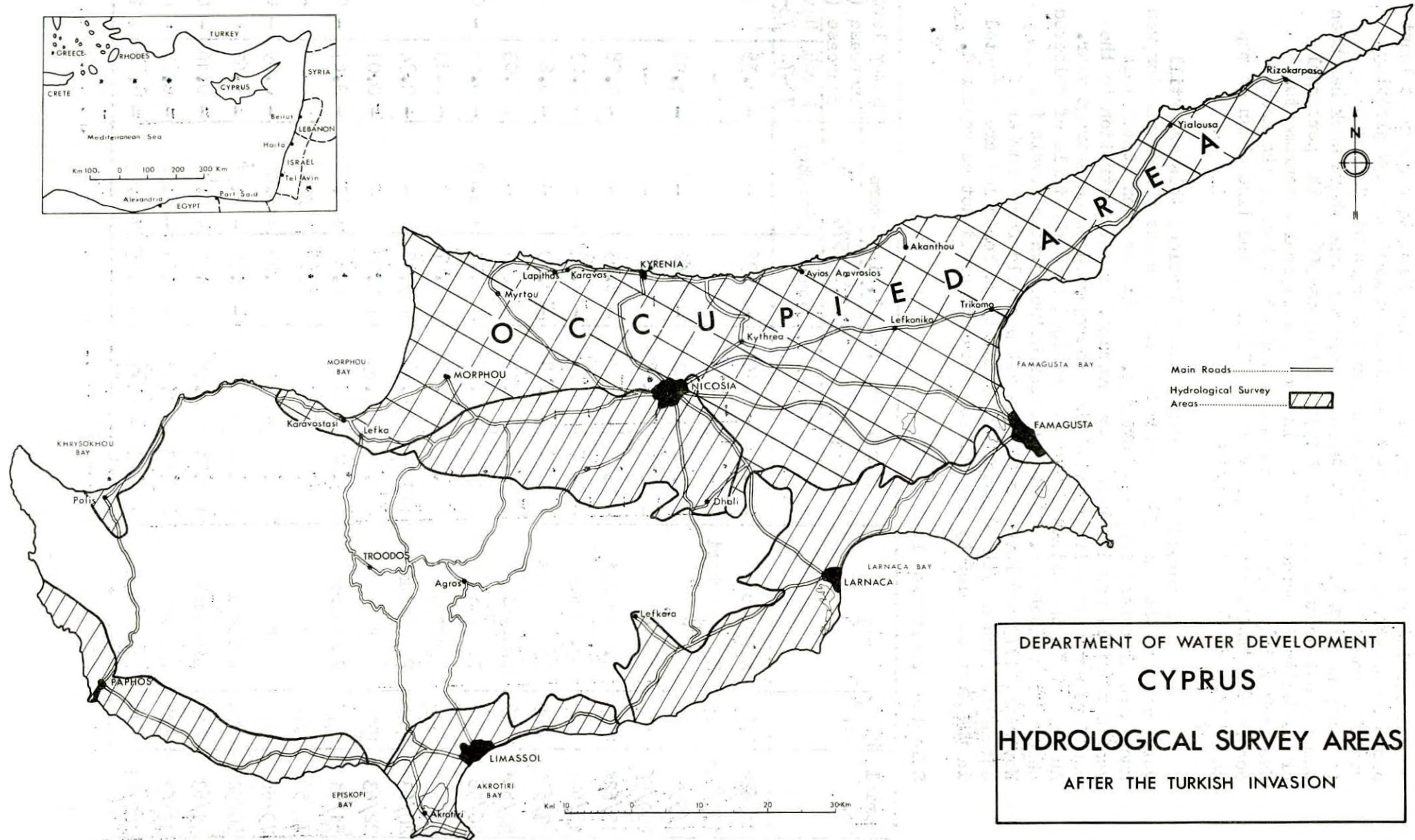
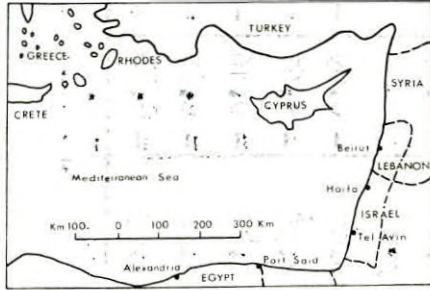
DEPARTMENT OF WATER DEVELOPMENT
CYPRUS
 HYDROLOGICAL SURVEY AREAS
 BEFORE THE TURKISH INVASION

This loss overturned the usual hydrological program as was carried out every year, since we had first to recover at least basic information. So new maps have been ordered and new plotting started around the end of the year for the areas C1, C2 and D (see map page 72). It must also be said that the above work has been carried out around the end of 1974 with about 30% of the personnel of the Water Resources engaged in the hydrological measurements. Needless to say that no measurements could be taken in the areas occupied by the Turkish troops to the North of the line shown on map page 72.

As regards the groundwater situation, this was still very grave in the main aquifers in the island since the extraction was much more in excess from the recharge. As it has been stated this year's rainfall was lower than the average. The infiltration to the aquifers was only a fraction of the one expected on an average year. An idea about the situation may be obtained from the table of selected observation boreholes. The comparison between water levels for November, 1973 and November 1974 is not possible for a number of boreholes (shown with an asterisk) since these boreholes are situated in the area occupied by the Turkish army and could not be measured.

Selected Observation Boreholes

Serial No.	Hydr. No.	Village	Water level a.m.s.l. in meters				Water level increase (+) or decrease (-)	
			1973		1974		March 73-74	November 73-74
			March	November	March	November		
44/62*	1965	Morphou	- 0.41	- 8.16	- 3.96	-	- 3.55	-
150/54*	15	Syrianokhori	-	-	-	-	-	-
1/55*	61	"	- 6.72	- 9.32	- 8.62	-	- 1.90	-
209/56	117	"	- 6.81	-	-	-	-	-
15/62*	875	K. Varoshia	- 5.75	- 6.17	- 6.03	-	- 0.28	-
18/62*	228	Ay. Memnon	- 2.47	- 3.10	- 2.44	-	+ 0.03	-
27/62*	285	Ay. Loucas	- 3.54	- 5.68	- 3.79	-	- 0.24	-
50/53*	558	Dherynia	- 0.74	- 1.23	- 0.71	-	+ 0.03	-
56/56	192	Liopetri	+ 1.21	+ 0.87	+ 0.71	+ 0.42	- 0.50	- 0.45
49/54*	134	Makrasyka	+24.80	+24.75	+24.67	-	- 0.13	-
20/63	1516	Paralimni	+19.71	+19.38	+19.37	-	- 0.34	-
22/63	1518	"	+ 5.69	+ 5.65	+ 5.70	-	+ 0.01	-
51/51	774	Phrenaros	+ 7.08	+ 6.58	+ 6.41	+ 6.02	- 0.67	- 0.56
76/56	972	"	- 7.88	DRY	DRY	DRY	-	-
79/56	975	"	+ 8.18	- 8.14	+ 8.09	+ 8.08	- 0.09	- 0.09
88/54	24	Kolossi	+ 0.45	Blocked	- 1.22	- 2.55	- 1.67	-
51/63	813	Limassol	+ 0.71	+ 0.48	+ 0.55	+ 0.21	- 0.16	- 0.27
13/63	807	Zakaki	- 0.53	- 1.23	- 0.61	- 1.04	- 0.08	+ 0.19
107/61	17	Yermasoyia	+ 3.40	- 0.17	+ 1.95	+ 1.95	- 2.20	+ 2.12



DEPARTMENT OF WATER DEVELOPMENT
CYPRUS
HYDROLOGICAL SURVEY AREAS
 AFTER THE TURKISH INVASION

2.6.2 Control and Conservation of Ground Water

2.6.2.1 Advisory Committee for the issue of well permits

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

The committee performed during 1974, 84 meetings and examined 2232 applications sent to the Director of Water Development Department by the District Officers as follows:

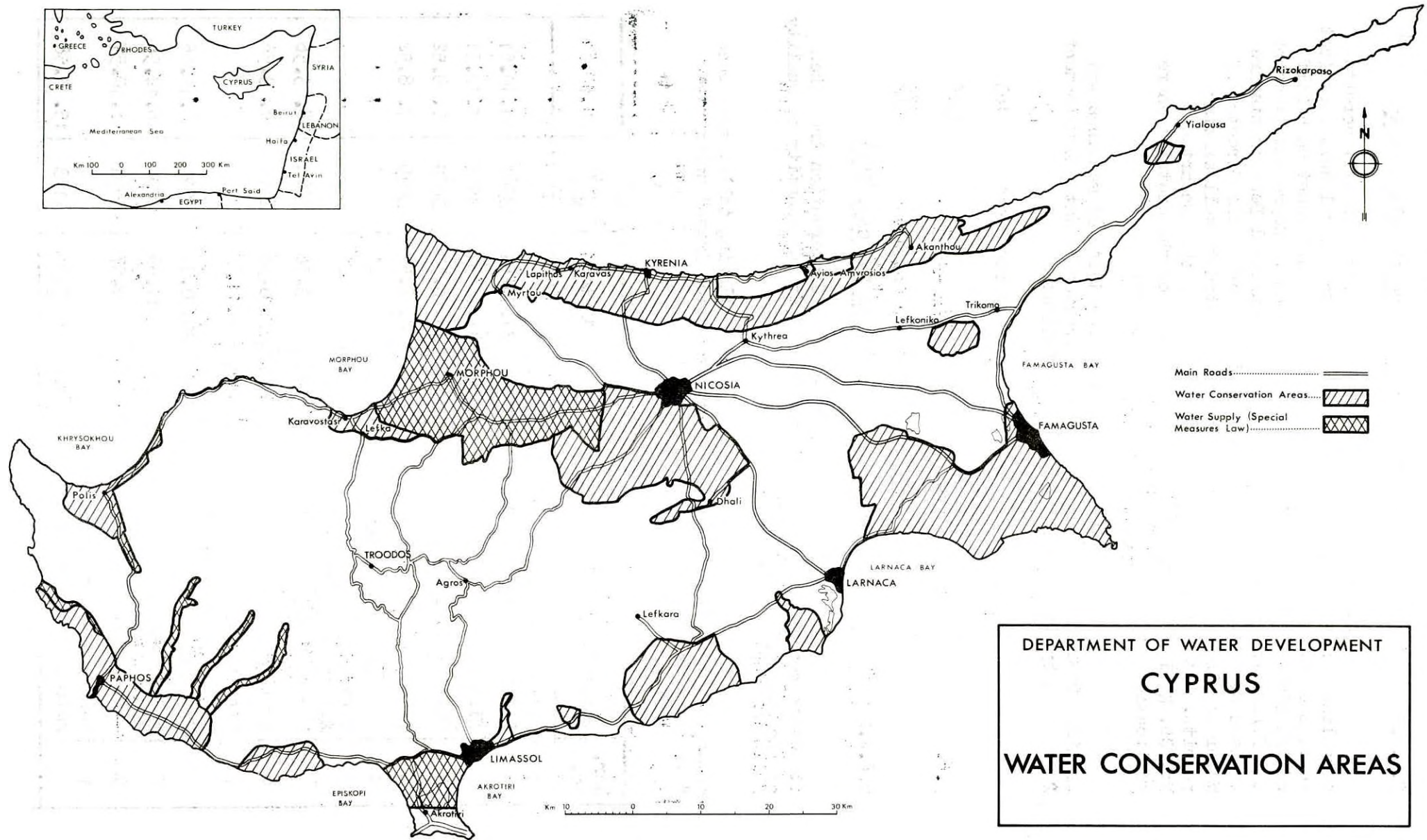
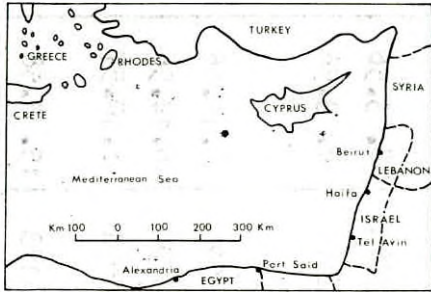
Water Supply (Special Measures) Law Areas	163
Water conservation areas	1594
Non Water conservation areas	475

2.6.2.2 Water Conservation Areas (Wells Law Cap. 351)

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

On map on page 74 and the following table, the areas which have been declared as "Water Conservation Areas" under the Wells Law Cap. 351 are shown.

Ser. No.	Water Conservation Area	Order No.	Date	Gazette No.	Date
1	K/Trimithia-Ayii Trimithias, Paleometokho, Mammari	556	31.10.51	3584	31.10.51
2	Nicosia	556	31.10.51	3584	31.10.51
3	Tersephanou, Klavdhia	374	18. 8.52	3639	27. 8.52
4	Laxia	374	18. 8.52	3639	27. 8.52
5	Famagusta, Phrenaros, Paralimn, Ormodhia, Xylotymbou, Pergamos, Kouklia, Avgorou, etc.	164	3. 3.56	3924	8. 3.56
6	Krotiri, Phasouri etc.	165	3. 3.56	3924	8. 3.56
7	Morphou, Syriankhori, Prastio, Nikitas, Elea, Pendayia	1052	30.10.56	3995	8.11.56
8	Dhali, Potamia	1194	29.11.56	4008	6.12.56
9	Ayios Andronikos etc.	916	26. 9.57	4081	3.10.57
10	Morphou, Peristerona, Astromeritis, Akaki etc.	314	3. 5.58	4133	15. 5.58



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CYPRUS
 WATER CONSERVATION AREAS

Ser. No.	Water Conservation Area	Order No.	Date	Gazette No.	Date
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	28.12.61
15	Dhiorios (Djibi Loc.)	324	21. 6.62	163	21. 6.62
16	Yialia, Ayia Marina, Argaka, Polis	359	7. 7.62	168	7. 7.62
17	Yialias River (Potamia, Dhali, Nisou, Mathiatis)	189	25. 4.63	245	25. 4.63
18	Kiti, Pervolia, Meneou, Dromolaxia	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, Evdhimou	S.B.A. 68	29. 7.67	S.B.A. 212	29. 7.67
25	Lysi, Kondea	776	7. 9.67	599	22. 9.67
26	Akanthou	777	7. 9.67	599	22. 9.67
27	Pergamos (Extension)	889	19.10.67	606	3.11.67
28	Ayios Amvrosios	890	19.10.67	606	3.11.67
29	Kyrenia Range Limestone Mass	817	7.11.68	693	22.11.68
30	Vasilikos, Xeropotamos	862	28.11.68	697	13.12.68
31	Yeroskipos, Konia, Ktima, Peyia	741	4. 9.69	748	19. 9.69
32	Karavostasi, Peristeronari	50	29.12.69	771	16. 1.70
33	Yeri	75	8. 1.70	773	23. 1.70
34	Neokhorio, Androlikou	845	14.10.71	904	29.10.71
35	Yiolou, Loukrounou, Skoulli	845	14.10.71	904	29.10.71
36	Pissouri, Evdhimou	576	10. 8.72	958	25. 8.72
37	Kormakitis, Myrtou, Dhiorios	851	7.12.72	979	15.12.72
38.	Akanthou (Extension)	288	15.11.73	1054	30.11.73
39	Ayios Ioannis (Malounda)	307	25.11.74	1158	25.11.74

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.

2.6.2.3 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. In 1974 the river aquifers of Dhiarizos, Xeropotamos and Ezuza rivers in Paphos and an area near Peyia have been declared under the above Law.

The main provisions of the above Law are:

- (i) The District Officer, with the concurrence of the Director of Water Development can withdraw any permit for any well or can apply any modifications on the extraction of water as required.
- (ii) On the permits which are renewed yearly, conditions are imposed regarding the quantity of water to be extracted, the method of extraction, the area to be irrigated, the measurement of water, the conveyance of water and the utilization of water.

Water 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 (Famagusta-Paralimni-Ormidhia-Akhna)	-	-	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	Ezuza River	196	23.5.74	1104	21.6.74
8	Peyia-Aspros River (Ext. of Yeroskipos-Peyia W.C.A. West of Peyia village)	196	23.5.74	1104	21.6.74
9	Mavrokolymbos River (Ext. of Yeroskipos-Peyia W.C.A.)	196	23.5.74	1104	21.6.74

2.6.2.4 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 affected 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 Western Mesaoria, and Limassol-Akrotiri areas. Information for 1974 about the installation

and operation of water meters are not available for Western Mesaoria area, since the information was lost during the war, left in the area occupied by the Turkish army.

Area	No. of water meters installed	No. of water meters in operation		Volume of water recorded M.C.M.	No. of cases of Illegal pumping	
		Continuous	Intermittent		Sent to the D.O.	Presented to Court
Western-Mesaoria	-	-	-	-	-	-
Limassol-Akrotiri	400 (12 removed)	344	44	14.95	166	33

2.6.2.5 Private Drillers (Wells Law, Section 36)

According to the above Law no one is allowed to operate a drilling rig without a Driller's Licence. Such a licence is issued by the Director of the Water Development Department after 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 such 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 sent to the above said Director together with a technical report on each borehole drilled.

The exact number of licences issued to private drillers during 1974 is not possible to give due to the fact that the records kept in Nicosia have been destroyed by the fire mentioned above. The number of private drilling rigs which drilled for water during 1974 was 76.

2.7 Water Quality

2.7.1 Chemical Analyses

During the year, 3486 samples of water were sent to the Government Analyst for Ionic Chemical Analysis. Of these 1705 samples were taken from springs, wells or boreholes, which are used or proposed as water supplies sources. The remaining 1781 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.

2.7.2 Bacteriological Analyses

<u>Water Supply</u>	<u>No. of samples</u>	<u>No. of Unsatisfactory samples</u>
Nicosia	84	8
Famagusta	48	10
Limassol	113	24
Larnaca	36	4
Paphos	-	-
Kyrenia	8	2
TOTAL	294	48

The Unsatisfactory samples at Nicosia, Famagusta, Limassol and Kyrenia were usually of Unchlorinated water. All Chlorinated samples at main Reservoirs were Highly Satisfactory.

2.7.3 Suspended Sediment Analyses

In view of the future construction of large Dams in Cyprus and the problem arising from Reservoirs 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.

On some rivers automatic samplers have been installed on experimental basis. Full evaluation of the results have not as yet been made.

During the year approximately 184 samples of rivers water were taken for Suspended Sediment Analyses.

2.8 Cost of Hydrological Studies

	Approved Estimated Cost	Actual Expenditure
Hydrological Observations and Research	£23,000	£20,230
Construction & Maintenance of Measuring Weirs	£ 5,000	£ 3,200
TOTAL	£28,000	£23,430

2.9 Special Studies

2.9.1 Morphou-Tylliria Feasibility Study
Measurement of river-water Diversions

The collection of data on diversion of river-water continued in the 12 stations on the Serakhis basin, five in the Karyotis catchment and one on the Elea river at Koutraphas.

With the occupation of the lower parts of these basins by the Turkish forces, seven stations in the Serakhis and two stations in the Karyotis have been rendered inaccessible since July 1974. Furthermore, the largest portion of the accumulated data up to the above date has been destroyed by fire or abandoned in the Morphou Regional Office.

Work continues on the remaining stations but the change in the water use pattern and possibilities has to be taken into consideration in the evaluation of the data collected.

2.9.2 The Morphou Mathematical Model

The Morphou-Mathematical Model which started being developed in 1972 was completed in September, 1973. The groundwater mathematical model which covers an aquifer area of about 240 km² subdivided into 59 four-square-kilometer nodal areas was quite successfully calibrated over a 72 month period of historic hydrologic information (1967 to 1973).

The model was prepared by J. S. Jacovides, Hydrologist of this Department as a contribution of the Department and FAO to the Morphou-Tylliria Feasibility Study carried out by the Swiss firm of Electrowatt.

A series of simulating runs of several alternative schemes contemplated by the Project have been made by the use of the model which are expected to assist in decision making.

Further to the simulation runs that were made by the end of 1973, the following runs were made during 1974 for completing our understanding of the response of the aquifer to different alternative schemes.

- (a) Future water balance and groundwater levels in Morphou aquifer with 18 MCM/a of present irrigation demand met by Prastio reservoir and 5.1 MCM/a additional pumpage for the Nicosia Water Supply.
- (b) Future water balance and groundwater levels in Morphou aquifer with varying Prastio reservoir water supply (22 to 27.9 MCM/a) substituting part of present irrigation demand and 4.6 MCM/a additional pumpage for Nicosia Water Supply.

During 1974, two more reports regarding the Morphou aquifer and the model were also prepared:

- (a) Brief report on the present state of the Morphou Water Problem (1974) and,
- (b) Morphou Mathematical Model. Description of the model, the computer program and introduction to operation procedures.

2.9.3 The Akrotiri Mathematical Model

The Akrotiri aquifer mathematical model which was prepared during 1971-72 by Mr. J. S. Jacovides, Hydrologist of this Department in association with Dr. R. Kitching of the Institute of Geological Sciences was extensively used during 1973.

The model, which is operated in the I.B.M. System-3 computer in Nicosia, consists of 42 one-square-kilometer inside nodal areas and it has been calibrated by the use of climatological and hydrogeologic data of a 60-month (1967-1972) period. Some 87 per cent of the computed water levels fell within ± 1.25 meters from the actual water levels of the same period which is considered as a very good calibration level.

During 1974 the model was utilised for forecasting the water levels and extent of sea-intrusion in the aquifer, that might be expected, by the end of the irrigation season of 1974 under different patterns of reduced extraction.

This study was undertaken for the purpose of evaluating the extent of reduction of pumpage that was necessary to be imposed as from May, for safeguarding the aquifer from excessive sea-intrusion, a concern that was arisen due to the extreme dry weather conditions of 1972-1974. The anticipated water-levels were subsequently checked with the actual water levels that were observed at the end of 1973.

The confidence on the usage of the model as a managerial tool for the aquifer was further confirmed by the degree of coincidence of forecasted and actual water levels.

By the use of the same model, a study was also made for the determination of the performance of the Akrotiri aquifer recharged by the overflow of a planned 30 M.C.M. storage capacity dam on Kouris and assumed future pumpage demand.

2.9.4 Environmental Isotope Survey

The research contract under the title "Environmental Isotope Survey" which was renewed by the International Atomic Energy Agency for a second year (1973) with Mr. J. Jacovides, Hydrologist, as the principal Scientific Investigator, was virtually completed by summer 1974.

Under this project 35 samples from boreholes of the Western Mesaoria aquifer were analysed at the Vienna I.A.E.A. Laboratories for oxygen-18 and radioactive Tritium whilst 3 samples for carbon-14.

Also, 41 samples from wells/boreholes and springs of the Kyrenia Range were analysed for oxygen-18 and Tritium whilst 3 samples were analysed for Carbon-14.

The research contract which is on an equal cost sharing basis between the I.A.E.A. and the Department was carried out at an estimated cost of £4,000.

The research programme aims to verify the applicability of radioisotope techniques in the hydrology of the Island and to assist in the better understanding for the hydrologic regime in respect to the groundwater reservoirs as well as the differentiation of the water masses from each other by the natural labelling of them by the stable isotopes and the radioisotopes, Tritium and Carbon-14.

The progress report (III) no. H/26 gives a relatively extensive account of the survey, the analyses results as well as their interpretation.

During the last 6 months of 1974, basic data for the Morphou aquifer were processed and analysed by means of computer programmes and despatched to I.A.E.A. to be utilised within a simulation model available at the I.A.E.A. for verification of the tritium results of samples taken from Morphou aquifer by the hydrogeological and climatological inputs estimated by the Morphou mathematical model.

The basic data that cover the period 1952-1973 and were supplied to I.A.E.A. are:

- (a) Correlation of the Nicosia Tritium content in precipitation to the Ottawa station.
- (b) Annual effective precipitation and tritium input due to precipitation recharge.
- (c) Monthly recharge values from streams and diversions.
- (d) Total volume of water in each nodal area of the aquifer based on annual water levels and estimated average porosity.

- (e) Annual subsurface flow from each nodal area to others.
- (f) Estimated annual extraction from each nodal area.

2.9.5 Evaporation Control Experiment, Mia Milia Dam

This undertaking which was intended to cover three months of the summer period was initiated in May under the supervision of Mr. Chr. Phanartzis. With the co-operation of the Meteorological office a full climatological station was installed and instrumented including an anemograph and a glass-A evaporation pan.

Application of evaporation retardant chemical started in June with simultaneous measurement of inflow, outflow and water levels in the reservoir for establishing a daily water balance.

Unfortunately the experiment was discontinued as a result of the Turkish invasion and valuable instruments and information were lost.

2.9.6 Urban Hydrology

The activities of the Water Resources Division were extended to cover also urban hydrology, especially with regard to the study of floods in urbanized areas. For this purpose, the Makedonitissa area, presently under urbanization, was selected for the collection of the necessary hydrometeorological data, with emphasis on rainfall intensities and depths, and flood occurrence. The work started with the installation of two rainrecorders and three 24-hour raingauges at selected points within the Makedonitissa catchment area.

The installation of the three flow-gauging stations was not carried out as the flow recorders in Famagusta harbour, now under Turkish occupation, could not be secured.

Except for the rainfall data covering the last wet months of 1974, there is not much information that can be so far extracted from this research study.

2.9.7 In-phase Calculation of Irrigation Water Requirements

For the purpose of deriving more realistic values of irrigation water requirements for use in simulation models for water resources systems operation, Mr. Chr. Phanartzis, Hydrologist I, prepared a computer programme. In this programme historic monthly temperature and rainfall were used for a period of 27 years to estimate such values which are in phase with other hydrological elements, especially runoff. The study was made for Larnaca region and covered a large variety of crops.

Although, the mean annual irrigation water requirements derived are not different from values previously in use, there are year to year variations which indicate the importance of simultaneous in-phase calculation of these requirements. During dry years water requirements are generally higher than average, while during wet years the opposite is the case. As regards monthly values, large variations were found in the irrigation requirements for the months of April and May and October and November.

This refinement of in-phase calculation of irrigation requirements has been included in all the recent simulation models of water resources systems.

III.

DIVISION OF
PLANNING

By

C.A. Christodoulou
Senior Water Engineer
Head of Division

3.1 Introduction

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

1. Reconnaissance and Feasibility Reporting
2. Investigations and Testing

The activities of each branch are described below:

3.2 Reconnaissance and Feasibility Reporting Branch

3.2.1 Southern Conveyor Project

A detailed agro-economic study has been carried out for Larnaca and Famagusta regions in cooperation with the Agricultural Department. This study includes subjects on land and water use, management practices, crop production costs and returns, yields, crop water requirements, potentialities for future development, typical designs and cost estimates etc.

The main aim was to collect agro-economic inputs and such data that will enable to carry out alternative solutions for future agricultural development and water utilization of all the available water resources within the Southern Conveyor Project.

A new series of aerial photographs on scale 1:15,000 covering the southern part of Cyprus from Dhiarizos river up to the Famagusta town were used for the present land use studies and crop identification.

The whole study was completed by the end of the year 1974.

3.2.2 Akrotiri Project

During 1974 a review report has been prepared on the above subject commenting on the Consultants' reports. The main conclusion of this report was that a smaller dam than that proposed by the Consultants was recommended. This resulted a higher internal rate of return for the project.

3.2.3 Paphos Project

Certain difficulties in the financing of the Project by the International Bank of Reconstruction and Development have slowed down progress during 1974.

The loan was to come operative on the 31st of March 1974 but in the meantime certain problems have arisen:

1. The resettlement of the Turkish village of Phinikas.
2. Compensation of the water rights of the Turkish village of Mandria.

Negotiations have started with the I.B.R.D. and the parties concerned to solve these problems but in the meantime the Turkish invasion caused the postponement of the issuing of the loan which now stands for the 31st of March 1975.

In the meantime the Government has proceeded during 1974 with the drilling of 17 out of 35 boreholes of the project in order to gain time in the implementation of the project.

A detailed design of the Conveyor Canal has been completed by the Department as has been agreed with the Bank.

3.3 Investigations and Testing Branch

3.3.1 General

During 1974 the work of the Investigations and Testing branch of the Division of Planning may be distinguished into three periods which chronologically are as follows:

- (i) 1st January to 20th July 1974 (date of the Turkish invasion of Cyprus),
- (ii) 20th July to 15th September 1974, and
- (iii) 15th September to 31st December 1974.

Up to the 20th July 1974 the work of the Sections continued smoothly and with the same intensity as in 1973. Investigations were carried out at five sites whilst a substantial number of laboratory tests were performed. Two construction sites, namely Arakapas Dam and Engomi Reservoir, had field laboratories working during the whole of this period.

After the Turkish invasion and up to the 15th of September 1974 the work of the branch came to a complete standstill. 75% of the personnel were called up to serve in the National Guard reserves throughout this period.

After the 15th September and up to the end of 1974 work restarted and continued but at a notably reduced intensity. A comprehensive site investigation and laboratory testing programme scheduled for execution in 1974 and in connection with the Morphou-Tylliria project, was abandoned since the greatest part of the project area still remains under Turkish Army occupation. During the period 15th September to 31st December 1974, three site investigations were performed whilst the number of laboratory tests performed was insignificant in relation to the pre-Turkish invasion period. The two field laboratories restarted functioning as smoothly and efficiently as before.

Following the example of previous years, the resources of the Sections were made available, on a hire basis, to Private Companies, Town Water Boards and the Cyprus Grain Commission, for the performance of site investigation and/or laboratory work. Furthermore equipment was made available for use by other Government Departments. In order to show the positive contribution made by the Sections in assisting the private sector, suffice to mention here that of a total of seven site investigation projects performed during 1974 only two of these were exclusively Departmental projects.

For the work of the Site Investigation Section a very close cooperation was maintained, throughout the year, with the Engineering Geology Section of the Geological Survey Department. The assistance of geologists was requested for:

- (i) programming of site investigation work,
- (ii) surface geological mapping,
- (iii) logging of exploratory boreholes,
- (iv) appraisal of subsurface geological conditions based on the results of the investigation,
- (v) conclusions and recommendations with regard to the influence of geological conditions on the proposed engineering structures.

The prompt and efficient assistance given whenever requested ensured, always, the best results from the collaboration.

3.4 Personnel

In order to show the number of personnel and their function within the Branch during the different periods of 1974, a comparative table is set out here.

T I T L E	1st January to 20th July				15th September to 31st December			
	Function				Function			
	Supervising	Laboratory	Drilling	Other	Supervising	Laboratory	Drilling	Other
Executive Engineer	1				1			
Inspector of Works	1				1			
Technical Assistant	1	5				2		
Laboratory Technician		6				4		
Draughtsman				1				1
Driller			4				2	
Assistant Driller			2					

3.5 Drilling Machinery and Laboratory Equipment

At the beginning of 1974 drilling machinery and laboratory equipment were available as described on Tables 1 and 2 respectively.

In 1974 drilling accessories (drill bits, core barrels etc.) to the value of £2600 were ordered. Up to the end of 1974 these had not been received.

At the beginning of 1974 it was apparent that in order to cater with the volume of work programmed for execution in 1974, the soils laboratory had to be expanded. On this basis a £3000 order of equipment was placed. After the Turkish invasion such prospects, as mentioned above, were non-existent and finally only £500 worth of equipment was received in 1974 and as described on Table 3. The remaining order, which included a triaxial shear strength test unit and a consolidation (Oedometer) test unit, was cancelled.

3.6 Site Investigation Section

The site investigation work performed during the year may be distinguished into:

- (i) the Departmental projects,
- (ii) the combined Water Development Department/Town Water Board projects, and
- (iii) the non-Departmental projects.

In all seven site investigations were performed in 1974 (c.f. to 11 no. investigations in 1973), of which only two were in the first category, described above, two in the second and the remaining in the third.

3.6.1 Departmental Projects

3.6.1.1 Dhypotamos Proposed Dam

The aim of the site investigation was to obtain relevant information for the detailed design and construction of the proposed rockfill embankment dam and its associated concrete spillway and diversion tunnel structures.

The site investigation was requested by the Head of the Design Division.

The feasibility and geotechnical studies, which included embankment fill material investigations, were carried out in 1971. The additional, design, investigations were started in November 1973 and completed in January 1974.

The fieldwork performed included:

- (i) three vertical coredrilled boreholes of a total depth of 52.0 m. along the diversion tunnel line, in order to investigate the depth of a river terrace deposit there, the extent of weathering of bedrock and thus make an assessment of tunneling conditions,
- (ii) eight hand excavated trial pits of a total depth of 22.0 m. within the buried channel deposits of the right abutment in order to investigate in detail the type of and variability of sediments, their in situ density and furthermore to facilitate sampling for shear strength laboratory testing.

Total expenditure for the work amounted to £650 and the following drilling rigs and associated equipment were used on site:

- (i) 1 no. Mobil Auger/Coredrill (W.D.D.560)
- (ii) 1 no. Flush Pump

3.6.1.2

Prastio Proposed Reservoir

As proposed by the Consultants (Electro-Watt Engineering Services Ltd. of Zurich) who carried out the feasibility studies for the Morphou-Tylliria Irrigation Development project, of which Prastio Storage Reservoir forms part of, this would have a 26 Mm³ capacity and cover an area of approximately 2.0 sq. Km. Its basic design would consist of an earthfill type, ring-dike, embankment of a height varying from 12.0 m. to 17.0 m. The feasibility study site investigations were carried out in 1972/73. The 1974 investigation aimed at providing further information as regards certain geotechnical problem areas that came to light during the feasibility study investigations of which the most critical were considered the following:

- (i) the existence of leakage hazards within the reservoir area,
- (ii) the existence of soft compressible clay foundations below the proposed embankment,
- (iii) the existence of highly compressible organic material below the proposed embankment,
- (iv) foundation conditions at the location of the inlet and outlet structures,
- (v) the availability and suitability of shell (gravelly) and filter material,
- (vi) the availability and suitability of clay core material,
- (vii) the most economic borrow areas for fill material and the mode of working of these for the most efficient construction programme.

The additional site investigation for the Prastio Reservoir was performed within the period 28th January to 20th July 1974. Thereafter outstanding fieldwork was abandoned. As performed the fieldwork included:

- (i) 18 auger drilled boreholes of a total depth of 200.0 m. with undisturbed sampling and Standard Penetration testing, in order to investigate foundation conditions along the proposed embankment axis as well as at the location of the inlet and outlet structures,
- (ii) 26 auger drilled boreholes of a total depth of 280 m. with disturbed bulk sampling, in order to investigate leakage hazards, the extent and distribution of organic material within the 2 sq. Km. reservoir area and furthermore clay core material availability within the reservoir area,

- (iii) 10 machine excavated trial pits, within the reservoir area, of a total depth of 28.0 m., with bulk sampling, in order to investigate further, clay core material availability and suitability as well as a leakage hazard at the southwest corner of the reservoir,
- (iv) 40 machine excavated trial pits of a total depth of 105.0 m. with bulk sampling, in connection with shell and filter material availability and suitability investigations and furthermore in order to define the most economic borrow areas of fill material,
- (v) 20 machine excavated trial pits and trenches of a total depth of 55.0 m. in connection with an investigation of surface "sink holes" and clay capping cracks which were considered as constituting a major leakage hazard.

Total expenditure for the work amounted to £2800 and the following boring, excavating and associated equipment were used on site:

- (i) Mobile Auger drill (W.D.D.560),
- (ii) Undisturbed (U4) sampling and Standard Penetration testing equipment,
- (iii) Backactor excavator (on hire).

3.6.2

Water Development Department/Water Board Projects

During 1974 the Department made available its technical services and resources to the Nicosia and Larnaca Water Boards in connection with the design and construction of the New Strovolos and Tremithos Reservoirs. In both cases site investigations were requested by the Head of the Design Division (responsible for the design of the Reservoirs) and the work was performed by the Site Investigation Section. Expenditure for the work was approved and covered by the relevant Town Water Board.

The aim of the investigations was to examine foundation conditions at the sites and obtain relevant information to be used in the design and construction of safe and economic foundations to the proposed reservoir structures.

3.6.2.1

Proposed New Strovolos Reservoir

This will be constructed within the Nicosia Water Board grounds (Athalassa Bypass) and adjoining the existing Strovolos reservoir. The proposal is for a rectangular reinforced concrete, partly buried, water storage reservoir of 8500 m³ capacity. Due to space limitations the reservoir to be constructed at the moment is of 4500 m³ capacity. A future reservoir of the additional capacity required will be constructed as and when needed.

Fieldwork was carried out in two phases within the following time periods:

- (i) 25th April to 13th May 1974, and
- (ii) 19th September to 1st October 1974.

The fieldwork included:

- (i) 3 vertical coredrilled boreholes of a total depth of 55.0 m. to investigate subsurface geological conditions at the site,
- (ii) 6 auger drilled boreholes of a total depth of 20.5 m. with associated undisturbed (U4) sampling and Standard Penetration testing in order to investigate foundation conditions and possible excavation difficulties.

Total expenditure for the investigation amounted to approximately £480 and the following drilling, boring and associated equipment were used on site:-

- (i) 1 no. Coredrill (W.D.D.497)
- (ii) 1 no. Flush Pump
- (iii) 1 no. Mobile Auger/Coredrill (W.D.D.560)
- (iv) Undisturbed sampling and Standard Penetration testing equipment.

3.6.2.2

Proposed Tremithos Reservoir

This will be constructed at a site adjoining six circular water storage reservoirs of the Larnaca Water Board, approximately 8.5 Km southwest of Larnaca.

The proposed structure will be a rectangular, reinforced concrete, fully buried water storage reservoir of 4500 m³ capacity.

Fieldwork at the site included three vertical coredrilled boreholes of a total depth of 39.0 m. with Standard Penetration tests in one of the boreholes. Fieldwork was performed within the time period 6th to 27th November 1974.

Total expenditure for the investigation amounted to approximately £420 and the following drilling and associated equipment were used on site:

- (i) 1 no. Mobile Auger/Coredrill (W.D.D.560)
- (ii) 1 no. Flush Pump
- (iii) Standard Penetration testing equipment.

3.7

Non Departmental Projects

3.7.1

Promenade Court - Limassol, Site Investigation

At the request of Messrs N. Roussos and J. Pericleous, Engineers and Architects, a site investigation was carried out at the site of the proposed twelve storied building owned by Promenade Estates Ltd. This in order to investigate foundation conditions at depth and provide all relevant information for the design and construction of the structural foundations.

Fieldwork performed within the time period 21st March to 24th April 1974 included three vertical boreholes of a total depth of 67.0 m. with associated undisturbed sampling and Standard Penetration testing. Boring was carried out using an Overburden drill and undisturbed sampling using thin walled "Shellby" tubes.

Total expenditure for the investigation amounted to £1124 and the following drilling and associated equipment were used on site:

- (i) 1 no. Rotary-Percussion (Overburden) drill (W.D.D.455)
- (ii) 1 no. Air Compressor (W.D.D.668)
- (iii) 1 no. Flush Pump
- (iv) Undisturbed sampling and Standard Penetration testing equipment.

3.7.2

Medstar Real Estate. Multistory Building, Site Investigation

In order to ensure good foundation conditions below basement excavation level, I. and A. Philippou, Architects, responsible for the design of the structure, requested that a site investigation be carried out at the site of the proposed building belonging to Medstar Real Estate Developers and located in the Ayia Paraskevi (Hilton Hotel) area of Nicosia.

Fieldwork which was performed within the time period 1st to 5th July 1974 included one coredrilled borehole to a depth of 15.5 m. . . .

Expenditure for the fieldwork amounted to approximately £76 and the following drilling equipment was used on site:

- (i) 1 no. Coredrill (W.D.D.497)
- (ii) 1 no. Flush Pump

3.7.3.

Cyprus Grain Commission Site Investigation

At the request of the Director, Cyprus Grain Commission, the Site Investigation Section undertook the performance of fieldwork at the proposed Grain Silo Sites in Limassol, Larnaca and Nicosia. Contracted Technical Consultant for the investigation was the Athens based firm of Kotzias and Stamatopoulos.

Work started at the Limassol site on the 28th November 1974 and continued into 1975. Upto the end of 1974 two auger drilled boreholes of a total depth of 40.0 m. were completed with associated undisturbed (shellby tube) sampling and Standard Penetration testing. Expenditure for the 1974 fieldwork amounted to approximately £300 and the Mobile Auger drill (W.D.D.560) was used on site.

3.8

Laboratories Section

During 1974 the work of the Section is distinguished into the Departmental and non-Departmental work performed at the Nicosia central laboratories and the work of the field laboratories.

At the central laboratories 95% of the total number of tests were performed prior to the Turkish invasion whilst the work of the Section fell drastically thereafter. As a result of the invasion the testing programme for the Prastio Reservoir was not finalised.

Tables 4 and 5 show analytically the type, project and number of tests performed in the Soils and Concrete Laboratories during the year.

3.8.1 Departmental Work

This was in connection with the site investigations for the Prastio Reservoir and Dhyptomamos Dam. As can be seen from Table 4 a substantial number of soils tests were performed for the Prastio Reservoir additional investigations.

3.8.2 Non-Departmental Work

In the Soils laboratory this was in connection with:

- (i) the site investigation for the proposed Promenade Court - Limassol,
- (ii) an investigation as to the suitability of certain soils for the brick manufacturing industry, performed at the request of the Director, Geological Survey Department, and
- (iii) an investigation as to the suitability of fill material for the Olympic Stadium, Nicosia, whilst under construction.

In the Concrete Laboratory the work was mostly in connection with the strength of cast concrete in the form of concrete cube crushing tests for various private companies and/or individuals.

At the request of the Director, Public Works Department, the soils laboratory facilities were made available for the performance of certain specialised tests in connection with the Limassol Harbour site investigation performed by the Public Works Department.

3.8.3 Field Laboratories

Following the procedure set in previous years, during 1974, field laboratories were manned and equipped at the following construction sites:

- (i) Arakapas Dam (Concrete)
- (ii) Engomi Reservoir (Reinforced Concrete)

The aim of field laboratories was the efficient quality control of construction materials and workmanship.

Field laboratories were equipped for the most common types of tests on concrete aggregate and mixed concrete such as:

- (i) sieve analysis,
- (ii) silt content,
- (iii) organic impurities,
- (iv) moisture content,
- (v) concrete cube casting,
- (vi) slump test,

whilst more sophisticated tests were performed in the central concrete laboratory.

In order to expedite the procedures, a hand operated cube crushing machine was installed at Arakapas field laboratory.

3.9 Grouting Section

During 1974 the Grouting Section was involved with three grouting works namely:

- (i) construction of grout curtain at Arakapas Dam,
- (ii) additional tunnel grouting at Lefkara Dam, and
- (iii) remedial works at Trimiklini Dam.

3.9.1 Arakapas Dam Grout Curtain

The design of the Dam provided for a grout curtain below the mass concrete, gravity type, main dam structure and in order to render foundation bedrock watertight. Construction of the grout curtain involved the drilling and grouting of two rows of holes within the river bed and a single row of holes within the abutments, a total of 77 no. holes. Grout holes had variable depths and variable diameter within the range 50 to 75 mm. Spacing of holes was 2.0 m. and these were drilled through the grout cap constructed prior to grouting thus facilitating the built up of grout pressures. The orientation of grout holes was vertical and their total linear length 1122 m. Of a total of 1122 m., 988 m. were drilled using rotary-percussion (Overburden) drilling and the remaining 134 m. using core drilling.

Using the single packer technique, rock grouting within the holes was carried out in 3.0 m. stages and from the bottom of the hole toward the grout cap. The grout mix consisting of water, cement and bentonite was injected under a defined grout pressure for each stage of grouting. Grout takes were 6.0 kgs/m. average, whilst total consumption in terms of dry material was as follows:

Cement = 5739 kgs.

Bentonite = 220 kgs.

In cooperation with the Construction Section, the Grouting Section carried out the work within the time period 9th January to 4th July 1974, at a total expenditure of £3590.

3.9.2 Lefkara Dam Additional Tunnel Grouting

After impounding the dam, during 1974, certain leakages were observed in the diversion tunnel and mainly near its entrance.

In order to eliminate these leakages, grouting works were carried out within the period June/July 1974.

The works consisted of the drilling and grouting of 22 no. holes of 37 mm. dia. For grouting a cement slurry was used and the total consumption in terms of dry material was 1748 kgs. of cement. Total expenditure for the works amounted to £469.

3.9.3 Trimiklini Dam Grouting, Remedial Works

Due to the opening up of a horizontal construction joint near the right abutment and just below spillway crest level, a crack developed, at the Trimiklini, mass concrete, gravity type dam.

In order to eliminate water leakage losses through the crack the grouting remedial works were carried out within the time period 17th to 30th October 1974. 31 no. vertical grout holes of 37 mm. dia. in three rows and of a total linear length of 84.0 m., were used.

Grouting was carried out using a cement slurry under injection pressures of up to 0.8 kg/cm². Grout takes were generally very low except within three of the grout holes. The total consumption in terms of dry material was only 380 kgs. of cement.

Total expenditure for the works amounted to £240 and was partly covered by the Trimiklini village authority.

3.10 Reports

In connection with the work of the Site Investigation, Laboratory and Grouting Sections the following reports were prepared and published in 1974:

- (i) F/41 "Morphou-Tylliria Feasibility Study - Prastio Proposed Reservoir - Site Investigations" March 1974,
- (ii) F/42 "Xeros Proposed Dam (Lower) - Site Investigations" May 1974,
- (iii) F/43 "Promenade Court - Limassol, Site Investigation" June 1974,
- (iv) F/44 "Kalavassos Dam, Site Investigations" October 1974,
- (v) F/45 "Nicosia Water Supply - New Strovolos Reservoir, Site Investigation" November 1974,
- (vi) F/46 "Trimiklini Dam - Remedial Works 1974 - Completion Report" December 1974,
- (vii) F/47 "Larnaca Water Supply - Tremithos Reservoir, Site Investigation" January 1975,
- (viii) "Site Investigation Report for the Proposed Multistory Building of Medstar Real Estate Developers at Aya Paraskevi - Nicosia".

Table 1 - 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	Light Percussion Boring Machine	Edeco	1	553

(ii) Air Compressors

No.	Description	Make	No. of	W.D.D. Ref. No.
1	600 cu. ft. Compressor	Atlas	2	280, 362
2	600 cu. ft. Compressor	Gardner	1	495
3	600 cu. ft. Compressor	Cumming	1	668

(iii) Flush Pumps

No.	Capacity H.P.	Make	No. of	W.D.D. Ref. No.
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

(iv) Associated Equipment for Use on Site

No.	Description
1	<p><u>Core Drilling Equipment:</u> to fit available coredrills and for boreholes of variable diameter and to depths greater than 100 m., including:</p> <ul style="list-style-type: none">(i) Casing tubes,(ii) Casing Shoe bits (diamond, diaborit, T.C.),(iii) Double Tube Core Barrels,(iv) Core bits (diamond, diaborit, T.C., Rockbit),(v) Central drill rods,(vi) Reaming Shells etc.
2	<p><u>Auger Drilling Equipment:</u> to fit mobile auger drill and for 0.20 m. dia. drilling to 30.0 m. or for 0.25 m. dia. drilling to 12.0 m., including:</p> <ul style="list-style-type: none">(i) Hollow stem auger flights of 1.5 m. length,(ii) Hard or soft formation cutters,(iii) Central boring rods,(iv) Head assembly.
3	<p><u>Light Percussion Boring Machine Equipment:</u> for 0.15 m. or 0.20 m. dia. boring to 25 m. depth in clayey or sandy formations.</p>
4	<p><u>2 Sets Standard Penetration Test Equipment complete with:</u></p> <ul style="list-style-type: none">(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	<p><u>Undisturbed sampling equipment complete with:</u></p> <ul style="list-style-type: none">(i) 10 cm. dia. head assembly,(ii) 10 cm. dia. open drive (U4) tubes,(iii) 10 cm. dia. cutting head,(iv) 8 cm. dia. and 7 cm. dia. thin walled (Shellby) tube sampler

Table 2 - Laboratory Equipment

(i) Soils Laboratory Equipment

No.	Description	Year Acquired
1	3 No. Liquid Limit apparatus	2 prior to 1967 1 in 1971
2	Normal and rapid moisture content 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, Hydrometer and Pipette 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 (1½" 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	1 No. sample extruder	1967
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
18	Universal Hydraulic Extruder	1970
19	Large Shear Box machine (12"x12" 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

Table 2 - Laboratory Equipment

(i) Soils Laboratory Equipment (continued)

No.	Description	Year Acquired
26	1 No. Kango Vibrating Hammer	1972
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	1973
33	2 No. Stop Clocks	1973
34	2 No. Geological Hammers	1973

(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 Entrainment 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

(iii) In Situ Testing Equipment

No.	Description	Year Acquired
1	Vane Shear Test Unit	1970
2	2 No. Plate Bearing Test Units	1970 and 1973
3	Well Permeability Test Unit	1972

Table 3 - Laboratory Equipment Purchased during 1974

No.	Description
1	2 No. Liquid Limit Apparatus
2	Quick stroke, 1½ in. dia. sample Extruder
3	Point Load tester unit complete with 3 No. pressure gauges

Table 4 - Soils Laboratory Tests During 1974

No.	PROJECT TYPE OF TEST	Prastio Reservoir	"Dams of Cyprus" Data Collection	Lab. Tests for G.S.D.	Promenade Court - Limassol	Dhyptanos Dam	Olympic Stadium	Miscellaneous	Total of each kind of test
1	Moisture Content	64			15				79
2	Bulk Density	64			15				79
3	Sieve Analysis	29	7			8		6	50
4	Hydrometer Analysis	96	20	12	10	5		4	147
5	Atterberg Limits	91	17	12	10		3	1	134
6	Specific Gravity	96	20	12	10	5	3	4	150
7	Standard Proctor	14	18				3		35
8	Modified Proctor	17							17
9	Compaction by Vibration	3	6					1	10
10	Permeability	14	5						19
11	Undrained Triaxial	69	15		13				97
12	Cons. Undrained Triaxial with p.w.p. measurements	3							3
13	Drained Triaxial					1			1
14	Shear box (Large)	3				2			5
15	Consolidation (Oedometer)	21			2				23
16	Suspended Sediment Analysis							129	129
	TOTAL	584	108	36	75	21	9	145	978

Table 5 - Concrete Laboratory Tests During 1974

No.	PROJECT	New Engomi Reservoir (Field Lab.)	Arakapas Dam (Field Lab.)	Private Tests	Tenders for Concrete and Aggregate	Miscellaneous	Total of each kind of test
	TYPE OF TEST						
1	Sieve Analysis	56	84	14	78	16	248
2	Silt Content	38	155	8	45	7	253
3	Organic Impurities	38	155	8	45	7	253
4	Specific Gravity	5	4		19	2	30
5	Aggregate Crushing test	5	4	5	12	2	28
6	Cubes Crushing test	187	560	213			1160
7	Slump test	96	217		4		317
8	Water Absorption	5	4		19	2	30
9	Bulking of Sand	5	3				8
10	Moisture Content	12	50		18	4	84
11	Sand Replacement	12					12
TOTAL		659	1236	248	240	40	2423

Table 6 - Grouting Machinery and Equipment

1.	1 no. "Moyno" Grout pump (pneumatic) Capacity = 50 psi/min. Pumping Pressure = 200 psi
2.	2 no. "Craelius" Grout pumps Reciprocating with diesel engine Capacity = 11 gal/m Pumping Pressure = 1000 psi
3.	2 no. Z.A. 300 High Speed Mixers (Pneumatic), "Craelius" Capacity = 66 Imp. gallons
4.	2 no. Z.A. 600 Grout Agitators (Pneumatic), "Craelius" Capacity = 132 Imp. gallons
5.	1 No. Colloidal grout mixer "Semix 175" type "Craelius"
6.	1 No. Grout Agitator "Concrete" type - Capacity = 77 Imp. gallons

IV.

DIVISION OF DESIGN

By

C. A. Christodoulou
Senior Water Engineer
Head of Division

4.1 The Design Division of the Water Development Department deals mainly with the detailed design of all major projects undertaken by the Department, preparing all drawings, specifications and conditions of contract.

The Division consists of the following Branches:

1. Domestic Water Supplies
2. Irrigation
3. Dams
4. Small Dams
5. Hydraulic Structures
6. Topography
7. Drawing and Records

Within the Design Division twelve qualified Engineers were working during the year 1974, as follows:

- One Senior Water Engineer
- Three Executive Engineers Class I
- Six Executive Engineers Class II
- Two Irrigation Engineers

Two of the above mentioned Branches, namely the Topography Branch and the Drawing and Records Branch, are offering services to all the other Divisions of the Department, their services being, for the first, topographical work, mapping etc. and for the second all the drawing work regarding every major or minor project carried out within the Department.

The activities of each of the above mentioned branches during 1974 are described below.

4.2 Domestic Water Supplies Branch

4.2.1 Introduction

For the efficient operation of the Water Supply System of Nicosia and for meeting present and future demands for the rapidly expanding City of Nicosia, it has been found necessary to reinforce the existing distribution system by introducing a number of new mains.

4.2.2 General

As a result of the detailed studies and analyses performed during 1973 by the consulting firm McLAREN INTERNATIONAL LTD., in co-operation with the Design Division of the Water Development Department, the following observations and recommendations for the immediate improvement of the waterworks system were presented:

1. TRUNK MAIN, commencing at Engomi Reservoir to Paphos Gate.
2. TRUNK MAIN, commencing at Ayii Omoloyitae connection to Gregoris Afxentiou Square.
3. TRUNK MAIN, commencing at Strovolos Reservoir to the outlet of Water District 2.
4. TRUNK MAIN, commencing at Lakatamia Reservoir to the outlet of Water District 7.
5. TRUNK MAIN, commencing at the outlet of Water District 7 to Strovolos Avenue.
6. TRUNK MAIN, on Kantara road from Saint Hilarion to the New Industrial Estate.

4.2.3 Analytical

The Design Division of the Water Development Department has done all the preliminary work required to establish the correct position of the mains, has completed all the necessary surveying work involved and completed all the necessary preliminary drawings.

4.2.3.1 TRUNK MAIN, Commencing at Engomi Reservoir to Paphos Gate

This a 30-inch diameter trunk main commencing at Engomi Reservoir east, then north on Andreas Karyos, private land, and Democratia Avenue to Gregoris Afxentiou.

Then a 20-inch diameter main east on Gregoris Afxentiou to Prince Charles Street and then on the Achaeon Street and Chelon Street.

Finally a 16-inch diameter main through Museum Street to Paphos Gate.

The object of this trunk main is to supply the Ayios Dhometios Water District and the within the walls City of Nicosia.

4.2.3.2 TRUNK MAIN, Commencing at Ayii Omoloyitae Connection to Gregoris Afxentiou Square

This is an 8-inch diameter main required to reinforce the existing system.

4.2.3.3 TRUNK MAIN, Commencing at Strovolos Reservoir to Outlet of Water District 2

This is an 18-inch diameter main positioned parallel to the existing 12-inch diameter inner ring main. The object of this new trunk main is to meet the demands of Water District 2 and supply adequate quantities of water at satisfactory pressures.

4.2.3.4 TRUNK MAIN, Commencing at Lakatamia Reservoir to the Outlet of Water District 7

This is again an 18-inch diameter main the object of which is to meet the growing demands of the rapidly expanding area 7.

4.2.3.5 TRUNK MAIN, Commencing at the Outlet of Water District 7 to Strovolos Avenue

This is an 18-inch diameter main through Odysseus Avenue.

Then a 16-inch diameter main from Odysseus and Strovolos Avenue west across the Pedieos River then north on Archiepiskopou Kyprianou Avenue to Themistocles.

Finally a 10-inch diameter main on Archiepiskopou Kyprianou Avenue from Themistocles to Stadium.

4.2.3.6 TRUNK MAIN, on Kantara Road from Saint Hilarion to the New Industrial Estate

This is a 10-inch diameter main with the object of meeting the demands of the New Industrial Area.

4.3.2.7 Remarks

Although all the preliminary works required for the construction and instalment of these mains have been completed, as a result of the late political developments in Cyprus the pre-existing situation has changed a lot. Therefore, the Design Division of the Water Development Department will have to reconsider some of these proposed works.

4.3 Irrigation Branch

4.3.1 During the year 1974, the following design work has taken place on Distribution Systems of Major Projects:

4.3.1.1 Mavrokolymbos

Following the implementation of Land Consolidation in Kissonerga and Khlorakas areas commanded by Mavrokolymbos Dam, final design was prepared for secondary lines of Khlorakas and tertiary system of the whole Distribution System of Mavrokolymbos Dam.

4.3.1.2 Yermasoyia

- (a) Akrounda-Phinikaria: Design work was prepared for part of Akrounda and Phinikaria Distribution Scheme in conjunction with Department of Agriculture, based on improved methods of Irrigation.
- (b) Phasouri-Zakaki Extensions: This scheme was further studied and a revised cost estimate was prepared based on the system resulted following the amendments to cover all areas according to existing Land Ownership.
- (c) Trakhoni Extensions: Preliminary design work has taken place on head works and Distribution System of this scheme and a revised cost estimate was prepared.

4.3.1.3 Palekhori

Two alternative schemes were designed for Palekhori Distribution System, one making use of the existing irrigation channel and the other based on closed systems.

4.3.1.4 Kiti

A revised estimate was prepared for phase IV of Kiti Distribution System covering areas of Kiti and Tersephanou villages.

4.3.1.5 Lefkara

A revised cost estimate of Lefkara Distribution System was prepared based on new material and labour cost

4.3.1.6 Land Consolidation

During the year 1974 the following areas were undergoing Land Consolidation: Kissonerga, Khlorakas, Akrounda, Phinikaria, Palekhorri, Ayios Ioannis Maloundas, Pera, Monagroulli and Arsos. Our Department was represented at the meetings of Land Consolidation Committees by Irrigation Engineer Mr. E. Kambourides and District Engineers of the Department.

4.4 Dams Branch

4.4.1 Dhyptomamos Proposed Dam

This proposed dam site is located on Pendaskinos River about 4 km upstream of the bridge crossing of the Nicosia-Limassol road, near Skarinou village. The proposed reservoir will store water from the Mylou and Syrkatis tributaries whose catchment area is of the order of 79 sq. km. Water will also be diverted into Dhyptomamos reservoir from Maroni river (Potamos tou Ayiou Mina).

The topographical and geological conditions and the availability of construction materials have dictated the choice of a rockfill dam. The maximum dam height above the river bed will be about 49 m. and its maximum height above foundation level will be about 64 m. The dam crest length will be about 353 m.

The proposed maximum storage elevation is 175.0 m. which corresponds to a reservoir capacity of 15 million cubic meters. It is proposed to use the water mainly for irrigation purposes; certain quantity, however, will be pumped to the Khirokitia Treatment Plant to meet future increase in demand of drinking water from the Plant.

During 1974, additional site investigations were carried out on the downstream end of the proposed diversion tunnel/channel and on the burried channel on the right dam abutment. The final dam study and design was started in 1974. This included flood studies stability analysis of the embankment, design of the spillway, diversion works (cofferdam, tunnel/channel), outlet works including the control shaft. Final construction drawings were started and will be completed in 1975 together with the Bill of Quantities and Specifications and a design report.

The volume of the embankment is about 880,000 m³ and the total estimated cost of the project will be of the order of £1,700,000.

4.4.2 Kalavassos Dam

During the second half of 1974 work started on the detailed design of Kalavassos Dam. Kalavassos damsite is situated on the Vassilikos river near the Kalavassos Mines Offices and Workshops and about 5.5 km north west of Kalavassos village.

The dam will have a gross storage capacity of 18 MCM and is primarily intended for irrigation but it will be possible to contribute some raw domestic water to the Famagusta Water Supply project.

The damsite is wholly within the Upper and Lower Pillow Lavas. From the preliminary work carried out it seems that a rockfill dam with a central clay core will be adopted. The height of the dam will reach 57 m. and the volume fill 1,250,000 cu.m.

Several preliminary designs have been carried out for various locations of the spillway which will be a free overflow type with minimal concrete lining. The final decision on the spillway will be taken after the completion of an optimization study which is under way and will be completed early in 1975. The other major feature of the dam will be a tunnel through the left abutment which will cater for river diversion during construction.

The invert of the tunnel will carry the scour flow during operation. The outlet pipework will also pass the tunnel.

4.5 Small Dams Branch

4.5.1 Perapedhi and Kilani Irrigation Divisions, Proposed Extensions and Improvements to the Existing Irrigation Work

A preliminary report was carried out for the proposed extensions and improvements to the existing irrigation works of Perapedhi and Kilani.

In 1956, a dam was constructed in the Kryos river to form a 53500 m³ reservoir. With this amount of water 245 donums of deciduous fruit trees are supposed to be irrigated, but in practice, the irrigated area is only 90 donums, because of the low irrigation efficiency (35%).

In order to increase the area irrigated a study was carried out which led to the following recommendations:

- (a) Raise the existing Perapedhi dam by 3.0 m, to increase the storage of the reservoir to 990000 m³
- (b) Construction of a new concrete reservoir 22.5 m height, to form a reservoir with a capacity of 123000 m³
- (c) Water developed by the combined reservoirs and the stream flow, for the irrigation of 482 donums of deciduous fruit trees at 75% irrigation efficiency 352000 m³/a
- (d) Area of deciduous fruit trees to be irrigated 482 donums
- (e) Provide steel pipes for the main conveyor
- (f) Provide a piped hose basin distribution system in steel and asbestos cement pipe
- (g) Provide an on-farm distribution system

The estimated cost of the work is £353,850 and the annual cost £28,924. The benefits are £41,945/annum and the benefit cost ratio 1.45.

4.5.2 Lymbia - Psevahas - Ayia Anna Irrigation Divisions Works

Several alternative schemes were studied for Lymbia - Psevahas and Ayia Anna. The three schemes are described as follows:

Alternative I: This alternative is a combined scheme for the Irrigation Divisions of Lymbia, Psevahas and Ayia Anna. It consists of an earth dam at Lymbia Dam site, 19 m high to form a reservoir of 1.38 Mm³ with an estimated cost of £160,000 and a piped sprinkler distribution system and automated pumping plant with an estimated cost of £93,000. The area to be irrigated will be 865 donums of the Lymbia - Psevahas - Ayia Anna Irrigation Division Lands. The scheme yields a benefit cost ratio of about 2.0.

Alternative II: This provides a separate scheme for Lymbia, and a combined scheme for Psevahas and Ayia Anna. The scheme for Lymbia provides an Earth Dam site at Lymbia Dam site as in alternative I and a Distribution system with a cost of £43,000 and will irrigate 625 donums of the Lymbia land with a benefit cost ratio of 2.4. The combined scheme for Psevahas and Ayia Anna consists of a concrete dam at the Psevahas dam site of 9 m high, of 0.17 Mm³ storage capacity with a cost of £47,000 and a piped sprinkler distribution system and pumping plant of £25,000 which will irrigate an area of 240 donums of the Psevahas and Ayia Anna Irrigation division Lands with a benefit cost ratio of 0.8.

4.5.3 Lymbia Irrigation Division Improvement Works

In view of the hydrogeological conditions it is proposed that the Existing Lymbia Irrigation Division works be improved and only a small amount of additional water be developed by:

- (a) Desilting and raising the existing Lymbia dam by 3.5 m to form a 145,000 m³ capacity reservoir the estimated cost being £28,000.
- (b) Providing a 55% irrigation efficiency conveyor and distribution system for furrow irrigation to irrigate an area of 200 donums with a cost of £55,000.

The scheme yields a benefit cost ratio of 1.7 which is satisfactory and, therefore, recommended.

4.6 Hydraulic Structures Branch

4.6.1 Khirokitia - Dhypotamos Diversion Project

The Khirokitia Diversion project is a part of the Vasilikos - Pendaskinos Project.

The study of this project was undertaken in June 1973 and its main object was to design a diversion System of an optimum quantity of water of the Maroni river to the Dhypotamos proposed Dam, and at the same time leaving a satisfactory water quantity for the irrigation purposes of the Khirokitia village.

The whole project consists of two main parts:

Part 1: Diversion Weir

The site of the proposed diversion weir is on the Maroni river at an elevation of 225.0 m above sea level and at a distance of 3 km north of the Khirokitia village.

The weir is a mass concrete type weir and has a maximum height of 8,0 m from river bed to the crest, and a width of 25,0 m.

The reservoir capacity is about 50,000 cu.m. water and it is going to be used for irrigation of the Khirokitia village.

Part 2: Diversion Structures

Alternative 1: Diversion Pipeline

On July 1973 the Topography Branch started the survey work for the main pipeline extending from the site of Diversion Weir to the proposed Dhyptomamos Dam site which is 11,3 km. long. After a comprehensive hydraulic study of the proposed pipeline, AC pipes of internal dia of 900 mm (36") were adopted. The maximum discharge capacity of the pipeline is 1,0 m³/S or about 3,4 million m³ per year which is approximately 75% of the total annual runoff of the Maroni river.

A plan and a longitudinal section of the pipeline were drawn, and detail design works for the Diversion weir, intake and desilting structures, the pipeline and related structures have been produced. Also a complete analysis of Bill of Quantities and cost estimates of the Diversion weir and pipeline was produced. The total estimated cost amounts to £658,000 pounds.

Alternative 2: Diversion Canal

The preliminary study of this alternative began in October 1974 in cooperation with Mr. B. Milinusic. The Topography Branch started the survey work for the main Canal which is 16,2 km, extending from Khirokitia proposed weir site to Dhyptomamos Damsite. This work consists of establishing the canal line and profile levelling.

Alternative 3: Tunnel - Diversion Canal

Survey work is to be extended to this alternative which is a combination of 550 m long Tunnel and 11,2 km of Canal.

Meanwhile the preliminary design work of Alternatives 2 and 3 has been produced. A trapezoidal concrete lined canal has been adopted of a maximum discharge 1,0 m³/S. For Syphons, AC pipes are to be used, with an internal dia of 800 mm (32"). The Tunnel, which is a supported type, with reinforced concrete, has an internal dia of 2,0 m.

A preliminary total estimated cost of Alternative 2 amounts to £402,000 and of Alternative 3 to £374,000.

Detailed design work for the main Canal and other structures related to it such as Tunnel, culverts, Bridges, Syphons and Aqueducts is still under preparation.

4.7 Topography Branch

This Branch was headed by Inspector of Works A. Evripidhou and has conducted all the Survey Work of the Department. These Surveys were of the Engineering type and consisted mainly of: Contour Surveys for Dam sites and Reservoirs, Profile-levelling and Cross-Sectioning for canals and pipelines, instrumental observations

for movement detection of constructed Dams and the neighbouring slopes, setting-out of Project lay-out, and preparation of cadastral maps for acquisition purposes.

The two major survey assignments, those of Paphos and Morphou-Tylliria Irrigation Projects, undertaken by this Branch in the year 1973, were completed early this year. The profiles of the canal centerline, the route traverses, the setting-out and referencing, the land acquisition plans and the contour surveys for the related structures are now completed and submitted accordingly.

Another major survey assignment is now undertaken by this Branch, that of Vasilikos Dhyptomamos Project, and Surveying operations are already in progress and will continue in the year 1975. It is estimated that these will be completed by August 1975.

Routine survey work requested by the small projects division is also completed and a detailed list of the Projects and the type of the Survey is given below:

It will be a great omission not to mention the occupation of parts of our Country by the Turkish Invasion forces which among the other miseries have brought a major setback to the efficiency of this Branch. Two officers of this Branch are still missing, two were seriously wounded during the Turkish Invasion and half of the staff are refugees either themselves or their families and relatives. It is hoped that things will get better soon and peace will prevail once again.

The staff of this Branch during the year 1974 was as follows:

Post	No.	Class	Remarks
I.W.	1	Permanent	I/C of Branch
T/A	5	--do--	
T/A	2	Temporary	
T/A	1	Daily Paid	
T/A	11	Hourly Paid	Two of them still missing

During this year the Branch has dealt with the following Projects:

Project	Type of Survey	Remarks
Paphos	Profile, contouring	Irrigation Project
Morphou-Tylliria	--do--	--do--
Prastio Reservoir	Cross-Sectioning	--do--
Dhyptomamos D. Site	Contouring	Extension of contours
Nicosia W.S.	Profile-levelling	W.S. Scheme
Strovolos Res.	Contouring	
Lakatamia Res.	--do--	
Constructed Dams	Movement observations	Detection of horizontal and vertical movement
Palekhori Pipeline	Profile-levelling	
Palekhori Distr. System	Profile-levelling	
Ayii Tremithias	Contouring	D. Site and Reservoir

Project	Type of Survey	Remarks
Lymbia	Contouring	D. Site and Reservoir
Alaminos	-do-	Two D. Sites and Reservoirs
Kiti Distr. System	Profile-levelling	Completion plans
Platres	Contouring	Earth Reservoir
Yialias River	-do-	Recharge schemes
Solea Valley	Contouring	4 No. D. Sites
Alethriko	-do-	D. Site and Reservoir
Mia Milea Dam	Traversing	Evaporation studies
Akanthou	Contouring	D. Site
Kalavassos	-do-	D. Site
Ovgos Dam	Cross-Sectioning	Sedimentation studies
Kalavassos Canals	Levelling	
Alakati-Kyrenia	Contouring	D. Site
Ayia Paraskevi-N'sia	Levelling	Pipeline
Polemidthia Dam	Contouring	Sedimentation studies
Lythredontas Dam	Contouring	Raising of Dam

4.8 Drawing and Records Branch

4.8.1 The staff of this branch numbered to 11 daily paid Technical Assistants, 8 Draughtsmen scale 5, 1 Foreman scale 4, one Technical Assistant scale 5, 3 hourly paid assistants and the Head of the Branch. It should be noted that two daily paid Technical Assistants have left during the year.

4.8.2 Drawing Section

Throughout the year under review, in addition to normal Departmental work, the Drawing Section was engaged in the execution of all drawing work needed for the Southern Conveyor Project as well as the Morphou-Tylliria Project.

Work done can be listed as follows, giving also the time spent in each category of drawings and maps.

	<u>Time spent in hours</u>	<u>Man months</u>
a. Existing and Proposed Dams	3911	24.4
b. Irrigation distribution systems for dams	1624	10.1
c. Routine Irrigation Schemes	2042	12.7
d. Domestic Water Supplies	6382	39.8
e. Recharge Schemes	268	1.6
f. Antiflood Schemes	Nil	Nil
g. River Training Works	16	0.1
h. Hydrological	129	0.8
i. Hydraulic Tables	254	1.5
j. Programmes and Organization	410	2.5
k. Completion plans	2247	14.0
l. Completion Reports	366	2.2
m. Akrotiri Project	91	0.5
n. Reports	666	4.1
o. General	2513	15.7
p. Odd jobs	284	1.7
q. Watershed Surveys	1697	10.6
r. Paphos Project	2255	14.0
s. Morphou-Tylliria Project	1617	10.1

	<u>Time Spent in hours</u>	<u>Man months</u>
t. Southern Conveyor Project	1973	12.3
u. Auxiliary Services		
i. Library	3008	18.8
ii. Plan Registry	711	4.4
iii. Plan Reproduction	763	4.7
iv. Drawing Materials Store	124	0.7
v. Training of Staff	Nil	Nil
w. Leave etc.		
i. Leave Paid	1583	9.8
ii. Leave Without Pay	77	0.4
iii. Sick Leave	1108	6.9
iv. Maternity Leave	1038	6.4
v. D.C.	2700	16.8
 Totals (hours)	 <u>39851</u>	 <u>249.0</u>

The above time spent on various jobs does not include any time spent by the Head of the Drawing Branch, the Foreman and on daily paid employee working with the photo process lab. Also the work of the Storeman (T.A.) of drawing instruments and surveying instruments is not included.

4.8.3 Reproduction Section

Plan reproduction continued during 1974 with the automatic continuous process dyeline paper printing machine with the old machine as stand-by. Some 2950 orders were issued to the Reproduction Section and 31,950 prints were made of various sizes and of all types.

4.8.4 Photo Process Lab.

The Photo Process Lab. continued throughout 1974 the reproduction, enlargement and reduction of maps, drawings and aerial photos for the Water Development Department as well as for other Ministries and Departments.

4.8.5 Photographic Section

During 1974 records were taken on major Construction projects, water supply and irrigation schemes, both in black and white photos and colour slides.

Furthermore, colour 16 mm filming was made throughout the work on Palekhori and Lefkara Dams until completion, and on Arakapas Dam and Engomi Reservoir. In addition filming was made on the destroyed forests of Pyrgos, Pomos and Limnitis Valleys.

4.8.6 Library and Technical Information Section

During 1974, 17 new books at a total cost of approximately £68 were purchased by the Department and subscription was continued on 8 Technical Periodicals at a total cost of £45. In addition 36 reports were prepared by officers of the Department and numerous other books and periodicals were received free of charge.

The Library is grateful to the Project CYP 71/513 of U.N.D.P./SF for the gift of 5 very useful books.

The Library continued to issue regular reports of material received and of articles from periodicals of special interest.

The above statement presents the situation in which the Departmental Library was before the 15th of July 1974. As it is known the Library has been thoroughly destroyed by fire, between 15th and 17th of July 1974.

The books which are included in the list of Departmental Reports have all been destroyed. But now some of them, those which are marked with an "*" have been collected from various Officers of our Department and which now exist in our New Library. Books purchased for our Library have been also destroyed except those marked with an "*". Also the periodicals which were purchased during 1974, have been thoroughly destroyed.

WATER DEVELOPMENT DEPARTMENT LIBRARY STATEMENT FOR 1974

BOOKS PURCHASED DURING 1974

Library Reg. No.	Title	Author	Price
6136	British Standards Year Book 1974	B. S. I.	£ 3-0-0
6138	Engineering Geology and Rock Mechanics Vol. I	DUNCAN N.	£ 3-0-0
6139	Engineering Geology and Rock Mechanics Vol. II	DUNCAN N.	£ 3-5-0
6177	The Americana Annual 1970	AMERICANA CORPORATION	£ 3-10-0
6178	The Americana Annual 1971	AMERICANA CORPORATION	£ 3-10-0
6179	The Americana Annual 1972	AMERICANA CORPORATION	£ 3-10-0
6180	The Americana Annual 1973	AMERICANA CORPORATION	£ 3-10-0
6182	Σιδηροπαγές Σκυροκονίαμα (Beton Arme), εἰς τὴν οἰκοδομικήν καὶ ἄλλας κατασκευάς. Συμμετονομαζομένη διὰ τὰ ἀπλά καὶ ὀπλισμένα Σκυροκονιάματα. Ὑπολογισμοὶ Ἐπιτέλεισι καὶ Ἐφαρμογαὶ μετὰ παραδειγμάτων. Τόμος πρῶτος.	ΠΑΠΑΔΗΜΗΤΡΙΟΥ Σ. Δ.	£ 5-0-0
6270*	Hospital Design and Function	WHEELER E. E. T.	£ 6-19-0
6271*	Stores and Shopping Centres	HORNBECK, J. S.	£ 6-11-0
6380*	Problems in Engineering Soils	CAPPER P. L. CASSIE W. F. AND GEDDES J. D.	£ 1-17-0
6382*	Soil Mechanics	ROESNAK S.	£ 2-10-0
6385*	Reinforced Concrete Designer's Handbook	REYNOLDS CH. E. & STUEEDMAN J.	£ 5-0-0

Library Reg. No.	T I T L E	Author	Price
6386*	Hydraulics and Fluid Mechanics	LEWITT E. H.	£ 2-17-0
6381*	Sewage Treatment. Basic Principles and Trends	BOLTON R. L. AND KLEIN L.	£ 5- 0-0
6383*	Water Supply. Metric Units	TWORT A. C., HOATHER R. C. and LAW F. M.	£ 6-10-0
6384*	Reservoirs and Tanks	MANNING G. P.	£ 2-10-0
		TOTAL	£67-19-0

BOOKS DONATED BY PROJECT CYP 71/513

Library Reg. No.	T i t l e	Author
6374*	Theory of Groundwater Flow	VERRNIZIT A.
6376*	Groundwater Resources Evaluation	WALTON W. C.,
6375*	The Use of Models and Analogs in Reservoir Engineering. Research Project CV - 218. Report No. 1.	BEAR J., JACOBS M. AND BRAGSTER C.
6377*	Dynamics of Fluids in Porous Media	BEAR J.
6378*	The Concise Oxford Dictionary of Current English	FOWLER H. W. AND FOWLER F. G.

SUBSCRIPTION OF TECHNICAL PERIODICALS 1974

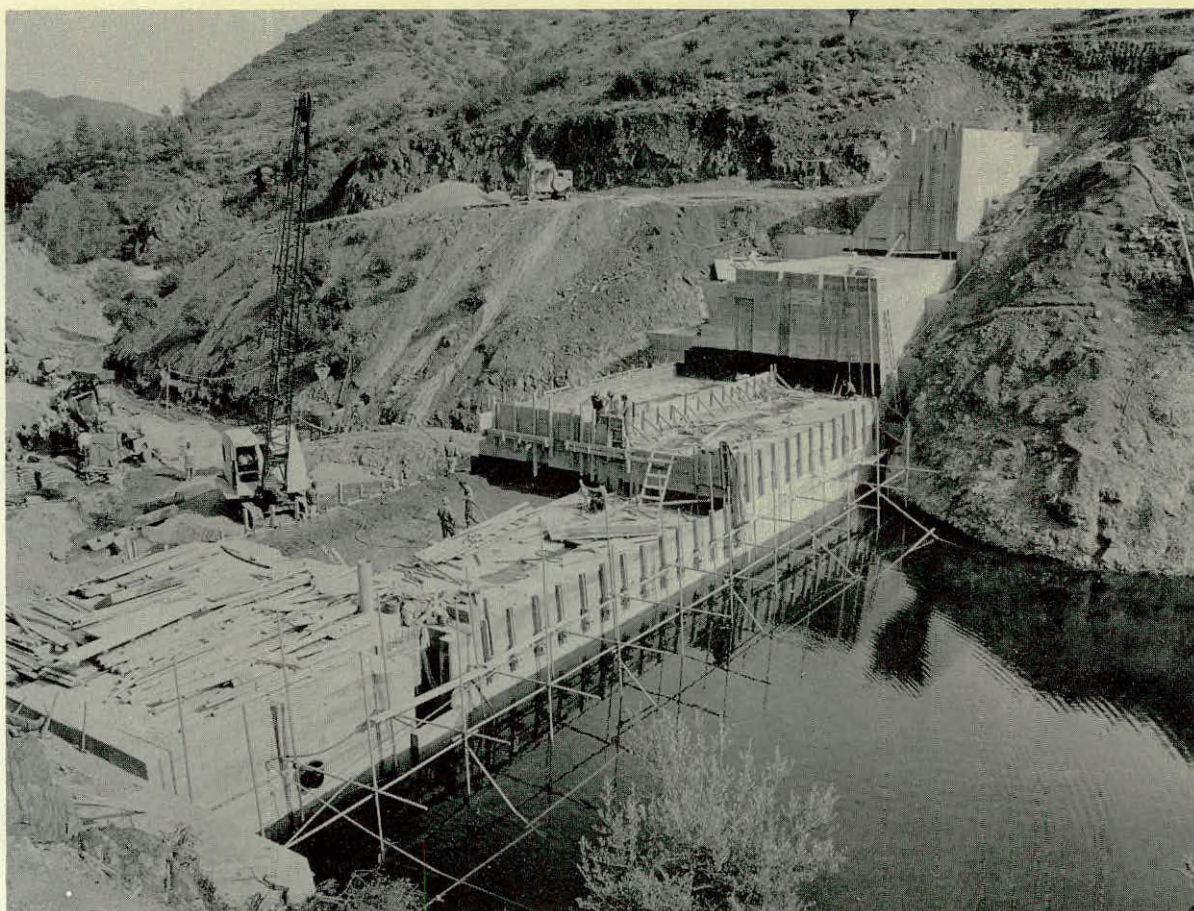
Ser. No.	T i t l e	Price
1	Journal of the American Waterworks Association	£12- 3-0
2	Proceedings of the Society of Water Treatment and Examination	£ 1- 0-0
3	Concrete	£ 3- 0-0
4	Proceedings of the Institute of Civil Engineers	£ 8- 0-0
5	Geotechnique	£ 6-10-0
6	Journal of the Institute of Water Engineers	£ 6- 0-0
7	Magazine of Concrete Research	£ 2- 0-0
8	Transactions of the American Society of Civil Engineers	£ 5-15-0
	TOTAL	£45- 4-0

WATER DEVELOPMENT DEPARTMENT LIBRARY STATEMENT FOR 1974
DEPARTMENTAL REPORTS 1974

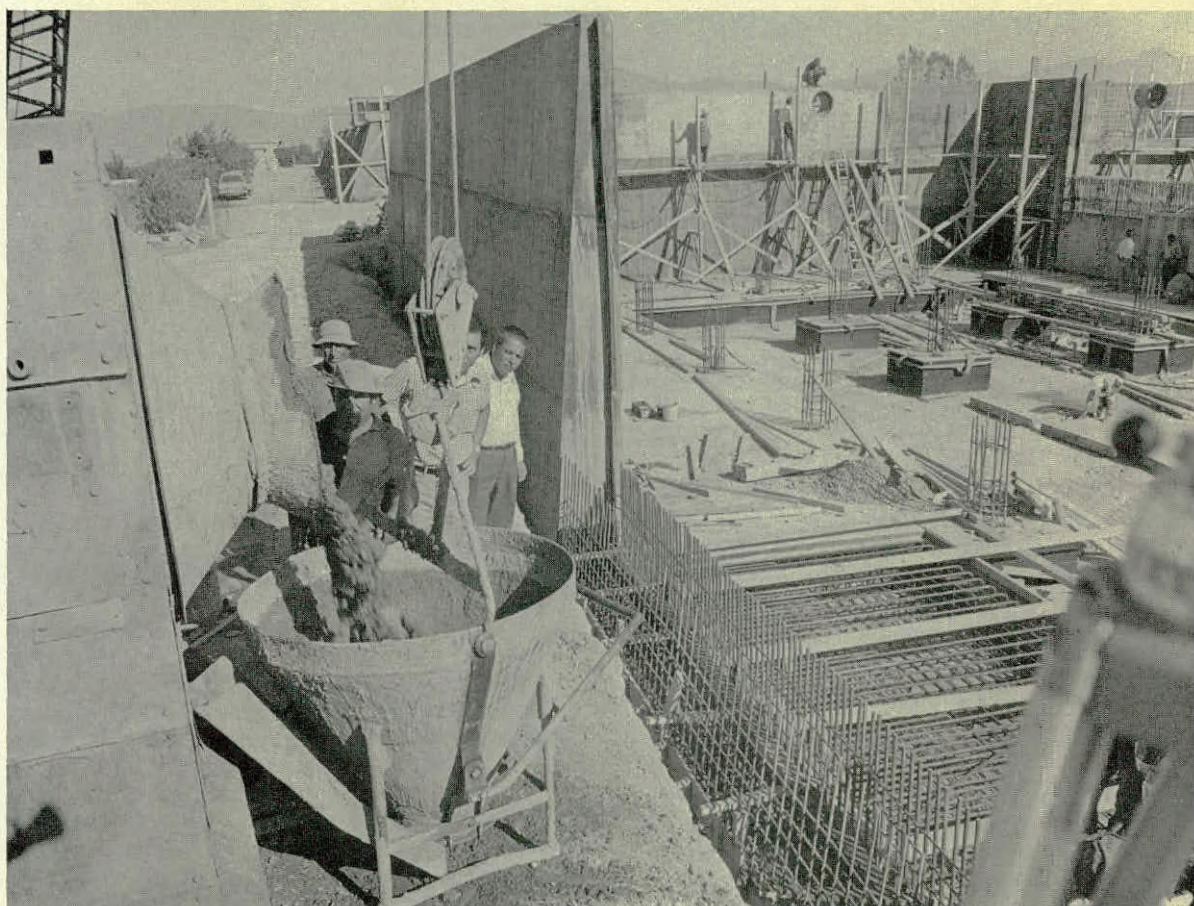
Library Reg. No.	Title	Author	Date
6146* 6147	The Performance of Akrotiri Aquifer Aquifer Research by the Overflow of a 30 MCM Storage Capacity Dam on Kouris and Assumed Future Pumpage Demand. (By the Use of Akrotiri Mathematical Model Under Assumed Future Conditions). Report No.H/23	JACOVIDES S. J.	January, 1974
6200 6201	Pano Arodhes Water Supply. House- to-House Scheme. Completion Report. Report No. C/93	KAZAMIAS TH. P.	January, 1974
6166* 6167	Morphou-Tylliria Feasibility Study. Simulation 6. Future Water Balance and Groundwater Levels in Morphou Aquifer with 18 MCM/a of Present Irrigation Demand met by Prastio Reservoir and 5-1 MCM/a Additional Pumpage for Nicosia Water Supply. (By the Use of Morphou Mathematical Model.) Report No. H/24	JACOVIDES S. J.	February, 1974
6189	Report on the I.B.R.D. Questionnaire Regarding the Proposed Power/desalination Project.	KONTEATIS C. A. C.	March, 1974
6184* 6185	Morphou-Tylliria Feasibility Study. Prastio Proposed Reservoir. Site Investigation Report No. F/41	LOUCAIDES P.	March, 1974
6193* 6194	Palekhoris-Kambi Dam. Irrigation Project. Assessment of Reliability of the Reservoir to Meet Project Water Demands. Report No. H/25.	PHANARTZIS A.C.	March, 1974
6208* 6209	Environmental Isotope Survey (Cyprus) Progress Report (III) of I.A.E.A. Research Contract No. 1039/R.B. Report No. H/26	JACOVIDES J.	April, 1974
6210* 6211	Forecast of Groundwater Levels at the End of the Irrigation Period of 1974. (By the Use of Akrotiri Digital Mathematical Model.) Report No. H/27	JACOVIDES J.	April, 1974
6249* 6250*	Kouris River. Revised Hydrology Report No. H/28.	PHANARTZIS A. C.	April, 1974
6202 6203	Kedhares Water Supply. House-to- House Scheme. Completion Report. Report No. C/94.	KAZAMIAS Th. P.	March, 1974
6251* 6252	Getting a Book Printed. Instructions Manual. Report No. S/9	PITSILLIDES S. C.	July, 1974
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6265*	Possibilities for the Utilization of Refugee Labour on Agricultural Development Schemes. (Preliminary Report.) Report No. L/16	MILINUSIC B. M. AND LATHAM E. W.	September 1974
6253* 6254	Peristerona (P) Water Supply. House-to-House Scheme. Report No. C/59.	KAZAMIAS P. TH	March, 1974
6272* 6273	Makrasyka Recharge Works. Report No. C/101	IOANNOU V.	September 1974
6279* 6280	Tymbou Irrigation Division No. 1. Report No. C/102	ELIADES E. CHR.	September 1974
6308*	Paphos Irrigation Project 1st stage. Groundwater Utilization. Report No. D/12	W.D.D.	October 1974
6311* 6312	Promenade Court - Limassol. Site Investigation. Report No. F/43	LOUCAIDES P.	June, 1974
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6304* 6305	Kondemenos Water Supply. House-to-House Scheme. Report No. C/100	GEORGHIOU S.	September 1974
6389* 6390	Kalavassos Dam. Site Investigation Report No. F/44	LOUCAIDES P.	October, 1974
6387* 6388	Vitsadha Irrigation Pumping Scheme for B. H. No. 26/70. Report No. C/104	IOANNOU V.	October, 1974
6398* 6399	Maroni (Larnaca) "Lakki - Xalona". Irrigation Division. Completion Report. Report No. C/103	ELIADES E. CHR.	November, 1974
6437* 6438	Trimiklini Dam. Remedial Works - 1974. Completion Report. Report No. F/46	LOUCAIDES P.	December, 1974
6439* 6440	Morphou-Tylliria Feasibility Study Cyprus. Morphou Mathematical Model. Description of the Model, the Computer Program and Introduction to Operation Procedures. Report No. H/33.	JACOVIDES J. S.	November, 1974
6662* 6663	Xeros Proposed Dam (Lower). Site Investigations. Report No. F/42	LOUCAIDES P.	May, 1974
6607* 6608	Paphos Irrigation Project. Mandria Water Rights. Report No. 3. A Proposal for the Compensation to Mandria Irrigation Division. Report No. D/11	MILINUSIC B. M.	May, 1974
6671*	Well and Borehole Inventory. Akrotiri Aquifer Area. Report No. H/29	SKORDIS P.	May, 1974

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6673* 6674	Brief Report on the Present State of the Morphou Water Problems (1974). Report No. H/31.	JACOVIDES J. S.	May, 1974
	Akrotiri Project. Review Report. Report No. P/3.	CHRISTODOULOU C.A.	April, 1974
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	Akanthou Recharge Works. Completion Report. Report No. C/96	IOANNOU VR.	March, 1974
	Akhna Recharge. Arabis Dam. Completion Report. Report No. C/97	IOANNOU VR.	May, 1974
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The Arakapas Concrete Gravity Dam



The New Engomi Reservoir for Nicosia Water Supply

V. DIVISION OF CONSTRUCTION

By

A. P. Georghiadhes
Head of the Division

5.1 The functions of the Division involve mainly the Planning, Construction, Supervision and Control of waterworks, undertaken by the Department, either by direct labour, or through contracts, in the field of Domestic Water Supply and Irrigation Works and in the capacity of Major and Minor Projects.

In addition the Division deals with the checking of designs and estimates of schemes prepared by the Small Projects Planning Division, the preparation of specifications for tenders of materials and machinery, as well as, with the utilization and administration of the constructional plant and the Department's Workshop respectively.

Another activity of the Division involves the preparation of completion Plans and Reports of all schemes executed directly by the Division or by Contract. Each Supervising Technical Officer has to prepare an up-to-date completion plan and also prepare a detailed report of the work executed. This Report includes all technical data, i.e. L.R.O. plans, Borehole records, chemical analysis, longitudinal sections, Bill of quantities and estimates of the work as submitted and also as executed. The implementation of this practice by the Division is considered of great importance for the schemes executed and for any detailed data that is needed for future development.

The numerous functions of the Division, and the various skilled trades involved necessitate the staffing of the Division with wide experienced personnel of all levels.

The staff of the Division during 1974 consisted of:

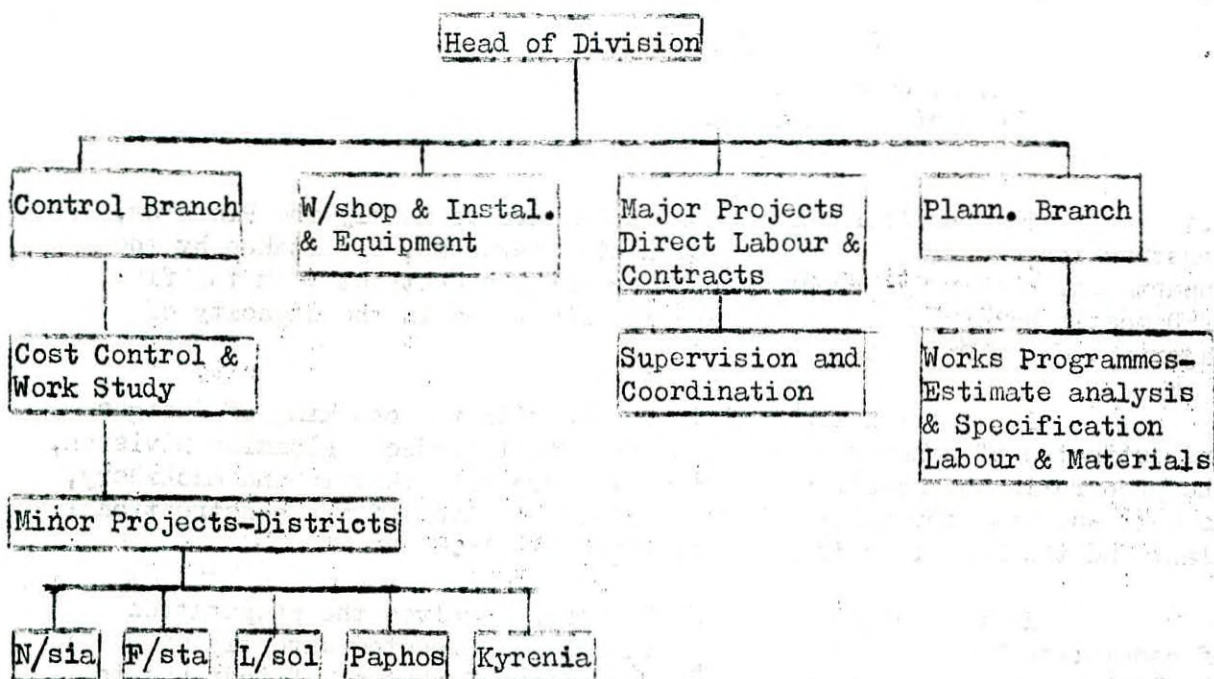
- 1 No. Executive Engineer class I - Head of the Division
 - 1 No. Mechanical Engineer
 - 3 Nos. Executive Engineers class II
 - 3 Nos. Senior Inspectors of Works
 - 8 Nos. Inspectors of Works
 - 2 Nos. Chief Foremen
 - 9 Nos. Assistant Chief Foremen
 - 4 Nos. Technical Assistants
 - 89 Nos. Monthly and Weekly paid Foremen
 - 379 Nos. Weekly paid regular Artisans
-
- 499 Nos. in total
- ====

5.2 Organizational Structure of the Division

An important event which took place during 1974 and which cannot pass unnoticable, was the re-organization of the Division of Construction by the Director, and the new Head of Section.

In view of the increasing demands of the numerous projects under construction and the wide functions of the Division, it was found necessary to establish within the Division a Project planning and control section for the more effective and economic execution of the Works, although, of course, these functions were carried in the past to some extent by the existing personnel of the Division.

The structural re-organization of the Division is as follows:



5.3 Planning Branch

Planning is of vital importance for the existence of any modern Construction Industry, as one has to plan and programme prior to any construction work. Planning prior to construction is very important for the most efficient utilization of resources, such as labour, plant and materials. During the Process of planning, all difficulties and any problems, likely to occur during construction will come to the surface and one will be aware of what one is likely to be faced with before hand. Short term planning during construction in view of factual data of course is equally important and one would say this is still continuation of the planning process.

In the case of the Construction Division of the Department this is even more true in view of the so many numerous and different type of Projects as well as emergency situations the Division is dealing with every year. Being conscious of these facts a great effort was put into, in establishing a planning section capable of dealing with such functions. The technical personnel of the Division attended courses in Planning & Programming by Critical Path analysis, given by the Productivity Centre. All the works in hand for 1974 were planned and programmed on these bases. Work Requirements in materials plant, and labour were planned in advance and Tenders were invited in due course.

5.4 Control Branch

Planning and Programming the works is one thing, trying to control what already has been planned and programmed is another. No planning can be efficient if one does not know the results if it, for either re-planning on the job in view of factual data or for future planning on similar projects. It is, therefore, also equally essential that some device of control is developed during the period of construction, on one hand to see that the works are carried out as planned and on the other to make sure that any necessary changes during construction are made in time for the most economical execution of the works.

With all these in mind an attempt was made to establish these two sections of Planning and Control in the Division of Construction. The Control section was meant to be an independent body exercising control over the works, and its staff was meant to be trained in control techniques such as work-study and cost process control, now widely used in Modern Construction Industry.

Unfortunately, due to shortage of qualified staff as well as offices, the establishment of these two sections could not be materialised in full, although some start was made during 1974. It is hoped that with the provision of additional offices and the allocation of another 1 or 2 Engineers to the Division of Construction the Planning and Control Section will be materialised in the near future.

5.5 Progress achieved in 1974

The Turkish Invasion of Cyprus in July and August 1974, and the occupation of an area of 40% of the Island by the Turkish Invasion Forces, interrupted the Programme of Construction for 1974 and caused severe hardships to the staff of the Division and the entire population of the Island in general. For the first time in the Division's history its functions had ceased to a great extent or be reorganized in the middle of the year. The Supervision of works under construction in the various Districts under Government Control was assigned to the staff of the Regional Offices of Limassol, Larnaca, and Paphos, under the control of the Head Office of the Division in Nicosia. This new arrangement was considered necessary after the Turkish Invasion of the Island as most of the inhabitants of the areas occupied by the Turkish Invading Forces fled for refuge to the Districts of Limassol, Larnaca and Paphos, which suffered less during those tragic days of the war. These Regional Offices were additionally staffed by refugee Officers of the Department from Famagusta, Kyrenia and Morphou, and other experienced officers from the Head Quarters. Spot Regular Supervision of these works was also difficult from the Main Office due to difficult and sometimes dangerous communication between the various Districts.

The original construction programme of the Division for 1974 included 173 schemes of a total estimated cost of £2,691,669. Due to the Turkish Invasion of the Island, and the occupation of an area of about 40%, a total of 45 schemes of an overall estimated cost of £742,056 were drastically affected. Some of these schemes were under construction at the time of the Turkish Invasion and were interrupted or abandoned completely and others could not be put in hand due to the fact that the area of the execution of these schemes was neighbouring Turkish areas. For all these 45 schemes that were situated in areas occupied by the Turkish Invading Forces an amount of £237,333 was spent between January and July 1974. Some of these schemes were of vital importance to the economy and welfare of the Island, i.e. the major water supply schemes for the Towns of Nicosia, Famagusta and Kyrenia and the major irrigation schemes for Massari Dam and the Morphou-Tylliria Project. All these 45 schemes that were affected as a result of the Turkish Invasion of Cyprus are shown elsewhere in this Report.

After the Turkish Invasion the Government being faced with the problem of unemployment, and in view also of the fact that most of the already approved funds, could not be used in the Districts under Turkish occupation approved 15 new Water Supply and Irrigation schemes of a total estimated cost of £155,036, for construction during 1974, in the three Districts left under Government control. Four of these schemes, of an estimated cost of £67,400 were Village Water Supply Schemes, and eleven of an estimated cost of £87,636 were Minor

Irrigation Schemes. These fifteen new schemes included in the 1974 construction programme of the Division were situated in the Nicosia and Limassol Districts and their objective was:-

- (a) to relieve the hardly affected economy of the Island,
- (b) to provide additional water to communities that gave accommodation to the 200,000 Greek Cypriot Refugees, and
- (c) to provide work to at least some of the 50,000 unemployed Greek Cypriots created as a result of the Turkish Invasion.

After the approval by the Council of Ministers of the 15 new Village Water Supply and Minor Irrigation Schemes, the total number of schemes for construction in 1974 was increased to 188, and the amount allocated for all these schemes has reached the amount of £2,846,705.

This amount included 87 Village Water Supply schemes of an estimated cost of £683,063, 16 Minor Irrigation schemes of an estimated cost of £485,037, 25 Major Irrigation Schemes of an estimated cost of £1,468,331 and 7 Town Water Supply Schemes of an estimated cost of £210,274.

In detail these 188 schemes that were included in the Development Budget of the Department for Construction in 1974, are shown below:-

Ser. No.	No. of Scheme	Nature of Scheme	Amount Allocated for 1974 £
1.	87	Village Water Supply Schemes	683,063
2.	69	Minor Irrigation Schemes	485,037
3.	25	Major Irrigation Schemes	1,468,331
4.	7	Town Water Supply Schemes	210,274
	188	Totals	2,846,705

It should be noted that the Division also deals with constructional works executed on behalf of Village Water Commissions, Water Boards, Municipalities, Irrigation Committees and even for private Developers from funds deposited by them direct. Therefore, over and above the usual 188 schemes that were included in the 1974 construction Programme of works, as approved in the Development Budget of the Department, the Division has to deal with a considerable number of such schemes all over the Island. The overall expenditure incurred on such schemes during 1974 reached the amount of £149,957. Taking into consideration the great number of these schemes, 331 in all, and the purpose for which they are executed, one can imagine the problems arising for their construction and the efforts made by the Technical Staff of the Division to respond to the demand for the construction of 519 individual schemes.

The overall expenditure incurred on the construction of all the schemes referred to above during 1974, reached the amount of £1,678,619. This amount was spent on carry over and new schemes included in the Development Budget of the Department, as well as on schemes executed on behalf of other Government Departments or Authorities, or from funds deposited by Water Boards, Municipalities, Village Water Commissions, Irrigation Committees or even Private Developers. Out of this amount £413,108 were spent on 87 village Water Supply schemes, £250,446 were spent on 69 Minor Irrigation schemes, £705,305 were spent on 25 Major Irrigation schemes, £158,563 were spent on 7 Town Water Supply schemes, £23,648 were spent on 12 schemes for Water Boards and Municipalities, £42,611 were spent on 73 works executed by the Division for other Departments, £37,881 were spent on 116 village Water Supply schemes from funds deposited by the Village Water Commissions, £6,145 were spent on 21 Minor Irrigation Schemes, and £40,912 were spent on 109 schemes for Private Developers. In detail the expenditure incurred on the Construction of all the schemes mentioned above is shown in the list below. More details on all the schemes are given in the pages that follow:

Ser. No.	Nature of Scheme	No. of Schemes	Amount Allocated for 1974 £	Expenditure incurred during 1974 £
1.	Village Water Supply Schemes	87	683,063	413,108
2.	Minor Irrigation Schemes	69	485,037	250,446
3.	Major Irrigation Schemes	25	1,468,331	705,305
4.	Town Water Supply Schemes	7	210,274	158,563
5.	Water Board & Municipalities	12	30,395	23,648
6.	Works for other Departments	73	75,742	42,611
7.	Village Water Supply Schemes from Deposits	116	64,310	37,881
8.	Minor Irrigation Schemes from Deposits	21	7,147	6,145
9.	Works for Private Developers from Deposits	109	59,196	40,912
	T o t a l s	519	3,083,495	1,678,619

5.6 Labour Force

As it is the usual practice the Division has made use of its 379 regular employees, and a number of casual artisans and employees that were recruited from the areas where the various schemes were executed. During 1974, in addition to the 379 regular employees of the Department, the Division of Construction engaged for the construction of all schemes a daily average of 507 casual labourers. In total during 1974 an average of 886 regular and casual employees were engaged daily by the Division, and the overall expenditure incurred during 1974 on wages reached the amount of £588,571.

It may be worth mentioning that the enormous difficulties encountered in previous years for the securing of casual employees for the construction of the schemes were over during 1974. The Turkish Invasion of the Island and the occupation by the Turkish Invasion Forces of an area of 40% stroke hard the rapidly progressing economy of Cyprus. Before the Turkish Invasion casual labourers had to be recruited by the staff of the Division from isolated areas and be transported to the sites of the works under construction. In 1974, the 200,000 Greek Cypriot Refugees have produced about 50,000 permanent unemployed persons, seeking employment, anywhere and at low wages. All casual employees, of course, are recruited through the local labour exchange offices.

5.7 Constructional Plant

For the execution of the works included in the construction programme of 1974, the Division made use of the Departmental and Government machinery primarily. In cases, however, where the Departmental machinery could not meet the demand, and especially in the field of Heavy Machinery, the Division had to hire such machinery from the private sector through open tenders. In total during 1974 machinery was hired for 21,550 working hours at an expenditure of £33,950. Also during 1974 machinery was hired for the excavation of 81,000 running meters of trenches for the laying of pipes at a cost of £16,180. Land Rovers and other vehicles had also been hired for 3,620 working days, at a cost of £8,780, from the private sector.

5.8 Materials

Most of the materials used for the construction of the schemes undertaken by the Division during 1974, were purchased from the Government Central Stores. Such materials are pipes, pipe fittings, steel, pumping units, water meters, timber, etc. Building materials, however, such as gravel, sand aggregate etc., were purchased through tenders. During 1974, 42,480 cubic meters of such materials at a cost of £39,450, were purchased through open tenders. After the Turkish Invasion in July 1974, however, most of the sources of natural aggregate came under Turkish occupation, with the result that it was very difficult to secure aggregates and in good quality from the few sources left. For this reason we had to mix different aggregates to attain the required grading.

The needs of the Division in cement were met from the Vassiliko Cement Factory and during 1974, 3356 tons of cement of a total cost of £29,500 were used for all works executed by the Division.

All types of pipes used for the construction of the schemes were purchased through the Government Central Stores. Such pipes are steel victaulic, steel galvanized iron, and asbestos cement. In all, during 1974, 257,959 meters of pipes of all types, valued at £354,455, were used for the projects undertaken for construction.

In addition to the above 1,789 water meters of $\frac{1}{2}$ inch in diameter, valued at £6,771, were purchased and installed by the Division for Village Water Supply Schemes.

Tables showing in detail the pipes and other materials used by the Division during 1974, for the construction of all types of schemes, are given on the next page.

A. List showing galvanized iron pipes class "B"

Ser. No.	Nominal diameter in inches	Length in running meters	Purchase price in pounds £
1	$\frac{1}{2}$	14,058	5,681
2	1	5,136	2,130
3	$1\frac{1}{4}$	10,308	5,126
4	$1\frac{1}{2}$	4,662	2,121
5	2	16,350	12,238
6	$2\frac{1}{2}$	13,008	14,060
7	3	5,568	4,556
8	4	19,596	39,255
Total		88,686	£85,167

B. List showing steel victaulic pipes class "B"

Ser. No.	Nominal diameter in inches	Length running meters	Purchase price in pounds £
1	6	19,533	17,279
2	8	2,933	9,755
3	10	8,566	17,790
4	12	940	3,163
5	14	2,780	11,558
Total		34,752	£59,545

C. List showing Asbestos Cement pressure pipes class "C"

Ser. No.	Nominal diameter in inches	Length running meters	Purchase price in pounds £
1	3	195	65
2	4	3,332	1,095
3	6	5,984	4,053
4	8	9,676	7,959
5	10	1,000	1,481
6	12	3,500	5,491
7	800 mm	8,475	83,750
Total		32,162	£105,894

D. List showing Asbestos Cement pressure pipes class "B"

Ser. No.	Nominal diameter in inches	Length running meters	Purchase price in pounds £
1	3	8,904	1,821
2	4	25,504	7,787
3	6	35,104	16,404
4	8	17,892	16,071
5	10	3,088	3,170
6	12	612	795
7	800 mm	7,880	38,229
8	900 mm	3,375	19,572
Total		102,359	103,849

List showing other materials and hired machinery used by the Division during 1974

Ser. No.	Description	Quantity	Purchase price in pounds £
1	Cement	3,356 tons	29,500
2	Water meters $\frac{1}{2}$ " ϕ	1,789 Nos	6,771
3	Heavy machinery	21,550 w/hours	39,950
4	Land Rovers, etc.	3,620 w/days	8,780
5	Excavation of trenches	81,000 r.meters	16,180
6	Sand	27,130 c.m.	19,630
7	Shingle	12,180 c.m.	16,570
8	Aggregate	3,170 c.m.	3,250
9	Clay	---	1,177
10	Gabions	---	4,800
11	Stones	---	400
	Total		£147,000

5.9 Village Water Supply Schemes

As already stated the original Development Budget of the Department included 83 Village Water Supply schemes of an estimated cost of £615,663. The Turkish Invasion of Cyprus and the occupation of an area of 40% of the Island by the Turkish Invasion Forces affected the construction of 20 such schemes of an estimated cost of £263,607. These schemes were either under construction, or were ready to be put in hand. On these 20 schemes the expenditure incurred until the day of the Turkish Invasion was £142,420. After the Turkish Invasion 4 new Village Water Supply schemes of an estimated cost of £37,400 were approved for construction in 1974.

Out of the total number of 87 Village Water Supply schemes that were programmed for construction in 1974, 43 schemes were completed during the year, 20 schemes were put in hand; or were ready to be put in hand and were interrupted due to the Turkish Invasion, 16 schemes were put in hand but could not be completed by the end of the year and were carried over for completion in 1975, and 8 schemes could not be put in hand for various difficulties and were carried over for execution in 1975.

The expenditure incurred on all 87 schemes reached the amount of £413,108. For easier reference these schemes have been classified as under:-

- (a) Village Water Supply schemes completed during 1974,
- (b) Village Water Supply schemes interrupted due to the Turkish Invasion of Cyprus,
- (c) Village Water Supply schemes put in hand during 1974, but not completed by the end of the year and carried over for completion in 1975, and
- (d) Village Water Supply schemes included in the 1974 Development Budget, but not put in hand for various difficulties, and carried over for execution in 1975.

Details of all these 87 schemes, as well as, the expenditure incurred in each scheme separately are shown on the lists that follow.

5.10 Village Water Supply Schemes Completed during 1974

As mentioned above out of the 87 schemes programmed for construction in 1974, 43 schemes were completed during the year. The amount allocated for these schemes for 1974 was £177,742, and the expenditure incurred was £143,768. Some of these schemes were put in hand before 1974

and their original estimate was much higher than the amount approved for 1974, as expenditure was incurred in 1973.

A list showing in detail these 43 schemes that were completed during 1974 is given below:-

A. Village Water Supply completed during 1974

Name of Scheme	Amount Approved for 1974 £	Expenditure incurred during 1974	Remarks
<u>Nicosia District</u>			
Potami) Vizakia(	7,270	3,160	New pumping scheme & H. to H.
Kambos) Tsakkistra(	3,664	3,050	Improvements
Kaliana	1,670	1,640	Impr. to spring & house-to-house
Klirou) Mitsero () Kalochorio)	23,352	23,125	Supplementary pumping scheme
Korakou	9,114	8,960	Improvements-House-to-House
Katydhata	1,718	1,710	Impr. to spring & House-to-House
<u>Limassol District</u>			
Kolossi	937	310	Storage tank and conveyor
Yerasa	832	340	House-to-House service
Kellaki	9,000	6,950	New B/H & House-to-House
Phini	5,980	5,910	St. tank & House-to-House
Kato Platres	600	590	Small pumping unit
Malia	800	750	Excavation of spring
Pakhna	3,400	3,400	Storage tank
Ayios Amvrosios	950	690	St. tank & House-to-House
Ephtagonia Phase I	4,028	4,020	New borehole & st. tank
Ephtagonia Phase II	3,200	1,500	Storage tank
Prastio (Kellaki)	4,200	2,720	Storage tank
Tserkez	1,700	1,440	Extension of distr. system
Apsiou	2,300	2,230	New B/H conveyor & st. tank
Phinikaria	850	550	Supplementary supply from spring
Potamos tis Yermasoyias	3,500	2,840	New borehole
Ayios Constantinos	83	40	Improvements
<u>Larnaca District</u>			
Aradhippou	7,222	4,890	New main conveyor
Lefkara Regional Scheme	4,152	1,930	Installation of a booster
C/F	100,522	82,745	

Name of Scheme	Amount approved for 1974 £	Expenditure incurred during 1974	Remarks
<u>Paphos District</u> B/F	100,522	82,745	
Kouklia	1,226	100	Installation of electrosubmersible pump
Panayia	3,580	2,150	New pumping scheme, distr. system & House-to-House
Timi	1,163	410	New pumping scheme & House-to-House
Amargeti	2,206	1,795	New pumping scheme, st. tank & G.I. conveyor pipeline
Armou	4,021	740	Improvement of spring, pumping scheme, st. tank & house-to-house
Tsadha	10,450	8,070	New pumping scheme, st. tank and G.I. conveyor
Skoulli	280	50	New st. tank & House-to-House
Lemona	520	40	New st. tank & House-to-House
Dhrymou	2,419	610	New st. tank & House-to-House
Kiti	2,665	2,530	New st. tank distr. system & House-to-House
Ayia Marina) Neo Dhimmata(	1,330	950	New st. tank for infiltration new G. I. conveyor pipeline & chlorinator
Kannaviou	2,650	2,100	New st. tank, distr. system & House-to-House
Kathikas	3,000	2,973	New pumping scheme
Akhelia	970	965	House-to-House service
Marathounda	7,460	5,530	New st. tank & House-to-House
Simou	7,250	7,820	New st. tank & House-to-House
Inia	11,080	11,050	New st. tank & House-to-House
Dhroushia	6,350	6,040	New st. tank & House-to-House
Polis Prodhromi	8,600	7,100	New pumping scheme st. tank & main conveyor
TOTAL	117,742	143,768	

5.11 Village Water Supply Schemes Interrupted due to the Turkish Invasion of Cyprus

Out of the 87 Village Water Supply schemes approved for execution in 1974, 20 schemes were interrupted as a result of the Turkish Invasion of the Island. Most of these schemes are now situated in occupied by the Turks areas, and three schemes are situated in free areas but in dangerous zones and cannot be continued. These 20 schemes include the major water supply schemes for Karavas and Lapithos in the Kyrenia District, and the Regional schemes for the Eastern Mesaoria Dry Villages, the Vatyli area and the Trikomo area in the Famagusta District.

Some of these schemes were completed or were nearing completion at the time of the invasion.

Out of the £263,607 which was the total amount approved for these schemes in 1974, the expenditure incurred during the year on 17 of these schemes reached the amount of £142,420. Four of these schemes are situated in the Nicosia District, eight in the Famagusta District, one in Larnaca District and seven in the Kyrenia District.

A list showing in detail these 20 schemes, as well as, the expenditure incurred on each one separately is given below:

B. Village Water Supply Schemes interrupted due to the Turkish Invasion of Cyprus

Ser. No.	Name of Scheme	Amount approved for 1974 £	Expenditure incurred during 1974	Remarks
	<u>Nicosia District</u>			
1	Piyenia	6,339	3,080	Work suspended while in progress
2	Pano Pyrgos	1,956	1,720	- do -
3	Pyroi	642	600	- do -
4	Nikitas	13,300	6,800	- do -
	<u>Famagusta District</u>			
5	Vatyli Regional Scheme	10,757	160	- do -
6	Trypimeni Regional Scheme	52,611	52,450	- do -
7	Kondea (Old & New)	16,729	2,850	- do -
8	Lyssi	776	10	- do -
9	Ayios Georghios - Lefkoniko	40	30	- do -
10	Trikomo Regional Scheme	13,000	-	Could not be put in hand due to Turkish invasion
11	Prastio-Gaidhouras	2,250	2,150	Suspended due to Turkish invasion
12	Eastern Mesaoria - Dry Villages	27,500	8,130	- do -
	<u>Larnaca District</u>			
13	Oroklini-Livadhia	10,700	-	Could not be put in hand Dangerous area
	<u>Kyrenia District</u>			
14	Karavas	59,510	26,940	Suspended due to Turkish invasion
15	Lapithos	28,014	23,190	- do -
16	Phterykha - Elia	8,374	6,910	- do -
17	Kalogrea	4,700	3,820	- do -
18	Kondemenos	729	280	- do -
19	Myrtou - Karpasia	4,700	3,220	- do -
20	Paleosophos	980	-	Could not be put in hand due to Turkish invasion
	TOTAL	263,607	142,420	

5.12

Village Water Supply Schemes Put in Hand during 1974, but not Completed during the Year and Carried over for Completion in 1975

Sixteen schemes out of the 87 Village Water Supply schemes approved for execution in 1974 were put in hand during the year, but could not be completed by the end of December and were carried over for completion in 1975. For these 16 schemes of an estimated cost of £201,552 the expenditure incurred during the year reached the amount of £126,920.

The reason for not completing these schemes was that they were put in hand late in the year due to delay in the completion of the administrative formalities or they were major schemes and the period for their construction was more than one year. It is expected that all these 16 schemes will be completed in 1975.

A list showing all these 16 schemes, as well as, the expenditure incurred on each one separately is given below:-

C. Village Water Supply schemes put in hand during 1974, but not completed during the year and carried over for completion in 1975

Ser. No.	Name of Scheme	Allocated for 1974	Incurred during 1974	Remarks
	<u>Nicosia District</u>			
1	Lymbia Regional Scheme	61,033	53,720	For installation of pumping units
	<u>Limassol District</u>			
2	Kyvidhes Reg. Schemes	17,400	12,990	Add. supply from spring and pumping unit
3	Trakhoni	8,220	8,000	Storage tank & House-to House
4	Pyrgos	11,500	2,440	Add. supply from B/H & conveyor pipeline
5	Ypsonas-Polemidhia	30,000	6,380	Add. supply from B/H & conveyor pipeline
6	Pissouri	2,900	--	Add. supply from spring
7	Kalokhorio	6,200	1,500	St. Tank & add. supply from spring
	<u>Larnaca District</u>			
8	Skarinou) Ay. Theodoros(Alaminos)	6,695	4,380	
9	Ormidhia	3,500	--	
10	Xylotymbou	5,100	3,340	
11	Ayii Vavatsinias	6,800	6,440	
12	Kiti	3,500	600	
	C/F	162,848	99,790	

Ser. No.	Name of Scheme	Allocated for 1974	Incurred during 1974	Remarks
	<u>Paphos District</u> B/F	162,848	99,790	
13	Stroumbi-Polemi	10,000	6,320	New pumping scheme, stor. tank etc.
14	Kallepia-Letymbou	7,350	8,250	New pumping scheme, st. tank etc.
15	Mamonia	2,254	2,430	New distr. system with House-to-House
16	Arminou	19,100	10,130	New pumping scheme & St. tank
	Total	£201,552	£126,920	

5.13 Village Water Supply Schemes Included in the 1974 Development Budget, but not Put in Hand for Various Reasons and Carried over for Construction in 1975

Eight schemes of an estimated cost of £401,162 included in the 1974 construction programme could not be put in hand during the year for various administrative difficulties, and were carried over for execution in 1975. Though the number of these schemes was rather small in comparison with the 87 schemes included in the 1974 programme of works, yet the Division made every possible effort that all the schemes approved for execution be put in hand so as to give employment to more people, especially after the July tragic events. It should be noted that the difficulties for which the schemes could not be started lie beyond the Division's control. A list showing these 8 schemes in detail is given below:

D. Village Water Supply schemes included in the 1974 Development Estimates, but not put in hand for various reasons and carried over for execution in 1975:

Ser. No.	Name of Schemes	Amount allocated for 1974 £	Expenditure incurred during 1974 £	Remarks
	<u>Nicosia District</u>			
1	Kambi-Pharmakas	1,720	-	Pending acquisition of spring
2	Linou	2,500	-	Delay in the issue of loan
3	Kambia) Analiondas () Episkopio) Ergates ()	23,000		Delay in the completion of Admin. formalities by D.O. & issue of loan funds scheme approved very late in the year
	C/F	27,220	-	

Ser. No.	Name of Scheme	Amount allocated for 1974 £	Expenditure incurred during 1974 £	Remarks
	<u>Limassol District</u> B/F	27,220	-	
4	Prodhromos	1,700	-	Scheme to be revised
5	Mallia	2,000	-	Scheme not ready
6	Ayios Pavlos	342	-	Scheme to be revised
	<u>Larnaca District</u>			
7	Vavla-Layia	4,000	-	Scheme rejected by Layia
	<u>Paphos District</u>			
8	Neon Khorion	4,900	-	Scheme to be revised will commence very early in 1975
	Total	£40,162	-	

5.14 Minor Irrigation Schemes

The original construction programme of works for 1974 included 58 schemes of an estimated cost of £397,401. After the Turkish Invasion of Cyprus, 11 new schemes of an estimated cost of £87,636 were approved for execution in 1974, thus increasing the number of schemes to 69, and the total amount to £485,037. 17 schemes of an estimated cost of £73,523 were interrupted due to the Turkish Invasion as they are situated in occupied by the Turks areas. On these 17 schemes the expenditure incurred, until the invasion, was £10,283. Out of the 69 schemes approved for construction in 1974, eighteen schemes of an estimated cost of £47,838 were completed, seventeen schemes of an estimated cost of £73,523 were interrupted due to the Turkish Invasion, eighteen schemes of an estimated cost of £247,906 were put in hand but could not be completed by the end of the year and were carried over for completion in 1975, and sixteen schemes of an estimated cost of £115,770 could not be put in hand during the year for various administrative difficulties and were also carried over for execution in 1975.

The expenditure incurred on all 69 schemes during 1974 reached the amount of £250,446. These 69 schemes have been classified as follows for easier reference:-

- (a) Minor irrigation schemes completed during 1974,
- (b) Minor irrigation schemes interrupted due to the Turkish Invasion,
- (c) Minor irrigation schemes put in hand during 1974, but not completed by the end of the year and carried over for completion in 1975, and
- (d) Minor irrigation schemes included in the 1974 Development Budget, but not put in hand for various difficulties and carried over for execution in 1975.

List showing in detail all these 69 schemes are given in the pages that follow.

5.15 Minor Irrigation Schemes Completed during 1974

Out of the 69 Minor Irrigation schemes that were included in the 1974 construction programme 18 schemes of an estimated cost of £47,838 were completed during the year. On these schemes the expenditure incurred reached the amount of £45,403. It should be noted that some of these schemes were put in hand in 1973, and therefore the amount allocated for each one in 1974 does not represent the actual original cost.

A list showing these 18 schemes, as well as, the expenditure incurred on each one separately, is given below:-

-- Minor Irrigation Schemes completed during 1974 --

Ser. No.	Name of Scheme	Amount allocated for 1974 £	Expenditure incurred during 1974 £	Remarks
	<u>Nicosia District</u>			
1	Pedhoulas	1,285	1,000	Pipe distr. system
2	Mosphili	1,018	940	- do -
3	Askas	320	230	- do -
4	Kambos	800	680	Storage tank
	<u>Limassol District</u>			
5	Kyperounda Earth Reser.	3,259	2,973	Earth reser. & Distrib.
6	Saittas Moniatis	4,879	3,260	Distribution System
7	Moniatis	3,360	2,700	- do -
8	Sylikou	3,460	3,400	- do -
9	Prodhromos Reservoir	8,400	8,130	Concrete Irr. Tank
10	Zoopiyi - Phase I	750	740	
11	Zoopiyi - Phase II	3,300	3,250	Distribution System
12	Paleomylos	580	380	Repairs
13	Erimi-Kolossi	11,500	10,360	Construction of intake
14	Kilani (Skotini)	86	20	Distribution System
	<u>Larnaca District</u>			
15	Maroni	3,512	3,190	Pumping scheme & Distribution system
16	Anglissidhes	2,400	1,880	Construction of reser. & Distribution System
	<u>Paphos</u>			
17	Ayia Marinoudha	139	140	Conveyor Pipeline
18	Episkopi	2,250	2,130	Pump-house & pipeline
	Total	£47,838	£45,403	

5.16 Minor Irrigation Schemes Interrupted due to the Turkish Invasion

Out of the 69 Minor Irrigation schemes approved for construction in 1974, 17 schemes of an estimated cost of £73,523 were interrupted as a result of the Turkish Invasion of Cyprus. These schemes were situated in areas occupied by the Turkish Forces and had to be interrupted. Some schemes were in hand at the time of the invasion and others were ready to be put in hand. The expenditure on all these schemes was £10,283.

A list showing in detail these 17 schemes is given below:

B. Minor Irrigation Schemes interrupted due to the Turkish Invasion of Cyprus

Ser. No.	Name of Scheme	Amount approved for 1974	Expenditure incurred during 1974	Remarks
	<u>Nicosia District</u>			
1	Exo Metochi	3,500	-	Could not be put in hand due to the Turkish Invas.
	<u>Famagusta District</u>			
2	Famagusta-Dherinia	3,912	-	- do -
3	Akanthou	8,421	2,150	Suspended due to Turkish Invasion
4	Makrasyka	1,447	540	- do -
5	Akhna	578	193	- do -
6	Vitsadha	6,223	4,550	- do -
7	Lysi	1,600	-	Could not be put in hand due to Turkish Invasion
8	Stylos-Limnia	200	170	Suspended due to T.Invas.
	<u>Kyrenia District</u>			
9	Vasilia-Recharge	2,600	-	Not started due to Turkish Invasion
10	Vasilia-Paleokastro	1,400	1,240	Work suspended due to Turkish Invasion
11	Kazaphani-Recharge	1,564	1,290	- do -
12	Lapithos-Kephalovrysos	12,500	-	Not started due to Turkish Invasion
13	Ayia Erini-Pumping	24,990	-	- do -
14	Karavas-Recharge	3,000	-	- do -
15	Ayios Yeorghios-Recharge	1,320	15	Suspended due to Turkish Invasion
16	Thermia-Recharge	135	135	- do -
17	Ayios Epiktitos-Recharge	133	-	- do -
	Total	£73,523	£10,283	

5.17

Minor Irrigation Schemes Put in Hand during 1974 but not Completed by the End of the Year and Carried over for Completion in 1975

Out of the 69 Minor Irrigation schemes included in the 1974 programme of construction 18 schemes of an estimated cost of £247,906 were put in hand during the year but could not be completed by December and were carried over for completion in 1975. The expenditure incurred on these schemes was £194,760.

A list showing in detail these 18 schemes is given below:

Minor Irrigation schemes put in hand during 1974 but not completed and carried over for completion in 1975

Ser. No.	Name of Scheme	Amount allocated for 1974 £	Expenditure incurred during 1974 £	Remarks
<u>Nicosia District</u>				
1	Pera-Politiko	5,500	5,100	R. C. canals
2	Ergates(Kourtoudhi)	13,500	4,110	- do -
3	Klirou (Laoura)	7,000	4,430	- do -
4	Idhalias River Rech.	10,000	6,550	Recharge dams with gabion
5	Spilia	4,870	3,450	Spring & Distr. system
<u>Limassol District</u>				
6	Pissouri	61,537	53,710	B/Hs and Distr. System
7	Mandria	13,650	8,860	Distribution system
8	Phini	7,200	5,730	Weir & Distrib. System
9	Pelendria	2,580	--	Distribution system
10	Tris Elies	15,000	9,000	-- do --
<u>Larnaca District</u>				
11	Kalavastos	13,250	19,340	Pumping scheme & Distr. System
12	Skarinou	6,370	5,570	- do -
13	Oroklini	6,500	6,330	- do -
<u>Paphos District</u>				
14	Peyia	17,500	15,380	Pumping scheme, st. tank & distribution
15	Goudhi-Kholi-Skoulli	28,583	30,710	Pumping scheme, st. tank & distr. st. tank & combined with W.S.
16	Mamonia	17,716	12,980	New pumping scheme, distr. system pumping scheme & distr. system st. tank
17	Peristerona	15,000	10,940	
Total		247,906	194,760	

5.18 Minor Irrigation Schemes Included in the 1974 Development Budget but not Put in Hand for Various Difficulties and Carried over for Execution in 1975

Sixteen out of the sixty-nine schemes approved for construction in 1974, could not be put in hand during the year for various reasons and finally were carried over for execution in 1975. Some of these schemes were approved late in the year and the loan funds were not made available by the end of the year, and other schemes were being revised at the request of the Irrigation Committees. The amount allocated for these 16 schemes for 1974 was £115,770. A list showing all the schemes is given below:

D. Minor Irrigation schemes, included in the 1974 Development Budget, but not put in hand for various reasons and carried over for execution in 1975

Ser. No.	Name of scheme	Amount allocated for 1974 £	Expenditure incurred during 1974 £	Remarks
<u>Nicosia District</u>				
1	Peristerona-Astromeritis	17,500	-	Daggered Provision
2	Galata-Esso	6,000	-	Pending issue of loan
3	Nisou (Frangos)	6,000	-	Funds Frozen
4	Dhali (Ftelia)	8,900	-	Pending issue of loan funds
5	Dhali (Katevas)	6,650	-	Pending issue of loan
6	Nikitari	4,900	-	- do -
7	Kalopanayiotis	6,870	-	Revision of scheme
8	Milikouri	750	-	Scheme rejected
9	Pera (Fassera)	8,400	-	Pending issue of loan
<u>Limassol District</u>				
10	Limnatis	850	-	Scheme to be revised
<u>Famagusta District</u>				
11	Phrenaros	200	-	Compensations
<u>Larnaca District</u>				
12	Kalavassos	3,750	-	Drilling of new borehole
13	Alaminos	7,000	-	Scheme rejected
14	Psematismenos	2,500	-	Drilling of new borehole
15	Athienou (Athanassi)	5,500	-	Scheme to be revised
<u>Paphos District</u>				
16	Peyia (Avgas)	30,000	-	New reservoir. No scheme available
Total		£115,770	-	

5.19

Major Irrigation Schemes

The 1974 Development Budget included 25 Major Irrigation Schemes of an estimated cost of £1,468,331. The actual expenditure on 20 of these schemes was £705,305. Out of these 20 schemes 14 involved dam works, 9 distribution systems, and 2 recharge works. The greatest expenditure incurred on a single project was on Yermasoyia distribution system where it reached the amount of £340,099. More details on the most important schemes as regards their construction and operation are given separately elsewhere in this report. A list showing all the Major Irrigation Schemes included in the 1974 Development Budget, as well as the expenditure incurred on each one separately is given below:

Major Irrigation Schemes - Expenditure incurred on Major Irrigation Schemes during 1974

Ser. No.	Name of Scheme	Amount approved for 1974 £	Expenditure incurred during 1974 £	Remarks
	A. DAMS (Government Funds only)			
1	Mavrokolymbos Dam	1,009	1,009	Maintenance
2	Yermasoyia Dam	5,000	1,630	Compensation & Minor Works
3	Massari Dam*	35,588	35,550	Turkish Invasion Minor works suspended
4	Lefkara Dam	42,785	39,100	
5	Khirokitia Treatment Plant	43,067	34,200	
6	Lefkara-Khirokitia Pipeline	15,840	14,160	
7	Morphou-Tylliria*	250,000	-	Suspended due to Turkish Invasion
8	Paphos Project	300,000	-	Not started yet
	B. DAMS (contributory)			
9	Agros (Pumping scheme)	4,976	4,940	
10	Agros (New Blunket)	4,032	4,030	
11	Kambi Dam Diversion	28,690	17,720	Steel pipes - Work in progress
12	Kambi Dam	10,810	5,930	
13	Arakapas Dam	85,169	78,420	Work in progress
14	Pedhoulas Dam	38,000	-	Suspended
	C. Distribution System (Government only)			
15	Argaka-Makounda	60,536	56,250	AC Pipes
16	Mavrokolymbos	16,000	8,931	AC Pipes - Work continues
17	Polemidhia	1,230	1,230	Maintenance
	C/F	942,732	303,100	

Ser. No.	Name of Scheme	Amount approved for 1974 £	Expenditure incurred during 1974 £	Remarks
18.	Ayia Marina	942,732 25,000	303,100 23,750	G.I. Pipes - Work continues
19	Yermasoyia	416,000	347,650	AC Pipes - Work continues
20	Lefkara	20,000	-	
21	Pomos	10,000	-	
22	Paphos Irrigation Project	17,425	17,425	B/H
23	Famagusta-Dherinia*	1,674	500	Suspended on due to Turkish Invasion
	<u>D. Distribution system (contributory)</u>			
24	Palekhorí	20,000	2,320	
25	Arakapas Distribution	15,500	10,560	Work Completed
	Total	1,468,331	705,305	

5.20 Town Water Supply Schemes

The Development Budget for 1974 included 7 schemes for the towns of Nicosia and Famagusta of an estimated cost of £210,274. For these schemes the expenditure incurred during 1974 reached the amount of £158,563. Three of these schemes were executed to supplement the Water Supply of Nicosia town, but unfortunately they have to be interrupted as a result of the Turkish Invasion of Cyprus. All seven schemes approved for execution in the 1974 are shown in detail below:

Town Water Supply schemes approved for execution in the 1974 Development Budget

Ser. No.	Name of scheme	Amount allocated in 1974 £	Expenditure incurred during 1974 £	Remarks
1	Famagusta Town	4,274	4,044	
2	Nicosia Town(extension of distr. main)	3,000	2,410	
3	Tseri schemes	3,340	5	
4	Dhikomo Emergency scheme	11,040	6,586	Interrupted due to Turkish Invasion
5	Pendadaktylos scheme	56,818	14,906	- do -
6	Pendayia scheme	14,802	13,894	- do -
7	Engomi Reservoir	117,000	116,718	Continues
	Total	210,274	158,563	

In addition to the above schemes the Division of Construction undertook 12 schemes during 1974 on behalf of the six towns of Cyprus.

For these 12 schemes an amount of £30,395 was deposited direct by the appropriate authorities, and out of this amount the expenditure incurred throughout the year reached the amount of £23,648. The scheme executed for Kyrenia town was interrupted as a result of the Turkish Invasion.

A list showing these 12 schemes as well as the expenditure incurred on each one separately is given below:

Water Boards & Municipalities
Works executed during 1974 from Deposits

Ser. No.	Name of Scheme	Amount allocated for 1974 £	Expenditure incurred during 1974 £	Remarks
	<u>Nicosia Town</u>			
1	Municipal (Slaughter House)	3,759	2,919	
2	Nicosia Water Commission	100	100	
3	Nicosia Water Board (Kokkinotrimithia)	2,003	2,003	
4	Nicosia W.B. (Tseri)	23	17	
5	Nicosia W.B. (G. Hard)	200	200	
6	Nicosia W.B. (Investigation)	820	330	
	<u>Limassol Town</u>			
7	Limassol W. B.	463	157	
	<u>Famagusta Town</u>			
8	Famagusta W. B.	546	546	
	<u>Larnaca Town</u>			
9	Larnaca W. B.	3,133	2,883	
	<u>Paphos Town</u>			
10	Paphos Municipality	505	500	
	<u>Kyrenia Town</u>			
11	Kyrenia Municipality (Extensions to new areas)	4,843	4,843	
12	Kyrenia Municipality New W. S. scheme	14,000	9,150	
	Total	30,395	23,648	

5.21 Water Works Executed for other Departments

Considerable work was executed during 1974 by the Division, on waterworks for other Government Departments, or from funds included in other Government Departments' estimates. In total work was carried out on 73 such schemes of a total estimated cost of £75,742. Some of these schemes were major ones and the expenditure incurred was quite high.

One such scheme was the water supply scheme for Pakhiamos (Kyrenia) which was put in hand late in 1973, executed for the Ministry of Commerce and Industry. This scheme of an estimated cost of £42,000 was stopped in July due to the Turkish Invasion. Considerable work was also executed for the Fire Services on the installation of Fire Hydrants, and on minor water supply schemes from funds allocated by the District Officers. In all £42,611 were spent on these 73 schemes.

5.22 Village Water Supply Schemes Executed during 1974 from Funds Deposited by the Villages

The overall expenditure incurred on such schemes during 1974 reached the amount of £37,881. This expenditure was made on 116 different schemes and mainly on repairs and maintenance of village Water Supply schemes. Yet considerable work was executed on a number of villages where the expenditure reached the amount of £2,000-£4,000. These schemes involved the extension of distribution systems, the replacement of pumping units, the installation of water meters, the construction of storage tanks, etc.

It is worth mentioning that the Division is always making great efforts in order to meet the demand for the execution of schemes for village water supplies involving maintenance and repairs that are not included in the Development Budget. This type of minor works is of vital importance for the villages, and the Division has to respond immediately to help the rural communities in urgent need of water.

5.23 Minor Irrigation Schemes Executed from Funds Deposited by the Villages

The demand for this type of works was not as high as in the field of water supply schemes and during the year the Division carried out works on 21 Minor Irrigation Schemes in comparison with 116 village water supply schemes.

The expenditure incurred on these 21 schemes during the year reaches the amount of £6,145.--

5.24 Water Works Executed from Deposits for Private Developers

As it is the usual practice the Division undertakes the construction for works in connection with Water Supply schemes for Private Developers. Such works mainly involve new water supply schemes and extensions of distribution systems for new divisions of land into building sites. The existing regulations for the division of private land into building sites include among other conditions the supply of suitable and adequate water supply to all the proposed sites. The water supply is usually secured from existing supplies of Towns or Villages and all expenditure incurred for such schemes plus Departmental charges are born entirely by the land developers. In order to maintain the high standard of works the appropriate Authorities which are usually the District Officers and the Water Boards issue new permits for land division under the condition that all water supply works are executed by the appropriate Authorities which are the Division of Construction and the Water Boards.

The Division during 1974 undertook the construction of 109 such schemes for private Developers involving an expenditure of £40,912.

5.2 New Engomi Reservoir

5.2.1 Introduction

For the efficient operation of the Water Supply system of Nicosia and for meeting present and future demands by the consumers it was found necessary to construct another water reservoir by the existing Engomi reservoir. This New Engomi Reservoir should be of a 20,000 m³ capacity.

The structural analysis as well as the design drawings for this reservoir were both prepared by the Design Division of the Water Development Department. It is a reinforced concrete reservoir with free standing catilevered walls with the roof designed as a flat slab. Several alternative designs were considered before deciding the type of Reservoir to be adopted.

The estimated cost for this project is £256,000.000.

The works for the construction of the New Engomi Reservoir started on the 15th of February, 1974. Both, the construction and supervision of the reservoir are being done by the Construction Division of the Water Development Department.

5.2.2 Progress Achieved in 1974

5.2.2.1 General

Plant

The plant on the site has been increasing gradually, according to the progress and need of the works.

The plant available on the site by the 31st December 1974, included:

(a) Air Compressor	P.W.D. No. 1
(b) Air Compressor	W.D.D. 495
(c) Air Compressor	W.D.D. 981
(d) Concrete Mixer	W.D.D. 634
(e) Concrete Mixer	W.D.D. 424
(f) Concrete Mixer	W.D.D. 223
(g) Dumper	W.D.D. 297
(h) Vibrators 2 No. 2" ϕ , 1 No. 3" ϕ	
(i) 4 Pneumatic drills	
(j) Soil Compactor	W.D.D. 685
(k) Soil Compactor	W.D.D.
(l) Land Rover	W.D.D. CE 527
(m) Electric Generator	No. 27497/1

Labour Force

The labour force working on the site during the period between March, 1974 and December, 1974 was also changing, the governing factor being the need of the work. Another factor which had affected the number of the labour force on the site was the upnormal situation created after the Turkish invasion last July.

The labour force working on the site by the 31st of December, 1974, had as follows:

(a) Site Engineer	1
(b) Inspector of Works	1
(c) Technical Assistant	1
(d) Chief Foreman	1
(e) Foremen	3
(f) Night Watchman	1
(g) Machine Drivers	2
(h) Time Keeper	1
(i) Time Keeper Assistant	1
(j) Carpenters	16
(k) Builders	10
(l) Steel Fixers	11
(m) Plumbers	4
(n) Labourers	80
(o) Laboratory Assistant	1
Total Force	<u>134</u>

5.2.3 Earthworks

Mass Excavation

The mass excavation started in mid February 1974 and it was completed by the end of March, 1974.

The total quantity excavated which consisted of mainly "havera" of medium hardness was 17,500 yds³.

The total amount spent on excavation was £2,842,000. i.e. It was completed at an average rate £0.162/yd³.

Limited Space Excavation

The limited space excavation which was structural foundations excavation included cutting and trimming of the key of the extended wall, the trimming of the Footings and the excavation for the drainage channels and the two outlets. All this work had been done using mostly pneumatic drills. The works on limited space excavation have not been completed yet. It is anticipated that they will be completed by the end of March, 1975.

The amount of limited space excavation completed by the 31st of December, 1974, was 2223 yds³. The cost so far was £8,132,431 i.e. the actual rate of the limited excavation is £3.661/yd³ which is a lot higher than the anticipated rate of £1.500/yd³. This is so because the space excavation is being completed mostly by pneumatic drills.

5.2.4 Filter Materials

Filter Materials are being used in two cases.

- (i) Filter Materials placed in drainage canals.
- (ii) Filter Materials placed under the floor slabs, started in the middle of 1974 and is still continued.

None of them has been completed yet.

In the first case, the filter material is being placed in two layers.

i.e. $\frac{3''}{8}$ to $\frac{3''}{4}$ }
and $\frac{3''}{4}$ to 2'')

As far as the filter material under the floor slabs is concerned, is being placed again in two layers 9" thick each. The reason for doing it in two layers is to achieve a better and more effective compaction so as to increase the strength and decrease the compressibility of the soil.

In both cases the filter material is being wetted and compacted thoroughly.

5.2.5 Concrete

Site concreting of wall footings started right after completion of the first stage of limited excavation and has been continuing through 1974. Up to the 31st December, 1974, we have completed most of the site concreting required for this job. With structural concrete we have worked and completed most of the sections of the external walls and the internal dividing wall. During December the first floor slabs were also concreted. It is anticipated that column concreting will start early in January, 1975 and it is also expected that by the end of February, 1975 the first roof slab (size 68'x96'x8 $\frac{1}{2}$ ') will be concreted.

5.2.5.1 Structural Concrete

This operation started in January 1975.

The mix design used for structural concrete is 1:1 $\frac{1}{2}$:3.

5.2.5.2 Site Concrete

The mix design used for site concrete is 1:3:6.

A good daily control is being kept on the materials used in concreting as well as during mixing time.

The chemical used during mixing, namely the plastocrete, has been found very effective in increasing both the workability and the strength of the concrete.

For curing purposes, instead of the usual methods, we are using a chemical, the antisol, which was also proved to be very effective.

The concrete cubes results (crushing) have been taken every day and the results are very satisfactory.

The actual quantity of structural concrete completed by the end of December, 1974, was 3037 yd³, while the estimated total quantity is 6900 yd³.

5.2.6 Formwork

The formwork used since the beginning of this project was all woodwork. For concreting footings we have been using six sets of formwork, specially prepared.

Other woodwork was also prepared and used for concreting the floor slabs.

For the concreting of the walls we have continued using four sets of formwork panels.

Finally, six sets of formwork have been prepared for concreting the columns.

The actual rate of purchasing and working the woodwork was found to be £2,770/yd².

The estimated rate of purchasing and working the woodwork was expected to be £1.490/yd².

Though it seems to be a considerable difference, it is expected that by the completion of the work the actual rate will be decreased. Still, it is not expected to be as low as £1.490/yd² which rate is rather underestimate.

5.2.7 Reinforcement

For the reinforcement, since the beginning of the work, we have been using three independent groups working on the cutting and bending of the reinforcement.

By the end of December, 1974 just over three fifths of the cutting and bending of the reinforcement have been completed. It is anticipated that up to December 1974 a total weight of 400 tons has been cut, bent and fixed in position.

5.2.8 Internal Pipework System

Regarding the internal pipework system, about half of the necessary work has been completed since early in October. The rest of the work required for completing the internal pipework system is expected to be completed sometime in February, 1975.

5.2.9 Laboratory Work

The quantity and quality control of our materials used for concrete, i.e. their suitability as far as crushing strength and grading is concerned continued throughout the period of work through 1974. We had some difficulty with the quality of the sand, but with good and daily control it has been overcome.

The concrete cubes results (crushing) have been taken every day and the results reached are very satisfactory.

Crushing strength (7 days) = 4,000 lb/m²

Crushing strength (28 days) = 4,900 lb/m²

As far as the quality of the filter material is concerned it has also been found very satisfactory.

There have also been some water replacement tests and some permeability tests which gave very satisfactory results.

5.2.10 Remarks

The work of the New Engomi Reservoir progressed very satisfactorily during the year 1974.

Technically no unexpected difficulty has created any problems.

During construction, some minor changes in the original designs were found necessary. The completion drawings are being prepared on the site.

The only real problem which affected the works during 1974, was the one due to the Turkish Invasion and the resulted unnormal situation. To start with, the works stopped completely for nearly two months, between mid July and September 1974. Due to that, the work was falling behind schedule as it was planned and programmed to be completed by March 1976. Soon though, due to the increased unemployment, in an effort to assist as many refugees as possible the labour force on 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 is now scheduled to be completed by October 1975. This time limit does not include fencing and asphaltting works.

As far as the expenditures are concerned, the working costs appear quite satisfactory.

The total amount spent by the end of December 1974 was £116,587.000 while the amount approved for completing this project is £256,000.000.

It is anticipated that the work will be completed without any financial problems.

5.3 Arakapas Dam

5.3.1 General

The main purpose of the dam is irrigation. It is built on the Yermasoyia river at an elevation of about 400 m. above sea level and at a distance of about 40 km N. E. from Limassol.

The dam is a mass concrete gravity type dam. It has a maximum height of 20.0 m from the river bed level to the crest of the dam and 18.0 m. to spillway crest level. The length of the crest is about 96.5 m.

The capacity of the dam is about 130,000 cu.m. The dam consists of 9 vertical blocks extending over the entire height of the dam.

A continuous grout curtain extending over the entire length of the dam, was provided in the dam foundations, injections, being done through a concrete cap.

The 4th, 5th, 6th and partly the 7th blocks from the left abutment will be serving as a spillway, 45 m. wide, discharging overflow water.

A ϕ 300 mm steel pipe situated in a recess along the sluiceway desilting outlet with cross section 1.80x1.80 - will extent through the entire length of the dam.

The construction of the dam started on 10th September, 1973 by the Construction Division of the Water Development Department.

5.3.2 Progress of Works Achieved in 1974

5.3.2.1 Excavation

The excavation of dam foundations, started at the end of September 1973 and have been completed by May 1974.

At the left abutment (looking downstream) sound rock has been met at an average depth of approximately 7 m. At this level the mass excavation was stopped and it proceeded to form the foundation steps. Some explosives were used to remove sharp rock promotaries. In general were used shallow charges, not exceeding 1.0 m. in depth in order to avoid shuttering of the surrounding rock at lower elevation.

At the right abutment the sound rock has been met at an average depth of approximately 5 m. At this level foundations steps were formed using compressors.

At the river bed the sound rock has been met at an average depth of approximately 8 m. At a depth of approximately 4 m. below original ground level the rock was met but it was weathered and fractured with certain shear zones. The total volume of excavation is about 9600 cu. m.

5.3.3 Drilling and Grouting

Drilling and grouting works commenced on the 8th January 1974 and were entirely finished by the 4th July 1974. According to the drawings two grout curtains had to be constructed beneath the upstream part of the dam foundations. The main grout curtain of about 15 m. deep and the second of about 12 m. deep. Grout mix was usually composed of water and ordinary Portland cement with the addition of 3% of betonite. During the formation of the main grout curtain it was observed that initial permeability at some sections was rather low, and the results obtained after grouting indicated that the permeability was reduced to the minimum required critirion. Therefore, a considerable quantity of drilling and grouting for the second grout curtain was omitted, at these particular sections.

After the completion of the grouting works number of control holes were drilling along the grouted zone in order to determine the effectiveness of grouting. Permeability water tests were performed and the results obtained were satisfactory.

The original estimated cost of drilling and grouting was finally reduced by nearly 60% due to the elimination of the work for the second line of grouting and the low rates achieved.

5.3.4 Concreting

Concreting was started on the 18th December 1973 forming the grout cap for grouting. The concrete which was used is mainly 1:2,5:5 and the total volume done upto the end of the year is about 8200 cu.m. At the end of the year about 85% of the work is done although the overall expenditure is only 65% of the estimated cost.

The sluiceway channel was formed and the installation of the ϕ 300 mm steel pipes including the perforated pipe was completed.

The manual operated gate is at the site and the installation is programming to be done at the end of January 1975. The 90% of drainage installation is completed.

It is expected that the work will be completed at the end of March 1975.

5.3.5 Expenditure

The total expenditure incurred upto the end of the end of the year is about £100,000.

Summary of Expenditure

Commencement date: 10.9.73

31.12.1974

Item No.	Description	Estimated Cost £	Revised Estimated Sept. 1974 £	Actual Cost £
1	General	4,500	6,000	5,448
2	Drilling and Grouting	6,133	6,133	3,823
3	Earthworks	4,582	8,668	8,390
4	Concrete	53,336	89,380	58,151
5	Pipes, Valves and Fittings	2,517	3,021	1,507
6	Metal Works	4,300	5,500	3,444
7	Supervision	5,132	8,000	8,341
8	Land Acquisition	700	1,000	-
	SUB TOTAL	81,200	127,702	89,104
9	Distribution System	12,500	15,500	10,560
	CONTINGENCIES	12,300	6,798	-
	GRAND TOTAL	106,000	150,000	99,664

Schedule of Plant and Labour Involved on Site During 1974

Plant

Excavators	1
Lorries	3 (until end of March 1974)
Compressors	3
Concrete mixers	3
Dumper	1
Vibrators	3
Water pumps	2
Electric Generator	1
Cranes	2
Flush pumps	2
Wagon drill	2
Over burden	1
Core drill	1
Grout pumps	2

LABOUR FORCE

Foremen	2
Surveyor	1
Lab. Technicians	2
Time Keeper	1
Skilled labourers	15
Unskilled labourers	26

5.4 Lefkara Dam

5.4.1 General

The design of Lefkara Dam was carried out by Messrs Pietrangeli ed Humphreys, an associated firm of Howard Humphreys and Sons, Consulting Engineers, in 1970.

International tenders for the construction of the dam were invited on the 18th December 1970, the closing date of submission of tenders being the 27th February 1971. Ten tenders were received from eight different countries. The contract was finally awarded to "Joint Venture Leonard Fairclough (U.K.) Ltd. and Medcon Construction Ltd. (Cyprus). The letter of acceptance of the tender was dated 29th April, 1971. The contract was signed on 29th May 1971, and the Engineer's order to commence was issued on the same day. The Contract price is £1,125,148.990 mils and the duration of the contract is 910 days from the Engineer's order to commence.

The dam is of the rockfill type with a central clay core. It is 74 meters high, crest elevation being at 361.0 meters above sea level with a total fill volume of about 820,000 cu.m. and storage capacity of 13.85 million cu.m. The mean annual inflow was estimated at 8.2×10^6 cu.m. from a catchment area of 36.3 km^2 . It is estimated that about 5.3×10^6 cu.m. of water will be made available annually from the dam for the water supply of Famagusta.

5.4.2 Expenditure

The total expenditure incurred from the commencement of the works up to the end of December 1974 was £1,194,738.- of which 1,089,461.- was for work done by the Contractor upto December 1974 and the balance of £105,277.- represents direct expenditure by the Department. The expenditure incurred during the year 1974 is as follows:-

(i) Payments to contractors	£26,188
(ii) Direct Expenditure by W.D.D.	£12,920
Total for Dam	<u>£39,108</u>

5.4.3 Progress Achieved in 1974

As reported in the 1973 annual report the certificate of substantial completion was issued in November 1973 and this date marks the commencement of the 12 month Period of Maintenance. This Period expired on 23rd November 1974 by which time some minor items were still outstanding. The final inspection of the dam will be carried out early in 1975.

The main outstanding items are the completion of installation and commissioning of hydraulic instrumentation and the control system for the hydraulically operated sluice valves.

5.4.4 Impounding and Drawoff

The reservoir was almost empty at the beginning of the year. It reached a maximum level of 319.42 m. in June 1974 corresponding to a total volume of 955,000 cu.m. This represents only about 7% of the total storage capacity of the dam and 12% of the average annual inflow.

As from mid-June 1974 water from the dam was made available for washing the Lefkara-Khirokitia pipeline and commissioning the Treatment Plant at Khirokitia.

On July 10th 1974 the treated water was connected to the Famagusta Water Supply System and delivery continued until 13th October 1974 by which time the reservoir level had dropped to 306.68 m. This level represents a dead storage of 134,000 cu.m.

The lowest raw water intake is installed at level 310.74 but it was possible to continue drawing off below that level using the irrigation intake at level 306.77 after a cross-connection to the break pressure tank was made from the irrigation main.

From 14th October to 31st December the reservoir level rose very gradually to 307.26. On December 31st the first visible flow in the river was observed.

5.4.5 Instrumentation

All instrumentation installed to observe the structural behaviour of the Dam is being read regularly.

The readings obtained up to the present time show normal behaviour in all respects.

5.4.6 Seepages

Seepage measurements are taken daily at various points. They have up to now been very small indeed. The maximum volume obtained at the measuring weir which collects seepages through the dam and its foundation was 25 litres/min.

5.5 Yermasoyia Main Conveyor

5.5.1 The Main Conveyor of Yermasoyia Dam is to carry water from the Dam at a rate of $0.85 \text{ m}^3/\text{s}$ to meet water demands for 11,540 donums of land west of Limassol town.

During the past five years of low rainfall and heavy pumping from the Akrotiri-Zakaki aquifer have rendered the latter very poor and furthermore, there was noticeable sea water intrusion at Zakaki area to the east and at Akrotiri area to the west of the peninsula thus endangering future water storage and hence future yields from the said aquifer.

Water from Yermasoyia Dam will be conveyed to supplement water deficiencies in the peninsula and retain the aquifer in balance and to irrigate additional fertile land that remains unused because of the absence of a reliable water source.

The scheme consists of the construction of a Break Pressure Tank made of concrete (capacity 275 m^3) built near by the dam and 12,896 m of piping.

The first 2,268 m consist of 900 mm dia. class 12 Kgf/cm² followed by 4,292 m of 800 mm dia. class 12 Kgf/cm² and the last 6,336 m consist of 800 dia. class 19 Kgf/cm². All pipes are made of Asbestos Cement and are supplied by Dalmadija Cement Company of Yugoslavia.

Construction works commenced on the 27th May 1974 and are programmed for completion by the end of April.

By the end of 1974 completed works included the Break Pressure Tank and 7,563 m of piping (59%) laid along the bed of Amathos river and along Makarios III Avenue including all special joints and valves, bends and Tees from which 6,380 m length (50%) was pressure tested and backfilled where as trench excavation preceded by 8,512 m (66%). Expenditure incurred at the end of the year was £262,790, the estimated cost being £416,000.

The personnel employed to carry out the works consist of:-

1 No. Executive Engineer (The District Engineer)

1 No. Chief Foreman

1 No. Assistant Chief Foreman

2 No. Technical Assistants and the labour force by the end of the year consisted of 40 No. skilled labourers and 66 No. unskilled labourers.

5.6 Akrounda - Phinikaria Distribution System

5.6.1 A total area of 920 donums at Akrounda and Phinikaria under land consolidation scheme is to be irrigated from Yermasoyia Dam.

The system consists of:

(a) Booster pump housing now under construction installation of 3 No. 400 KVA booster pumps.

(b) Construction of 2 No. 120 m³ capacity reinforced concrete circular reservoirs which are completed.

(c) Laying of 14,480 m. of steel piping Akrounda pipeline consists of 7,850 m. of piping the largest being 14" in diameter, victaulic, for the first 4,300 m. the rest consisting of victaulic steel piping ranging in diameter from 12" down to 6" dia.

All the above piping is laid, and in addition to that 2,150 m. of 4" Galvanized Iron piping was laid temporarily to substitute concrete and earthen irrigation channels which convey water from Akrounda Dam (23,000 m³ capacity) and which have been cut off in many places because of land consolidation road construction works.

Phinikaria pipeline consists of 3,810 m. of piping the largest being 10" in diameter victaulic for the first 3,000 m., the rest consisting of 8" dia. and 6" dia. victaulic pipes.

All the above piping is laid now remaining the laying of outlet to individual plots which will be laid in accordance with land improvement scheme now under way.

Also 670 m. of 14" dia. steel piping was laid from the pump house to the concrete storage tanks.

Works started in March 1973 and carried through 1974 and are scheduled for completion by the end of May 1975.

Expenditure in 1974 was £87,700 bringing the total to £141,428. Total estimated cost is £166,000.

5.7 Remarks

On the whole, the year 1974 has been one of the most active years for the Division of Construction, both in size and cost of Work execution, as well as, in planning and administration. The activities of the Division were reaching their zenith at the second half of the year as most of the administrative and other problems obstructing the Commencement of most schemes were solved, where a serious set-back occurred due to the Turkish Invasion of Cyprus and the occupation of nearly 40% of the Island.

As a result of the Political situation a number of schemes were stopped immediately in occupied districts while others were at a standstill for over two months as most of the Personnel was either trapped or dispersed somewhere in the Island.

After resuming the works, great efforts were made for the acceleration of the works under construction as well as starting new ones where possible. Re-planning of all the works was absolutely necessary in view of the created situation, and the surplus personnel which had to be employed in one way or another. The repercussions on the cost of the various projects due to the political situation was soon evident, and ways and means were to be found to keep the cost within the approved limits. New schemes had also to be approved in order to absorb all that personnel who abandoned their work, in the Turkish occupied areas. The effects of human suffering all around and other humanitarian problems which affected greatly the efficiency and output of the workers had a direct repercussion on the cost of the various schemes of limited funds.

Mobilization of personnel and equipment from one place to another was now difficult due to the created situation, and direct supervision of the works from the main office created a lot of problems. As a result a decision was taken at higher authority, to decentralize the works, by allocating these to the Regional offices, but still under the overall control of the Head Office.

Although this procedure solved in a way the Problem of mobilization, created other problems as to the ways and means of control to be exercised by the Head Office, in view also of the fact that some of the District Engineers were new in the profession of construction.

The Division had to plain and create methods for close co-operation between the Regional Offices and the Main Office and thus exercise effective control on all works under construction. Special forms were prepared and progress fortnight reports were requested from the Regional Offices indicating expenditure of work upto date, percentage of work done and amount spent as compared to estimated cost etc. The response was not absolute but is improving gradually. The number of Inspectors who were in charge of the various Districts are acting now as co-ordinating officers between the Regional Offices and the Head Office. In spite of all difficulties, however, in planning and control of the works, in addition to the created emergency situation the fact that the Division was dealing in projects in the region of three million pounds is a proof of the magnitude of the work involved and the efforts made by the Division of Construction for the materialization of these projects in 1974.

5.8 Workshop

5.8.1 The workshop of the Department is part of the Division of Construction but provides services to the other Divisions of the Department. It is equipped with all localities required for construction work as earth moving equipment, motor transport, carpentering, plumbing and fittings, the slotting and perforation of drilling casing, electrowelding of drilling bits and grouting.

Installation and maintenance of pumping stations and pumping units and also maintenance of the electromechanical equipment on dams is carried out by the workshop.

The despatching of materials and stores to all sites of work all over the Island is also done by the workshop.

The labour force of the workshop during 1974 consisted of an average of 53 regular and 20 casual artisans specialised in all activities of this branch of the construction division. Regular labourers were employed by the despatching section of the workshop.

The maintenance of the heavy earth moving equipment and other minor machinery including the land rovers and drilling rig was carried out at the cost of £68,000.000 and includes replacement of fittings and other accessories. (The above sum includes the cost of petrol and oil for vehicles.)

The total operational hours of the equipment and the mileage covered by the land rovers are shown below:

Heavy earth moving equipment	17,500 hours
Motor vehicles	820,000 miles

The Activity of the Workshop was extended to:

37 new pumping installations for domestic supplies	£23,675.000
9 new pumping installations for irrigation	£ 5,690.000
52 repairs to pumping installation for domestic supplies	£ 3,565.000
9 repairs to pumping installation for irrigation	£ 630.000
Various casting and fittings	£30,850.000
Various carpentry works	£ 2,000.000
Various masonry works	£ 465.000
despatching of material and stores	£ 4,780.000
	<hr/>
	£71,655.000

Mechanical Equipment

	<u>No.</u>
Ruston Bucyrus drilling rig 22w	1
Catterpillar D8	3
Catterpillar Excavator 955	2
Allis Cholmers Traxcavator	1
Ruston Bucyrus Excavator RB19	1
Excavator "Smith"	21

Mobile Plant

Mobile core drill on FH 45	1
Mini core drill	1
Small core drill	2
Core drill	6
Overburden	3

	<u>No.</u>
Wagon drill	2
Grouting pumps	2
Concrete pumps	1
Air compressors	15
Diesel alternators	10
Electrosubmersible pumps	12
Turbine pumps	5
Centrifugal pumps	10
Portable pumps	8
Sheep foot rollers	18
Vibrating soil compactor	2
Concrete vibrators	20
Concrete mixers	61
Mobile cranes	2
Hoists	3
Thorny croft tractive unit low loader	1
Dumpers	4
5 ton diesel lorry (Austin)	1
Bedford RL Lorry	7
Land rovers	26
Toyota Land cruiser	6
Toyota station wagon	8
Pumps for testing pipes	18
Rubber tyred compaction rollers "ALBARET"	2
Umpowers	2
Utility Hoist Crane on AC623	1
Air pumps	2
Flush pumps	15
Cutting machine for pipes	14
Air concrete vibrators	18
Small drilling rig	1

5.9 Brakish Water Desalination

5.9.1 During the first months of the year the study for the experimental treatment of brakish waters concentrated on the areas of Zygi, Alethrico and Aradhippou and a choice was made on the actual boreholes to be treated. For the above project a mobile Reverse osmosis plant would be present by the British Government under the directions of a scientific group from U.K.A.E.A. The plant would be made up of four individual units each of 7.500 i.g.p.d. capacity. Two of the units would be based on the R3 process, one on the hollow fibre process and the fourth on the spiral wrap process.

Early in July the three members of the U.K.A.E.A. arrived in Cyprus and delivery of the three units was done, the fourth unit was delivered at Famagusta a few days before the Turkish invasion and was left there since then.

In spite the war and the departure of the U.K.A.E.A. team and three units have been mounted on the trailer and made ready for final assembly.

VI. DIVISION OF OPERATION AND
MAINTENANCE

By

K. C. Hassabis
Assistant Director

6.1.1 This Division includes the branches dealing with:

- (i) The operation and maintenance of Major Irrigation Projects
- (ii) The operation and maintenance of Domestic (Town) Water Supplies.

6.1.2 Management and Operation of Major Irrigation Projects

The year under review was a dry year and the quantity of water collected in most of the major dams was below normal, since rainfall and runoff continued to be low.

Thus the water available at the dams was limited in quantity, and only part of the areas commanded by the dams was irrigated.

The amount of water available for irrigation in the Major Dams was $6.367 \times 10^6 \text{ m}^3$ (including Yermasoyia Dam where Distribution System is under construction) as compared to $1.858 \times 10^6 \text{ m}^3$ for 1973.

The amount of water sold for irrigation was $2.544 \times 10^6 \text{ m}^3$ i.e. 40% of the water available. The corresponding water utilized in 1973 was 971243 m^3 , i.e. there was an increase in utilization amounting to 161%.

Gross income from the sale of water was £26,138 compared to £11,137 for 1973, while the net income was £10,487 compared with £409 for 1973.

The following table gives comparative figures for income and expenditure for the last 7 years.

Data on Water Usage for 1968 - 1973

Year	1968	1969	1970	1971	1972	1973	1974
Water Storage in 1000 m^3	N.A.	N.A.	6160	5352	3777	1858	6367
Water Sold in 1000 m^3	1185	1038	1961	2467	2757	971	2544
Gross Income £	15363	21241	22594	26891	29391	11137	26138
Operation £	3507	5911	5849	7688	7282	6450	11048
Maintenance £	858	7582	5328	3342	4849	4278	4603
Total Expenses £	4365	13493	11177	11030	12131	10728	15651
Net Income £	10998	7748	11417	15861	17260	409	10487

Note: N.A. = Not Available

6.1.3 Details of Operation of Major Irrigation Projects

6.1.3.1 Argaka - Magounda

Irrigation started on 2nd January 1974 and ended on 19th December 1974. Maximum water stored in the dam was 874,000 m³ while the minimum one was 303,000 m³. A quantity of 524,955 m³ of water was used as follows:

(a) 440,876 m³ for irrigation of the following plantations:

<u>1st Period</u>		<u>2nd Period</u>		
Tomatoes	85 dons	Tomatoes	12 dons	
Cucumbers	30 "	Cucumbers	85 "	
Melons & Water Melons	150 "	Beans	136 "	
Cow peas	35 "	Cow peas	70 "	
Citrus	58 "	Citrus	58 "	
Pears	8 "	Pears	8 "	
Bananas	40 "	Bananas	55 "	
Almonds	30 "	Almonds	30 "	
Cereals	260 "	Avocado	2 "	
Avocado	2 "			
	Total	678 dons	Total	456 dons

(b) 79294 m³ for irrigation of cereals.

(c) 4785 m³ for testing of Distribution System under construction.

6.1.3.2 Avia Marina

Irrigation started on 27th March 1974 and ended on 29th November 1974. Maximum water stored in the dam was 117m164 m³ while the minimum quantity was 47,614 m³. Water sold for irrigation was 189,063 m³ which was used as follows:

<u>1st Period</u>		<u>2nd Period</u>		
Tomatoes	35 dons	Cucumbers	$\frac{1}{2}$ dons	
Cucumbers	6 "	Cow peas	1 "	
Melons & Water Melons	110 "	Citrus	65 "	
Cow peas	60 "	Pears	6 "	
Citrus	65 "	Vines	3 "	
Pears	6 "	Bananas	9 "	
Vines	3 "			
Bananas	9 "			
	Total	294	Total	84 $\frac{1}{2}$

6.1.3.3 Kalopanayiotis

Irrigation started on 2nd April 1974 and ended on 18th November 1974. The dam overflowed in April and the minimum quantity of water stored was 22,000 m³ in October. A quantity of 116,305 m³ was used for the irrigation of 327 donums of deciduous, namely pears, apples, peaches and plums.

6.1.3.4 Kiti

Maximum water stored was 120,000 m³. A quantity of 87,010 m³ of water was used for the irrigation of permanent plantations.

6.1.3.5 Mavrokolymbos

Maximum water stored in Mavrokolymbos dam was 395,000 m³ on 31st December 1974. A quantity of 404,800 m³ of water was used for the irrigation of vegetables and citrus as follows:

- (a) A quantity of 130,100 m³ was utilized by Potima Chiflik free of charge.
- (b) A quantity of 138,941 m³ was used by Kissonerga village.
- (c) A quantity of 135,759 m³ was used by Khlorakas village.

During 1974 the following plantations were irrigated from Mavrokolymbos dam:

Melons - Vegetables	273 dons.
Potatoes - Onions	160 "
Cereals	400 "
Bananas	100 "
Table Grapes	60 "
Total	993 dons.

6.1.3.6 Polemichia

Irrigation started on 2nd January 1974 and ended on 26th July 1974 due to lack of water in the dam. Maximum water stored was 390,000 m³. A quantity of 461,000 m³ of water was sold for irrigation of citrus, vegetables, deciduous and table grapes while 49,500 m³ of water were used as water rights.

The distribution system covers an area of 2,550 donums, planted as follows:

- (a) 894 dons. of citrus
- (b) 957 dons. of vines
- (c) 11 dons. of deciduous
- (d) 688 dons. of seasonal plantations

6.1.3.7 Pomos

Irrigation started on 22nd February 1974 and ended on 29th November 1974. The dam overflowed on 21st March 1974, while the minimum water stored was 16,773 m³ on 2nd December 1974. The quantity of water sold for irrigation was 786,604 m³ and an additional quantity of 21,347 m³ of water was used from borehole B. A total amount of 807,952 m³ of water was used for irrigation as follows:

<u>1st Period</u>		<u>2nd Period</u>	
Tomatoes	166 dons	Tomatoes	8 dons
Cucumbers	5 "	Cucumbers	3 "
Melons & Water Melons	156 "	Citrus	47 "
Cow peas	138 "	Cow peas	5 "
Citrus	47 "	Pears	3 "
Pears	3 "	Bananas	180½ "
Almonds	100 "	Alfa-Alfa	5 "
Cereals	120 "	Peaches	9 "
Alfa-Alfa	5 "		
Peaches	9 "		
	Total		Total
	749 "		260½ "

6.1.3.8 Yermasoyia

Maximum water stored in Yermasoyia was 2,640,000 m³ on 17th April 1974 while the minimum one was 1,140,000 m³ on 20th December 1974. A quantity of 182,000 m³ was given to Yermasoyia village as water rights, while 49,500 m³ was sold for the irrigation of citrus and vegetables in Yermasoyia area.

6.2 Maintenance of Major Irrigation Projects

6.2.1 General

During the year routine maintenance work was carried out on the Dam projects, except for the case of Mavrokolymbos, where major earthworks operations, involving 3800 cubic meters of soil, were carried out in the left hand slopes of the reservoir area where some slides have occurred in order to stabilize the slopes. Further stabilization works in the same area have to be carried out in 1975, when the water level in the reservoir, allows such works to be resumed.

6.2.2 Summary Expenditure on Maintenance Works

The total amount spent for maintenance on the dam projects was £5571, as follows:-

<u>Government Projects</u>	
Dams	£3075
Irrigation Networks	£1608
	£4683
<u>Contributory Projects</u>	
Government Contribution	£ 721
Village Contribution	£ 107
	£ 828
Total	£5511
<u>i.e. Total Government Expenditure</u>	£5404

6.2.3 Details of Maintenance Works - Government Dams

6.2.3.1 Argaka

Cleaning of Embankment from vegetation. Removal from spillway of 4000 c.m. of soil and rocks. Repairing of foot bridge and treatment with solignum the timber - Painting of valve house windows. Painting of manhole covers.

Expenditure:	Dam	- £348
	Distribution	- £ 30
	Total	<u>£378</u>

6.2.3.2 Athalassa - No work was carried out.

6.2.3.3 Ayia Marina

Cleaning of embankment from vegetation. Painting of steel ladders - cleaning of spillway, guard house yard and painting of W.L. indicator. Painting of manhole covers and grills.

Expenditure:	Dam	- £ 59
	Distribution	- £ 20
	Total	<u>£ 79</u>

6.2.3.4 Kalopanayiotis

Painting of all metal structures including 2 No. LEA recorders - treating of foot bridge timber with solignum. Painting of all external woodwork of guard house.

Painting of all manhole covers and maintaining of 3 No. main valves.

Expenditure:	Dam	- £140
	Distribution	- £ 63
	Total	<u>£203</u>

6.2.3.5 Kiti

Emergency repairs to main gate.

Emergency repairs to main 21" ϕ conveyor pipe (2 No. breakages). Repairing of a siphon. Replacing of 112 irrigation ports with their frames. Filling with flintkote of 400 expansion joints. Repairing of 10 breakages on canals - Cleaning of all main canals.

Expenditure:	Dam	- £ 41
	Distribution	- £840
	Total	<u>£881</u>

6.2.3.6 Lefkara

Installation of "notification" boards (Greek and English).

Expenditure: - £40

6.2.3.7 Massari

Installation of notification boards.

Expenditure: - £40

6.2.3.8 Mavrokolymbos

Removing of 5000 c.y. of soil from slide area. Cleaning of spillway and filling of joints with gutta terna. Painting of all metal structures and deck of bridge. Cleaning of access road and ditches.

Repairing of 20 No. sluice valves. Painting of all meters, S.Vs. and manhole covers. Cleaning of canals. Filling up of joints with gutta terna. Emergency replacing of 6" and 10" ϕ pipes (Broke during Agricultural Department Works).

Expenditure: Dam	- £1195
Distribution	- £ 96
	<hr/>
Total	£1291

6.2.3.9 Polemidhia

Cleaning of tunnel and entrance of tunnel from silt. Painting of all metal structures (gate, shaft, rails etc.). Maintaining of winch diesel engine.

Painting of all manhole covers - Repairing of water meters and sluice valves.

Expenditure: Dam	- £641
Distribution	£506
	<hr/>
Total	£1147

6.2.3.10 Pomos

Removing of dead trees from reservoir - Cleaning of Embankment and drains from vegetation.

Filling up of spillway joints with gutta terna. Painting of all metal structures. Treating of bridge timber with creosete.

Painting of all manhole covers and sluice valves. Filling up of joints with gutta terna.

Expenditure: Dam	- £150
Distribution	- £ 53
	<hr/>
Total	£203

6.2.3.11 Syngressis - No work was carried out.

6.2.3.12 Yermasoyia

Painting of railings. Concreting of curbing outside the guard house. Constructing of a protective wall left of spillway. Filling up of joints of spillway with flintkote. Painting of winches. Conveyance of piped water to the engine house. Installation of "notification" board.

Expenditure: Dam	- £421
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No.	Project	Dam £	Distribution £	Total £	Remarks
1	Argaka	348	30	378	
2	Athalassa	-	-	-	
3	Ayia Marina	59	20	79	
4	Kalopanayiotis	140	63	203	
5	Kiti	41	840	881	
6	Lefkara	40	-	40	Installation of notification board
7	Massari	40	-	40	Installation of notification board
8	Mavrokolymbos	1195	96	1291	
9	Polemidhia	641	506	1147	
10	Pomos	150	53	203	
11	Syngrassis	-	-	-	
12	Yermasoyia	421	-	421	
Totals		3075	1608	4683	

6.2.4. Maintenance Works - Contributory Dams.

No.	Project	Expenditure			Remarks
		Govt. £	Contr. £	Total £	
1	Agros	-	-	-	
2	Akrounda	-	-	-	
3	Ayios Pappos	338	-	338	Repairing of P/U
4	Famagusta Recharge Dams	-	-	-	
5	Galini	-	-	-	
6	Geunyeli	-	-	-	
7	Gypsos	-	-	-	
8	Kandou	-	-	-	
9	Kanli	-	-	-	
10	Kalo Khorio (Klirou)	53	27	80	Emergency Repairs to axle
11	Kyrenia Range Dams	-	-	-	
12	Lefka Kafizes	-	-	-	
13	Lefka Marathasa	-	-	-	
14	Lythrodhondas (2 dams)	-	-	-	
15	Mia Milia (Special Case)	-	-	-	
16	Morphou Serrakhis	40	-	40	Installation of notification board
17	Ovgos	-	-	-	
18	Palekchori	40	-	40	Installation of notification board
19	Pera Pedhi	-	-	-	
20	Petra (2 dams)	-	-	-	
21	Prodromos	40	-	40	Installation of notification board
22	Pyrgos	-	-	-	
23	River Training (general)	-	-	-	
24	Trimiklini	210	80	290	Grouting - Installation of notification board
Totals		721	107	828	

Data on Operation and Maintenance of Government

Dam Project for 1974

Ser. No.	Project	Capacity m ³ x10 ³	Maximum Water Stored m ³ x10 ³	Water Sold m ³ x10 ³	Gross Income £	Expenditure			Net Income £	Remarks
						Operation £	Maintenance £	Total £		
	1	2	3	4	5	6	7	8	9	10
1	Akrounda- Magounda	1,150	874	520.170	4,805	1,023	378	1,401	+3,404	
2	Ayia Marina	300	117	189.063	1,890	718	79	797	+1,093	
3	Kalopanayiotis	358	358	116.305	1,512	1,060	203	1,263	+ 249	
4	Kiti	1,610	120	8.790	88	26	881	907	- 819	
5	Mavrokolymbos	2,180	395	404.800	3,189	2,300	1,291	3,671	- 482	
6	Polemidhia	3,430	390	461,441	6,659	1,914	1,147	3,061	+3,598	
7	Pomos	860	860	786.604	7,649	2,178	203	2,381	+5,268	
8	Yermasoyia	13,500	2,640	49.500	346	1,749	421	2,170	-1,824	Distribution System under Construction
9	Syngrasi	1,110	540	-	-	-	-	-	-	200000 m ³ were used for recharge in Lapatios
10	Athalassa	790	73	-	-	-	-	-	-	
11	Lefkara	13,850	960	-	-	-	-	-	-	
TOTALS			7,327	2,544.000	26,138	11,048	4,603	15,651	+10,487	

6.3. Management of Water Supplies under the Provisions of Law Cap. 350

6.3.1 Town water supplies and Regional Water Supply Schemes administered by Government, was the main task embraced by the activities of this Branch of the Operation and Maintenance Division of the Department. A task which could hardly be implemented due to the prevailing dry weather and the complications resulting from the Turkish invasion in Cyprus.

The year under review was rather dry with a precipitation below average normal. It was another year linked to the consecutive last four and stamped to bear the marks of "drought". Replenishment of the under-ground water was not, therefore, effected and certain places and communities experienced shortage of water for domestic and/or irrigation purposes.

6.3.2 Greater Nicosia Scheme

- (a) Administration: The proposal for the amalgamation of this scheme with that of the Nicosia Water Board, is still on paper and its administration has, since construction and operation, remained in the hands of Government. In the absence of any regulations to govern such administration, and, for the purpose of keeping uniformity over Nicosia Water Supply as a whole, Nicosia Water Board's basic Law and Regulations are adopted in the case of Greater Nicosia Scheme as well.
- (b) Operation: Until the Turkish invasion in Cyprus on 20th July, 1974, all sources of this scheme were in operation in order to provide water to its consumers and "bulk" supplies to the Nicosia Water Board. More details in this respect, are given in subject under heading "Nicosia Town and Suburbs Water Supply".
- (c) The highest daily consumption in 1974 for Greater Nicosia Scheme "area of supply" was 11,910 c.m. on 13th July, 1974 (under restrictions).
- (d) During the year, the distribution system of Greater Nicosia Scheme was extended by 24,900 ft. of 6" ϕ and 4" ϕ asbestos pipes laid wholly in new parcellations and 390 house connections were made. By 31st December, 1974, the number of consumers reached the figure of 12,015.
- (e) A statement showing expenditure and revenue for Greater Nicosia Scheme for the year 1974 is given on page 172.

6.3.3 Nicosia Town and Suburbs Water Supply

- (a) Apart from separate administration, Water Supply to Nicosia and Suburbs as a whole is faced commonly and restrictions are imposed on the whole area as long as water available from all sources is not adequate to suffice requirements. Such being the case, during the year under review, restrictions to the supply were imposed on 23rd May, 1974. These restrictions provided for a supply of 24 in 48 hours to all consumers.

- (b) The position of water supply to Nicosia and suburbs became, however, worst during the Turkish invasion when most of the high yielding sources remained idle and repairs of damages caused to the distribution system by bombing were on daily record. At this point, I feel obliged to express my thanks to the staff concerned and stress on their devotion to duty and capability through which they could cope in providing water to both Greek and Turkish Quarters of the "area of supply".
- (c) In this respect, it is worth mentioning that because the Turks, who occupied the Morphou Pumping Station on 17th August, 1974 could not put it in operation, arrangements were made through the United Nations in Cyprus and a gang of appropriate service had promptly offered themselves to be transferred to the site for operational purposes. Nevertheless, the Turks had evidently treated this gesture as a matter of prestige, for them and dropped down the proposal, stating that they can operate the Station by themselves. Such operation, however, could only be materialized after the despatch of instructions in writing on 20th August, 1974. Eversince, operation of this source is made in a satisfactory way and water is conveyed to Engomi Reservoir regularly.

(d) In the circumstances, the total amount of water conveyed from all sources reached the figure of 7,234,657 c.m. and was distributed excluding losses, as follows:-

(i)	Greater Nicosia Scheme, "area of supply"	2,602,841 c.m.
(ii)	Nicosia Water Board "area of supply"	4,271,260 c.m.
(iii)	Nicosia "Town within walls"	658,262 c.m.
	Total	<u>7,532,363 c.m.</u>

Note: The difference observed between quantities pumped and consumed should be continued as water pumped from sources situated in Turkish occupied areas (Dhikomo and Sykhari) records of which could not be obtained.

- (e) The highest consumption for the "areas of supply" mentioned above was 28,090 c.m. (under restrictions).
- (f) Irrespective to the existing political situation, Nicosia and Suburbs Water Supply need be supplemented in order to suffice the ever increasing demand. Time has come for the planning and execution of more reliable water supply schemes which might provide required quantities at low cost and could eventually substitute low yielding sources the utilization of which has become uneconomical.

6.4 Water Supply to Government Residences and Institutions

Apart from water supplied for domestic use, other sources of low quality water are used for the provision of water for irrigation to the above houses and Institutions. Such supply could be met satisfactorily and remained uninterrupted during the year under review.

6.4.1 Famagusta Water Supply Project

- (a) Administration: The "bulk" supply of water to Famagusta Town in particular, has originated the name of this scheme. Having been wholly financed by Government, its administration remained in the hands of Government, being implemented by this Branch. From both administration and operation angles, this scheme might be considered as the precursor of the creation of National Water Board in Cyprus.
- (b) Operation: The "Famagusta Water Supply Project" is a typical scheme, the first of its kind, to provide pumping of water from boreholes and treatment of surface water stored in a dam. The water is supplied in "bulk" to Famagusta and Larnaca Town as well as to a great number of communities and local irrigators.

Pending the completion of Khirokitia Treatment Plant and the installation of the main conveyor from Lefkara Dam to feed this Plant, in June 1974, water could only be made available by then, from existing boreholes which were pumped to the maximum in order to supplement and cope with demands as much as possible.

Operation of the Treatment Plant on an experimental basis started early in July 1974 in the presence of the consultants, who left away on the date of the Turkish invasion in Cyprus. Due to the urgent need of water both for Famagusta and Larnaca Town to meet their summer requirements, operation was then undertaken and continued by a group of technicians of this Branch, until all water stored in the Lefkara dam was treated by 13th October 1974.

The total amount of water treated and/or pumped by this Project reached the figure of 2,596,777 c.m. including losses and was distributed as follows:

Famagusta Water Board	897,272 c.m.
Larnaca Water Board	1,013,690 c.m.
Regional villages water supplies	138,525 c.m.
Local irrigators	185,466 c.m.
Refugee camps	48,865 c.m.
Total	<u>2,283,818 c.m.</u>

A statement showing expenditure and revenue of the Famagusta Water Supply Project for the year 1974 is given on page 173.

6.5 Technical Advice to Water Boards

In our capacity as an official member of all existing Water Boards, officers of this Department attended all meetings and offered, in addition, technical advice when necessary.

6.5.1 Facts about each Water Board and brief description on the position of their Water Supplies are outlined below:-

6.5.1.1 Nicosia Water Board

The ever increasing demand necessitates the supplementation of its water supply. Improvements on distribution system as recommended in the study prepared by Messrs. McLaren International Ltd. are implemented where feasible. Pipe laying for Nicosia Water Commission (Town within walls) was in progress until the Turkish invasion in Cyprus. By that time 50% of the required pipe laying was laid.

Other informations are:-

The total quantity of water supplied was 2,973,516 c.m. as per statements 1 and 2 attached.

The total quantity of water consumed as registered by area meters was 4,929,522 c.m. as per statement 3 attached, (including Nicosia Water Commission).

The total maximum consumption per day (including Nicosia Water Commission) was 16,180 c.m. on 22nd May, 1974, (without restrictions).

The total number of consumers on 31st December, 1974 was 14,050.

(i) Extension of distribution system in feet

(a) 5,384 ft of 4" ϕ A.C. pipes

(ii) Total length of distribution system in feet including extensions for 1974

(a) 12" ϕ = 12100 ft.

(b) 10" ϕ = 25000 ft.

(c) 8" ϕ = 12930 ft.

(d) 6" ϕ = 82581 ft.

(e) 4" ϕ = 633623 ft.

Total 766234 ft.

The total number of hydrants installed in 1974 was 8

The total number of hydrants installed up to 31st December 1974 was 873

6.5.1.2 Limassol Water Board

Negotiations between Government and this Water Board for the use of boreholes, in "Amathos" river near Yermasoyia were in progress. It is hoped that soon an agreement will be reached thus giving an end to the utilization of a supplementary scheme to the

Town's Water Supply. Despite this fact, water requirements could be met from existing sources and a regular supply throughout the year could be maintained. The maximum consumption reached the figure of 20,728 c.m. From records, the following details are also collected:-

Total quantity of water supplied from all sources 5,114.340 c.m.

Total quantity of water consumed, registered by area meters 4,990.401 c.m.

Total maximum summer consumption per day -- on 4th July 1974 20.728 c.m.

Extension of distribution system in feet run and size of pipes 19.435 c.m.

23,790' /4"
1,014' /6"
544' /8"

25,248'

Total length of distribution system (including extensions as above)

773,468' /4"
99,615' /6"
36,655' /8"
27,000' /10"

936,738' feet
=====

Total number of hydrants installed in 1974.

Total number of hydrant installed within area of supply by 31st December 1974 1.028

6.5.1.3 Famagusta Water Board

Due to the Turkish occupation of this town, no reliable information could be obtained. All records were left behind during evacuation of the Town and, therefore, no details on the activities of the Water Board could be given. What it should, however, be stated is that water to the Town was made available, even after its Turkish occupation to meet requirements of the Turkish people and troops in the area.

6.5.1.4 Larnaca Water Board

The restrictions of this Town's Water Supply were soon lifted, after the operation of the Khirokitia Treatment plant and ever since an uninterrupted supply was provided. Plans for the erection of a new reservoir were prepared and construction is expected to start in 1975.

Water Supplied during the year 1974

1,678,160 c.m. as shown on the attached statement.

Water Consumed during the year 1974 Registered by area meters

1,528,990 c.m. as shown on the next page.

Maximum Summer consumption

6070 c.m. per day

Total number of consumers at 31st December 1974

4965, excluding Turkish consumers which are estimated to be 1100.

I. Extension of distribution system during 1974 in f.

1,740 f. of 8" ϕ
15,820 " " 6" ϕ
17,850 " " 4" ϕ

II. The total length of distribution system is not available.

I. Hydrants installed during the year 1974: 42

II. Total number of hydrants installed within water supply area: 306

GREATER NICOSIA SCHEME (Including Morphou Bay Scheme)

Revenue and Expenditure Account for 1974

<u>Expenditure</u>		<u>Revenue</u>	
(a) Pumping Charges		(a) Sale of water	
(i) Wages	£ 21,601.708)	(i) In bulk	£ 27,401.975)
(ii) Electricity	£ 3,876.995 } £ 28,041.108	(ii) To consumer	£ 126,900.295 } £ 154,302.270
(iii) Materials	£ 2,562.405 (	(b) Connection fees	.734.000
(b) Maintenance Charges		(c) Usage of pipelines	3,828.880
(i) Wages	£ 5,397.900)	(d) Other revenue	1,968.813
(ii) Materials	£ 1,870.664 } £ 7,268.564		
(c) Collection fees	£ 18,966.279		
(d) Morphou Running Expenses			
(i) Wages	£ 5,033.295)		
(ii) Electricity	£ 52,248.097 } £ 59,595.231		
(iii) Materials	£ 2,313.839 (
(e) Tseri Running Expenses			
(i) Wages	£ 3,278.691)		
(ii) Electricity	£ 5,749.042 } £ 11,859.283		
(iii) Materials	£ 2,831.550 (
	£ 125,730.465		
Administration	£ 5,000.000		
Grand Total	= £ 130,730.465	Total	= £ 160,833.963

Note: This statement does not include for the amortization of the installations and equipment of the scheme. The cost of the existing installations was approx. £1,976.000 and the amortization was calculated to be £169.800 per year.

FAMAGUSTA WATER SUPPLY (GOVT. SCHEME)
Expenditure and revenue account for 1974

	<u>Expenditure</u>		<u>Revenue</u>	
17A/ii(i)	Pumping Charges	£ 58.317.820	Sale of water	£ 36.228.500 Paid
17A/ii(ii)	Maintenance Charges	£ 2.002.802	Outstanding payments 1974	£ 67.227.294
	Purchase of water	£ 73.940		
	Total	£ 60.394.562	Total amount	£103.455.794

VII.

DIVISION OF
SMALL PROJECTS PLANNING

By

P. Pantelides
Head of Division

7.1

Introduction

The destruction by fire of the Division offices during the coup of July, and the Turkish invasion which followed, have been the major handicaps in the activities of the Division in the latter months of the year - all records, reference books and drawings kept in the office were destroyed by the fire, and practically all the members of the staff had suffered severe losses as a result of the invasion.

In spite of all the adversities, some notable progress has been achieved in the design of new water supply projects for villages suffering from water shortage, and new irrigation schemes for farming communities, where the need for re-activation has emerged after the decapitation of the northern and most productive part of the Island by the Turks.

7.2

Village Water Supplies

Because of the after-effect of the severe drought of 1972-1973 and reduced rainfall on the mountains in 1973-1974 several villages whose supply depends on mountain springs, still had to resort to tankers for their daily water in the summer months of the year. An acute shortage was experienced in Pedoulas where a lot of money had to be spent for water transport. The situation had deteriorated in some villages, particularly in the Pitsillia region where a great number of refugees from the North were accommodated during the summer months, but villages where water transport had to be laid on, were very few as compared with the previous year.

The general supply situation in summer 1974 is described in list A-B whereby it is shown that:

- (a) All villages in Cyprus have had pipe supply systems since 1968.
- (b) With the completion of 22 house-to-house supply systems in 1974, only 93 out of a total number of 619 villages still remain with public fountains i.e. 15.2%.
- (c) From 526 villages with house-to-house systems 346 enjoyed a per capita daily rate at over 90 liters or 20 gallons, and systems were working satisfactorily; some 180 villages with house connections were getting less than 20 gallons per head per day and the supply situation at house-gate was inadequate and non-constant.

The pertinent problems in hand, therefore, at the end of the year were the following:

- (a) To implement house-systems in some 93 villages including Turkish throughout the Island with adequate supply rates.

- (b) To find and distribute supplementary water to 150 villages (including Turkish) as required for efficient and continuous house supplies.

7.2.1 Water Supply Schemes Prepared in 1974

A total of 24 new schemes were prepared and submitted to the District Officers in 1974 at a total Estimated Cost of £711,000 as per list "C".

Another 32 schemes were in the course of preparation at the end of the year as per list "D".

A comprehensive list of Village Water Supply Projects in the free sector of the Island proposed for implementation with capital foreign aid was prepared at the end of the year, postulating expenditure in the order of £1,500,000.

Some of the more important projects prepared in 1974 are briefly described herebelow.

7.2.2 Brief Description of Important Village Water Supply Schemes Prepared in 1974

- (i) Orini (Nicosia) Regional Water Supply Project (Pera, Kambia, Analiontas, Ergates, Episkopio)
Estimated Cost £35,000.

Pera village had a separate borehole supply which has been depleted, and the other villages a joint supply from another borehole whose water were contaminated; the new Project provides the commissioning of two new boreholes, one situated in the vicinity of Pera for the exclusive use of Pera village and another borehole drilled in the vicinity of Anayia-Aredhiou for joint supply to the other villages.

- (ii) Pitsillia - Solea - Marathassa Regional Project (Pikromiloudhi-Chrome Gallery)

This scheme provides for the extension of the present "regional" system which supplies the villages of Alona, Platanistassa, Polistipos, Lagoudera and Sarandi from the "Pikromiloudi" springs to convey water to the dry villages of Xyliatos, Ayia Marina, Livadia, Alithinou, Askas and Phterikoudi". More water will be brought to the "Pikromiloudi" Headwork from springs issuing in a gallery constructed recently on Troodos by the Hellenic Co., for tapping chromites and situated some 2 kilometers uphill. The cost of this phase of the project including house-to-house systems in Xyliatos, Ay. Marina is estimated at £74,000, and Phterikoudi (separate item) at £4,580.

A separate phase of this project provides for pumping water from the mouth of the gallery to a commanding site on Troodos from where it will be possible to convey water by gravity to the eastern and southern slopes of mount Olymbos, and in order of priority to Pedoulas and Prodromos at the cost

of £41,500. This part of the Project is currently revised to provide a gravity supply line from the gallery to the villages of Moutoulla - Pedoula - Prodromos where the need is greatest, and to defer pumping to Troodos at a later stage and in the light of results to be obtained from drilling operations on the Troodos Range - the cost of this gravity supply system to the three fore-mentioned villages will be of the order of £55,000.

In connection with this scheme it is noteworthy that irrigation development works are being programmed for implementation in the Solea valley where the Chrome-Galleries are now discharging - a brief description of these works is given in this report under the paragraphs concerning irrigation.

(iii) Ypsonas - Polemidia (£30,000)

These two villages were getting their water supply from a borehole in the Akrotiri aquifer together with Erimi and Kolossi; but because of intensive development in these areas and over-pumping in the aquifer, the supply has proved inadequate and a new borehole had to be constructed exclusively for Ypsonas and Polemidia.

The works consist of a pumping unit and a pumping main to the inter-village storage tanks near Ypsonas.

(iv) "Arminou" Regional Water Supply Scheme (£85,570)

This is a typical project postulating supplementary supply to a group of villages on the hills where local sources are inadequate. The water has to be supplied from a borehole on the upper Diarizos river-bed situated at a lower elevation and distributed to the villages through successive stages of pumping. The works are divided in three self-contained phases of construction for specified villages at full government cost.

The 1st phase provides for the main pumping unit on the borehole, an auxiliary tank near the borehole and pumping main to a master tank overlooking Arminou from where it could gravitate to Arminou and Salamiou.

The 2nd phase includes a second pumping arrangement from Salamiou to Trakhypedoula and Kelokedara.

The 3rd phase comprises a new pumping main from the borehole to Philoussa and hence by gravity to Philoussa Kedares and Pretori village.

The whole inter-community system will operate automatically with piezometric starting and closing devices and the water will be sold in bulk to local authorities under the management of the District Administration.

(v) Paphos Lower Villages (£276,180)

This is another major water supply project postulating borehole pumping installation on the Xeros river gravels and inter-community distribution to some 29 villages situated on the lower western perimeter of Paphos District as far as the Coral Bay; the total cost estimated at £276,180 is split up in three self-contained phases of construction at full Government cost, of which the first phase from Phinicas to Yeroskipou will cost £158,800.

Essentially the project consists of borehole pumping installations on the river bed at Nata-Kholetria and a pumping main to a common balancing reservoir near Nata. A regional gravity Conveyor will run first to Yeroskipou and at a later stage to be extended to Konia and still further as far as the present supply systems of Khlorakas and Kissonerga. The final phase will provide secondary pumping arrangements from Konia Junction to villages on a higher elevation in the Armou-Tremithoussa region. All villages capable of benefitting from this project will either be connected to the regional main conveyor through secondary branch pipelines terminating to their respective village reservoirs, or cases where the main conveyor crosses the existing village supply system will be directly connected. As in the case of Arminou the water will be sold in bulk to village authorities under the management of the District Administration.

A similar project for some 47 villages in the hill country of Paphos District is currently being prepared to supplement existing supplies from mountain springs which can no longer cope with present village expansion and higher demand for water.

7.3 Irrigation

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 in the context of the 3rd Five Year Development Programme is to extend permanent irrigation by 1000 to 1500 domums 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-Departmental 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, "wider 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.

7.3.2 Schemes Prepared in 1973

Because of the severe mutilation of the agricultural industry by the Turkish invasion and the need of re-activation of the national economy, more emphasis has been laid in the latter half of the year under review on the exploitation of Government boreholes - all the schemes which were ready for implementation at the end of the year appear on list "E" estimated at a total cost of £515,000. The schemes which have been budgeted for implementation in 1975 are marked with an asterisk at a total cost of about £260,000.

Some of the more important schemes prepared in 1974 and submitted to the District Officers, or in the course of preparation are briefly described herebelow:

(i) Borehole pumping schemes (£125,000)

A total of seven irrigation pumping projects from Government boreholes in equal number of villages have been finalised namely for:

Dhali (Irrigation of new fodder crops for stock breeding)

Potami (for new citrus and seasonal crops)

Yerakies (pumping from surface springs for new deciduous and seasonal vegetables)

Mandria (for new deciduous)

Yiolou (for all kinds of permanent crops and vegetables)

Ergates (for vegetables)

Nissou (for supplementary irrigation of existing crops and compensation for water supplies extracted in the neighbourhood).

The total expenditure for these schemes is estimated at £125,000 and acreage of new permanent and seasonal irrigation envisaged thereof is in the order of 1000 and 500 don. respectively.

Other important pumping which were on the Drawing Board at the end of the year include:

Episkopi, Kolossi, Kato Platres in the Limassol District

Orounda, Kambos, Tsakkistra (Nicosia District)

Steni, Khoulou, LEMONA Amargeti, Polemi (Paphos District)

Expenditure for these schemes will be in the £200,000 bracket, and irrigation acreage in the order of 1500 don. (Permanent) and 500 don. (seasonal).

(ii) Small storage Reservoirs

A scheme postulating seasonal storage of irrigation water for summer use in Pakhyammos village near Polis-tis-Khrysochou has been prepared but not yet finalised because of the Turkish Invasion.

Several sites for off-stream storage projects similar to "Kyperounda" have been investigated during the year in the Pitsillia area.

The raising of some of the existing small concrete dams for greater storage has been studied by a separate group of engineers during the year and preliminary reports with estimates have been put up for the dams at:

Lymbia
Perapedhi
Lythrodonta
Kalo-Khorio (Klirou)

A small concrete gravity dam and distribution system at Ay. Theodoros (Agrou) is under study by the Limassol Branch of this Department.

A scheme for Loutros and Varishia villages consisting of a gravity dam on the Varishia stream and pumping from the Limnitis valley was prepared but not finalised because in the meantime at least one of these two villages has been wiped off by the invaders.

A request for off-stream storage in the village of ORINI, south of Nicosia (Deftera, Anayia, Aredhiou, Ergates, Psimolophou, Episcopio, Pera and Politiko) is currently being investigated. All these villages have ab-antiquo irrigation intake rights on the Pedieos river but irrigation benefits to farmers are very limited because surface flows peter out during the later spring season. The idea is to divert water from the upper reaches of Pedieos river (580 meter contour Locality "Agnotissa") into the westernly adjacent clay hammocks of "hali" lands, where one or several large storage earth reservoirs could be built at comparatively low cost. The diversion rate will have to be commensurate with the draw - out capacity of the present village channel intakes which will have to be closed, or reduced on the river bed side, thus ensuring no interference with spate flows to the downstream Messacrian plain; but they will be getting their share of water from the reservoirs through a regional conveyor system, and at times coinciding with irrigation requirements of crops. A project like that will contribute to an expansive growth of the vegetable industry already established in the "Orini" plain and a greater output from existing permanent crops such as apricots.

(iii) Recharge Works

The programme of gabion weirs on the bed of the Idalia River in the Nissou-Dhali area has been continued and works estimated at £9,000 were designed and implemented by special warrant in 1974.

Similar works have been designed on the Merikas river-bed near Paleometokho, where private boreholes are being used for local irrigation and for water supply purposes to Nicosia.

The construction of spreading grounds for recharge purposes along the Pedieos river bed upstream of Pano-Deftera, in conjunction with river training and land reclamation of marginal lands is being currently investigated.

(iv) Solea Valley

Progress has been made in defining the reasonable expectations and legitimate claims of separate Irrigation Divisions, with a view to an acceptable project aiming at water conservation in the Solea Valley and settlement of the dispute about the "Pikromiloudi" spring, whose water has been piped for domestic use.

The principal components of the project as summarised herebelow, could be dealt with a separate self-contained irrigation schemes with clearly defined benefits to specified Divisions who will share the cost of implementation on the usual bases:

- (a) Lining in concrete the existing main intake and conveyor canals to off-set losses in the earth channels.
- (b) Consolidation of master intakes, clearing the jungle growth along the river bed and construction of small reservoirs (preferably off-stream) for night storage.

These structures will enable the farmers to irrigate daily during normal working hours and avoid sub-surface losses at the intakes.

- (c) Construction of boreholes on suitable sites in the Galata-Kakopetria area for new irrigation development in lieu of a dam reservoir at Ay. Nicolaos as originally planned.
- (d) Construction of a large off-stream reservoir on a suitable site for supplementary or new irrigation in the Central and Lower Solea valley; distribution thereof to be effected mainly by gravity and by pumping only where necessary.
- (e) The question of a general re-adjustment of the ab-antique water rights and private ownership to be considered at a later stage, in view of the fact that most of these private water titles are concentrated in the invaded areas.

(v) Inter-Departmental Committee for Small Irrigation Projects (III)

This 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 to co-ordinate the activities of the District Agricultural Services for the supply of agro-economic data in the preparatory stages of the projects.

Some 26 schemes were considered by this committee as per list F1 and F2.

A general catalogue of villages where schemes were in the course or preparation or still under investigation is given on lists "F", "G" and "H".

Village Water Supplies

Total	Villages with house to house distribution				Villages with Public Fountains			Villages without a pipe supply		Popula- tion %	Total of villages
	Schemes completed	Total No. of villages	Villages %	Popula- tion %	Total No. of villages	Villages %	Popula- tion %	Total No. of villages	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				620
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	97.2	93	15.00	2.8				619

Water Supply Situation at the End of 1974

District	Satisfactory piped supply (Supply rate 90 lts/head/day & over)								Unsatisfactory piped supply (Supply rate below 90 lts/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.	%	Popul.	%	No.	%	Pop.	%		
Nicosia	110	65.1	96701	77.8	7	4.2	1022	0.8	37	21.9	25470	20.5	15	8.8	1103	.9	169	124296
Kyrenia	40	85.1	31882	96.8	1	2.1	70	0.2	1	2.1	55	0.2	5	10.7	920	2.8	47	32927
Famagusta	40	40.8	34135	38.0	1	1.0	0	0	48	49.0	54369	60.6	9	9.2	1213	1.4	98	89717
Limassol	75	65.8	64994	87.7	8	7.0	519	0.7	23	20.2	7552	10.2	8	7.0	1043	1.4	114	74108
Paphos	45	34.1	23927	46.3	16	12.1	3191	6.2	55	41.7	23125	44.7	16	12.1	1452	2.8	132	51695
Larnaca	36	61	27503	67.8	1	1.7	150	0.4	16	21.7	11837	29.2	6	10.2	1044	2.6	59	40534
Total	346	55.9	279142	67.6	34	5.5	4952	1.2	180	29.1	122408	29.6	59	9.5	6775	1.6	619	413277

Water Supply - Schemes Prepared
in 1974 and Submitted to D.Os

Summary of List "C"

District	No. of Schemes	Estimated Cost
Nicosia	8	197,365
Limassol	5	63,620
Paphos	7	390,770
Kyrenia	3	53,970
Famagusta	1	5,280
Total	24	711,005

Water Supply - Schemes Prepared in 1974
and Submitted to District Officers

Nicosia District

Ser. No.	Village	Nature of Scheme	Estimated Cost £
1.	Tymbou) Pyroi (	Supplementary supply from new B/H	30,000
2.	Pera	Supplementary supply from new B/H	12,000
3.	Kambia) Analiondas () Episkopio) Ergates (	Combined scheme supplementary supply from new B/H	23,000
4.	Prodromos) Pedhoulas (	Combined scheme Supplementary supply from "Kannoures"	41,500
5.	Sarandi) Lagoudhera () Polystipos () Alona () Platanistassa () Phterikoudhi () Askas () Livadhia () Alithinou () Xyliatos () Ay. Marina ()	Combined scheme supplementary supply from "Kannoures"	74,035
6.	Ayia Erini (Kannavia)	House-to-house scheme	1,290
7.	Philia	Improvements to the Distribution system	11,000
8.	K. Koutraphas	House-to-house scheme	3,040
9.	Syrianokhori	Improvements to the distribution system	1,500
		Total	197,365

Limassol District

1.	Souni-Zanadjia	Additional supply from Pano and Kato Kyvidhes scheme and house- to-house distribution system	19,940
2.	Ayios Athanasios	Additional storage tank	6,000
3.	Ypsonas) Polemichia (	Additional supply from new B/H	30,000
4.	Pelendri (Phylagra)	New scheme from spring to the locality Phylagra	4,180
5.	Phinikaria	Additional supply from Mouttayiaka scheme	3,500
		Total	63,620

Paphos District

List "C" (Contd.)

Ser. No.	Village	Nature of Scheme	Estimated Cost £
1	Arminou) Mesana) Salamiou) Kalokedhara) Trakhypedhoula) Philousa) Pretori) Kedhares)	Regional scheme Additional supply from B/H near Arminou	85,570
2	<u>Paphos Lower Villages</u> <u>Regional Scheme</u> Phinikas) Ay. Varvara) Anarita) Timi) Akhelia) Koloni) Ay. Marinoudha) Yeroskypou) Konia) Anavarkos) Khlorakas) Emba) Lemba) Kissonerga) Koral Bay) Armou) Marathounda) Episkopi) Neon Khorion) Mesoyi) Tremithousa)	Phase I Additional supply from B/H near Nata Phase II Phase III	158,800 63,320 54,060
3	Tala	Improvements to the Distribution system	11,140
4	Yiolou	Additional storage tank	1,700
5	Ay. Marina (Kel.)	House-to-house scheme	5,040
6	K. Akourdhalia	House-to-house scheme	3,200
7	Pendalia	House-to-house scheme	7,940
		Total	390,770

List "C"

Kyrenia District

Ser. No.	Village	Nature of Scheme	Estimated Cost £
1.	Dhiorios) Ay. Erini () Kormakides)	Transport of Electricity and installation of electric motors	9,000
2.	Kyrenia Town	Supplementary supply from new B/H and improvements to the Distribution system	30,730
3.	Thermia	Supplementary supply from Kyrenia water supply system and house-to-house distribution system	14,240
Total			53,970

Famagusta District

1	Paralimni	Supplementary supply from new B/H	5,280 =====
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List "D"

Schemes under Preparation by Nicosia
Main Office

Nicosia District

Ser. No.	Village	Nature of Scheme
1.	Kakopetria	House-to-house scheme
2.	Kapedhes	Improvements
3.	Kakopetria-Galata	Relaying of pipes
4.	Galata	House-to-house scheme
5.	Agrokipia	Extension of distribution system
6.	Orounda	Extension of distribution system

Famagusta District

1.	Kalopsidha	Supplementary supply from new B/H and house-to-house
2.	Komi Kebir) Patriki () Ovgoros () Kridhia ()	Supplementary supply from new B/H
3.	Yialousa	Extension to Ay. Therissos locality
4.	Lysi) Kondea () Prastio () Gaidhouras () Kouklia () Akhna () Makrasyka () Xylotymbou () Paralimni () Ay. Napa () Dherinia ()	Supplementary supply from Famagusta main pipeline

Limassol District

1.	Moniatis	Supplementary supply from new spring
2.	Ay. Athanasios	Additional storage
3.	Mouttayaika regional scheme	General improvements
4.	Mathikoloni	Supplementary supply from new spring

Paphos District

Ser. No.	Village	Nature of Scheme
1.	Paphos higher villages "Lazaridhes" regional scheme	Supplementary supply from "Lazaridhes" river
2.	Paphos industrial area	New scheme from Paphos town

Limassol District

1.	Erimi) Kolossi (	Supplementary supply
2.	Monagri) Dhoros (" "
3.	Ay. Theodoros	" "
4.	Kyperounda	" "
5.	Sykopetra	" "
6.	Vasa	" "
7.	Pareklisia	Improvements
8.	Kalon Khorio Zoopiyis	Supplementary supply
9.	Phasoula	" "
10.	Trimiklini	" "

Paphos District

1.	Mesoyi	Supplementary supply
2.	Miliou	" "
3.	Nata	" "
4.	Mousere	" "
5.	Lasa	" "
6.	Kinoussa	House-to-house scheme

LIST OF SMALL IRRIGATION SCHEMES
(Ready for Construction at the end of 1974)

List "E"

Nicosia District

* Included in 1975 Estimates

Ser. No.	W.D.D. Reference	Village	Division or Assoc.	Locality	Nature of Proposed Works	Estimated cost £	Village Contrib. %	Irrigation		Remarks
								Perm. don.	Seas. don.	
1	127/40/10	Nisou	Assoc.	Frangos	Pumphouse of pipeline B.H. 27/64	8,000	-	-	-	Compensation to Irrigation Association
2	57/41/II	Dhali	Division	Ftelia	Pumphouse of Distrib. pipes B.H. 67/69	12,120	1/3	120	-	) Irrigation of Fodder crops
3	57/41/II	Dhali	Division	Katevas	Pumphouse of Distrib. pipes B.H. 56/69	9,580	1/3	80	-	
4*	51/54/V	Peristerona-Astromeritis	"	Koftousa	R.C.C. Channels	20,500	1/4				Included in 1975 Estimates (Daggered)
5*	74/68	Astromeritis	"	-	" "	10,000	1/2			
6	96/70	Peristerona	"	-	" "	10,000	1/2			
7	123/40/A1	Exometochi	"	within village	Flood protection works	2,300	-	-	-	
8	24/42/II	Neo Khorio	Associat.	Alakatia	Flood protection works	620	-	-	-	
9	35/54	Palekhorio	Associat.	Maroullena	Constr. of Irrigation Tank and intake channel	2,000	44%	10	15	
10	63/52/III	Akaki-Meniko	Division	Afxenti-Riatikon	R.C.C. Channels	40,700	1/4	-	500	400 don. winter
					C/F	115,820				

Ser. No.	W.D.D. Reference	Village	Division or Associat.	Locality	Nature of Proposed Works	Estimated cost £	Village Contrib.	Irrigation		Remarks
								Perm. don.	Seas. don.	
11	39/1744	Vyzakia	Division	-	R.C.C. Channels	115,820 22,680	1/3	-	140	
12	44/39	Ay. Trimithias Paleometokho Kokkinotrimithia	"	Merikas River	Recharge Weirs (Gabions)	10,000	1/3	-	-	
13	55/61	Yerakies	"	Xeros Potamos	Pumping Scheme	56,000	1/3	216	-	
14	27/39	Ergates	"		Pumping Scheme	15,000	1/3		100	Vegetables
15	88/52/II	Pharmakas	Associat.	Koskinas	Distribution Pipes	7,000	44	55	45	
16*	127/40/89/ II	Potami	Division	Kambos	Pumping Scheme from B.H. 187/63	14,000	1/3	100	40	
17*	127/40/39	Palekchori	Division	Pera Avlaki	Supplementary Distrib. Channels	1,500	1/3			
18*	105/63	Pera-Politiko	Division	Pedhieos	R.C.C. Channels (Suppl.)	7,000	1/3	-	450	
19	101/40	Akaki	Division	No.2	R.C.C. Channels	1,730	1/3	-	50	
20	127/40/25	Kakopetria	Division	Frangiko- Kouphoelies	Distribution Works	18,660	1/3	260	-	
21	42/50/II	Evrykhou	Division	Dhimma Evrykhou	" "	15,960	1/3	420	330	
22	86/53/II	Tembria	Division	Esso Dhimma	" "	12,750	1/3	160	300	
23	127/40/118	Kaliana	"	Neron tis Tsappas	" "	7,180	1/3	121	9	
						305,280				

Nicosia District (Contd.)

List "E" (Contd.)

Ser. No.	W.D.D. Reference	Village	Division or Associat.	Locality	Nature of Proposed Works	Estimated cost £	Village Contrib. %	Irrigation		Remarks
								Perm. don.	Seas. don.	
24	62/67	Korakou	Division	Esso Dhimma	Distribution Works	305,280				
					B/F	22,790	1/3	300	100	
25	62/67	Korakou-Phlasou Linou	"	Selloshis	" "	14,990	1/3	53	250	
26	30/46/III	Phlasou- Evrykhou- Korakou	"	Koussouliotis	" "	13,240	1/3	130	700	
27	30/46/III	Phlasou	"	Ay. Epiphanitis	Construction Works	20,960	1/3	120	200	
28	61/66	Katydhata	"	Jami-Mylos	" "	15,600	1/3	470	230	
29	127/40/25/ III	Kakopetria	"	Pano & Kato Apotheri	" "	15,000	1/3	125	-	

Limassol District

1	41/44	Mallia	Division	Trozena	Distribution Works	3,500	1/3	25	10	
2*	127/40/47/ III	Kolymbos	Associat.	Kolymbos	" "	1,900	1/3	6	-	
3*	127/47/95/ III	Potamitissa	Division	Arsoullou	" "	1,400	1/3	13	-	
					C/F	414,660				

Limassol District (Contd.)

List "E" (Contd.)

Ser. No.	W.D.D. Reference	Village	Division or Associat.	Locality	Nature, of Proposed Works	Estimated cost £	Village Contrib. %	Irrigation		Remarks
								Perm. don.	Seas. don.	
					B/F	414,660				
4*	127/47/95/ III	Potamitissa	Division	Pano Potami	Protection Works	1,536	1/3	-	-	
5*	127/40/49/ 36	Kyperounda	Associat.	Frakti- Postrou	Distribution Works	1,350	1/2	10	-	
6*	127/40/49/ II	Kyperounda	"	Vassiliko	" " "	2,050	40%	10	-	
7	127/40/49/ 48	Kyperounda	"	Appis	" " "	2,300	1/2	4	-	
8	127/40/49/ 55	Kyperounda	"	Livadhi tis Messis	Irrigation Tank and Distribution Works	2,250	44	20	-	
9	127/40/49/ II	Kyperounda	"	Dhiala	Irrigation Tank and Distribution Works	900	1/3	12	-	
10	127/40/49/ II	Kyperounda	"	Khalo-spitia	" " "	2,500	1/2		-	
11	127/40/52/ III	Ay. Ioannis (Agrou)	Division	Teratsia	" " "	2,900	1/3	35	-	
12	127/40/52/ III	Ay. Ioannis (Avgorou)	"	Kephalovrysos	" " "	1,700	42	16	9	
13	42/43/III	Phini Phase B	"		Distribution Works	11,700	1/3	170	-	
					C/F	443,846				

Ser. No.	W.D.D. Reference	Village	Division or Associat.	Locality	Nature of Proposed Works	Estimated cost £	Village Contrib. %	Irrigation		Remarks
								Perm. don.	Seas. don.	
						B/F				
14	127/40/59/ II	Louvaras	Division	Tsoukkalas	Irrigation Tank and Distribution Works	443,846 800	1/3	180	-	
15	45/44/2	Pyrgos	"	Almyrovryssi	Distribution Works	5,700	1/4	-	80	
16	45/44/2	"	"	Dhemma tis Rigenas	" "	4,600	1/4	-	300	
17*	127/40/1	Ay. Theodoros (Agrou)	"	Koufes	" "	5,100	1/3	30	-	
18"	127/40/1	Ay. Theodoros (Agrou)	"	Lois	" "	1,400	1/3	8	-	
19	112/59	Kato Amiandos - Pelendri	"		" "	3,050	1/3	135	-	
20	127/40/99	Agros	"	Kato Enetikos	" "	1,850	1/3	18	-	
21*	127/40/99	Agros	Associat.	Erimos	Excavation of Springs	590		-	-	
22*	127/40/18	Agridhia	"	Limmi	Distribution Works	2,500	1/3	20	-	
23	28/42/II	Lemythou	Division	Tsangarouda	" "	2,250	1/3	8	15	
24*	127/40/50	Zoopyi	"	Zoodokhe-Piyi	" "	3,900	1/3	30	-	
						C/F				
						475,586				

Limassol District (Contd.)

List "E" (Contd.)

Ser. No.	W.D.D. Reference	Village	Division or Associat.	Locality	Nature of Proposed Works	Estimated cost £	Village Contrib. %	Irrigation		Remarks
								Perm. don.	Seas. don.	
					B/F	475,586				
25*	49/46/II	Dhierona	Division	Kamaroudha	Distribution Works	5,900	1/3	150	-	
26*	64/52	Trimiklini	Associat.	Zenonas	" "	1,300	1/2	8	-	
27*	96/44	Mandria	Division	Mylavryst	Pumping Scheme from B.H.	8,600	1/3	65	-	

Paphos District

1*	127/40/144	Yiolou	Division		Pumping Scheme B.H. 59/71	23,500	1/3	180	-	
					TOTAL	514,886				

List "F" 1

List of Small Schemes Approved by the
Inter-Departmental Committee in 1974

1. Prodhromos
2. Exometochi (Pumping Scheme)
3. Orounda - Peristerona (Ornitharis - Matsiaris)
4. Potamitissa (Arsoullou)
5. Peristerona - Astromeritis
6. Potami (Pumping Scheme)
7. Ayii Vavatsinias
8. Agros (Kato Enetikos)
9. Mandria (Limassol) Pumping Scheme
10. Phini
11. Lemythou
12. Dhymes (Sykameri)
13. Kalo Khorio Klirou Dam (Distribution)
14. Yiolou Pumping Scheme
15. Ayios Ioannis Agrou (Teratsia)
16. Ayios Theodoros Agrou (Lois)
17. Ayios Theodoros Agrou (Koufes)
18. Peristerona (Paphos) Pumping Scheme
19. Pelendria
20. Kato Amiandos - Pelendria (Yeropotamos & Dhierona)
21. Trimiklini (Zenonas)
22. Aghriki (Limni)
23. Khandria (Kolymbos)
24. Kyperounda (Appis)
25. Kyperounda (Vassiliko)
26. Kalopanayiotis

List "F" 2

List of Small Schemes not Approved by the
Inter-Departmental Committee in 1974

1. Inia (Mega Pighadi)
2. Statos (Kato Pighadi)
3. Miliou (Kolokouris)
4. Palekythro (Weir)

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List "G"

List of Schemes in the Course of Preparation in 1974

* To be brought before the Inter-Departmental Committee

Nicosia District

- * Ergates (R.C.C. Channels)
- Takkistra (Pumping Scheme)
- Kambos
- Akaki (Kamena)
- Pakhyammos (Pumping Scheme) and off-stream storage

Limassol District

- * Paleomylos (Khardji - Ay. Georghios)
- Ay. Demetrios (Kaloyiros)
- Dora (Vassiliko)
- Moniatis
- * Kyperounda (Mavros Kolymbos)
- Pelendri (Skamioratos)
- Ayios Georghios Silikou (Kato Peghadi - Mousas - Tsanidhis)
- Pissouri (Ext. of Distribution)
- Kolossi (Pumping Scheme B.H. 38/68)
- Kato Platres (Pumping scheme)
- Episkopi (Pumping Scheme E.B. 71/69)
- * Pelendri (Kato Englis)is)
- Pelendri (Avlaki Hji Stylianou)
- Pelendri (Vrysi Archangelou)
- Pelendri (Englisis Ppsilon)
- * Ayios Pavlos (Dhimma tou Khorion)

Paphos District

- Polemi (Pumping Scheme)
- Steni (Pumping Scheme)
- Khoulou (Pumping Scheme B.H. 195/63)
- Khoulou (Pumping Scheme B.H. 181/63)
- Lemona (Pumping Scheme E.B. 60)
- Philousa Kelokedharon (Yerondas)
- Amargeti (Pumping Scheme)

Larnaca District

- Ayios Theodoros (Pumping Scheme B.H. E.B. 24)
- Alaminos (Recharge Dams)

List "H"

List of Schemes under Investigation

at the End of 1974

Nicosia District

Ayios Theodoros (Soleas, (Small Storage Reservoir))

Nisou - Dhali (Idalios River Recharge Scheme)
Additional Gabion Weirs

Upper Pedieos (Earth Reservoirs)

Limassol District

Ayios Demetrios

Phini

Monagroulli

Kato Polemidhia

Prodromos

(Pyrgos (Reinvestigation))

Ayios Ioannis (Agrou) (Kephalovrysos)

Dhymes

Kyperounda (Platanos)

Pano Platres (Reservoirs)

Ay. Ioannis Agrou (Platania)

Ay. Ioannis Agrou (Yerambelos)

Yermasoyia

Agridia (Panayia)

Agros (Mylos)

Pano Platres

Pelendri (Livadhia)

Agros (Anastasia)

Potamitissa (Vlou)

Dhymes (Sykameri) Reinvestigation

Ayios Demetrios

Kapilio (earth reservoir)

Apsiou (Pumping Scheme)

Mathikoloni

Paphos District

Trachipedoula

Miliou

Statos (Akres - Vrysi)

Dhroussia

Kelokedhara (Psathaes)

Episkopi (Kakoskala)

Peyia

Ayia Marina (Khrysokhou) Distribution from Dam

List "H" (Contd.)

Paphos District (Contd.)

Polemi

Kritou Tera

Polis Khrysokhous (Pumping Scheme)

Larnaca District

Tokhni - Kalavassos (Pumping Scheme)

Odhou (Distribution Works)

VIII.

REGIONAL OFFICES

By

N. Chr. Toufexis,
Superintendent of Works

8.1 Limassol Regional Office

8.1.1 General

The staff of the Limassol Regional Office, at the end of the year, consisted of the following 26 No. Officers:

The District Engineer

1 No. Executive Engineer

1 No. Inspector of Works

1 No. Chief Foreman

1 No. Assistant Chief Foreman

1 No. Foreman Grade I

7 No. Technical Assistants

8 No. Technical Assistants (Daily paid)

1 No. draughtsman (female, daily paid)

2 No. Secretaries (Female, daily paid)

2 No. hourly officers.

The technical staff was divided in three groups according to the four main functions of the Regional Office viz.

(i) Hydrology

(ii) Design

(iii) Maintenance

(iv) Construction

8.1.2 Hydrology

8 No. officers were engaged in surface and ground hydrology measurements tabulating results and keeping records and assessing the situation for the following areas:

(1) Special Measure Law of Akrotiri - Fassouri

(2) Water Conservation Area of Moni - Pyrgos, Yermasoyia, Pissouri, Paramali, Evdimou. Also Tokhni, Zygi and Vassilikos River areas which are in Larnaca District.

(3) Free area, meaning the rest of Limassol District not included in paragraphs (1) and (2) above and also including Tokhni, Zygi and Vassilikos river area not included within Conservation area boundaries.

Hydrology measurements were as follows:

8.1.2.1 Stream gauging and Rainfall Observing Stations in Operation

- (i) 16 gauging stations equipped with automatic water level recorders in Kourris (4 No.), Garyllis (1 No.), Hapotami (1 No.), Amathos (2 No.), Vassilikos (2 No.) and Evdimou (1 No.) rivers. Also Kourris Intakes (4 No.) and Salt Lake (1 No.).

Also 3 No. automatic water level recorders are in operation on an equal number of B/Hs in Akrotiri - Phassouri area (2 No.) and Yermasoyia area (1 No.) to observe the behaviour of the water table in the aquifer.

- (ii) 2 No. rainfall observing stations at Yermasoyia and Polemidhia dams.

8.1.2.2 Surface Water Hydrology

Weekly visits were made during the year to the stream gauging stations equipped with automatic water level recorders for observation and for calibration purposes by the use of current meters (212 measurements). Also samples of stream water for chemical and suspended sediment analyses were taken regularly.

Copy for the data taken from rainfall observing stations are sent to the Meteorological Office at the end of each month.

8.1.2.3. Ground Water Hydrology

Ground water conditions in the whole hydrological area of Limassol District and including Kalavastos, Zygi and Tokhni areas were observed by means of 524 observation wells and boreholes. The depth for established Bench Mark on top of the observation wells and boreholes to ground water level was measured twice a year in March before the irrigation period and in December after the irrigation period and before percolation of water took place.

Observation wells and boreholes are distributed as follows:

<u>Name of Area</u>	<u>No. of wells or boreholes</u>
1. Kalavastos - Zygi - Tokhni	68
2. Moni - Pyrgos	73
3. Yermasoyia	77
4. Akrotiri - Phassouri	251
5. Paramali - Evdhimou	37
6. Pissouri	28
Total	534

The ground water movement in the 28 No. boreholes or wells at Paramali-Evdhimou area was not observed in December because the area was not safe for such visits.

In addition to the above measurements monthly and weekly observations for ground water movement were taken in a total of 208 observation wells or boreholes in the above described areas.

Also 655 spring discharges were gauged volumetrically or by current meter.

8.1.2.4 Chemical Analyses

A total number of 236 water samples were taken from springs, wells/boreholes and streams and sent to the Government Laboratory for chemical analysis.

In addition to the above 652 samples of ground water were taken in March and November were analysed by the Limassol Regional Office for chloride content.

8.1.2.5 Bacteriological Analysis

125 samples of ground water were taken from springs and boreholes used for Limassol water supply and sent to the Pathological Laboratory for analysis.

8.1.2.6 Questioning

The annual questionnaire was carried out on 893 wells and boreholes during the summer for determination of the ground water extracted by the area irrigated and type of crops planted.

8.1.2.7 Well sinking permits

55 applications to sink of wells or boreholes in the Special Measures Law and Conservations areas and 34 applications in the non Conservation area were investigated and have advised the District Officer Limassol accordingly.

11 applications for quarries permits were investigated and submitted to Nicosia Head Office.

10 applications into encroachment in hali land were investigated and submitted to Nicosia Head Office.

In addition to the above 51 several cases in the Special Measures Law, were examined and submitted to the District Officer Limassol.

8.1.2.8 Plotting of New Wells and Boreholes

A total number of 33 new legal and illegal wells and boreholes were plotted on map and necessary details entered into the appropriate register.

8.1.2.9 Water Meters

During the year, 6 water meters were installed on an equal number of boreholes in Akrotiri-Phassouri area, raising the total number to 400, meanwhile 12 of them have been removed.

8.1.3 Design of Projects

6 No. officers were engaged in Major and Minor projects design which on completion are sent directly to the Director for approval except in the case of minor irrigation which are sent to the Agricultural District Officer as well in order to have the views of his department for final approval by the interdepartmental committee.

24 No. minor irrigation schemes were examined from which 14 No. designs were prepared and submitted and 10 No. cases were not recommended.

11 No. water supply schemes were examined from which 5 No. designs were prepared and submitted and 6 No. cases were not recommended.

8.1.4 Major Projects

The interim report for Ayios Theodoros (Agros) design of dam and distribution system was prepared. The final design of which is now being completed at the estimated cost of £225,000 cp.

8.1.5 Maintenance of Dams

There are 10 No. reservoirs in the district including 2 No. off channel reservoirs with a total capacity of 17,963 m³. All but 2 No. of the reservoirs (Yermasoyia and Polemidhia) are run by the local irrigation committees. All reservoirs are periodically inspected for their structural soundness and water storage in them is recorded regularly.

Yermasoyia and Polemidhia reservoirs were built by Government funds and are by far the largest reservoirs in the district. Both dams are made of earth and have a capacity of 13.6 MCM and 3.5 MCM respectively. Runoff however during 1974 for both Amathos and Garyllis rivers was much below average and the maximum quantities stored during the year were 2,650 m³ and 390,000 m³ respectively.

Yermasoyia and Polemidhia dams are frequently inspected and maintenance work are carried out annually.

Maintenance works expenditure for Yermasoyia and Polemidhia Dams and the latter's distribution system carried out in 1974 was as follows:-

<u>Project</u>	<u>Expenses incurred</u>
Yermasoyia Dam	£ 281.-
Polemidhia Dam	£ 770.-
Polemidhia Dam-Distribution system	£ 75.-
Total	£1,126.-

These dams are checked monthly for vertical and horizontal movements. Pore water pressure is also observed and all results are recorded in graphical representations. Evaporation from the reservoirs is estimated by means of the sunken pan type at Yermasoyia Dam and the elevated pan type at Polemidhia Dam. Max figures taken were 10 mm on July 3rd and 9.5 mm August 2nd respectively and the respective amount evaporated during the year was estimated to 472,400 m³ and 52,100 m³.

8.1.6 Construction

Construction works for the district are directed and coordinated through 8 No. officers attached for this purpose and regular reports are sent to the head of construction branch at head quarters.

(a) Major projects under construction

(1) The Yermasoyia Main Conveyor (estimated cost £416,000)

Approximately 13 km long, consists of 900 mm and 800 mm diameter A C pipes being laid along the river bed and through the town.

The Conveyor will be connected with the Polemidhia Dam main pipe line and will convey water from Yermasoyia Dam to the area west of Limassol town to irrigate a total of 11,540 donums of land together with Polemidhia reservoir.

This project commenced in June 1974 and is programmed to be completed by the end of April 1975.

(2) Akrounda-Phinikaria distribution system (estimated cost £166,000 cp.)

Akrounda-Phinikaria land consolidation scheme will be irrigated from Yermasoyia Dam. For both these areas the main and secondary pipe lines were laid by October 1974, now remaining the laying of tertiaries and outlets which will be laid in accordance with land improving works now under way.

Construction works for the erection of the booster pumps station for the above scheme commenced in September 1974 and scheduled for completion in May 1975.

(3) Arakapas Dam (estimated cost £150,000 cp).

Construction works continued through the year 1974 and is scheduled for completion in March 1975.

This Dam is of gravity type and made of mass concrete. When completed the reservoir will have a capacity of 130,000 m³ and is to be used to irrigate 200 donums of village gardens.

8.1.7 Construction of Small Projects

During the year 1974 construction works for irrigation schemes and water supply schemes were carried out. 13 No. irrigation schemes were constructed from which 5 No. continue over the year, for a total estimated cost £136,905. Also 17 No. water supply schemes were executed from which 5 No. are carried over the year and are nearing completion for a total estimated cost £116,300.

8.1.8 Meetings

The District Engineer attends a number of meetings in which he represents the Director of the Department as follows:

- | | |
|---|--------|
| (1) Limassol Water Board | 10 No. |
| (2) Sewage Board | 1 No. |
| (3) Coordinating Committee | 3 No. |
| (4) Land Consolidation | 8 No. |
| (5) Joint Water Committee | 2 No. |
| (6) Special Measures Law | 3 No. |
| (7) Also Advisory Committee meetings with the Director or his representative where applications for borehole drilling and use of water are examined | 6 No. |

6 No.
33 No.

8.2 Paphos Regional Office

8.2.1 General

By the end of the year the staff of the Paphos Regional Office was composed of the District Engineer, Mr. A. Lambrou, Head of the Paphos Regional Office, one Executive Engineer class II, Mr. Kyriakos Spanos, Head of the Irrigation Branch of the Office, three monthly paid Technical Assistants, seven daily paid Technical Assistants, two hourly paid employees, one daily female Typist and one hourly female draughtsman.

The above Personnel was divided in two groups, the first one was occupied with the Hydrology branch and the second with the construction works and investigations. Interruption in the work has occurred during July and August due to the abnormal situation caused by the Turkish invasion.

8.2.2 Hydrological Investigations and Research

The staff of the Hydrology branch was engaged on the collection of hydrological and hydrogeological data as follows:

8.2.2.1 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 or monthly visits for observations, measurements and maintenance.

- (i) 10 stream gauging stations equipped with automatic water level recorders.
- (ii) 1 rainfall observing station with automatic rain gauge recorder.

8.2.2.2 Surface Water Hydrology

Weekly and monthly visits were made during the year to the stream gauging stations equipped with automatic water level recorders for observation and for calibration purposes by the use of current meters. A total number of 547 current meter measurements were taken on rivers during the year for calibration and run off purposes. Also samples of stream water for chemical and suspended sediment analysis were taken regularly.

8.2.2.3 Ground Water Hydrology

Ground water conditions in South Western Paphos and Polis Khrysokhou areas, were observed with the help of 218 wells/boreholes. The distance from established Branch Marks on top of every observation well/borehole to the ground water level was measured twice a year.

In March, before the irrigation period, and in November, after the irrigation period.

In addition monthly or more frequent measurements of the groundwater were taken from 105 observation wells/boreholes during the year for special studies.

Also 52 springs were under observation during the year and a total number of 518 spring discharges were gauged Volumetrically or by current meter.

8.2.2.4 Chemical Analyses

Samples of stream and ground water were taken and sent to the Government Laboratory for Chemical Analyses.

113 samples of ground water taken from observation wells/boreholes during March and November were analysed by the Paphos Regional office for Chloride content.

8.2.2.5 Suspended Sediment Analyses

A total number of 45 samples of stream water were taken at the permanent Gauging Stations and analysed by the Soil Laboratory for Suspended Sediment.

8.2.2.6 Questioning

The annual questioning was carried out on 3639 wells/boreholes and springs in South Western Paphos and Polis Khrysokhou areas during Summer for the determination of the ground water extracted, the area irrigated, and kind of crops planted.

8.2.2.7 Well sinking permits

A total number of 516 applications for well sinking permits were investigated and reports submitted to the District Officer Paphos.

8.2.2.8 Encroachments on Government Land and Quarries

58 applications regarding encroachments on Government Land were investigated and reports submitted to the Director of the Department.

8.2.2.9 Court Cases

A total number of 27 illegal sinking or deepening of wells were presented in front of court according to our request to the District Officer.

8.2.2.10 Water Meters

27 water meters installed on the Dhiarizos Lower catchment were observed once a month, and a total number of 297 readings were taken and recorded in the ledgers of this Office.

8.2.3 Construction and Investigation Branch

The staff of the above branch was engaged on the following works:

8.2.3.1 Investigations

15 applications and complaints regarding small water supply and irrigation problems were investigated and reports submitted to the District Officer Paphos.

Also several 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.

8.2.3.2 Small Projects Investigations

Several 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 bill of quantities with the estimated costs were submitted to the Nicosia small Projects Division.

8.2.3.3 Plotting and Levelling

39 new wells were plotted on the L.R.O. plans of this office, 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	" " "

8.2.3.4 Operation and Maintenance of Paphos Dams

The operation and maintenance of Paphos Dams were carried out properly 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.

8.2.3.5 Construction Works

The Construction of works was undertaken by this office in this year and the following schemes were completed in 1974.

- (1) Argaka Magounda Dam Distribution System
- (2) Panayia W.S. scheme
- (3) Armou " "
- (4) Tsada " "
- (5) Mamonia " "
- (6) Polis - Prodromi W. S. Scheme
- (7) Stroumbi-Polemi " " phase A
- (8) Marathounda " "
- (9) Simou " "
- (10) Dhroushia " "
- (11) Inia " "
- (12) Kili " "
- (13) Akhelia " " phase A
- (14) Paphos Airport " "

The Completion of the following schemes is expected early in 1975.

- (1) Ayia Marina Dam Distribution System
- (2) Goudhi - Skoulli Irrigation Scheme
- (3) Peristerona (Khr.) " "
- (4) Peyia " "
- (5) Mamonia " "
- (6) Mavrokolymbos Dam Distribution System Stage II
- (7) Arminou Regional W.S. Scheme phase A
- (8) Kallepia-Letymbou W.S. Scheme

8.3 Morphou Regional Office

8.3.1 General

The staff of the Morphou Regional Office was composed of the District Engineer, Mr. Markos Dimiotis, Head of the Regional Office, one Inspector of Works, Mr. Andreas Nicolaidis, one monthly paid Technical Assistant, six daily paid Technical Assistants, two regular employees and one female Typist.

The above personnel was engaged on the collection of hydrological and hydrogeological data as well as for the maintenance and operation of the dams in Morphou Region till the occupation of the Morphou area by the Turkish troops on 14th August, 1974.

8.3.2 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 or monthly visits for observations, measurements and maintenance.

- (i) 23 stream gauging stations equipped with automatic water level recorders.
- (ii) 2 rainfall observing stations.

8.3.3 Surface Water Hydrology

Weekly and monthly visits were made during the year to the stream gauging stations equipped with automatic water level recorders for observations and for calibration purpose by the use of current meters. Also samples of stream water for chemical and suspended sediment analysis were taken regularly.

Data taken from rainfall observing stations at the end of every month were sent to Meteorological Office.

8.3.4 Ground Water Hydrology

Ground water conditions in the Western Mesaoria were observed with the help of 300 well/boreholes. The distance from established Bench Mark on top of the observation wells/boreholes to the ground water level was measured twice a year, in March before the irrigation period and in November after the irrigation period.

In addition to the above observations, monthly measurements of the ground water level as well as sampling of water for chemical analysis were taken from 200 wells/boreholes for special studies.

Most of the springs in the area were measured on a routine basis as small number was gauged for a short period after the request of another Departmental Division. During the year, 360 spring discharges were gauged. 32 springs were gauged once a month, 75 springs twice a year.

8.3.5 Questioning

The routine questionnaire was not carried out for the period under review due to the occupation of the Morphou area by the Turkish troops.

8.3.6 Chemical Analyses

Samples of water were taken at various frequencies in Morphou Regional Area. For the first six months of 1974 a number of 620 samples of water were taken from wells/boreholes, springs, rivers and streams at weekly, monthly and annual intervals and submitted to the Government Analyst for Ionic and Boron Analysis.

In addition, 220 samples of ground water taken from observation wells/boreholes during March were analysed by the Morphou Regional Office for chloride content.

8.3.7 Bacteriological Analysis

30 samples of water were taken mainly from boreholes used for water supply of Nicosia and sent to the Pathological Laboratory for analysis.

8.3.8 Suspended Sediment Analysis

8 samples of stream water were taken at the permanent gauging stations and analyzed by the soil Laboratory for suspended sediments.

8.3.9 Application Concerning Well Sinking and Special Measures Laws

A total number of 500 applications concerning wells sinking and Special Measures Law were investigated and reports were submitted to the District Officer Nicosia.

8.3.10 Plotting and Levelling of New Boreholes

A total number of 40 new legal and illegal boreholes were plotted on map and necessary details entered into appropriate registers. Bench marks were established on top of 20 boreholes.

8.3.11 Water Meters

During the first six months 8 water meters were installed on an equal number of boreholes in Morphou area raising the total number to 630.

8.4 Famagusta - Larnaca Regional Office

8.4.1 General

The Regional Office had its seat in Famagusta, dealing with all problems of the Department in the Famagusta District and in a region of the Larnaca District.

After the Turkish invasion on the 20th of July, 1974 the building in which the office was situated was bombed and was totally destroyed. All maps and records of the office were destroyed and, therefore, I am not able to give the activities of the office in exact accuracy.

During the cease fire and as from July 29th 1974, our office was transferred to the GOLDEN SANDS HOTEL Famagusta, where we started again reorganizing the Regional Office.

After the second attack of the Turkish troops on August 14th, 1974 we left Famagusta, and on the 4th of September 1974, we established our office in Larnaca. During the period as from the 14th August, 1974, upto the date of establishment of the office the staff of the office was engaged in the Civil Defence dealing with problems relative to this Department.

The activities of the Regional Office are now covering the whole Larnaca District and the free areas of Famagusta District.

By the end of the year the staff of the Regional Office was composed of one Executive Engineer I, Mr. C. Andreou, Head of the Office, one Senior Inspector of Works (Mr. G. Constantinides) one Inspector of Works (Mr. G. Frangopoulou) two monthly paid Technical Assistants, one daily paid Technical Assistant, two daily paid technicians, two regular labourers and one daily paid secretary typist.

8.4.2 Activities of the Regional Office (Famagusta)

8.4.2.1 Hydrological Investigations

8.4.2.2 Stream Gauging and Rainfall Observing Stations

During the existence of the office in Famagusta the following permanent stream gauging and observing stations were in operation, and weekly or monthly visits were made for observation and maintenance purposes.

- (i) Five stream gauging stations equipped with automatic water level recorders (Paralimni: ourfall of lake, Liopetri, Kolopannes, Kharangas, and Melini).
- (ii) Two rainfall observing stations (Phrenaros and Rizokarpaso)

The above data taken from the rainfall observing stations were sent at the end of every month to the Meteorological Office.

8.4.2.3 Surface Water Hydrology

Monthly visits were made during the year to the stream gauging stations equipped with automatic water level recorders for observation and calibration purposes by the use of current meter. Also samples of stream water for chemical analysis were taken regularly.

8.4.2.4 Ground Water Hydrology

The ground water conditions in the Eastern Mesaoria were observed with the help of 480 boreholes/wells.

The water levels (i.e. the distance from established bench marks on top of the observation wells/boreholes to the ground water) were taken only in March, before the irrigation period.

In addition, monthly measurements of the ground water level as well as sampling of water for chemical analysis were taken in the Government observation boreholes.

Also the yield of ten springs was measured once per month.

8.4.2.5 Chemical Analysis

A total number of 300 samples were taken from boreholes/wells, springs and streams and sent to the Government Laboratory for chemical analysis.

Also a certain number of samples taken from boreholes/wells during March were analysed in the Regional Office Famagusta.

Samples taken during December were analysed in the Regional Office Larnaca.

6.4.2.6 Bacteriological Analysis

120 samples of ground water were taken from boreholes/wells and used for the water supply of Famagusta and Lapathos area, were sent to the Pathological Laboratory for analysis.

8.4.2.7 Questioning

The annual questionnaire was started in June 1974, but as I mentioned above, this could not be completed, and the records collected were destroyed.

8.4.2.8 Well Sinking Permits

A total number of 618 applications for sinking and covering permits of wells/boreholes in the conservation area as well as 50 applications in the non-conservation areas were examined and submitted to the District Officers of Famagusta and Larnaca.

These permits were examined by the Advisory Committee of the Ministry of Agriculture and Natural Resources.

The applications examined per District are as follows:

	Conservation Areas		Non Conservation Areas	
	Approved	Not Approved	Approved	Not Approved
Famagusta	136	338	27	3
Larnaca	32	52	20	
Total	228	390	47	3

8.4.2.9 Plotting of New Boreholes

Due to the fact that our offices in Famagusta were destroyed I am not able to give the number of boreholes plotted in the Region up to the end of July 1974.

In the Kiti - Meneou conservation area were plotted 169 boreholes/wells and in Liopetri 332.

8.4.2.10 Water meters

The water meters which were in the office were destroyed due to the fire caused from the bombing of the building. These were moved to the Water Board Famagusta for safety purposes and after leaving Famagusta these remained there.

8.4.3 Activities of the Regional Office (Larnaca)

After the establishment of the office in Larnaca we undertook all the works of the Department in the Larnaca District and the free areas of Famagusta District.

8.4.3.1 Hydrological Investigations

8.4.3.2 Groundwater Hydrology

The ground water levels in this Region were taken late in November.

8.4.3.3 Borehole Permits

A total number of 51 applications for sinking and covering permits of wells/boreholes were examined and submitted to the District Officers of Larnaca and Famagusta.

8.4.3.4 Plotting of Boreholes

As I mentioned above, all maps and records were destroyed and, therefore, we started plotting of the boreholes in the whole area, by giving new hydrological numbers.

Up to the end of the year there were plotted 169 boreholes/wells in the Kiti, Meneou Area and 332 in Liopetri.

8.4.4 Construction Works

After the establishment of the office in Larnaca, we undertook the construction of various irrigation and water supply projects.

8.4.4.1 Irrigation Projects

(a) Oroklini Irrigation Division Loures

The construction of this project began before the war. We undertook the supervision of this project on the 10th of September 1974. The work was completed by the end of October 1974. (There is still pending the installation of the pumping unit.)

There were laid 1029 metres of Asbestos-cement pipes 100 mm diameter and a balancing tank of 45 m³ was constructed.

(b) Kalavasos Irrigation Division (Syrmata-Kopetra)

This project commenced on the 3rd October 1974 and up to the end of the year there were laid 3470 m of asbestos cement pipes, 150 mm diameter and 480 meters of asbestos cement pipes 100 mm diameter, and a balancing tank of 13 m³ was constructed.

8.4.4.2 Water Supplies

(a) Ay. Vavatsinias

This project commenced on the 7th October 1974. Up to the end of the year 3732 meters of galvanized iron pipes 50 mm diameter were laid.

(b) Refugee Camps

Due to the invasion of Turkey a big number of people took refuge in the Larnaca District, and the Public Works Department asked our office to undertake the water supply of the refugee camps under construction.

Up to the end of the year the following lengths of pipes were laid in the various refugee camps:

Galvanized iron pipes	100 mm dia.	1698 m
" " "	38 mm dia.	810 m
" " "	25 mm dia.	540 m
" " "	19 mm dia.	50 m
" " "	13 mm dia.	48 m

Besides the above minor repairs and maintenance of various village water supply systems were carried out during the year.

8.4.4.3 Investigations and Designs

During the year there were submitted by the District Officers of Larnaca and Famagusta various applications for the investigation and design of irrigation and water supply schemes.

There was designed a new scheme for the supplementary water supply of Ayia Napa and submitted for approval.

There were also prepared three schemes for irrigation purposes at Ayios Theodoros Larnaca. These schemes will be submitted for approval in the coming year.

8.5 Kyrenia Regional Office

8.5.1 General

Up to the date of the Turkish invasion on 20th July, 1974, the staff of the Kyrenia Regional Office was composed of one Chief Foreman (Mr. Errikos Ioannou), Head of the Office, one monthly paid Technical Assistant, and two hourly paid Technical Assistants.

The above personnel was engaged on the collection of hydrological and hydrogeological data, as well as, for the investigation and design of minor Water Supply and Irrigation Schemes.

8.5.2 Stream Gauging, Rainfall and Kyrenia Limestone aquifer were observed by personnel from Head Quarters.

8.5.3 Ground Water Hydrology

Ground water conditions in the whole hydrological area of Kyrenia District including Ay. Erini, Kormakitis, Myrtou and Ay. Amvrosios-Kalogrea areas were observed with the help of 220 observation wells and boreholes. The distance from established bench mark on top of the observation well and borehole to the ground water levels was measured only once instead of twice a year. This was done in March, just before the irrigation period. The next measurement was due to be done after the irrigation period.

Also 110 spring discharges were gauged twice a year and 30 springs once a month.

8.5.4 Questioning

The routine questioning is usually carried out during the summer months. This work has not been carried out due to the Turkish invasion.

8.5.5 Bacteriological Analysis

Two samples were taken monthly from the Kyrenia Town Water Supply Distribution System and were sent to the Pathological Laboratory for analysis.

8.5.6 Well Sinking Permits

Up to the 24th of May 1974, 226 applications for the sinking of wells and boreholes were investigated and reports were submitted to the District Officer Kyrenia through the Departmental Committee.

Another 80 applications have been investigated. All these applications have been left in the office. From the total of 306 applications for sinking and covering permits of wells/boreholes 260 applications were in the water conservation areas and 46 in the non-conservation area.

8.5.7 Plotting and levelling of new wells/boreholes

27 new wells and boreholes legal and illegal were plotted on map and necessary details entered into the appropriate register.

8.5.8 Minor Irrigation and Water Supply Schemes

One irrigation scheme for Karavas was designed and submitted to the head office at Nicosia.

Also a pumping scheme for the Turkish village of Trapeza was designed.