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REPUBLIC OF CYPRUS

MINISTRY OF AGRICULTURE AND NATURAL RESOURCES

A N N U A L R E P O R T

OF THE

DEPARTMENT OF WATER DEVELOPMENT

FOR THE YEAR

1969

By

C. A C. KONTEATIS
Director
of the Department of Water Development

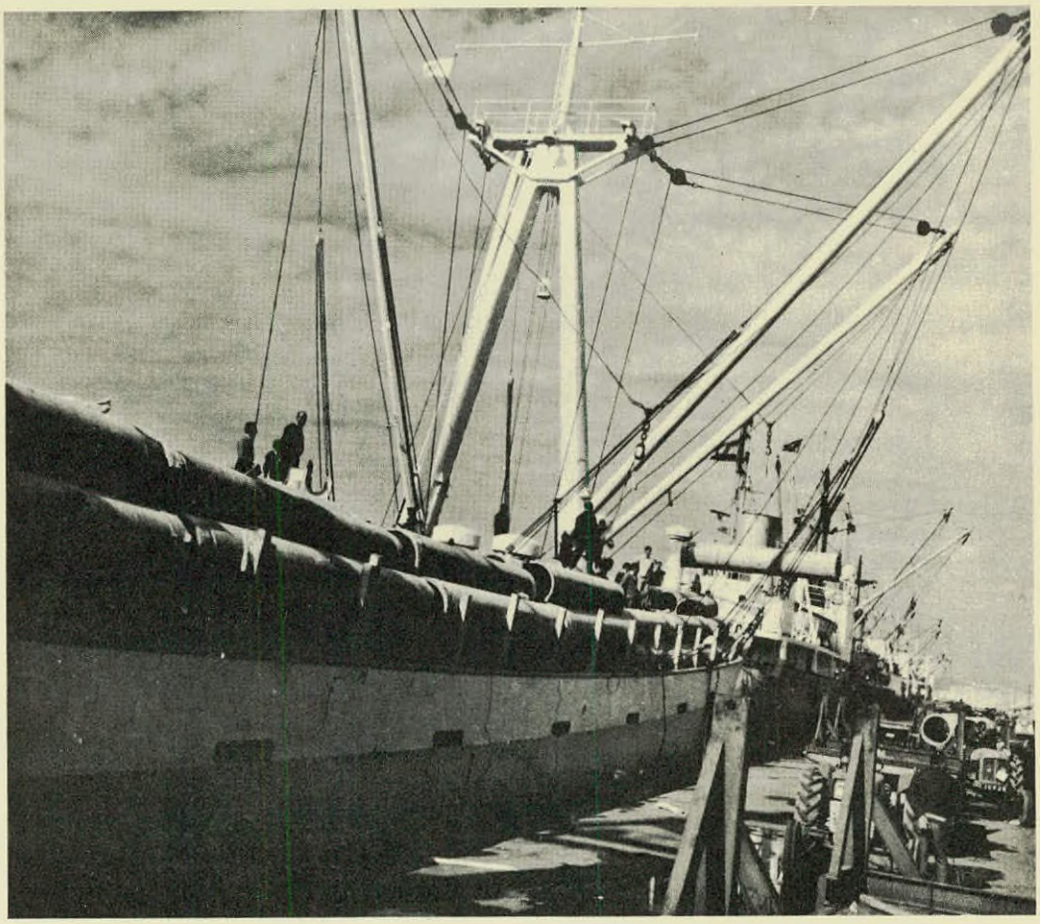
CONVERSION TABLE

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 cubic meter per second	=	35.315 cubic feet per second
One Liter	=	0.224 gallon

TABLE OF CONTENTS

Page

Page



Famagusta Water Supply Project
Unloading of Asbestos Cement pipes to be used for the main conveyor from Vasilikos Area to Famagusta.

Famagusta Water Supply Project
Inauguration of the Khirokitia Phrenaros pipeline by the Minister of Agriculture and Natural Resources Mr. G. Tombazos on the 30th December 1969.

I. GENERAL

1.1 Introduction

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 including all engineering hydrological and geological aspects of all types of water development projects 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. Soil Conservation and agricultural problems involved in the economic use of water are responsibilities of the Department of Agriculture. The Government institutional set up for water resources conservation and development and the role of the Department of Water Development is shown on page 10. This institutional set up and the water legislation are being reviewed through the studies of the United Nations Special Fund Project (CWPP), and it is hoped that a report will be submitted in 1970. A basis for this study will be the already submitted report by FAO on Cyprus Water Legislation dated October 1962.

1.2 Departmental Organization

The Departmental organization is shown on page 11 and is made up of :-

1.2.1 Division of Water Resources

This Division groups together all services required for the collection of hydrological and hydrogeological data whether groundwater or surface water, drilling works, control of groundwater extraction and engineering geology problems as connected with the planning and execution of water work 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, as connected with foundations.

1.2.3 Division of Design

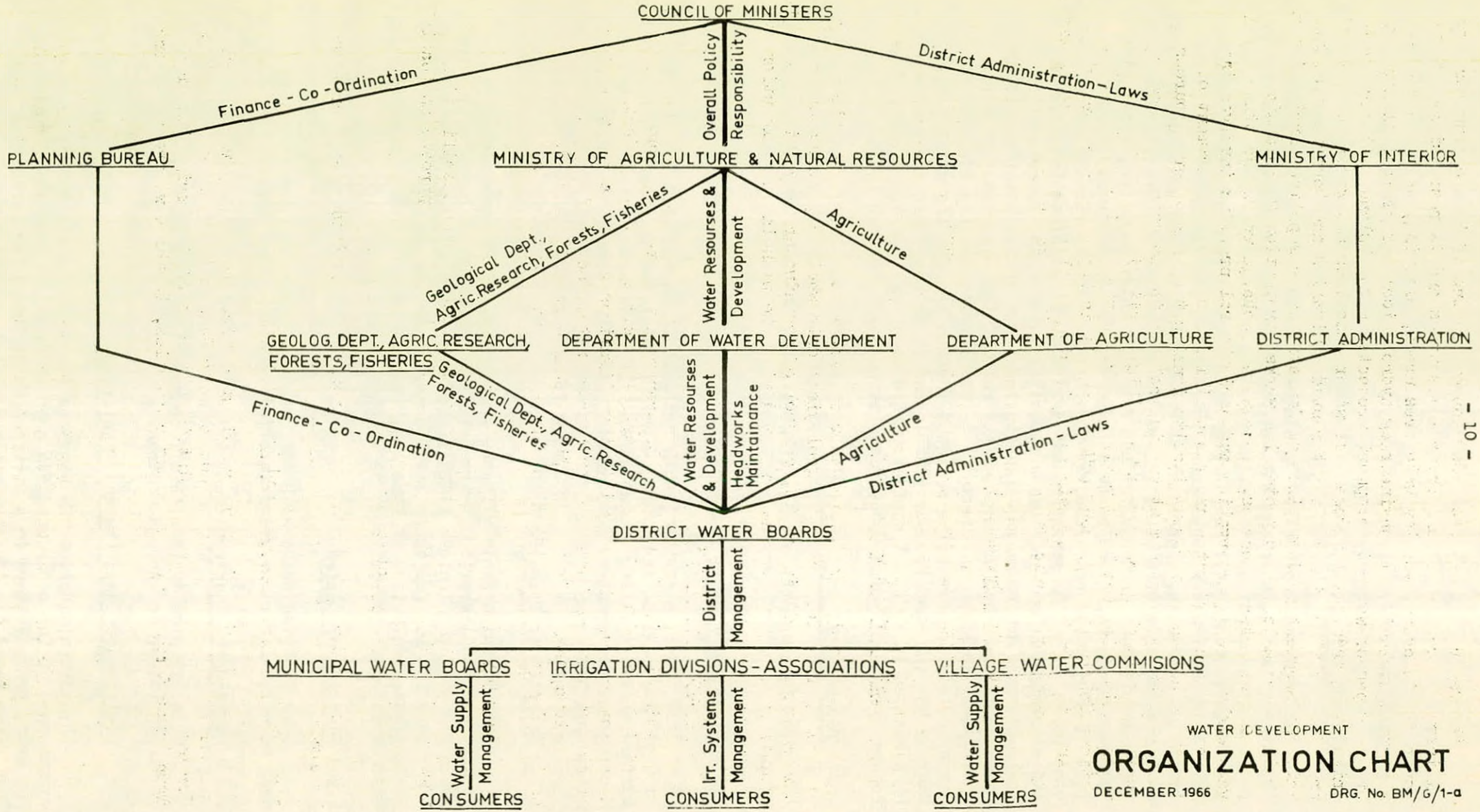
This Division deals with the detailed design and specification work required for major projects after they have been approved as feasible.

1.2.4 Division of Construction

This Division deals with all construction work whether carried out by direct labour or through contract.

1.2.5 Division of Operation and Maintenance

This division gives the services required for the operation and maintenance of the major projects such as dams and town water supplies. For every project there is a District Water Board for Irrigation or a Town Water Board for domestic water supplies, to which we are a member.

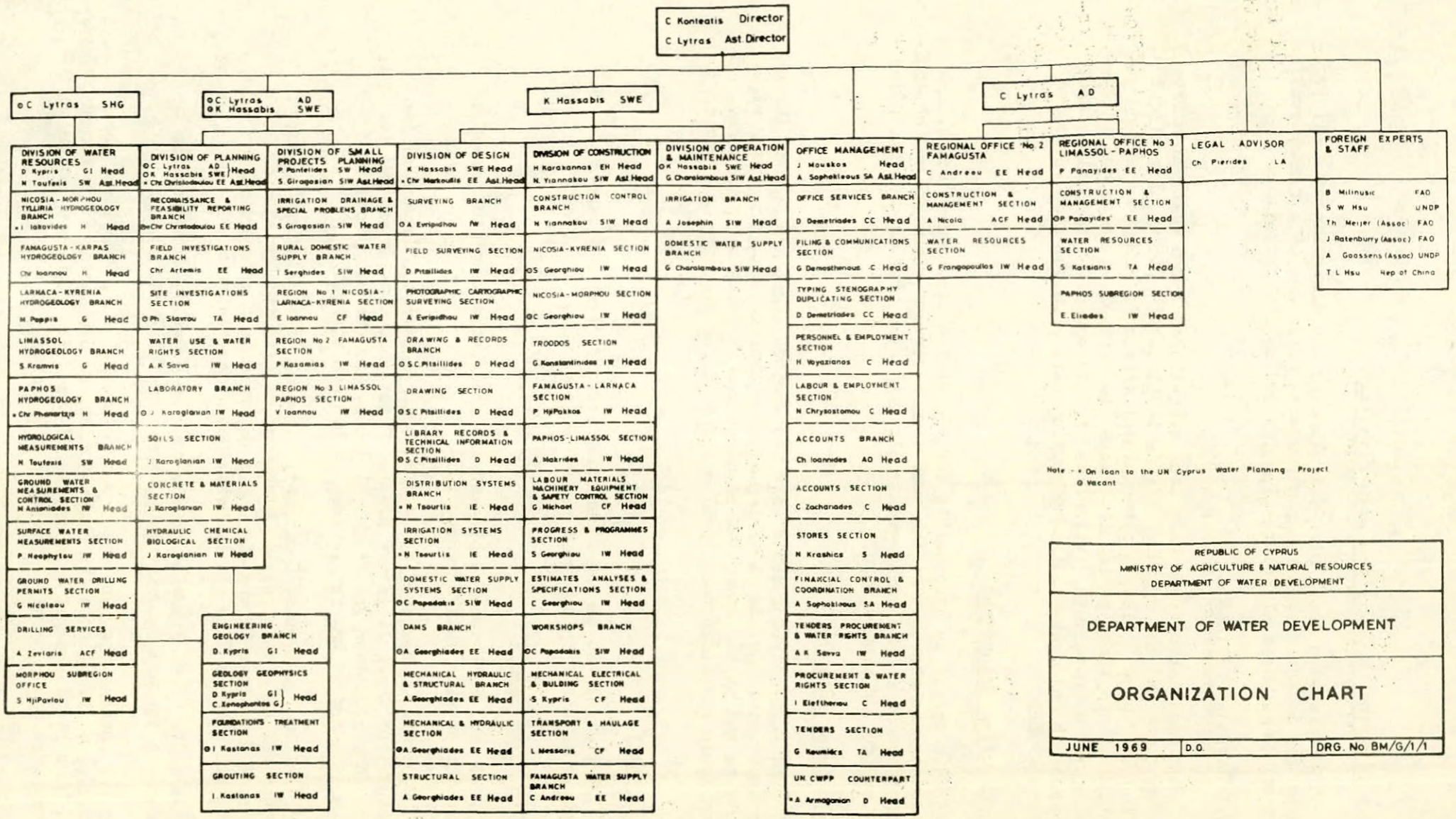


WATER DEVELOPMENT

ORGANIZATION CHART

DECEMBER 1966

DRG. No. BM/G/1-a



Note - * On loan to the UN Cyprus Water Planning Project
⊙ Vacant

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

DEPARTMENT OF WATER DEVELOPMENT

ORGANIZATION CHART

JUNE 1969	D.O.	DRG. No BM/G/1/1

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

Two regional offices have been established : one regional office in Famagusta and one regional office in Limassol with a sub-regional office in Paphos. Also, a sub-regional office in Morphou has been established. In these regional offices the mainwork carried out is hydrological measurements, collection of data,operation and maintenance of projects and control of construction work from the administrative point of view.

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 deals with the various legal problems of the Department which include water legislation,contractors , and water right problems and at the same time prepares new legislation as required. He also deals with important legal matters of the Ministry as a whole.

1.3 Staff

A list of the Senior Technical Staff is given on page 30. The numbers of staff by post are given on page 32.

1.3.1 Appointments

1.3.1.1 Mr. C. Lytras, Geologist 1st Grade, was appointed Assistant Director as from 1st February, 1969.

1.3.1.2 The contract of Mr. J. Mouscos, ex-Director-General of the Ministry of Agriculture and Natural Resources, who was engaged for Special Administrative and Financial duties for one year, expired on 15.9.1969 and it was not renewed at his own request.

1.3.1.3 Mr. D. Kypris, Geologist, attached to the Geological Survey Department as a counterpart in connection with the GroundWater and Mineral Resources Survey Projects, returned to the Department in July and took over as Head of the Water Resources Division.

1.3.1.4 Mr. S.C. Kramvis who was appointed Geologist in May was seconded to the Geological Survey Department as from June.

1.3.1.5 During the year under review Messrs. P.G. Panayides, Chr. Artemis, C. Nicolaides, Vl. Partassides, N. Stylianou, N. Demetriou and Miss St. HjiPavlou were appointed Executive Engineers and Mr. D. Patsalides was appointed Topographer Engineer.

1.3.1.6 Mr. S. Theodosiou was appointed MechanicalEngineer during the same year and took over charge of the Workshop of the Department.

1.3.2 Resignations, termination of engagement and transfers

The following staff resigned from the Department during the year.

1.3.2.1 Mr. N. Ioannides, Senior Water Engineer, gave his resignation for personal reasons and went to Denver Colorado, U.S.A. where he settled. Mr. Ioannides worked with us usefully for about nine years and he had specialized in Engineering Geological problems. He was the Head of the Division of Planning and his departure left a vacancy.

1.3.2.2 Miss St. HjiPavlou Ex-Engineer to take private consulting work in Nicosia.

1.3.2.3 Mr. A. Georghiou Ex-Engineer to take up work in the U.K.

1.3.2.4 Mr. A. Tymvios Ex-Engineer to take up work with Joannou and Paraskevaides Contractors in Libya.

1.3.2.5 Mr. A. Bayada Ex-Engineer to take up private work in Nicosia.

1.3.2.6 Mr. P. Panayides was transferred to Limassol and took over charge of the Limassol Regional Office in June.

1.3.2.7 Mr. Tieh Liang Hsu, Expert Engineer Geologist under bilateral agreement with the Republic of China since September 1967, left Cyprus, his contract having expired in September, 1969.

1.3.2.8 Mr. Theodor Meyer, United Nations Associate Expert Engineer, left in November 1969 at the expiration of his contract

1.3.3 Scholarships - Fellowships

1.3.3.1 Mr. A.P. Georghiades, Executive Engineer who was granted a 12 months scholarship by the British Government to attend a M.Sc. Course in Materials and Construction Management at Birmingham University left Cyprus in September1969 .

1.3.3.2 Mr. P. Makkoulas, Technical Assistant left Cyprus for the United Kingdom in August 1969 having been granted a 9 months scholarship under the British Government's Technical Assistance Programme in Soil Testing, to be carried out in the Laboratories of the Contractor George Wimpey & Co.

1.3.3.3 Mr. P. Alexandrou, Technical Assistant, has been offered a 6 months fellowship by the United Nations Food and Agriculture Organization in Hydrometeorology tenable in Israel and left Cyprus in December.

1.3.4 Participation to Conferences and Seminars - Visits abroad

1.3.4.1 Mr. C. Konteatis, Director, participated in the 37th Executive Council Meeting of the International Commission on Large Dams which was held in Warsaw Poland between the 8th and 10th of September 1969 and during which Cyprus was elected as a Member of this Organization.

1.3.4.2 Mr. K. Hassabis, Senior Engineer, participated in the Inter Regional Seminar on Flood Damage Prevention Measures and Management held in Tbilisi, Georgia Russia, between the 25th September and 18th October 1969.

1.3.4.3 Mr. Konteatis and Mr. Karakannas, Engineer Hydrologist, visited the Italit Asbestos cement pressure pipe factory in Naples between the 15th and the 18th May to inspect the manufacturing and supply procedures for the Famagusta Water Supply scheme.

1.3.4.4. Mr. Hassabis, Senior Engineer and Mr. Andreou, Executive Engineer, visited the Dalmajia Asbestos Cement pressure pipe factory in Split Yogoslavia between the 23rd and the 28th June in connection with the Famagusta Water Supply pipes, manufacturing and supply.

1.3.4.5 Mr. Hassabis visited the Italit Asbestos Cement pressure pipe factories in Naples and Genova between the 29th June and the 3rd of July in connection with the Famagusta Water Supply pipes manufacturing and supply.

1.4 Foreign Experts and Technical Assistance

1.4.1 Foreign Staff

1.4.1.1 Mr. B. Millinusic FAO Senior Irrigation Engineer continued his useful work with us through the year. He helped in major construction work such as the Famagusta Water Supply Scheme. Furthermore he spent a lot of his time in planning work in connection with the studies of the CWPP, being given special duties for this work from FAO Rome.

1.4.1.2 Mr. S. Hsu UNDP Dams Expert continued his services with us throughout the year being mainly occupied with Dam Design work such as, the Lefkara Dam for Famagusta Water Supply, the Massari and Palechori proposed Dams and dams maintenance works.

1.4.1.3 Mr. A.H. Goossens from Belgium Associate Expert UNDP worked with us doing mainly investigation works for major projects.

1.4.1.4 Mr. Rattenbury from the U.K. Associate Expert UNDP worked with us on the Famagusta Water Supply construction works.

1.4.2 Technical Assistance

The following technical assistance from abroad continued throughout the year as follows:-

1.4.2.1 United Nations Special Fund Project for Groundwater and Mineral Resources (GWMRP)

This Project which started in December 1962 has been completed during 1969, that is to say after 7 years of work. According to the communique issued on 21st November 1962, "the main purpose of this survey was to assess the mineral reserves and groundwater resources in different areas, by means of geological and geophysical exploration while strengthening the Geological Survey Department, and the drilling section of the W.D.D. through the training of local staff in the use of modern investigation techniques".

The groundwater investigation would have covered selected zones covering 1250 sq. miles extending mainly over the eastern and more populated part of the Island where the water supply was difficult.

The main hydrogeological work was sub-contracted to TAHAL consulting engineers of Israel, who submitted their final report in April 1969. Together with the final report, 13 other reports were prepared by TAHAL for 13 different aquifers of the Island. It has been estimated by TAHAL that the average annual water crop of Cyprus is about 1300 mil.cu.m. of which about 350 are groundwater and 950 are surface water. It is stated, however that the question of the amount that could ultimately be made available for use is subject to physical, technical and economical constraints. These quantities are far in excess of what we think could be possibly exploited

at present. It is also estimated that 30% of the total groundwater replenishment goes to recharge the 3 main aquifers, that of western Mesaoria that of south eastern Mesaoria and that of the Akrotiri peninsula, all of which are over exploited. In the report recommendations are given for additional prospecting for groundwater, for the utilization of surface flows through the construction of dams, for model studies to be made of groundwater management schemes, for the application of isotope methods in determining the parameters of the groundwater flow, systematic data collection and record keeping.

1.4.2.2 Water Resources and Utilization Special Fund Project (CWPP)

This Project which was scheduled to be completed by December 1969 has been extended due to many unforeseen difficulties which cropped up for completion in 1970. Work has been continued on all fields such as hydrology, agriculture, engineering and economics. During the year the services of a Project Manager and Deputy Project Manager, a senior engineer, senior hydrologist, an assistant hydrologist, an irrigation expert, an agricultural economist an economist and two associate experts were provided by FAO. At the same time the Government contributed at least one counterpart for each of the experts as well as a big number of technical and clerical staff and other services. The sub-contractor for the Paphos Feasibility Study, T. Ingledow of Canada continued their work through the year. Many damsites in Paphos have been studied and all the site investigations and laboratory tests were carried out by the Department's equipment and staff. A lot of work was done using computers. The new computer centre C.C. Ltd., has been proved to be more suitable for our work than that of the Bank of Cyprus. Furthermore, two electronic calculating machines were sent to us from FAO for expediting calculation works. Various special consultants came from FAO during the year for supervising the work in the fields of engineering, geology, farm management, land tenure, hydrology and computer studies. Furthermore, a FAO/IBRD mission came to Cyprus to assess the progress of the Paphos Feasibility Study.

In the course of the year a request was drawn up to the UNDP for Feasibility Studies in the 2 regions, the Morphou/Tylliria and the Limassol/Akrotiri. This report which was prepared in May 1969 and was sent to the UNDP for approval, was drawn up in accordance with the requirements of the CWPP for indicating the important areas for Feasibility Studies to be undertaken, similar to that of the Paphos Feasibility.

In the case of the Morphou/Tylliria Project this will include the study for the water utilization in the local catchments involved and the conveyance of the surplus water towards the Morphou plains, in order to satisfy the deficiency from pumpage and for future extensions in irrigation and the domestic water supply of Nicosia.

In the case of the Limassol/Akrotiri proposed project this involves the study for the utilization of the water resources of the Kouris river, the inter-connection of the proposed Kouris dam with the existing Polemidhia dam distribution systems and the integration with the grounwater resources of the region for the irrigation of the Akrotiri peninsula. Such studies will also reveal the possibility for any surplus of water from this region to be diverted towards Famagusta. Such surplus may be due to land, labour and farmer's interest constraints. Later on in the year it was considered with the consent of the UNDP and the Ministry of Overseas Development that we could more readily get assistance for the Limassol/Akrotiri project under the British Technical Assistance scheme and a request was made to the British High Commissioner.

1.4.2.3. British Technical Assistance

Assistance was given by the Ministry of Overseas Development for 4 main projects.

1.4.2.3.1 Famagusta water supply, Hydrological and drilling explorations

For this study the consultant geologist Dr. Dixey paid two visits in connection with the hydrological and drilling explorations in the Vasilikos, Psematismenos and Khirokitia aquifers. Dr. Dixey submitted his final report on the investigations in July 1969. During the investigations 14 production boreholes were drilled. The main supplies for yielding good quality water for domestic purposes have been obtained from the Pakhna sandstone aquifer and from the Vasilikos river alluvial aquifers. The Pakhna sandstone which is mostly exposed in a narrow zone along the Maroni river bed near Khirokitia has an area of about 10 sq. km and has been estimated that the aquifer is recharged by approximately 3 million cu.m. per year for the year 1967-69, and has a storage of 20 million cu.m. The quality of the water from this sandstone is quite satisfactory with chlorine and sulphate contents of 100-110 p.p.m. and 165 - 290 p.p.m. respectively.

The Vasilikos alluvial aquifer is estimated to have an annual recharge of about ½ million cu.m. and a storage of about 1 million cu.m. The investigations covered also the gypsum aquifers of the Pakhna Formation and the chalks of the Lapithos Formation. However, the former yields hard water and the latter contains quantities of salts which are unacceptable for drinking purposes.

1.4.2.3.2 Famagusta Water Supply Engineering Works

Throughout the year we received advice from time to time from Howard Humphreys of the U.K. in connection with the engineering works for Famagusta, such as for the pumping installations the main coveyor pipeline, storage reservoirs investigations on the proposed dams and for the water treatment plant. The main advice of the firm was their final outline of the report on the Famagusta Water Supply, Lefkara dam dated December 1969. This involves a major rockfill dam which will be of the order of 60 metres high above riverbed of 800 000 cu.m fill, and would have a storage capacity of about 17 mill.cu.m. which under multi-annual operation will be capable of maintaining a supply to Famagusta of 5.2. mill.cu.m. of water annually. This dam when built will be the largest in Cyprus both in capacity, volume of fill and in height.

1.4.2.3.3 Sandeman-Kennard and Partners inspection and reporting on the special problems of some of our dams

A visit was paid in May 1969 by professor N.R. Morgenstern and Mr. M.F. Kennard, for inspection of the problems on the Yermasoyia, Polemidhia, Mavrokolymbos and Kalopanayiotis dams. The inspection on Yermasoyia revealed a satisfactory completion of both the chemicals grouted alluvial river bed and the grouting of the sandstone abutments on either side. Regarding the Polemidhia dam a decision was taken to go ahead with the extension of the grout curtain as completed by Soil Mechanics Ltd., under the main Mowlem and Ridgeways contract. The extension decided started in 1969 under direct control and supervision of the Department. The observation of Mavrokolymbos dam regarding the movement of the clay and superficial deposits in the reservoir area was done through the numerous piezometers previously established. It was obvious that during the year movements of all the slip masses have been generated, but these movements are generally selfstabilising and do not constitute a threat to the capacity of the reservoir. It was considered that no further remedial measures were necessary at present, but that it was necessary to continue

the observations on the piezometric levels and on the horizontal and vertical displacements of the markers. Regarding the big crack which appeared above the Kalopanayiotis dam reservoir it was concluded that in order to maintain the stability of the hillside the dam should be empty during winter time so that the hill side could freely drain during the rainy season. The surface drainage to divert as much as possible of the runoff reaching the affected hillside has been completed. The observation for displacement of the hillside and the dam are being continued.

1.4.2.3.4 Kyrenia limestone, Hydrological Studies and Drilling Explorations

During the year we started a new project with the help of Dr. Dixey in respect of hydrogeological and drilling works on the Kyrenia limestone. This region has in the past been studied by a German hydrogeological team and by the Ground Water and Mineral Resources Project. However, due to the importance of this aquifer it was decided to go ahead with supplementing those studies and drilling production boreholes for specific domestic water supply schemes in this region. 5 drilling rigs have been provided for this project in order to expedite the work. Some of these boreholes would reach a depth of 1000 ft and the water may be struck as deep as 600 ft from the ground level taking up to 6 months for completion and could cost up to £4 000 each. A big number of boreholes is envisaged starting from Vasilia in the west, to Kantara on the east and the whole project may be of a duration of 2 - 3 years.

1.4.2.4 Water Use Project for Morphou and Akrotiri

In 1969 an IBRD team came to Cyprus to discuss with us the possibility of IBRD financing for the establishment of Irrigation Divisions, the application of efficient distribution systems in Morphou, and for the distribution of the Yermasoyia dam as well as for efficient irrigation systems to be applied in the Akrotiri peninsula. During these discussions the basis was laid for the preparation by the Government of a Feasibility Study for these two Projects to be submitted in 1970 to IBRD for financing purposes.

1.5 Cyprus National Inter-Departmental/Departmental Committees

1.5.1 International Hydrological Decade :-

This committee which was established on 19th August, 1969, for U.N.E.S.C.O.'s Hydrological Decade (1965-1974) and which is made up of :-

Chairman	Mr. C.A.C. Konteatis Director Water Development Department
Secretary	Mr. N Chr. Toufexis Asst Head of Water Resources Division
Members	Mr. Y HjiStavrinou Director Geological Survey Department
	Mr. A. Papasolomondos Director Agricultural Department

Dr. Th. Christou
Director
Agricultural Research Institute.

Mr. A. Polykarpou
Director
Forest Department

Mr. Cl. Philaniotis
Asst Meteorologist
Meteorological Office.

met on the 4th July, 1969, in the Library of the Water Development Department and prepared the following Programme for the second part of the Decade 1970-1974:-

1.5.1.1 Use of electronic computers in analysing and processing of hydrological data. Purchase of a fluorometer for the measurement of discharge using the dye dilution method.

1.5.1.2 Establishment of a second network in the Vasilikos river basin to study both Surface Water and groundwater and the interactions between the two.

1.5.1.3 Research on hydrological systems.

1.5.1.4 Undertake research in two small neighbouring basins, one forested and the other bare, with similar geologic conditions on water yield and its distribution in time.

1.5.1.5 Research on specific Hydrological problems

1.5.1.6 Research on deep percolation of precipitation and irrigation water.

1.5.1.7 Sediment (Suspended and bed load) transportation by Streams especially during floods of exceptional magnitude and duration.

1.5.1.8 Artificial recharge

1.5.2 International Commission on Large Dams

The Cyprus National Committee on Large Dams was unanimously elected a member of the International Commission at the 37th Executive Council Meeting of the ICOLD held in Warsaw, Poland on September, 8th-10th 1969.

The National Committee was represented at the 37th Executive Council meeting by its Chairman, Mr. C.A.C. Konteatis and by Civil Engineer Mr. A. Papadopoulos of Limassol ex-Minister of Communications and Works.

The Committee is at present composed of the following members :-

Chairman	Mr. C.A.C. Konteatis Director of the Water Development Department
Secretary	Mr. C.C. Artemis Executive Engineer Division of Planning
Members	Mr. K. Hassabis Head of the Division of Design, Water Development Department.

International Commission on Large Dams
WORLD REGISTER OF DAMS
NATIONAL COMMITTEE OF . CYPRUS.....
Information on Dams supplied to National Committee
by
Director, Department of Water Development
Including Dams in Existence, under Construction or Proposed
1961

	(1) FILE NO.	(2) NAME OF DAM	(3) YEAR OF COMPLETION	(4) (5) LOCATION RIVER	NEAREST CITY	(6) STATE COUNTY OR EQUIVALENT	(7) TYPE	(8) (9) (10) HEIGHT ABOVE LOWEST FOUNDATION	FOUNDATION TO CUT-OFF	ABOVE GROUND LEVEL	(11) LENGTH OF CREST	(12) VOLUME CONTENT OF DAM	(13) CAPACITY OF RESERVOIR	(14) PURPOSE	(15) INSTALLED POWER CAPACITY	(16) OWNER	(17) ENGINEERING BY	(18) CONSTRUCTION BY	(19) REMARKS	
			-: Delete units which are not being used :-					FEET	FEET	FEET	FEET	CUBIC YARDS	CUBIC FEET x 10⁶		KW					
1		YERMASOYIA	1968	YERMASOYIA	LIMASSOL	LIMASSOL DISTRICT	E	162	51	110	965	650,000	480	I		GOVERNMENT	ENERGOPROJECT OF YUGOSLAVIA	CYBARCO OF CYPRUS		1
2		KALOPANAYIOTIS	1966	MARATHASA	NICOSIA	NICOSIA DISTRICT	E	129	44	85	450	200,000	14	I		GOVERNMENT	HOWARD HUMPHREYS & SONS OF U.K.	DEPARTMENT OF WATER DEVELOPMENT		2
3		MAVROKOLYMBOS	1966	MAVROKO-LYMBOS	KTIMA	PAPHOS DISTRICT	E	153		133	600	350,000	77	I		GOVERNMENT	ENERGOPROJECT OF YUGOSLAVIA	CYBARCO OF CYPRUS		3
4		POMOS	1966	LIVADHI	KTIMA	PAPHOS DISTRICT	E R	126		106	560	200,000	30	I		POMOS IRRIGATION DIVISION	ENERGOPROJECT OF YUGOSLAVIA	MEDITERRANEAN CONSTRUCTORS GREECE G.P ZACHARIADES CYPRUS		4
5		AYIA MARINA	1965	XEROS TYLLIRIAS	KTIMA	PAPHOS DISTRICT	R	108		100	380	80,000	11	I		AYIA MARINA IRRIGATION DIVISION	ENERGOPROJECT OF YUGOSLAVIA	MEDITERRANEAN CONSTRUCTORS GREECE G.P ZACHARIADES CYPRUS		5
6		POLEMIDHIA	1965	GARYLLIS	LIMASSOL	LIMASSOL DISTRICT	E	147		124	650	281,000	138	I		GOVERNMENT	ENERGOPROJECT OF YUGOSLAVIA	MOWLEM & RIDGWAY OF U.K.		6
7		AGROS	1964	KOURRIS	LIMASSOL	LIMASSOL DISTRICT	E	86		66	570	80,000	3.5	I		AGROS IRRIGATION DIVISION	DEPARTMENT OF WATER DEVELOPMENT	DEPARTMENT OF WATER DEVELOPMENT		7
8		ARGAKA	1964	MAGOUNDA	KTIMA	PAPHOS DISTRICT	R	135		100	560	180,000	40	I		GOVERNMENT	HOWARD HUMPHREYS & SONS OF U.K.	MOWLEM & RIDGWAY OF U.K.		8
9		LIOPETRI	1964	POTAMOS	FAMAGUSTA	FAMAGUSTA DISTRICT	E	60		48	1,800	65,000	12			LIOPETRI IRRIGATION DIVISION	DEPARTMENT OF WATER DEVELOPMENT	DEPARTMENT OF WATER DEVELOPMENT	GROUND WATER RECHARGE	9
10		MIA MILIA	1964	PEDIEOS	NICOSIA	NICOSIA DISTRICT	E	71		50	415	70,000	12	I		MIA MILIA IRRIGATION DIVISION	DEPARTMENT OF WATER DEVELOPMENT	DEPARTMENT OF WATER DEVELOPMENT		10
11		OVGOS	1964	SERAKHIS	NICOSIA	NICOSIA DISTRICT	E	52		46	2,400	170,000	30	I		MORPHOU IRRIGATION DIVISION	DEPARTMENT OF WATER DEVELOPMENT	DEPARTMENT OF WATER DEVELOPMENT		11
12		KITI	1964	TREMITHIOS	LARNACA	LARNACA DISTRICT	E	74		52	3248	230000	57	I		GOVERNMENT	IL NUOVO CASTORO OF ITALY	DEPARTMENT OF WATER DEVELOPMENT		12
13		KANLI KEUY	1963	PEDIEOS	NICOSIA	NICOSIA DISTRICT	E	65		40	700	62,000	39	I		KANLI KEUY IRRIGATION DIVISION	DEPARTMENT OF WATER DEVELOPMENT	DEPARTMENT OF WATER DEVELOPMENT		13
14		ATHALASSA	1962	PEDIEOS	NICOSIA	NICOSIA DISTRICT	E	60		42	1,370	135,000	28	F,I		GOVERNMENT	DEPARTMENT OF WATER DEVELOPMENT	DEPARTMENT OF WATER DEVELOPMENT		14
15		GEUNYELI	1962	PEDIEOS	NICOSIA	NICOSIA DISTRICT	E	59		53	655	66,000	37	I		GEUNYELI IRRIGATION DIVISION	DEPARTMENT OF WATER DEVELOPMENT	DEPARTMENT OF WATER DEVELOPMENT		15
16		LEFKA	1962	MARATHASA	NICOSIA	NICOSIA DISTRICT	G	113		89	490	15,000	13	I		LEFKA IRRIGATION DIVISION	DEPARTMENT OF WATER DEVELOPMENT	DEPARTMENT OF WATER DEVELOPMENT		16
17		MORPHOU	1962	SERAKHIS	NICOSIA	NICOSIA DISTRICT	E	51		39	4,500	197,000	61	I		MORPHOU IRRIGATION DIVISION	DEPARTMENT OF WATER DEVELOPMENT	DEPARTMENT OF WATER DEVELOPMENT	ALSO GROUND WATER RECHARGE	17
18		PRODHROMOS	1962	DHIARIZOS	LIMASSOL	LIMASSOL DISTRICT	E	34		20	1,400	96,000	4	I		PRODHROMOS IRRIGATION DIVISION	DEPARTMENT OF WATER DEVELOPMENT	DEPARTMENT OF WATER DEVELOPMENT	RECTANGULAR RESERVOIR	18
19		TRIMIKLINI	1958	KOURRIS	LIMASSOL	LIMASSOL DISTRICT	G	109		95	250	8,000	12	I		TRIMIKLINI IRRIGATION DIVISION	DEPARTMENT OF WATER DEVELOPMENT	DEPARTMENT OF WATER DEVELOPMENT		19
20		PYRGOS	1957	KATOURIS	NICOSIA	NICOSIA DISTRICT	G	73		67	215	10,000	10	I		PYRGOS IRRIGATION DIVISION	DEPARTMENT OF WATER DEVELOPMENT	DEPARTMENT OF WATER DEVELOPMENT		20
21		KANDOU	1956	KOURRIS	LIMASSOL	LIMASSOL DISTRICT	G	46		43	175	4,000	1.2	I		KANDOU IRRIGATION DIVISION	DEPARTMENT OF WATER DEVELOPMENT	DEPARTMENT OF WATER DEVELOPMENT	MASONRY	21
22		PERAPEDHI	1956	KOURRIS	LIMASSOL	LIMASSOL DISTRICT	G	71		64	215	6,000	2	I		PERAPEDHI IRRIGATION DIVISION	DEPARTMENT OF WATER DEVELOPMENT	DEPARTMENT OF WATER DEVELOPMENT		22
23		KAFIZES	1953	XEROS MORPHOU	NICOSIA	NICOSIA DISTRICT	G	77		54	90	9,000	4	I		LEFKA IRRIGATION DIVISION	DEPARTMENT OF WATER DEVELOPMENT	DEPARTMENT OF WATER DEVELOPMENT	MASONRY	23

Mr. Y Zambarloukos
Representative of the Association of Civil
Engineers and Architects

Mr G Paraskevaides
Representative of the Association of Contractors.

Since its election as a full member of the ICOLD the Cyprus National Committee has held two meetings at which matters of organization were mainly discussed but no technical sessions have yet been held. Once the Cyprus Section has been fully organized and a constitution adopted, it is intended to organize technical activities such as lectures by engineers, visits to construction sites etc

A comprehensive report on dams and associated works in Cyprus is at present being prepared by the Chairman of the National Committee, Mr. C.A.C. Konteatis, and it is hoped that it will be ready in 1971.

The table on page 19 gives important data of our main dams as compiled for the use of the ICOLD:

1.5.3 International Commission on Irrigation and Drainage

This Commission was set up in June 1950 with its headquarters in India (New Delhi). Cyprus became a participating country since 1954 and a National Committee was established in 1964. At present the Cyprus National Committee is composed of the following :-

Chairman	Mr. C.A.C. Konteatis Director, Water Development Department
Secretary	Mr. N. Tsiourtis Topographer Irrigation Engineer Design Division.
Members	Mr. A. Papasolomontos Director, Department of Agriculture.
	Mr. A. Polykarpou Director, Department of Forestry.
	Mr. Th. Christou Director, Agricultural Research Institute

In August 1969 a meeting of the committee was held at the Chairman's office. In that meeting all members were represented and the following decisions were taken :-

1.5.3.1 To reorganize the committee so as to be able to be more active.

1.5.3.2 Mr. N. Tsiourtis was appointed as secretary of the committee.

1.5.3.3 Annual bulletin and publications of the I.C.I.D. of interest shall be distributed or circulated to the members.

1.5.3.4 It was finally decided, if that was approved by the Government, to be represented at the Twenty First Meeting of the International Executive Council to be held in Ankara, June 24 - 27 1970. Unfortunately this was turned down by the Government.

The main activities of the Cyprus National Committee are summarized below :-

1.5.3.5 A "Brief Note on the I.C.I.D." was prepared and circulated to its members. This presents the objectives and constitutional status of the Commission.

1.5.3.6 A paper of the "Objects and Activities of the I.C.I.D. from 1950 - 1969" was prepared and circulated to the members.

1.5.3.7 A list of all books bulletins and Reports related to the I.C.I.D. (all available in the library of the W.D.D.) was prepared and circulated to all members for their reference.

1.5.3.8 Finally the committee decided to invite the Minister of Agriculture and Natural Resources to address, through a written message to be published, the Twentieth anniversary of the I.C.I.D. and the Twenty fifth anniversary of the United Nations. The invitation was accepted by the Minister.

I.C.I.D. Activities.

In April, 1969, the Seventh Congress of the I.C.I.D. was held, in Mexico City. During that meeting four questions were discussed. Cyprus was not represented in that meeting.

1.5.4 International Water Supply Associations

The first move towards the formation of the Association was made in 1949 and the constitution was adopted at the first meeting of the General Assembly held in Amsterdam on 22nd September 1949.

There are four categories of membership in the Association :-

a) Corporate
b) Associate
c) Individual
d) Honourary

The object of the Association is to establish an International body concerned with the public supply of water through pipes for domestic agricultural and industrial purposes.

To secure concentrated action in improving the knowledge of public water supplies, technical, legal and administrative :-

To secure a maximum exchange of information on research, methods of supply of water and to encourage intercourse and better understanding between men engaged in the public supply of water :-

Until 1969, the Department of Water Development was an "Associate" member of the I.W.S.A.

At a meeting held on 18th December 1969, a National Committee was established and an application was lodged to the effect that Cyprus becomes a "Corporate" member of the Association.

The National Committee is made up of :-

Chairman	Mr. C.A.C. Konteatis Director of the Water Development Department.
Secretary	Mr. G Haralambous Supt. of Works, Water Development Department.
Members	Ministry of Interior Water Board of Nicosia " " Limassol " " Famagusta " " Larnaca

The application will be placed before the meeting of the Executive Board of the Association to be held in Copenhagen on 9th April 1970 and if accepted the decision will then be placed before the next General Assembly of the Association which is to be held in September 1972 for formal notification :-

So far it is known that the application for Cyprus becoming a "Corporate" member of the I.W.S.A. has been welcomed by the Secretary-General of the Association.

1.5.5 The Inter-Departmental Co-Ordination Committee

This committee is made up of the Director of Water Development as Chairman and of the Directors of the Departments of Agriculture, Forests and Geological Surveys as Members, and its task is to co-ordinate work in connection with the planning of major irrigation projects. The Committee met in February to discuss the Karavas proposed Dam which was finally decided to be abandoned for the time being as being uneconomic.

1.5.6 There are two Departmental Committees :-

1.5.6.1 Head of Divisions meetings

Four such meetings were held under the Chairmanship of the Director during the year to discuss problems related to the works, staff equipment and other matters.

1.5.6.2 Engineers and Hydro-Geologists meetings

One meeting under the chairmanship of the Director was held in November and inaugurated these meetings which will be held from time to time to discuss problems of the qualified staff and the progress of the works undertaken by them.

1.6 Water Resources

During the year the rainfall throughout the Island was higher than normal having reached 760 mm on the average which is by 260 mm more than the last 50 years average which was 500 mm. This figure is by 50 mm higher than the second highest rainfall record since 1916 and which occured in 1929-30 hydrological year. River flows were also in general well above average, a lot of their flows having discharged to the sea, and our aquifers have been plentifully replenished. In spite of this abundance of rainfall last year the water table continued to decline especially in the aquifer of south-eastern Famagusta. The good rainfall of 1969 contributed in making the borehole owners more reluctant to accept the application of the special measures law and at the same time farmers increased the rate of illegal boring especially in the district of Famagusta. We regret to observe that the progress of the application of water meters in the main aquifers that of Morphou, and that of Akrotiri under the special measures law has not been at all satisfactory. A comparison with the previous year 1968 in the 3 regions shows that :-

(a) in Famagusta/Larnaca 364 water meters were installed in 1968 and 104 in 1969 having still another 2000 water meters to be installed ;

(b) in Morphou 199 water meters were installed in 1968, 198 in 1969, leaving 218 still to be installed;

(c) in Akrotiri 322 were installed in 1968 and 33 in 1969, leaving 154 still to be installed.

It can be seen that although a good start has been made in 1968 the progress in 1969 cannot be considered satisfactory especially in Famagusta and Akrotiri.

Futhermore the application of efficient systems of irrigation in these 3 areas in connection with the provision of the special measures law has not been satisfactory. The reasons are that :-

(a) The Government did not take strong measures for the implimentation of the Law.

(b) The farmers argue about the type of irrigation systems proposed to them.

(c) The method of financing the irrigation systems and the provision for mortgaging land for the loan does not promote the application of these systems.

Once more I have to refer to the illegal drilling which has become a normal feature in the Famagusta district. This year occasionally illegal drilling has been observed in Morphou. Here I must put on record that in spite of the fact that members of the staff of the Department had twice after many days and nights watching for illegal drilling in Famagusta helped the Police to arrest two illegal drillers yet when they were brought before the Court they were sentenced in my opinion to an insignificant fine.

The hydrological observations on the numerous boreholes, springs and rivers on the Island is continued as usual and reports have been written about the flactuations of the water table quality of the aquifer and the river and spring flows. During the year another 4 measuring weirs with automatic recorders were built for measuring riverflows.

34 boreholes were drilled for finding water for domestic water supply and for irrigation purposes. Such boreholes were drilled in all districts and included boreholes for Famagusta water supply, boreholes on the Kyrenia limestone and in many other parts of the Island. Finally the Water Resources Division has been contributing to the work of the CWPP through the provision of counterpart staff and hydrological data.

1.7 Planning and Design of Projects

Our planning work this year was mainly for the CWPP as our counterpart contribution to the master plan studies and for the Paphos Feasibility work. Detailed investigations have been going on for the foundation conditions on several damsites especially in the Paphos rivers for work required for the Feasibility study. Important investigation works were also carried out for the building of the Hotel and Catering Institute, of the Ministry of Labour.

The detailed design work for the Famagusta water supply project was completed this year and enabled an early start for the construction.

Regarding the Palekhori dam for which investigations were carried out at the Sklidros site on the main river and at the Kambi site about a mile upstream in a tributary, it was concluded that the former site presents many engineering and geological problems such as a major fault zone which exists on the western abutment and badly weathered rock on both abutments reaching depths up to 12 meters. Furthermore, this site presents major problems on land slides and problems of leakage especially near the village of Apliki. Therefore, it was decided to build the dam on the Kambi site where sound diabase rock is exposed on all the site.

The final design for the Massari dam was completed last year. This dam which is similar to that of Morphou is scheduled to be built on the permeable alluvial river bed of the Serakhis river upstream of the Massari bridge and has the main purpose of groundwater

replenishment through the reservoir base or through spreading grounds which are designed to be built along the river bed from the proposed dam reaching as far as the existing Morphou dam. Furthermore, this dam is required to supply water to the existing irrigation intakes of the beneficiaries downstream of the proposed dam. This dam with the relevant spreading grounds is considered to give a very important contribution to the replenishment of the Morphou aquifer. However, certain water rights problems involved, may take time to solve.

The investigation for Karavas dam has been completed and it was finally concluded that this dam would be un-economic to build, for it provides limited storage and on the other hand considerable expenditure is required because of adverse geological conditions such as the eastern abutment which is formed of conglomeratic material which could be too costly to make water tight.

Our recommendations for Yermasoyia distribution system have been right from the beginning to convey water from the Yermasoyia dam to the Akrotiri peninsula where there is a great potential of land resources for the use of this water. However, the Department was requested to supply many alternative solutions, which in the course of the year has been done, and it is hoped that it will be possible for the Government to approve the scheme for the distribution of the Yermasoyia Dam water next year.

Other design work for major projects has been done during the year such as for a typical earth reservoir at Kyperounda, for an extension of the distribution system of Kiti dam, and for the design of the distribution system of the Argaka-Magounda dam.

1.8 Construction of Projects

During the year, 198 schemes were under construction for irrigation, domestic water supply and flood protection purposes.

By far the largest project was the Famagusta Water Supply on which an amount of £869.000 was spent during the year. The construction of this project started early in 1969, and included :-

1.8.1 The Pumping installations on the Khirokitia and Vasilikos boreholes.

1.8.2 The construction of the storage reservoir at Khirokitia and the necessary chlorination house.

1.8.3 The construction of the storage reservoir at Phrenaros.

1.8.4 The 305 mm diameter, 7300 meters long steel pipeline from the Vasilikos boreholes to the Khirokitia reservoir.

1.8.5 The 500 mm, 600 mm and 650 mm, asbestos cement pressure pipeline from the Khirokitia reservoir to the Phrenaros reservoir of a total length of 63 500 meters.

1.8.6 The break pressure tank at Alethriko.

This work which according to the original programme drawn up in 1966 was scheduled to be completed in 1969 and makes up the first phase for Famagusta Water Supply, was substantially completed by the end of the year and water was delivered to Famagusta as scheduled. An inauguration ceremony of these works was held at Phrenaros on the 30th

December when the Minister of Agriculture opened the valve and connected the new supply to the existing town supply. This is considered to be a record in construction works in Cyprus for any single project constructed within one year.

Many other smaller schemes were constructed during the year such as:-

The Kythrea lower villages water supply scheme, supplying water to 7 villages in the area.

The Ayios Georgios - Klepini water supply scheme, supplying water to these two villages.

The Bellapais - Kazaphani water supply scheme, supplying water to these two villages.

The Vasillia regional village water supply scheme, supplying water to 9 regional villages in Kyrenia district.

The Morphou water supply.

During 1969, 86 small irrigation schemes were constructed at a total cost of about £300 000. The main projects were :-

Lining of canals in the Morphou area.
Groundwater recharge projects in Morphou, Famagusta and Kyrenia, in the form of small dams.

Lining of canals in Kakopetria and other Solea villages.

A special feature of construction works during the year was the restoration of flood damages which resulted in many parts of the Island due to the heavy rainfall of the year. One of the most heavily affected areas was Kythrea whose water supply including that of the neighbouring villages was damaged. About £38 000 were made available by the Government to repair 41 affected irrigation schemes and 19 village water supply schemes all over the Island.

The grouting of the eastern abutment of the Polemidhia dam was started by the Department in autumn 1969 in order to complete the grout curtain undertaken by the contractors Mowlem and Richways some years ago.

The Morphou dam was raised by 4 ft. in 1969 in order to increase the capacity of the spillway.

The average number of labourers employed in the Department during 1969 was 1 438 as compared with 1 173 in 1968. 24.82% were classed as regulars whilst approximately 38.32% were skilled employees, 0.91% semi-skilled and 60.77% unskilled. 12.29% of the labourers employed were Turks.

The approximate monthly average of labourers engaged was as follows:-

January	1 178
February	1 249
March	1 316
April	1 407
May	1 503
June	1 634
July	1 788
August	1 706

September	1 503
October	1 367
November	1 416
December	1 193
Average	1 438

1.9 Operation and Maintenance of Projects

The difficulties with the satisfactory management of the major projects continued throughout the year.

The water from the Polemidhia dam was not readily sold because the farmers at Akrotiri were reluctant to buy water mainly due to the availability of sufficient groundwater supply during the year due to the good rainfall.

No decision could be taken by the Government for the distribution of the Yermasoyia dam water.

Difficulties with the selling of the water of the Mavrokolymbos dam were encountered because of not having completed the distribution system due to the expectations for land consolidation in the village.

At Argaka dam the water was not sold satisfactorily because the people were unwilling to agree on the water rights they claimed from this river.

A better result was achieved in selling of the water from the Pomos and Ayia Marina dams in Tylliria.

At Kiti dam there is a good interest for purchase of the water but more lined canals should be made in order to save more water for selling.

Kalopanayiotis dam functions very satisfactorily and no problems have been encountered in selling the water.

The Syngrasi dam was very usefull this year in supplying water by pumping to the Lapathos aquifer for replenishment of the sand stone aquifer through borehole recharge. The records taken showed a good recovery of the water table due to the recharge.

Routine maintenance works were carried out by the Department on many of the dams.

The most important maintenance work was on the Trimiklini dam which was heavily silted up during the heavy floods of the year. The silt was mainly from the Asbestos Mines' fine wastes which were washed out from the Mine into the dam. The silt accumulated reached up to 60 ft. above river bed. Considerable efforts were made during the year which eventually were successful in washing this silt through the gallery of the dam.

Our contribution for the management of the Water Boards continued throughout the year by giving our advice and technical contribution to the various Water Boards. Furthermore, we have been running the Greater Nicosia Water Supply Scheme as previously. A report has been submitted to the Water Board and to the Government for the amalgamation of the Greater Nicosia Water Supply Scheme with that of the Nicosia Water Board. The idea of this amalgamation is that the Government will keep

the ownership of the sources and main conveyor, thus selling the water to the Water Board at the storage tanks. The Water Board would take up ownership and administration of storage tanks and town distribution system for selling water to the private water consumers.

1.10 Finance and Expenditure

As it can be seen on page 33 the total expenditure during the year reached £2 073 692 which represents a new record of expenditure in the Department history. £248,058 out of this amount represents administration costs. The largest item of expenditure was the Town Water Supplies, the expenditure of which reached £869 557.

The monthly statement of Development Expenditure for the Department during the year 1969 is shown on page 34.

From this statement it will be observed that the monthly expenditure for the year is uneven, especially during the first part of the year. This is attributed to the time which the various formalities take for the applications of loans to go through the various stages to the Loan Commissioners, the process thereafter and more particularly the delay which is invariably observed in cases where the beneficiaries have arrears for previous loans which makes the decision of the Loan Commissioners very difficult indeed.

The Loan Commissioners considered the applications for loans towards the end of 1968 in anticipation of the approval of the 1969 Budget. So that an early start could be made on the projects in 1969.

It is hoped that with the assistance of the various Government Departments and particularly District Officers, the starting of the schemes earlier in each year will ensure as far as possible the completion of the schemes which are budgeted for that year.

In Table 3 on page 35 shows the expenditure of various budgetary items since the establishment of the Department in 1939. On this Table an effort is made to show the relationship of expenditure between items which can be considered as over-head and administration costs as compared with actual works expenditure. From this Table we can see that the maximum expenditure in the history of the Department was realized during the year 1969 and reached £2 073 692 whilst the minimum during 1939 was £19 752. The percentage of overheads to works expenditure vary over the years from 6.6 in 1950 to 56.8 in 1939.

With the present organization, the amount of investigation, planning, design and supervision required, it appears from the last few years that this percentage should be of the order of 20%. A case was presented to the Government about the possibility of charging some of these overheads, especially items which are included in the Development Estimates to the actual works, and the Government is still considering the matter.

For the first time we included in this Report detailed statements of expenditure for Major Irrigation Works, Minor Irrigation Works and Village Water Supplies which were carried out during the year 1969.

These statements appear under Page No 38

As a result of the exceptional high rainfall during the year 1969, we had heavy floods, which caused damages to various Irrigation Works amd Village Water Supplies in several places in the Island. The Government has made available the sum of £38 330 for their restoration and during 1969 the sum of £25 643 was spent and the balance of £12 687 will be spent during 1970. Some of the interested communities contributed in cash or free labour towards this effort.

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.T.C.
Kyprianos C. Hassabis	Senior Water Engineer	B.Sc. (Civil Eng.) University of London, M.E., N.S.T.C. (Concrete Design Technology), M.I.C.E., A.S.C.E.
Nicos Ioannides	Senior Water Engineer	B.Sc. (Civil Eng.) University of London
Haralambos Karakannas	Engineer Hydrologist	M.A.S.C.E., M.I.P.H.E., F.R.S.H.
Christodoulos Christodoulou	Executive Engineer Class I	Dipl. (Civil Eng.) National Technical University of Athens
Christos Marcoullis	Executive Engineer Class I	Dipl. (Civil Eng.) National Technical University of Athens
Andreas P. Georghiades	Executive Engineer Class I	Dip. Tech. (Civil Eng.) University of London, M.Sc. University of Birmingham, M.I.C.E.
Costakis Andrecu	Executive Engineer Class I	Dipl. (Civil Eng.) University of Dresden
Charis Lapas	Executive Engineer Class II	B.Sc. (Civil Eng.) University of Glasgow
Polyvios G. Panayides	Executive Engineer Class II	B.Sc. (Civil Eng.) University of London, M.Sc. (Civil Eng.) University of Houston.
Christodoulos Artemis	Executive Engineer Class II	B.Sc. (Civil Eng.) University of London, M.Sc.(Soil Mechanics) D.I.C., A.C.G.I.
Eleftherios Gavrielides	Executive Engineer Class II	B.Sc. (Civil Eng.) University of London
Vasilios G. Georghiades	Executive Engineer Class II	Dipl. (Civil Eng.) National Technical University of Athens
Markos Dhymiotis	Executive Engineer Class II	Dipl. (Civil Eng.) National Technical University of Athens
Neophytos Demetriou	Executive Engineer Class II	B.Sc. (Civil Eng.) University of London
Theocharis Thrassou	Executive Engineer Class II	Dipl. (Civil Eng.) University of Moscow, M.Sc. (Hydrotechnical Construction) University of Moscow.
Vlasis Partassides	Executive Engineer Class II	Dipl. (Civil Eng.) University of Moscow, M.Sc. (Civil and Industrial Eng.) University of Moscow

Name	Post	Qualifications
Costakis Nicolaides	Executive Engineer Class II	Dipl. (Civil Eng.) University of Moscow, M.Sc. (Civil and Industrial Eng.) University of Moscow.
Nicos Stylianou	Executive Engineer Class II	Dipl. (Civil Eng.) The Polytechnic, London, M.Sc. (Foundation Eng.) University of Birmingham, A.M.I.C.E.
Savvas Theodosiou	Mechanical Engineer Class II	B.Sc. (Mechanical Eng.) University of Manchester.
Dedalos Kypris	Geologist Class I	Dipl. (Natural Science) University of Athens, D.I.C. Applied Geophysics.
Michalakis Peppis	Geologist Class II	B.Sc. (Geology) American University of Beirut, M.Sc.(Geology) American University of Beirut.
Sotiris C. Kramvis	Geologist Class II	B.Sc. (Geology) University of Birmingham, M.Sc. (Geophysics) University of Birmingham.
Christos Phanartzis	Hydrologist Class II	B.Sc. (Hydrology) University of Arizona, A.M.A.G.U.
Iacovos Iacovides	Hydrologist Class II	B.Sc. (Hydrology) University of Arizona
Christos Ioannou	Hydrologist Class II	Dipl. (Natural Science) University of Salonica, Dipl. (Hydrology University of London.
Nicos Tsiourtis	Topographer/Irrigation Eng.	B Sc. (Agricultural Eng.) Technion Israel Institute of Technology, A.E.A.I.
Demosthenis M. Patsalides	Topographer/Irrigation Eng.	B.Sc. (Agricultural Eng.) Technion Israel Institute of Technology, A.E.A.I.
Elias Kambourides	Topographer/Irrigation Eng.	B.Sc. (Agricultural Eng.) Technion Israel Institute of Technology, A.E.A.I.
Panos Pantelides	Superintendent of Works	
Nicos Toufexis	Superintendent of Works	

TECHNICAL STAFF OF W.D.D. ON 31.12.69

	MONTHLY AND DAILY PAID TECHNICAL STAFF			D	AD	SWE	SH	EH	EE	ME	Geo	H	TIE	LA	ADM	SW	SIW	IW	CF	EDR	ACF	TA	DR	F	Exp	Total Nos
1	Permanent staff			1	1	2	1	1	8		2					3	5	12	3		4	24		39		106
2	Temporary staff								⊗10	1	1	2	3	1	1		1	9	1	1	8	106	3	14		162
3	Foreign Experts	(i)	U.N.D.P.																						2	3
		(ii)	U.N. (F.A.O.)																						1	
TOTAL NUMBERS				1	1	2	1	1	⊗18	1	3	2	3	1	1	3	6	21	4	1	12	130	3	53	3	⊗271
DISTRIBUTION OF STAFF																										
4	U.N.S.F.P. Cyprus Water Planning Project (On loan)								5			1	3									24				33
5	U.N.S.F.P. Mineral & Ground Water Surveys (on loan)										1											6		1		8
6	Divisions	i	Water Resources				+1		1		2					1		5			1	46		3		60
		ii	Planning			1			+1									3				8		1	3	17
		iii	Design			1			4 +2									2		+1		14	3	2		29
		iv	Construction					1	1	+1							2	6	3		9	6		40		69
		v	Small Projects Planning													1	2	4	1		1	4				13
		vi	Operation & Maintenance														2	1			1	3		2		9
7	Administration			1	1									1												3
8	Turkish Officers absent from duty								1													9		2		12
9	On scholarship								1			1										2				4
10	Vacancies								1						1	1						‡8		2		13
TOTAL NUMBERS				1	1	2	1	1	⊗17	1	3	2	3	1	1	3	6	21	4	1	12	130	3	53	3	⊗270

REFERENCE

D	Director
AD	Assistant Director
SWE	Senior Water Engineer
SH	Senior Hydrogeologist
EH	Engineer Hydrologist
EE	Executive Engineer
ME	Mechanical Engineer
Geo	Geologist
H	Hydrologist
TIE	Topographer / Irrigation Engineer monthly & daily paid
LA	Legal Adviser (on contract)
ADM	Administrative Officer
SW	Superintendent of Works
SIW	Senior Inspector of Works
IW	Inspector of Works
CF	Chief Foreman
EDR	Engineering Draughtsman
ACF	Assistant Chief Foreman
TA	Technical Assistant montly & daily paid
DR	Draughtsman
F	Foreman
Exp	Foreign Experts

⊗ One post frozen

\+ Posts held by daily paid staff

‡ Vacancies in daily paid posts

DRG. No. BM/G/12

Table 1 - 1969 Expenditure - Water Development Department

Details	Government funds £	Contribution by Beneficiaries £	Total £
1. Administration	248,058	-	248,058
2. Irrigation, Drainage & Dams	377,889	91,064	468,953
3. Town Water Supplies	838,962	30,595	869,557
4. Village Water Supplies	120,746	131,059	251,805
5. Drilling & Prospecting	22,938	-	22,938
6. Hydr. Obs. Res. & Weirs	22,365	-	22,365
7. Workshops (Maintenance)	25,690	-	25,690
8. Purchase of machinery tools and equipment	16,910	-	16,910
9. Consultants' Fees	5,021	-	5,021
10. Govt. Water Supplies	2,163	-	2,163
11. Major Projects Investigations and Surveys	25,083	-	25,083
12. Greater Nicosia Scheme	65,605	-	65,605
13. Water Supply - Special measures Law	116	-	116
14. Flood Damages	29,499	7,351	36,850
15. Erection of Buildings	6,276	-	6,276
16. Stores	6,302	-	6,302
Include Ordinary & Development Expenditure	1,813,623	260,069	2,073,692
Breakdown of Administration			
1. Personal Emoluments	139,149	-	139,149
2. Casual Assistance	11,953	-	11,953
3. Technical Assistance	37,538	-	37,538
4. Travelling	22,858	-	22,858
5. M'ce ' Oper, of M. Transport	20,561	-	20,561
6. Office Expenses	2,434	-	2,434
7. Leave Pay to R.E.	13,565	-	13,565
TOTAL	248,058	-	248,058

Table 2 - Monthly Statement of Development Expenditure for 1969

1969 Approved	£2,460,924
Add. S/Warrants 19/69, 67/69	£ 310,412
Total	£2,771,336

Month	Monthly £	Expenditure up-to-date £	Balance £	% to-date expended
January	14,528	14,528	2,756,808	0.52
February	34,522	49,050	2,722,286	1.77
March	43,953	93,003	2,678,333	3.35
April	297,963	390,966	2,380,370	14.11
May	122,121	513,087	2,258,249	18.51
June	246,317	759,404	2,011,932	27.40
July	91,131	850,535	1,920,801	30.69
August	62,023	912,558	1,858,778	32.93
September	226,282	1,138,840	1,632,496	41.10
October	142,541	1,281,381	1,489,955	46.24
November	141,157	1,422,538	1,348,798	51.33
December	194,108	1,616,646	1,154,690	58.33

Summary

Approved amount	£2,771,336 (100%)
Less Actual Expenditure	£1,616,646 (58.33%)
Unspent Balance	£1,154,690 (41.67%)

Table 3 - 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 inve'tigations										
	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 & B/Hs										
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	1966	1967	1968	1969
1	Administration	81677	64255	70527	81983	151580	130164	135410	145389	183927	228902	248058
2	W/Shops & M'ce of Plant and Stores	20441	28979	30238	31789	14000	16150	15500	14147	14848	25594	38268
3	Purchase of Machinery tools etc ,	960	-	-	31712	120000	46030	16875	10973	12927	5918	16910
4	Hydrological Observations	7090	6059	10640	40520	40500	43223	28200	18863	20538	19768	22365
5	Consultant's Fees	-	-	-		-	39378	45065	51297	32040	14676	5021
6	Major Projects Investigations	-	-	-	-	-	10202	15290	7733	20880	34801	25083
	Sub-total "A"	£110168	99293	111405	186004	326080	285147	256340	248402	285160	329659	355705
7	Drilling of water	45084	48837	83608	82151	63700	47588	40200	24253	35029	49095	22938
8	Water Meters for wells & B/Hs	-	-	-	-	-	-	-	983	2672	86	116
9	Town water supplies	113853	220370	88282	97724	70900	197871	178010	138390	68782	171190	937325
10	Village Water Supplies	113493	137825	602436	602537	486600	507679	404600	108926	130340	232253	251805
11	Small Irrigation Projects	68274	49288	141712	253817	383052	400046	95002	113636	221169	174065	237594
12	Major Irrigation Projects	50000	50000	120000	150000	414948	369420	691349	689010	941131	493045	263209
	Sub-total "B"	£390704	506320	1036037	1204229	1418600	1522604	1409160	1075198	1399123	1119734	1717987
	Grand Total	£500872	605613	1147442	1390233	1744680	1807751	1665500	1323600	1684283	1449393	2073692
	% of A to B	28.2	19.6	10 7	15 4	22.9	18.7	18.1	23 1	20.3	20.3	17.2

Statement of Expenditure for the year 1969

Major Irrigation Works (2D-10) — Contributory Schemes

Scheme	Estimated Cost			Actual Expenditure		
	Government Dedaggered £ mils	Village £ mils	Total £ mils	Government £ mils	Village £ mils	Total £ mils
Ovgos Saline Water	150.000	56.937	261.299	26.040	8.680	34.720
Agros "Blanket"	260.000	151.869	454.612	37.702	18.851	56.553
Morphou Recharge "Prot".	8,670.000	5,643.539	14,313.977	6,845.939	4,429.724	11,275.663
Ovgos Dam "Compens."	595.000	1,525.447	6,101.788	305.920	128.743	514.971
Syrianokhori P. House	13,533.000	6,767.000	20,300.000	2,665.966	1,332.982	3,998.948
Morphou "Serrakhis"	4,100.000	900.000	5,000.000	3,356.382 1,768.141	736.767 589.380	4,093.149
Morphou Serr. Compens.	2,649.000	883.254	3,532.011	5,289.550	1,161.120	2.357.521
Morphou "Serr."P. House"	3,133.000	1,567.000	4,700.000	3,041.292	1,520.646	4,561.938
Morphou "Raising of Dam"	10,125.000	3,375.000	13,500.000	8,140.859	2,713.620	10,854.479
Morphou "Ser." Spr. Grounds	13.533.000	6,767.000	20,300.000	-	-	-
Syrianokhori "Kokkinogi" Channels	13,850.000	13,850.000	27,700.000	-	-	-
Agros Diversional Water	4,923.000	-	4,923.000	-	-	-
Kalopanayiotis	11,452.000	-	11,452.000	3,032.220	-	3,032.220
Polemidhia Expl. Holes	110.000	-	110.000	45.239	-	45.239
Polemidhia Compensation	907.000	-	907.000	906.395	-	906.395
Polemidhia Grouting I	650.000	-	650.000	263.013	-	263.013
Polemidhia Grouting II	13,000.000	-	13,000.000	5,540.794	-	5,540.794
Polemidhia Grouting III	550.000	-	550.000	532.843	-	532.843
C/F £	102,190.000	41,487.046	147,755.687	36,673.772	11,314.366	48,068.446

Scheme	Estimated Cost			Actual Expenditure		
	Government Dedaggered £ mils	Village £ mils	Total £ mils	Government £ mils	Village £ mils	Total £ mils
B/F	102,190.000	41,487.046	147,755.687	36,673.772	11,314.366	48,068.446
Polemidhia Grouting IV	11,000.000	-	11,000.000	4,901.920	-	4,901.920
Polemidhia Grouting V	2,800.000	-	2,800.000	1,463.000	-	1,463.370
Polemidhia Old Scheme	366.000	-	366.000	343.345	-	343.345
Polemidhia Promisory Notes	138,000.000	-	138.000.000	138,000.000	-	138,000.000
Mavrokolymbos	8,054.000	-	8,054.000	278.278	-	278.278
Mavrokolymbos Remedial Works	8,894.000	-	8,894.000	1,933.055	-	1,933.055
Yermasoyia	39,549.000	-	39,549.000	22,624.370	-	22,624.370
Lapathos Recharge	814.000	-	814.000	569.795	-	569.795
Pomos	504.000	-	504.000	50.950	-	50.950
Distributions						
Kalopanayiotis	3,598 000	-	3,598.000	2,217.007	-	2,217.007
Polemidhia Works	1,860.000	-	1,860.000	1,388.664	-	1,388.664
Polemidhia Flood Damage	4,000.000	-	4,000.000	3,943.802	-	3,943.802
Polemidhia Compensation	3,663.000	-	3,663.000	1,610.408	-	1,610.408
Mavrokolymbos	78,832.000	-	78,832.000	26,511.536	-	26,511.536
Yermasoyia	2,000.000	-	2,000.000	1,095.072	-	1,095.072
Mia Milia	9,225.000	3,075.000	12,300.000	-	-	-
Kiti	13,881.000	-	13,881.000	13,209.049	-	13,209.049
T o t a l	£429,230.000	44,562.046	477,870.687	256,814.393	11,314.366	268,209.067

Statement of Expemditure for the year 1969

Minor Irrigation Works (2D-11)

Contributory Schemes

Scheme	Estimated Cost			Actual Expenditure		
	Government £ mils	Village £ mils	Total £ mils	Government £ mils	Village £ mils	Total £ mils.
Agros "Dikhalorotsos"	540.000	390.000	930.000	513.320	371.715	885.035
Agros "Dhikhalorotsos"	672.000	528,000	1,200.000	36.219	26.226	62.445
Akhyritou - Vrysoulles	3,447 081	1,724.040	5,171.121	2,385.497	1,192.751	3,578.248
Akanthou	1,043.592	522.797	1,566.389	562.918	281.475	844.393
Akhna	1,213.697	607.848	1,821.545	260.618	130.309	390.927
Agridhia "Kaouras"	49.100	24.550	73.650	8.594	4.296	12.890
Agridhia "Vrysi-tou-Khoriou"	141.494	111.173	252.667	82.891	65.129	148.020
Agridhia "Pano Episkiko"	1,064.341	532.170	1,596.511	985.602	492.801	1,478.403
Ay. Ioannis "Peroyia"	163.141	81.571	244.712	157.030	78.515	235.545
Arakapas	927.071	461.035	1,388.106	909.240	454.620	1,363.860
Avgorou	1,103.435	551.715	1,655.150	55.542	27.771	83.313
Ay. Epiktitos	821.284	411.642	1,232.926	733.240	366.620	1,099.860
Evrykhou	245.573	122.787	368.360	234.136	117.068	351.204
Famagusta-Dherenia	12,666.000	6,334.000	19,000.000	8,822.687	4,411.343	13,234.030
Galata-Sina Oros Phase I	2,086.921	1,043.961	3,130.882	2,072.342	1,036.669	3,109.011
Galata-Sina Oros Phase II	2,666.000	1,334.000	4,000.000	2,193.427	1,096.712	3,290.139
Galata-Esso (Old Scheme)	649.471	324.237	973.708	649.471	324.237	973.708
Gypsos	873.637	436.819	1,310.456	690.928	345.463	1,036.391
Kalo-Khorio Klirou M/ce of Dam	100.000	50.000	150.000	96.120	37.330	133.450
Khirokitia Phase I	1,066.500	534.250	1,600.750	891.302	412.276	1,303.578
C/F	£31,540.338	16,126.595	47,666.933	22,341.124	11,273.326	33,614.450

Scheme	Estimated Cost			Actual Expenditure		
	Government £ mils	Village £ mils	Total £ mils	Government £ mils	Village £ mils	Total £ mils
B/F	31,540.338	16,126.595	47,666.933	22,341.124	11,273.326	33,614.450
Khirokitia Phase II	4,050.000	1,350.000	5,400.000	3,306.924	1,124.558	4,431.482
Katokopia	3,262.103	3,263.102	6,525.205	3,024.891	3,024.892	6,049.783
Kakopetria	5,337.861	2,668.931	8,006.792	4,842.324	2,421.162	7,263.486
Kalokhorio L'ssol	373.634	187.816	561.450	330.075	165.037	495.112
Kyra	2,846.746	2,236.729	5,083.475	2,602.009	2,044.435	4,646.444
Kato Amiantos "Kardana"	279.928	140.464	420.392	44 867	22.433	67.300
Lythrodontas M'ce of Dam	200.000	100.000	300.000	99.659	49.829	149.488
Ovgos Morphou	3,662.164	3,661.165	7,323.329	1,435.396	1,435.395	2,870.791
Meniko-Akaki Antiflood	188.000	62.000	250.000	100.371	33.457	133.828
Morphou "Teratsia"	7,500.000	7,500.000	15,000.000	7,388.735	7,388.735	14,777.470
Panayia "Sarka"	317.252	211.502	528.754	213.955	142.637	356.592
Petra	367.396	184.698	552.094	321.373	160.687	482.060
Potami	2,646.525	1,324.262	3,970.787	762.626	381.313	1,143.939
Potamitissa "Pano Potami"	109.842	54.921	164.763	75.570	37.784	113.354
Potamitissa "Kato Potami"	18 660	9.330	27.990	18.520	9.260	27.780
Pelendri "Kountourides"	206.101	103.505	309.606	22 489	11.244	33.733
Peristerona) Astromeritis)	2,355.009	1,569.670 785.335	4,710.014	2,105.645	1,403.764 701.881	4,211.290
Tembria	865.929	432.465	1,298.394	775.622	387.810	1,163.432
Xylotymbou	3,667.000	1,833.000	5,500.000	1,883.770	941.874	2,825.644
Trimiklini M'ce of Dam	300.000	150.000	450.000	295.436	147.716	443.152
Trimiklini M'ce of Dam Antiflood	16.000	-	16.000	16.000	-	16.000
C/F	£70,110.488	43,955.490	114,065.978	52,007.381	33,309.229	85,316.610

Scheme	Estimated Cost			Actual Expenditure		
	Government £ mils	Village £ mils	Total £ mils	Government £ mils	Village £ mils	Total £ mils
B/F	70,110.488	43,955.490	114,065.978	52,007.381	33,309.229	85,316.610
Arakapas "Angoulos" Antiflood	46.000	24.000	70.000	46.667	23.333	70.000
Ay Pavlos "Yiannitsis Antiflood"	70.000	20.000	90.000	38.676	11.049	49.725
Ay. Theodoros L'ca	4,166.000	2,084.000	6,250.000	3,860.704	1,930.352	5,791.056
Amargetis "Ziripilli" Antiflood	750.000	250.000	1,000.000	643.930	214.644	858.574
Ay. Demetris "kaloyiros" Antiflood	94.000	46.000	140.000	78.915	39.457	118.372
Ay. Therapon Antiflood	4,570.000	600.000	5,170.000	3,004.176	394.213	3,398.389
Ay. Pavlos "Dhomes" Antiflood	250.000	50.000	300.000	203.000	40.599	243.599
Agros "Mylos Lambada" Antifl.	90.000	45.000	135.000	113.595	56.788	170.383
Agros "Kokkires Antiflood"	50.000	25.000	75.000	41.302	20.651	61.953
Dhymes "Livadhi Antiflood"	66.000	34.000	100.000	63.545	31.773	95.318
Dhymes "Kambos Kardhana Antifl."	40.000	20.000	60.000	40.000	20.000	60.000
Dhymes "Kambos" Antiflood	36.000	19.000	55.000	33.689	16.845	50.534
Dhymes "Hj. Pelendros" Antifl.	66.000	34.000	100.000	64.430	32.215	96.645
Dhierona "Kamaroudhia"	200.000	100.000	300.000	25.430	12.715	38.145
Galini	4,000.000	2,000.000	6,000.000	3,726.607	1,863.303	5,589.910
Kalopanayiotis	2,200.000	1,100.000	3,300.000	1,464.297	732.147	2,196.444
Kelokedhara "Ziripilli" Antiflood	877.000	223.000	1,100.000	879.250	219 812	1,099.062
Kato Amiantos Pelendri Antiflood	894.000	446.000	1,340.000	862.493	431.246	1,293.739
C/F	£88,575.488	51,075 490	139, 650.978	67,198 087	39,400.371	106,598.458

Scheme	Estimated Cost			Actual Expenditure		
	Government £ mils	Village £ mils	Total £ mils	Government £ mils	Village £ mils	Total £ mils
B/F	88.575.488	51,075.490	139.650.978	67,198.087	39,400.371	106,598.458
Kilani Antiflood	2,006.000	1,004.000	3,010.000	1,638.700	819.350	2,458.050
Kapilio Antiflood	610.000	50.000	660.000	76.124	6.344	82.468
Lyssi Recharge-Akhna	916.627	459.315	1,375.942	482.598	241.298	723.896
Lemythou Antiflood	160.000	80.000	240.000	127.503	63.751	191.254
Moutoullas	3,000.000	1,500.000	4,500.000	2,207.738	1,103.870	3,311.608
Karavas "Motides"	616.000	484.000	1,100.000	584.452	459.212	1,043.664
Nata Kholetria - Antiflood	1,500.000	500.000	2,000.000	1,494.054	498.019	1,992.073
Nikoklia Antiflood	1,238.000	412.000	1,650.000	1,221.655	407.218	1,628.873
Ormidhia	4,705.624	2,352.814	7,058.438	494.507	247.254	741.761
Phrenaros	242.940	121.470	364.410	87.333	43.667	131.000
Pharmakas "Dexameni tou-Khoriou	227.000	113.000	340.000	176.781	88.391	265.172
Philia	3,466.000	1,734.000	5,200.000	3,062.921	1,531.462	4,594.383
Psevdas	700.000	350.000	1,050.000	644.740	322.370	967.110
Pano Zodhia	2,500.000	2,500.000	5,000.000	2,434.016	2,434.017	4,868.033
Prodromos "Kyparissi" Antiflood	74.000	36.000	110.000	67.272	33.635	100.907
Paleomylos "Hardji" Antiflood	133.000	67.000	200.000	103.478	51.738	155.216
Pera - Pedhi Antiflood	320.000	160.000	480.000	310.374	155.186	465.560
Syrianokhori	7,500.000	7,500.000	15,000.000	7,472.206	7,472.206	14,944.412
Tripimeni	2,933.000	1,467.000	4,400.000	2,284.710	1,142.355	3,427.065
Tris Elies "Drakontas" Antiflood	166.000	84.000	250.000	165.809	82.904	248.713
Trimiklini	605.234	302.117	907.351	0.334	0.166	0.500
C/F	£122,194.913	72,352.206	194,547.119	92.335.392	56,60 1.784	148.940.176

Scheme	Estimated Cost			Actual Expenditure		
	Government £ mils	Village £ mils	Total £ mils	Government £ mils	Village £ mils	Total £ mils
B/F	122.194.913	72,352.206	194.547.119	92,335.392	56,604.784	148,940.176
Ashia-Strongylos	666.000	334.000	1,000.000	661.409	330.704	992.113
Ayios Pavlos "Yiannitsis"	340.000	170.000	510.000	297.425	130.714	428.139
Astromeritis	2,500.000	2,500.000	5,000.000	2,437.041	2,437.042	4,874.083
Agros M'ce of Dam	400.000	200.000	600.000	379.028	189.513	568.541
Agridhia "Kaminadja" Antiflood	60.000	30.000	90.000	45.463	22.731	68.194
Agros "K. Erimos"	420.000	330.000	750.000	320.251	251.626	571.877
Agros "P. Yitonia" Antiflood	26.000	14.000	40.000	20.328	10.164	30.492
Ay. Ioannis "K. Akros"	930.000	570.000	1,500.000	781.512	478.991	1,260.503
Agros "Paleomylos"	333.000	167.000	500.000	284.758	142.379	427.137
Agros "Kamara-Omirides"Antiflood	13.000	7.000	20.000	13.333	6.667	20.000
Dhymes "Hj. Phisouni" Antiflood	60.000	30.000	90.000	54.535	27.267	31.802
Elia "Chiflik"	1,508.000	1,092.000	2,600.000	1,435.364	1,039.400	2,474.764
Eftagonia "Pothos"	1,624.000	1,176.000	2,800.000	1,269.745	919.470	2,189.215
Kato Platres-Antiflood	123.000	62.000	185.000	81.533	40.767	122.300
Kato Amiantos-Palendri "Appis"	883.000	442.000	1,325.000	607.307	303.652	910.959
Kholetria	96.039	47.519	143.558	94.256	47.129	141.385
Katydhata-Antiflood	637.000	213.000	850.000	630.597	210.200	840.797
Karavas "Platani"	375.000	375.000	750.000	373.704	373.704	747.408
K. Koutraphas Antiflood	697.000	233.000	930.000	697.240	232.413	929.653
Mandria L'ssol Antiflood	30.000	15.000	45.000	24.968	12.484	37.452
Moniatis Antiflood	33.000	17.000	50.000	33.333	16.667	50.000
Milikouri	301.195	151.097	452.292	273.729	136.864	410.593
C/F	£ 134,250.147	80,527.822	214,777.969	103,152.251	63,965.332	167,117.583

Scheme	Estimated Cost			Actual Expenditure		
	Government £ mils	Village £ mils	Total £ mils	Government £ mils	Village £ mils	Total £ mils
B/F	134,250.147	80,527.822	214 777.969	103,152.251	63,965.332	167,117.583
Mathikoloni Antiflood	63.000	32.000	95.000	58.201	29.101	87.302
Maroni	2,867.000	1,433.000	4 300.000	1,255.005	627.002	1,882.007
Phini Antiflood	86.000	44.000	130.000	67.528	33.764	101.292
Potamitissa "Arsoulou"Antiflood	30.000	15.000	45.000	26.360	13.180	39.540
Potamitissa "Hassanis"Antiflood	20.000	10.000	30.000	17.351	8.676	26.027
Pyrgos "Katouris"	6,666.000	3,334.000	10,000.000	5,902.786	2,951.392	8,854.178
Psomolophou	4,000.000	2,000.000	6,000.000	2,991.576	1,495.788	4,487.364
Potamiou	1,533.000	767.000	2,300.000	1,106.095	553.048	1,659.143
Prodromos "Plat. Antonides"	2,900.000	1,450.000	4,350.000	650.524	325.263	975.787
Prastio-Morphou	7,500.000	7,500.000	15,000.000	2,729.159	2,729.162	5,458.321
Ay.Georghios Kyr.M'ce of Dam	300.000	150.000	450.000	294.477	147.239	441.716
Arsos Limassol	2,132.000	1,068.000	3,200.000	769.224	384.613	1,153.837
Arghaki	2,500.000	2,500.000	5,000.000	2,170.382	2,170.381	4,340.763
Anglissides	4,267.000	2,133.000	6,400.000	1,783.525	891.763	2,675.288
Ay.Theodhoros"Ag.Gerghios" Antiflood	26.000	14.000	40.000	8.602	4.300	12.902
Arsos L'ssol Antiflood	160.000	80.000	240.000	42.564	21.281	63.845
Ay.Theodhoros Agrou "Vas.Pinak"Antiflood	54.000	28.000	82.000	49.460	24.730	74.190
Ay. Theodhoros Agrou Antiflood	100.000	50.000	150.000	64.584	32.292	96.876
Gastria	33.071	245.606	278.677	33.071	245.606	278.677
K.Amiantos-Pelendri"K. Phylagra"	1,733.000	867.000	2,600.000	1,232.379	616.190	1,848.569
K.Amiantos-Pelendri "P. Phylagra"	884.000	816.000	1,700.000	342.891	316.515	659.406
Limnia-Ay.Serghios "Plakos " Antiflood	133.000	67.000	200.000	129.551	64.775	194.326
C/F	£ 172,237.218	105,131.428	277,368.646	124,877.546	77,651.393	202,528.939

Scheme	Estimated Cost			Actual Expenditure		
	Government £ mils	Village £ mils	Total £ mils	Government £ mils	Village £ mils	Total £ mils
B/F	172,237.218	105,131.428	277,368.646	124,877.546	77,651.393	202,528.939
Limnia-Ay. Serghios"Kourouklas" Antiflood	166.000	84 000	250.000	162.835	81.417	244.252
Pera-Pedhi M'ce of Dam	65.000	65.000	130.000	86.862	43.431	130.293
Pelendri "Pervoloudhia"	690.000	460.000	1,150.000	619.107	412.736	1,031.843
Tymbou Antiflood	850.000	425.000	1,275.000	414.813	207.407	622.220
Vitsada Antiflood	100.000	50.000	150.000	86.777	43.388	130.165
Ziyi-Tokhni	5,667.000	2,833.000	8,500.000	2,107.874	1,053.937	3,161.311
Karavas "Mezeres"	306,000	294.000	600.000	266.090	255.656	521.746
Total Irrigation	£180,081.218	109,342.428	289,423.646	128,621.904	79,749.365	208,371.269

Statement of Expenditure for the year 1969

Village Water Supply Schemes (2D/20)

Contributory Schemes

Scheme	Estimated Cost			Actual Expenditure		
	Government	Village	Total	Government	Village	Total
Ayia Kebir	1 452 633	7 218 311	8 670 944	1 112 840	5 530 934	6 643 324
Bella-Pais		368 731			343 964	
Kazaphani	1 108 191	739 460	2 216 382	1 031 890	687 928	2 063 782
Bella-Pais	417 543	417 542	835 085	379 633	379 634	759 267
Ay Khariton-Vitsadha-Psillatos	800 000	-	800 000	786 419	-	786 419
Asomatos L'ssol	1 059 987	1 200 876	2 260 863	266 454	302 041	568 495
Ay Epiktitos		2 233 055			2 116 029	
Klepini	2 657 967	211 958	5 102 980	2 519 083	201 526	4 836 638
Petra tou Dhigeni	79 289	-		58 924	-	
Khodhara	171 646	-		127 561	-	
Pyrga	-	158 283		-	117 628	
Angastina	-	267 270		-	198 622	
Marathovounos (Dry Villages)	-	590 666		-	438 955	
Tsiattos (Dry Villages)	237 573	-		176 555	-	
Mousoulita (Dry Villages)	2 969 660	85 823	5 939 321	2 206 916	63 779	4 413 834
Kourou-Monastiri (Dry Villages)	59 394	-		44 139	-	
Mora (Dry Villages)	207 876	-		154 483	-	
Ashia (Dry Villages)	-	673 222		-	500 309	
Aphania (Dry Villages)	-	217 677		-	161 766	
Yenagra (Dry Villages)	-	204 610		-	152 057	
Ornithi (Dry Villages)	16 332	-		12 139	-	
Exo Metochi	2 929 913	2 929 911	5 859 824	2 322 590	2 322 592	4 645 182
C/F	14 168 004	17 517 395	31 685 399	11 199 626	13 517 815	24 717 441

Scheme	Estimated Cost			Actual Expenditure		
	Government £ mils	Village £ mils	Total £ mils	Government £ mils	Village £ mils	Total £ mils
B/F	14,168.004	17.517.395	31,685.399	11,199.626	13,517.815	24,717.441
Kalokhorio Klirou	2,586.276	2,586.272	5,172.548	160.985	160.986	321.971
Kalokhorio L'ssol	1,284.548	1,284.548	2,569.096	53.894	53.895	107.789
Kazaphani	1,983.799	1,983.798	3,967.597	1,938.070	1,938.070	3,876.140
Kalopanayiotis	2,456.395	2,456.392	4 912.787	40.540	40.540	81.080
Kato Pyrgos Phase I	1,215.627	1,215.626	2,431.253	2,796.363	2,796.365	5,592.728
Kato Pyrgos Phase II	4,550.000	8,550.000	13,100.000	3,376.987	6,346.555	9,723.542
Kornos	235.733	235.733	471.466	155.255	155.256	310.511
Lythrodontas	1,330.999	1,355.996	2,686.995	747.569	762.061	1,509.630
Mouttayiaka	66.086	101.612	167.698	10.734	16.454	27.188
Kato Dhikomo	1,418.705	4,256.111	5,674.816	1,360.225	4,080.678	5,440.903
Neo Khorio Kythreas	1,574.984	1,574.984	3,149.968	1,397.033	1,397.035	2,794.068
Pentayia	1,498.795	2,574.585	4,073.380	1,455.051	2,503.194	3,958.245
Phlamoudi	867.799	511.313	1,379.112	320.976	189.239	510.215
Palekythro	4,862.707	4,862.708	9,725.415	4,735.999	4,736.002	9,472.001
Pano Dhikomo	265.705	619.976	885.681	188.209	439.155	627.364
Pano Kyvidhes	719.924	1,199.923	1,919.847	352.126	436.687	788.813
Polemi	195.111	894.595	1,089.706	0.357	1.643	2.000
Pano Dhikomo)		262.375			244.452	
Kato Dhikomo)	971.759	709.383	1,943.517	905.377	660.927	1,810.756
Vasilia)		763.805			476.224	
Agridhakia) Part I		381.401			238.227	
Sysklipos)		458.682			285.780	
Ay. Ermolaos)		407.138			254.136	
C/F £	42,252.956	56,764.351	97,006.281	31,195.376	41,731.376	71,672.385

Scheme		Estimated Cost			Actual Expenditure		
		Government £ mils	Village £ mils	Total £ mils	Government £ mils	Village £ mils	Total £ mils
	B/F	42,252.956	56,764.351	97,006.281	31,195.376	41,731.376	71,672.385
Ay. Marina	Part I	4,520.446	228.841	7,330.918	2,817.886	142.391	4,572.482
Asomatos			305.122			190.520	
Panagra			37 641			23.926	
Orga			113.921			71.446	
Livera			113.921			71.446	
Agridhaki	Part II		560.541			437.739	
Sysklipos			671.651			525.124	
Ay. Ermolaos		4,330.519	597.241	6,944.711	3,384.893	467.137	5,427.637
Ay. Marina			336.325			262.662	
Asomatos			448.434			350.032	
Agridhakia	Part III		599.143			437.147	
Sysklipos			718.972			524.575	
Ay Ermolaos		3,675.076	638.753	5,991.430	2,680.953	466.289	4,371.451
Ay Marina			359.486			262.487	
Agridhaki	Part IV	1,550.000	1,550.000	3,100.000	771.983	771.984	1,543.967
Sysklipos	Part V		480.000			459.282	
Ay Ermolaos		2,053.000	427 000	3,200.000	1,964.708	408.250	3,061.881
Ay Marina			240.000			229.641	
Sysklipos Part VI		1,800.000	1,800.000	3,600.000	1,595.162	1,595.164	3,190.326
Ay. Ermolaos Part VII		1,866.000	2,134.000	4,000.000	2,370.902	1,185.452	3,556.354
Ay. Marina Part VIII		6,150.000	2,050.000	8,200.000	5,041.256	1,680.418	6,721.674
Asomatos Part IX		3,200.000	1,600.000	4,800.000	2,120.837	1,060.419	3,181.256
Vasilia Part X		772.090	772.089	1,544.179	301.993	301.995	603.988
	C/F	£72,170.087	73,547.432	144,327.519	54,245.949	53,657.452	107,903.401

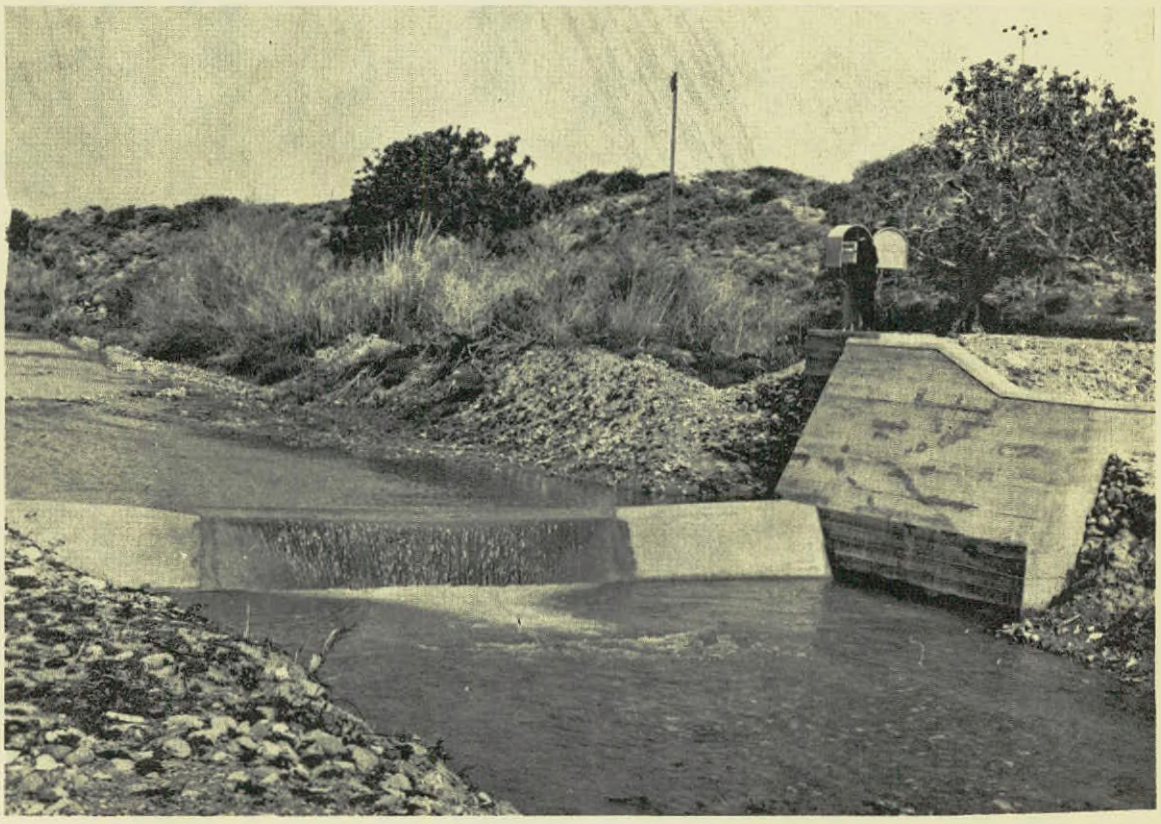
Scheme	Estimated cost			Actual expenditure		
	Government £ mils	Village £ mils	Total £ mils	Government £ mils	Village £ mils	Total £ mils
B/F	72,170.087	73,547.432	145,717.519	54,245.949	53,657.452	107,903.401
Panagra)		142.000			106.601	
Orga (Part XI	3,000.000	429.000	4,000.000	2,239.527	319.954	2,986.036
Livera)		429.000			319.954	
Panagra Part XII	1,275.000	425.000	1,700.000	1,090.063	363.353	1,453.416
Orga)		662.000			565.421	
Livera(Part XIII	3,976.000	662.000	5,300.000	3,392.528	565.421	4,523.370
Orga Part XIV	1,566.922	522.308	2,089.230	1,342.648	447.549	1,790.197
Livera Part XV	5,700.000	1,900.000	7,600.000	4,661.215	1,553.739	6,214.954
Trakhoni	2,547.646	2,547.644	5,095.290	2,233.368	2,233.370	4,466.738
Voni	2,410.273	2,410.272	4,820.545	2,216.750	2,216.752	4,433.502
Angastina	2,900.000	3,900.000	6,800.000	2,894.674	3,892.367	6,787.041
Ashia	8,500.000	11,000.000	19,500.000	7,311.783	9,462.207	16,773.990
Arminou	1,200.000	1,900.000	3,100.000	1,163.237	1,841.773	3,005.010
Dhiorios	767.000	766.000	1,533.000	444.811	444.811	889.622
Evrykhou Antiflood	350.000	350.000	700.000	221.118	221.119	442.237
Kolossi Antiflood	400.000	400.000	800.000	386.573	386.573	773.146
Klepini	57.932	28.964	86.896	12.490	6.245	18.735
Lymbia	4,550.000	7,050.000	11,600.000	4,141.336	6,415.216	10,556.552
Kissoussa Antiflood	450.000	50.000	500.000	283..705	31.523	315.228
Mathiatis	2,186.695	728.897	2,915.592	1,518.750(R.)	506.250(R.)	2,025.000(R.)
Mousoulita	475.000	855.000	1,330.000	463.249	833.642	1,296.891
Marathovounos	3,910.000	6,410.000	10,320.000	3,654.937	6,122.849	9,777.786
Nikitari	2,400.000	3,000.000	5,400.000	1,409.144	1,761.034	3,170.178
C/F	£120.792.555	120,115.517	240,908.072	92,290.355	93,262.675	185,553.030

Scheme	Estimated cost			Actual Expenditure		
	Government	Village	Total	Government	Village	Total
B/F	120 792 555	120 115 517	240 908 072	92 290 355	93 262 675	185 553 030
Patriki	3,514 000	3.796 000	7 310 000	3 064 678	3 310 771	6 375 449
Palekhori	1,550 000	3,650.000	5 200 000	1 532 611	3.608 654	5 141 265
Pyrga	1,450 000	2 450 000	3,900 000	1 435 968	2 426 237	3 862 205
Trimiklini Reg. Scheme Antiflood	290 000	290 000	580 000	277 136	277 136	554 272
Yenagra	1,850 000	2 500 000	4 350 000	1 820 666	2.467 160	4 287 826
Ypsonas P.& K.Polemidhia Antiflood	400 000	400 000	800 000	397 242	397 243	794 485
Aphania	2 750 000	3,930 000	6 680 000	2,570 051	3 672 433	6 242 534
Ay. Amvrosios L'ssol Antiflood	300 000	100 000	400 000	273 414	91 138	364 552
Morphou	44 000 000	67 000 000	111,000 000	7 010 814	10.675 397	17 686 211
Pakhna Antiflood	150 000	150 000	300 000	122 356	122 356	244 712
Phrenaros	2 000 000	2 000 000	4 000.000	1,930 543	1 930 544	3 861 087
Sotira Antiflood	300 000	100 000	400 000	49 141	16 381	65 522
Komi-Kebir	5.550 000	7 050 000	12,600 000	3 170 202	4,026 626	7 196 828
Kissonerga Antiflood	720 000	180 000	900 000	0 040	0 010	0 050
Polis Prodromi Antiflood	733 000	367 000	1 100 000	94 328	47 164	141 492
Kathikas)		1 891 000			1 500 892	
Phiti)		1 154 000			915 934	
Polemi) Papaloucas	5 000 000	898 000	10,000 000	3 968 516	712 349	7 937 031
Lassa)		512 000			406 773	
Ay Demetrianos) Reg.		481 000			381 770	
Psathi) Scheme		64 000			50.797	
Zoopiyi)		3 808 000			293 527	
Louvaras)	7 798 000	1 994 000	13 600 000	601 033	153 752	1 048 312
Louvaras	3 533 000	1 767 000	5,300 000	622 847	311 423	934 270
Total	202 680 555	226 647 517	429 328 072	121 231 941	131 059 192	252 291 133

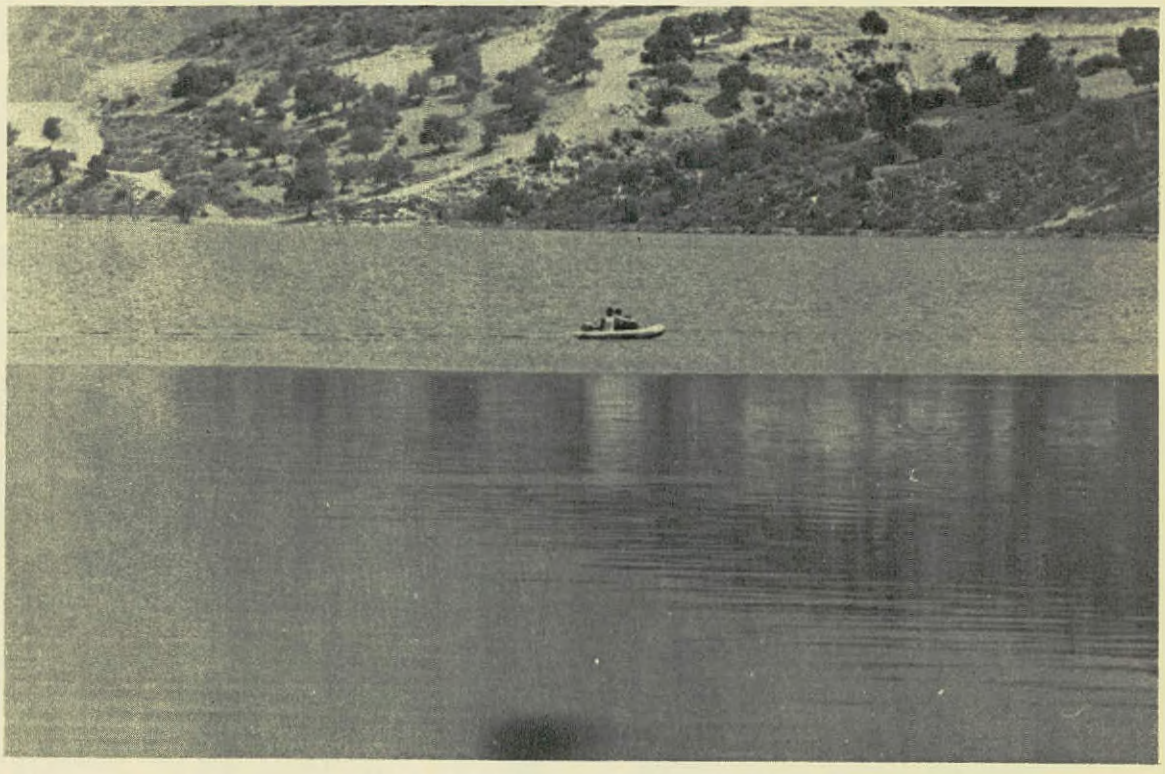
1.11 Publications of the Water Development Department during 1969

Library Reg. No.	Title	Author	Date
4577	Foundation Investigations for Cyprus Grain Commisssion at Famagusta Grain Silo Site Report No. F/5.	Ioannides N.C.	January 1969
4589	Dam Design and Construction. Progress Report No 19	Hsu S.W.	January 1969
4195	Preliminary Estimating Data Instructions Manual No. S/6	Konteatis C.A.C., Yiannakou N., Milinusic Br., Hsu S.W.	February 1969
4220 4221	Maintenance of Dams Instructions Manual No S/7	Konteatis C.A.C., Hsu S.W.	March 1969
4227 4228	Annual Report of the Drawing Office Branch for the year 1968	Pitsillides S.C.	March 1969
4297	Stability Analyses of Earth Dam on Pervious Foundation Massari Dam Project	Hsu S.W.	March 1969
4303	Yermasoyia Dam Calibration of Automatic Radial Gates	Thrassou Th.	March 1969
4562	Report No. 17 (Revised). Land Reclamation of the Salt Lake of Akrotiri (Preliminary Study)	Milinusic B.M.	April 1969
4579	Argaka-Magounda. Irrigation Scheme Revisions.	Meijer Theo.	April 1969
4266	Dam Design and Construction Progress Report No. 20	Hsu S.W.	May 1969
4578	Kythrea Flood of 2-3 Dec. 1968. Report No. H/2	Phanartzis Chr.	May 1969
4176 4581	Massari Dam Vol.I Design Report Vol II Estimates Quantities and Specifications. Vol. III Drawings Report No D/1	Georghiades A.P.	June 1969
4354	Report on the Hydrogeology and Safe Yield of Nissou-Dhali - Potamia Area. Report No. H/4	Jacovides J.	July 1969
4360 4361 4362	Kalopanayiotis Dam. Completion Report Report No. C/2	Marcoullis Chr	August 1969
4372	Xeropotamos River. Asprokremmos Dam. Material Investigations. Report No. F/2	Artemis C.	August 1969
4349	Geological Reconnaissance of Evretou Damsite Stavros tis Psokas River-Polis Area. Report No. G/3	Hsu T.L.	August 1969

Library Reg. No.	Title	Author	Date
4350	Geological Reconnaissance of Sarama Damsite Stavros tis Psokas River-Polis Area. Report No. G/2	Hsu T.L.	August 1969
4588	Lefkara Dam Project-Planning Report.	Hsu S.W.	September 1969
4346	A Summary of Geological Reconnaissance of Damsite in Cyprus. Report No. G/1	Hsu T.L.	September 1969
4351	Dam Design and Construction Progress Report No.21 1 May - 31 August 1969	Hsu S.W.	September 1969
4352	Ezuza River. Morokambos Dam. Material Investigations. Report No. F/4	Artemis C.	September 1969
4353	Evaporation Control Experiment at Yermasoyia Dam Report No. H/3	Phanartzis Chr.	September 1969
4355	Report on the Water-Balance of Morphou Aquifer for 1960-1968 and Safe-Yield Apraisal for 1967-1968. Report No.H/5	Jacovides J.	September 1969
4393 4416 4417 4438	Famagusta Water Supply. Khirokitia Project Phrenaros Reservoir Geological and Foundation Investigations. Report No. F/6	Xenophontos C., & Artemis C	October 1969
4394 4434	Serrakhis River. Morphou Earth Dam. Raising of Embankment. Report No. F/7	Artemis C.	October 1969
4395 4418 4436 4437	Palia Vrysi River. Karavas Dam. Foundation & Material Investigations. Report No.F/8	Christodoulou C.A	October 1969
4562	Report No.19. Famagusta Water Supply. Pipeline Yermasoyia Dam - Khirokitia Reservoir. (Preliminary Study).	Milinusic B.M.	October 1969
4498 4499	Electrical Analogy Models for Seepage Investigations. (Application: Lefkara Dam) Report No. D/3	Thrassou Th.	November 1969
4562	Report No.20. Yermasoyia Dam Project. Preliminary Study of Distribution System 1. Parekklisha, 2. Moutayiaka 3. Ayios Tykhonas 4.Trakhoni	Milinusic B.M.	Novermber 1969
4489 4490	Hydropower Development at Lefkara Dam. Report No P/1	Thrassou Th.	December 1969
4457 4461	Syrgatis River. Lefkara Dam. Foundation Investigations. Report No F/9	Marcoullis Chr.	December 1969



Vasilikos River Representative Basin. V — shaped Weir at the Coastal Flow - Gauging Station.



Evaporation Control Experiment — Yermasoyia Dam Application of an Evaporation retardant from a boat. The difference in appearance between the treated and non-treated water surface is very clearly illustrated.

II. DIVISION OF WATER RESOURCES

By

C.S. Lytras, Asst. Director &

D. Kypris, Head of Division.

2.1 Introduction

The Division of Water Resources groups together all services required for the collection of hydrological and hydrogeological data regarding ground and surface water, drilling works, control of groundwater, extraction and engineering geology problems as connected with the planning and execution of water works projects.

2.1.1 Mr. C.S. Lytras the Assistant Director acted as Head of the Division until - July 1969 when Mr. D. Kypris, Geologist Class I, who had been attached to the Geologic-1 Department as part of this Department' s contribution to the Ground Water and Mineral Surveys U.N. Special Fund Project, returned and resumed duties with his parent Department. Mr. N. Toufexis, Assistant Head of the Division acted also as Head of the Surface Water Resources Branch since Mr. Chr. Phanartzis, Hydrologist, has been attached to the Cyprus Water Planning Project. Mr. M. Peppis Geologist, was the Head of the Drilling Branch and Mr. J. Jacovides, Hydrologist, was the Head of the Groundwater Branch. Mr. Chr. Ioannou, Hydrogeologist, continued the work he has started in October 1968 on the hydrogeology of the Southeastern Mesaoria Plain. Mr. C. Xenophontos, Geologist, of the Geological Department and attached to this Department continued his work in dealing with engineering Geology problems and acted as Head of the Engineering Geology Branch.

2.2 Prospecting Drilling

The programme of Prospecting Drilling was carried out with a crew of 10 drilling rigs. The rigs included two heavy duty Ruston Bucyrus 60 R.L. and eight Ruston Bucyrus 22W. Two additional Bucyrus 22W remained on loan with the Geological Survey Department. Three more rigs are still in the hands of the Turks.

During the year, 77 boreholes were drilled for water with an aggregate footage of 17,272 feet with an average depth of 225 feet. A table showing the results of drilling at each village and District is shown on page 36.

A total of 22 boreholes were subjected to lengthy pumping tests ranging from 15 hours to 167 hours continuous duration. The total volume of water pumped was 17,558 300 gallons over a total pumping time of 1241 hours.

2.3 Drilling Costs

During the year the total expenditure for drilling was £31 800. The total footage drilled was 17 272 feet. The total number of boreholes was 77. The average cost of drilling was £413 per borehole or £1.84 per foot of drilling. These costs include wages of drilling crews for drilling, casing and testing the various boreholes. Costs also include long pumping tests with electrosubmersible pumps as well as maintenance of drilling equipment.

Boreholes Drilled for Water in 1969 - Summary of Results

District	Locality	Number drilled	Number successful	Percentage successful	Hours pumped	Total output gallons	Average Yield G.P.D.
Nicosia	Ayios Ioannis (Malounda)	2	1	50.0			
	Dhali	3	3	100.0	48	211 000	105 500
					43	967 500	540 000
					19	488 400	616 926
	Galata	2	-	-	-	-	-
	Kapouti	2	1	50.0	-	-	-
	Koutrafas	1	1	100.0	-	-	-
	Lakatamia	1	-	-	-	-	-
	Laxia	3	-	-	-	-	-
	Morphou	4	4	100.0	24	735 000	735.000
					51	1 530 000	720 000
					30	450 000	360 000
					24	663 400	663 400
	Margo	8	-	-	-	-	-
	Paliometocho	1	1	100.0	8	36 000	108 000
	Philia	2	2	100.0	58	494 000	204 414
					96	1 560 000	390 000
	Potamia	9	8	88.9	48.5	280 684	136 833
	Potamos tou Kambou	1	1	100.0	-	-	-
	Xeri	1	-	-	-	-	-
	Yerolakkos	4	1	25			
Kyrenia	Ayia Irini	2	-	-	-	-	-
	Phterykha	1	To be completed in 1970				
Larnaca	Khirokitia	3	3	100.0	65.5	524 558	192 204
					67	489 500	175 343
					167	2 558 458	367 686
	Aradhippou	4	1	25.0	-	-	-
	Lefkara	1	-	-	-	-	-
	Kalavasos	5	3	60.0	48	559 812	279 906
					44	880 000	480.000
					73	1 332 306	438 018
Famagusta	Ayios Andronikos	1	1	100.0	77	1 272 844	396 730
	Lefkoniko	1	-	-	-	-	-
	Phrenaros	1	1	100.0	96.5	358 500	89 160

District	Locality	Number drilled	Number successful	Percentage successful	Hours Pumped	Total output gallons	Average Yield G.P.D.
Limassol	Paramali	2	2	100.0	-	-	-
	Erimi	1	-	-	-	-	-
	Episkopi	1	1	100.0	15.5	119 096	184 407
	Kamdou	2	2	100.0	68 46	681 031 645 980	240 364 337 033
	Yermasoyia	1	1	100.0	24	720 000	720 000
Paphos	Kholetria	2	2	100.0	-	-	-
	Kouklia	1	1	100.0	-	-	-
	Polemi	1	-	-	-	-	-
	Statos	2	-	-	-	-	-
	Theletra	1	-	-	-	-	-

2.4 Some notes on certain prospecting boreholes of special hydrogeological interest

Prospecting boreholes were drilled in various geological formations in order to locate new aquifers or to obtain more information on already known aquifers.

As it is already known the most high yielding aquifers are the river gravel aquifers. Prospecting drilling was carried out this year in many of these aquifers in most of the districts.

The most interesting boreholes drilled in this type of aquifer are given below :-

Borehole Serial No. 3/69 (Grid. Ref. N. 64,630; E. 52,451)

This borehole was drilled in Potamos tou Kambou river just to the north of the village and penetrated 106 feet of gravels and sands of which 100 feet are saturated. The borehole was tested with a piston pump for 8 hours and yielded 5,000 g.p.h with no drawdown.

Borehole Serial No. 68/69 (Grid. Ref. N. 22,318; E. 98,897)

This borehole is located in the Vasilikos River. It penetrated 50 feet of gravel and sand of which 22 feet are saturated. During a preliminary test the borehole yielded 6,000 g.p.h with a drawdown of 7 feet. The duration of the test was 8 hours.

Drilling in the Pliocene sediments gave satisfactory results in the area of Philia village.

Borehole Serial No. 17/69 (Grid. Ref. N. 69,488; E. 80,540)

The borehole was drilled about one half a mile to the East of Philia village. The depth of the borehole is 180 feet. The aquifer has a thickness of 162 feet and consists of fine gravel, sands and calcareous sandstones. The saturated thickness is 98 feet. During an 8 hours preliminary pumping test the borehole yielded 5,000 g.p.h. with a drawdown of 8 feet.

More drilling was carried out during 1969 in the Khirokitia aquifer. This aquifer consists of calcareous sandstones, grits and sands of the Pakhna Formation.

Borehole Serial No. 4/69 (Grid. Ref. N. 27,550; E. 02,575)

The total depth of this borehole is 405 feet. It is located near the Khirokitia Reservoir. The thickness of the aquifer is 360 feet of which 200 feet is saturated. This borehole was tested for 167 hours continuously and gave a steady yield of 17,000 g.p.h. The total amount of water extracted was 2,500.000 gallons. The total drawdown was 165 feet.

Drilling on the Kyrenia Range in an effort to locate new aquifers in the various limestone blocks, a borehole was located just to the west of Phteryhka village. Water was struck at various levels and the static water level stood at 80 feet from the surface. By the end of the year the borehole had reached the depth of 700 feet. Drilling should be continued because the borehole was all the way in limestone.

Number and Footage of Boreholes - Number of Boreholes Drilled - 1946-1969

Purpose	1946 1962	1963	1964	1965	1966	1967	1968	1969
Boreholes at Full Cost	2161	12	11	2	8	11	6	30
For Government	901	190	86	215	83	44	62	45
For W.D.D.	854	11	14	16	7	-	2	2
TOTAL	3916	213	111	233	98	55	70	77
Aggregate Footage Drilled.	686,615	40,301	22,825	27,506	16,980	15,008	18,498	17,272
Average Depth	175	189	206	118	173	273	264	225

Boreholes Drilled in 1969

Purpose	No.	Footage Drilled	Percentage successful	Total Tested Yield Gallons	Hours Pumped
Irrigation	13	2,947	86.0	7,099,300	393
Domestic W.S.	19	2,378	16.0	2,047,000	138
Prospecting	43	11,647	56.0	8,412,000	710
Total for water	75				
Observation	2	300			
Technical and Geological	-	-			
Total	77	17,272			

2.5 Surface Hydrology Work

2.5.1 Meteorological Notes

The rainfall and climatological records of 158 observing stations of the Cyprus Government Meteorological Office have been analysed by the Division of Water Resources and the results on the principal features of the weather during the Hydrological year - 1st October, 1968 to 30th September, 1969 - are given here under :

(a) The average rainfall over the whole island was 759 mm which is 150.8% of normal (503 mm) this being the mean since 1908-1957. See page 62 . .

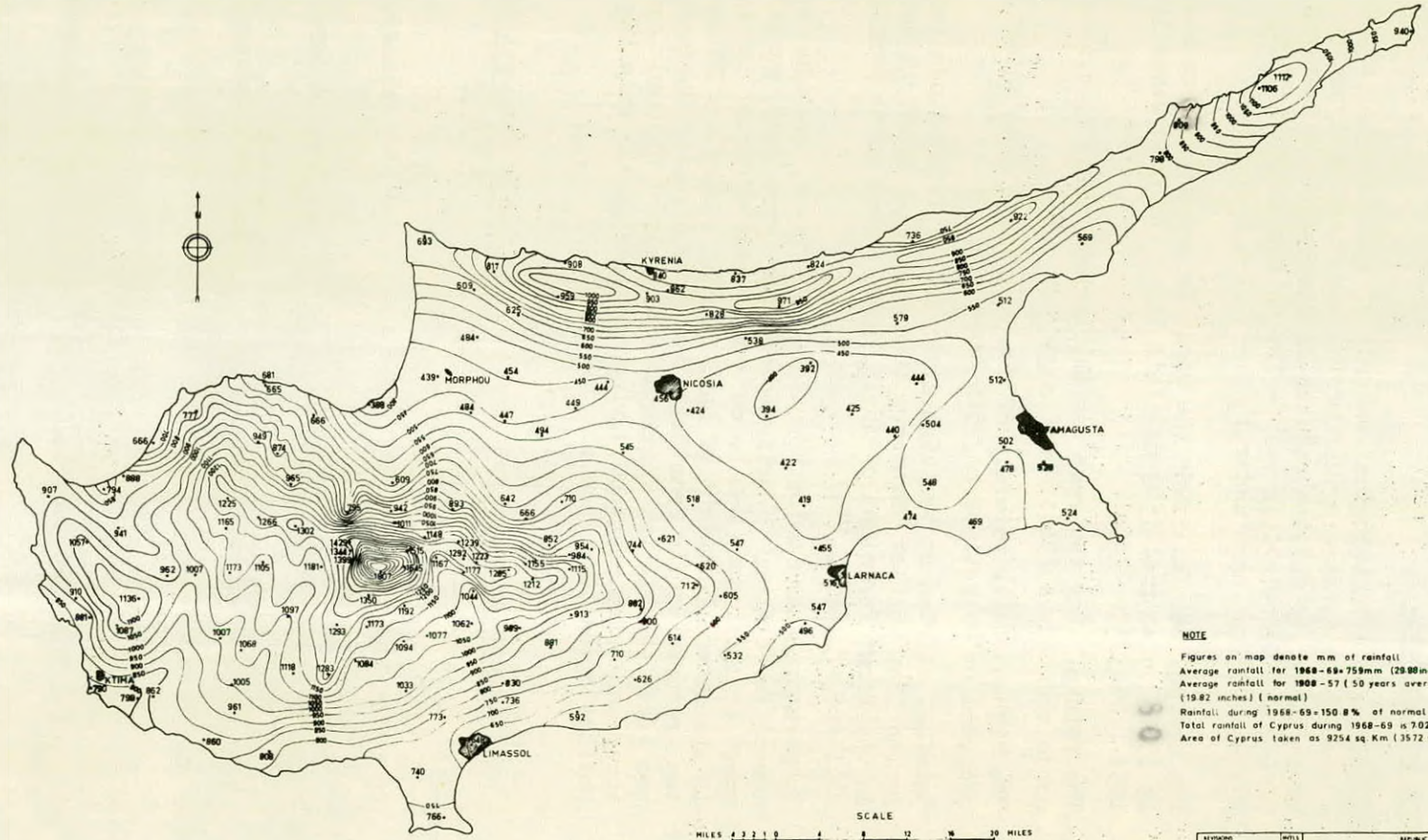
(b) The rainfall for the year was the highest since regular records started in 1916. See page 64.

(c) The highest daily rainfall of the year was 236 mm which occurred at Polystipos on 25th December, 1968.

(d) Snowfall started at the high altitudes of Troodos mountains in the last week of November, 1968. The last snowfall occurred in the first fortnight of April, 1969. Snow cover persisted till end of April, 1969.

(e) Temperatures were below normal in mid-winter, becoming above normal in February. During Spring they were above normal except in April that was below. Heat wave affected the island in the second fortnight of May. During summer and Autumn the temperatures varied from below to above normal. Hereunder are given the highest (maximum) and lowest (minimum) temperatures and dates recorded during the year at the existing Meteorological stations :

Place	Highest Temperatures and date	Lowest Temperatures and date
Nicosia	41.7 C° (on 3rd June)	-1.7 C° (on 30th January)
Limassol	38.9 C° (on 2nd June)	0.0 C° (on 29th January)
Larnaca	39.4 C° (on 2nd June)	0.6 C° (on 30th January)
Famagusta	38.3 C° (on 23rd May)	-1.1 C° (on 30th & 31st January)
Paphos	32.5 C° (on 24th September)	1.4 C° (on 30th January)
Kyrenia	37.2 C° (on 31st May & 1st June)	1.7 C° (on 30th January)



NOTE

Figures on map denote mm of rainfall
Average rainfall for 1968-69 = 759mm (29.88 inches)
Average rainfall for 1908-57 (50 years average) = 503 mm (19.82 inches) (normal)
Rainfall during 1968-69 = 150.8% of normal
Total rainfall of Cyprus during 1968-69 is $7.02 \times 10^9 m^3$ ($247.91 \times 10^9 ft^3$)
Area of Cyprus taken as 9254 sq. Km (3572 sq. miles)

REVISIONS | DATE

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

RAINFALL

ISOHYETAL MAP OF CYPRUS BASED ON RAINFALL FROM 1st Oct. 1968-30th Sep. 1969

DRG. No

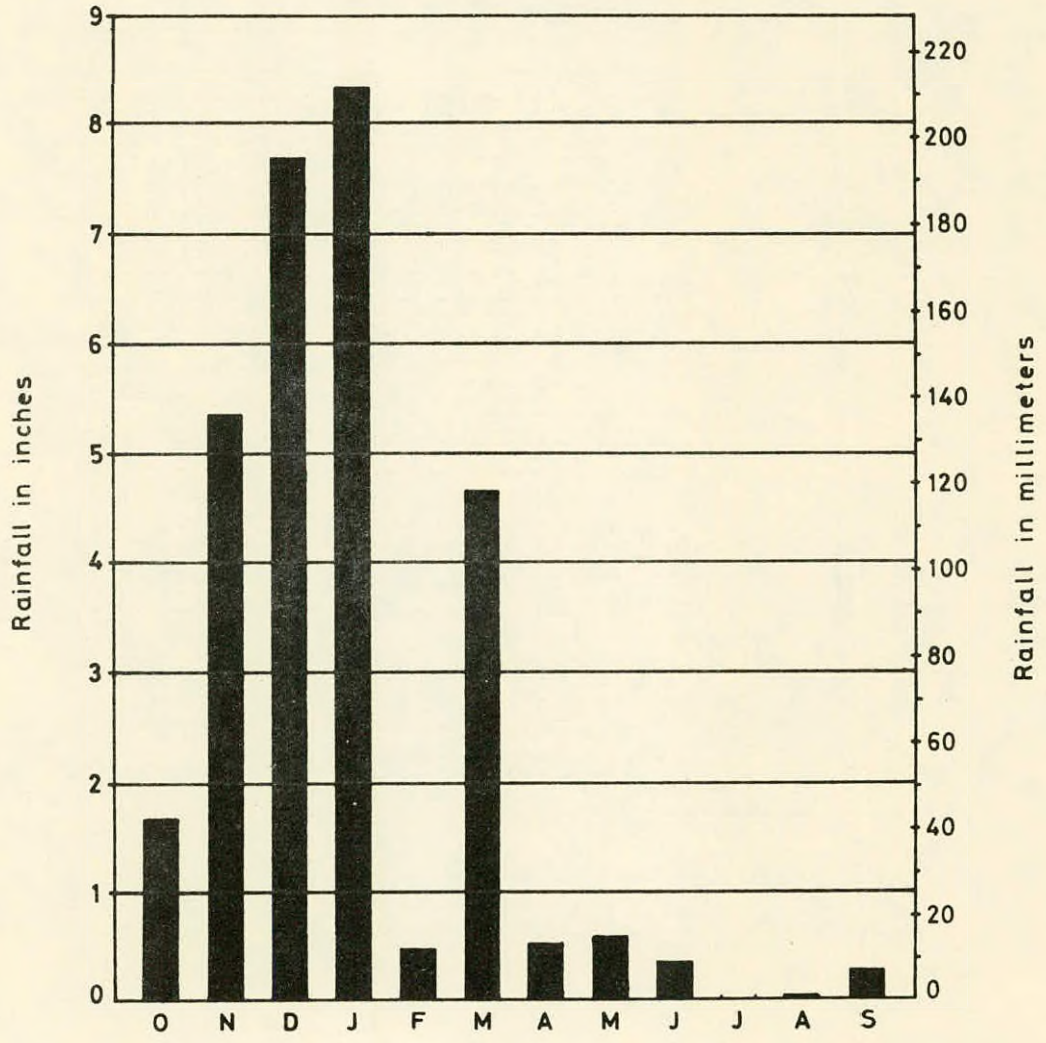
SURVEYED BY | TRACED BY
DESIGNED BY | CHECKED BY
DRAWN BY | APPROVED BY

INCIDENCE OF RAINFALL

The incidence of rainfall per month as worked out from selected rainfall stations during the hydrological year 1968-1969 is given as under :-

Month	Rainfall in inches	Rainfall in millimeters	Percentage %
October	1.68	42	5.53
November	5.35	136	17.92
December	7.71	196	25.82
January	8.28	210	27.67
February	0.46	12	1.58
March	4.64	118	15.55
April	0.50	13	1.71
May	0.59	15	1.98
June	0.35	9	1.19
July	0.00	0	0.00
August	0.04	1	0.13
September	0.28	7	0.92
Totals	29.88	759	100%

GRAPHICAL PRESENTATION
OF INCIDENCE OF RAINFALL



ANNUAL AVERAGE RAINFALL OF CYPRUS
FROM 1916-1969
RAINFALL IN INCHES
HYDROLOGICAL YEAR
RAINFALL IN MILLIMETRES
Mean annual rainfall = 19.82" (503mm)
Mean
19.82"
503mm
1916-17 13.93" (354mm)
1917-18 17.07" (433mm)
1918-19 20.59" (523mm)
1919-20 25.35" (644mm)
1920-21 21.26" (540mm)
1921-22 18.59" (472mm)
1922-23 22.05" (560mm)
1923-24 17.87" (454mm)
1924-25 16.84" (428mm)
1925-26 28.08" (713mm)
1926-27 18.43" (468mm)
1927-28 15.55" (395mm)
1928-29 22.13" (562mm)
1929-30 28.35" (720mm)
1930-31 24.00" (610mm)
1931-32 9.87" (251mm)
1932-33 11.67" (296mm)
1933-34 15.84" (402mm)
1934-35 24.23" (615mm)
1935-36 20.13" (511mm)
1936-37 20.77" (527mm)
1937-38 20.31" (516mm)
1938-39 23.45" (596mm)
1939-40 19.69" (500mm)
1940-41 14.19" (360mm)
1941-42 21.03" (534mm)
1942-43 24.43" (620mm)
1943-44 19.63" (498mm)
1944-45 23.43" (595mm)
1945-46 18.99" (482mm)
1946-47 18.41" (467mm)
1947-48 19.62" (498mm)
1948-49 20.12" (511mm)
1949-50 22.85" (580mm)
1950-51 13.99" (355mm)
1951-52 23.81" (605mm)
1952-53 23.45" (596mm)
1953-54 19.93" (506mm)
1954-55 21.00" (533mm)
1955-56 20.30" (515mm)
1956-57 15.50" (394mm)
1957-58 18.66" (474mm)
1958-59 14.05" (357mm)
1959-60 14.09" (358mm)
1960-61 17.20" (437mm)
1961-62 23.96" (608mm)
1962-63 21.93" (557mm)
1963-64 12.06" (306mm)
1964-65 20.54" (522mm)
1965-66 18.45" (469mm)
1966-67 27.08" (688mm)
1967-68 18.19" (462mm)
1968-69 29.88" (759mm)

Place	Highest Temperatures and date	Lowest Temperatures and date
Akradhes	37.8 C° (on 1st & 2nd June)	-1 1 C° (on 30th January)
Panayia Bridge	37 8 C° (on 2nd & 3rd June)	-4 4 C° (on 30th January)
Morphou	41 7 C° (on 1st June)	-1 7 C° (on 30th January)
Halefga	37 8 C° (on 3rd June)	-2 8 C° (on 29th & 30th January)
Saittas	37 2 C° (on 3rd & 6th June)	-3 9 C° (on 29th & 30th January)
Pano Amiandos	31.7 C° (on 3rd June)	-8.3 C° (on 30th January)
Prodhromos	33.0 C° (on 1st September)	-7.2 C° (on 29th January)
Stavros tis Psokas	35 0 C° (on 3rd June)	-4.4 C° (on 30th January)
Kornos	40 0 C° (on 3rd June)	-6.2 C° (on 29th January)
Platania	33.3 C (on 3rd June)	-3 9 C° (on 30th January)
Phassouri	38 3 C° (on 3rd June)	0.0 C° (on 30th January)

2.5.2 Flood Discharges

During the hydrological year 1968/69 floods of exceptional magnitudes were reported in most rivers the majority occurring in December and March The most noteworthy are those at Dhiarizos, Yermasoyia and Serrakhis at Morphou on the 26th December, 1968, and the highest flood flow was 300, 290 and 260 cubic meters per second respectively.

The table on next page summarizes some of the larger floods and rainfall measured in the catchment or in adjacent catchments on the day of the flood or on the previous days.

Floods of less importance have been ignored.

Gauging Station No.	River & Area (km^2)	Location	Peak Flow		Rainfall		
			m^3/s	Date	mm	Place	Date
1-1-3-95	Khapotami 37.8	Kiasoura	54	26.12.68	51	Omodhos	24.12.68
					89	"	25.12.68
1-1-7-95	Khapotami 110.9	Kouklia	120	26.12.68	51	"	24.12.68
					89	"	25.12.68
1-2-6-95	Dhiarizos 130.0	Philousa	150	26.12.68	60	Kaminaria	24.12.68
					74	"	25.12.68
					25	"	26.12.68
1-2-7-90	Dhiarizos 263.7	Kouklia	300	26.12.68	60	"	24.12.68
					74	"	25.12.68
					25	"	26.12.68
1-4-4-50	Ezouza 81.3	Kannaviou	49	26.12.68	52	Ayia F.S.	24.12.68
					84	"	25.12.68
			25	22.3.69	38	"	21.3.69
					38	"	22.3.69
1-4-9-80	Ezouza 211.3	Akhelia	127	26.12.68	52	"	24.12.68
					84	"	25.12.68
			86	22.3.69	38	"	21.3.69
					38	"	22.3.69
1-6-2-80	Mavrokolymbos 39.9	Potima	14.5	26.12.68	62	Stroumbi	24.12.68
					72	"	25.12.68
1-6-4-60	Xeros 15.8	Peyia	15	25.12.68	25	Mavrokolymbos Dam	24.12.68
					25	"	25.12.68
2-2-3-95	Khrysokhou 67.3	Skoulli	38	27.11.68	63	Stroumbi	26.11.68
					56	"	27.11.68
			51	26.12.68	62	"	24.12.68
					72	"	25 12.68
2-2-6-90	Stavros-tis Psokas 93.0	Evretou	145	26.12.68	40	Stavros-tis Psokas	24.12.68
					70	"	25.12.68
			38	22. 3.69	24	"	21. 3.69
					54	"	22. 3.69
2-7-2-75	Pyrgos 38.6	Phileyia	37	26.12.68	14	"	23.12.68
					40	"	24.12.68
					69	"	25.12.68
					14	"	26.12.68
2-8-3-10	Limnitis 48.7	Limnitis Saw Mill	46	26 12.68	11	Kambos	23.12.68
					28	"	24.12.68
					89	"	25.12.68
					27	"	26.12.68
2-9-4-90	Kambos 52.6	Potamos tou Kambou	11.5	20. 3.69	64	"	19. 3.69
					13	"	20. 3.69
3-2-1-85	Marathasa 26.1	Upstream of Kalo-panayiotis Dam	21	26. 2.68	79	Pedhoulas	24.12.68
					127	"	25.12.68
			25	20. 3.69	74	"	19. 3.69
					24	"	20. 3.69
3-2-2-90	Marathasa 56.9	Upstream of Lefka Dam	26	26.12.68	79	"	24 12.68
					127	"	25.12.68

Gauging Station No.	River & Area (km^2)	Location	Peak Flow		Rainfall		
			m^3/s	Date	mm	Place	Date
3-2-4-95	Marathasa 85.2	Karavostasi	15	26.12.68	79	Pedhoulas	24.12.68
					127	"	25.12.68
3-3-1-70	Ayios Nicolaos 16.1	Kakopetria	26	26.12.68	104	Plantania F.S	24.12.68
					168	"	25.12.68
3-3-3-95	Karyotis 63.2	Evrykhou	47	26.12.68	104	"	24.12.68
					168	"	25.12.68
			20	20. 3.69	91	"	19. 3.69
3-3-5-95	Karyotis 94.0	Pendayia	49	26.12.68	104	"	24.12.68
					168	"	25.12.68
			23	20. 3.69	91	"	19. 3.68
3-4-2-90	Atsas 33.1	Evrykhou	15.5	26.12.68	104	"	24.12.68
					168	"	25.12.68
3-5-4-40	Elea 81.6	Vizakia	21	27.11.68	80	Lagoudhera	26.11.68
					118	"	27.11.68
			97	26.12.68	107	"	25.12.68
					33	"	26.12.68
			25	20. 3.69	67	"	19. 3.69
					10	"	20. 3.69
3-7-1-50	Peristerona 78.5	Panayia F.S.	200	26.12.68	64	Alona	24.12.68
					183	"	25.12.68
3-7-3-90	Akaki 92.5	Malounda	240	26.12.68	85	Palekhori	24.12.68
					199	"	25.12.68
3-7-7-85	Skylloura 76.1	Ayios Vasilios	27	8. 1.69	8	Sysklipos	7 1.69
					76	"	8. 1.69
			95	20. 3.69	112	"	19. 3.69
					23	"	20. 3.69
3-7-8-60	Ovgos 210.7	Kyra	72	20. 3.69	112	"	19. 3.69
					23	"	20. 3.69
3-7-9-50	Serakhis 457.6	Morphou Dam Spillway	260	26.12.68	85	Palekhori	24.12.68
					199	"	25.12.68
			133	20. 3.69	25	"	18. 3.69
					81	"	19. 3.69
6-1-1-80	Ayios Onoufrios 1.5	Kambia	21	26.12.68	95	Makheras Monastry	2 .12.68
					83	"	25.12.68
			26	19. 3.69	53	Mandra tou Kambiou	18. 3.69
					80	"	19. 3.69
6-1-1-85	Pedhieos 29.5	Kambia	58	26.12.68	95	Makheras Monastry	24.12.68
					83	"	25.12.68
			54	19. 3.69	53	Mandra tou Kambiou	18. 3.69
					80	"	19. 3.69
6-5-3-15	Yialias 93.3	Nisou	43	26.12.68	22	Perakhorio	24.12.68
					55	"	25.12.68
			120	19. 3.69	50	"	19. 3.69
6-5-2-95	Alykos 80.4	Ayios Sozomenos	14.5	19. 3.69	50	"	19. 3.69
6-5-3-95	Yialias 213.7	Pyroi	90	26.12.68	22	"	24.12.68
					55	"	25.12.68
			125	19. 3.69	50	"	19. 3.69

Gauging Station No.	River & Area (km^2)	Location	Peak Flow		Rainfall		
			m^3/s	Date	mm	Place	Date
8-4-3-40	Tremithios 90.1	Ayia Anna	39	26.12.68	41	Kornos F.S	24.12.68
					86	"	25.12.68
			24	20. 1.69	38	"	19. 1.69
					18	"	20. 1.69
			21	19. 3.69	23	"	18. 3.69
					43	"	19. 3.69
8-4-5-40	Tremithios 150.6	Kiti Dam Spillway	25	20. 1.69	38	"	19. 1.69
					18	"	20. 1.69
8-5-1-90	Pouzis 58.8	Mazotos	14	22. 1.69	30	Stavrovouni Monastry	21. 1.69
					18	"	22. 1.69
8-7-3-60	Mylou 31.8	Kornos	31	26.12.68	41	Kornos F.S	24.12.68
					86	"	25.12.68
			66	18. 6.69	22	"	18. 6.69
8-7-4-80	Syrgatis 181.1	Skarinou	92	26.12.68	41	Lefkara Pano	24.12.68
					90	"	25.12.68
			68	20. 1.69	58	"	19. 1.69
					22	"	20. 1.69
			29	19. 3.69	38	"	18. 3.69
					26	"	19. 3.69
			49	18. 6.69	22	Kornos F.S	18. 6.69
8-8-2-50	Maroni 30.3	Vavla	25	26.12.68	76	Ora P.S.	24.12.68
					89	"	25.12.68
			21	19. 3.69	38	Dhrys Kato	18. 3.69
					27		19. 3.69
8-8-3-30	Maroni 53.6	Khiro-kitia	25	26.12.68	76	Ora P.S.	24.12.68
					89	"	25.12.68
			22	19. 3.69	38	Dhrys Kato	18. 3.69
					27	"	19. 3.69
8-9-7-20	Vasilikos 106.6	Kalavasos Mines	75	26.12.68	53	Kellakia	24.12.68
					98	"	25.12.68
8-9-7-50	Vasilikos 135.7	Kalavasos	80	26.12.68	53	"	24.12.68
					98	"	25.12.68
9-2-3-85	Yermasoyia 109.8	Phinikaria	290	26.12.68	165	Arakapas	25.12.68
			72	12. 1.69	70	"	12. 1.69
9-2-4-90	Akrounda 27.2	Downstream of Akroun-da Dam	14	26.12.68	165	"	25.12.68
9-4-3-90	Garyllis (Mersina) 4.6	Upstream of Pole-midhia Dam	16	26.12.68	98	Kalokho-rio (L'ssol)	24.12.68
					104	"	25.12.68
9-6-7-75	Zygos 124.1	Khalassa	28	27.11.68	46	Ay. Theo-dhoros	26.11.68
					92	"	27.11.68
			137	26.12.68	72	"	24.12.68
					180	"	25.12.68
9-6-9-05	Kouris & Kryos 169.9	Khalassa	34	28.11.68	82	Amiandos Pano	26.11.68
					154	"	27.11.68
			250	26.12.68	104	"	24.12.68
					190	"	25.12.68
			72	12. 1.69	56	"	11. 1.69
					27	"	12. 1.69
			26	30. 3.69	85	"	19. 3.69
9-8-1-95	Evdhimou 35.4	Evdhimou	16	26.12.68	122	Pakhna	25.12.68
					54	"	26.12.68

2.5.1.2 Automatic

Water Level Recorders in operation

At the end of the hydrological year the following automatic water level recorders were in operation:-

Gauging Station No.	Stream	Location	Co-ordinates
1-1-3-95	Khapotami	Kissousa	VD 805513
1-1-7-95	Khapotami	Kouklia	VD 627383
1-2-6-95	Dhiarizos	Philousa	VD 754575
1-2-7-90	Dhiarizos	Kouklia	VD 601411
1-4-4-50	Ezouza	Kannaviou	VD 610633
1-4-9-80	Ezouza	Akhelia	VD 524444
1-6-2-80	Mavrokolymbos	Potima	VD 446567
1-6-4-60	Xeros	Peyia	VD 437580
1-8-2-80	Avgas	Toxeftra (Akamas)	VD 394644
2-2-3-95	Khrysokhou	Skoulli	VD 497709
2-2-6-90	Stavros-tis-Psokas	Evretou	VD 520705
2-3-8-95	Yialia	Kato Yialia	VD 549848
2-4-2-95	Xeros	Ayia Marina	VD 560870
2-4-7-60	Livadhi	Paleambela	VD 602906
2-7-2-75	Pyrgos	Phileyia	VD 717857
2-8-3-10	Limnitis	Limnitis Saw Mill	VD 737822
2-9-4-90	Kambos	Potamos-tou-Kambou	VD 826892
3-1-3-95	Xeros	Karavostasi	VD 852889
3-2-1-85	Marathasa	Upstream of Kalopanayiotis Dam	VD 842733
3-2-1-95	Marathasa	Kalopanayiotis Dam	VD 841739
3-2-2-90	Marathasa	Upstream of Lefka Dam	VD 852795
3-2-4-95	Marathasa	Karavostasi	VD 863895
3-3-1-70	Ayios Nicolaos	Kakopetria	VD 900707
3-3-2-60	Platania	Kakopetria	VD 927698
3-3-3-95	Karyotis	Evrykhou	VD 906773
3-3-5-95	Karyotis	Pendayia	VD 883902
3-4-2-90	Atsas	Evrykhou	VD 931810
3-5-3-90	Asinou	Nikitari	VD 997820
3-5-4-40	Elea	Vizakia	WD 018806
3-5-7-80	Elea	Ghasiveran	VD 914914
3-7-1-50	Peristerona	Panayia Forest Station	WD 075754
3-7-3-90	Akaki	Malounda	WD 163783
3-7-5-70	Merika	Paleometokho	WD 175874
3-7-5-85	Kokkinotrimithia	Kokkinotrimithia	WD 150906
3-7-7-85	Skylloura	Ayios Vasilios	WD 156964
3-7-8-60	Ovgos	Kyra	WD 050964
3-7-9-50	Serakhis	Morphou Dam	WD 007948
3-8-6-50	Aloupos	Aloupos Chiftlik	WE 980018
4-2-3-70	Panagra	N'sia-Kyrenia Road	WE 077119
4-4-2-50	Boghaz	Kyrenia Road Forest	WE 296077
4-7-1-75	Boghaz	Akanthou	WE 636142
4-5-5-90	Alakati	Platymatis	WE 455105
5-2-3-85	Melini	Ayia Trias	XE 125337
5-3-4-85	Laris	Rizokarpaso	XE 218405
5-9-4-90	Kharangas	Boghaz (F/sta)	WE 883100
6-1-1-85	Pedhieos	Kambia	WD 224741
6-1-1-80	Ayios Onoufrios	Kambia	WD 225735
6-1-5-50	Vathis	Athalassa	WD 345867
6-5-3-15	Yialias	Nisou	WE 359756
6-5-2-95	Alikos	Ayios Sozomenos	WD 413808

Gauging Station No.	Stream	Location	Co-Ordinates
6-5-3-95	Yialias	Pyroi	WD 446824
7-1-7-50	Kolopannes	Kalopsidha	WD 746842
7-1-2-80	Ayios Yeorgios	Akhna Polic Station	WD 750814
7-1-3-80	Avgorou	Avgorou	WD 765800
7-1-4-50	Phrenaros	Phrenaros	WD 804800
7-1-6-80	Ayios Loucas	Ayios Loucas Lake	WD 827871
7-1-6-85	Ayios Loucas Lake	Ayios Loucas Lake	WD 834865
7-2-3-50	Liopetri	Upstream of Liopetri Dam	WD 806732
7-2-7-05	Paralimni Lake Outflow	Paralimni	WD 892801
8-2-1-90	Aradhippou	N'sia-L'ca road	WD 517683
8-2-2-90	Aradhippou	Panayia Yematousa	WD 516689
8-4-3-40	Tremithios	Ayia Anna	WD 442668
8-4-5-40	Tremithios	Kiti Dam	WD 510590
8-5-1-90	Bouzis	Mazotos	WD 472518
8-6-3-50	Mavraris (Xeropotamos)	Alaminos	WD 398519
8-7-3-60	Mylou	Kornos	WD 332613
8-7-4-80	Syrkatis	Skarinou Station	WD 343535
8-8-2-50	Maroni	Vavla	WD 261558
8-8-3-30	Maroni	Khirokitia	WD 317503
8-9-7-20	Vasilikos	Kalavasos Mine	WD 256503
8-9-7-50	Vasilikos	Kalavasos	WD 257472
9-2-3-85	Yermasoyia	Phinikaria Irrigation Weir	WD 093475
9-2-4-90	Akrounda	Downstream of Akrounda Dam	WD 070477
9-2-5-95	Yermasoyia	Yermasoyia Police Station	WD 081397
9-4-3-80	Garyllis	Upstream of Polemidhia Dam	VD 977450
9-4-3-90	Garyllis(Mersina Trib.)	Upstream of Polemidhia Dam	VD 990435
9-4-4-50	Garyllis	Polemidhia (Downstream of Dam)	WD 009396
9-6-4-95	Kouris	Khalassa	VD 920470
9-6-9-05	Kouris & Kryos	Khalassa	VD 921466
9-6-7-75	Zyghos	Khalassa	VD 941471
9-6-9-89	Erimi Irrigation Channel	Erimi	VD 924372
9-8-1-95	Evdhimou	Evdhimou	VD 780397

2.5.1.3 Stream (River) Discharges

The discharges which could be measured during the year at the Gauging stations described in previous paragraph are as follows:-

Gauging Station No.	Catchment	Rainfal during 1968-69 10^6cu.m	Discharge during 1968-69 10^6cu.m	Maximum discharge in a day 10^6cu.m	Peak discharge m^3/S
1-1-3-95	Khapotami - Kissousa	48.6	20.7	2.16	54
1-1-7-95	Khapotami - Kouklia	134.4	61.5	4.17	120
1-2-6-95	Dhiarizos - Philousa	163.7	70.0	5.00	150
1-2-7-90	Dhiarizos - Kouklia	314.6	133.0	8.00	300
1-4-4-50	Ezouza - Kannaviou	92.6	30.0	2.16	49
1-4-9-80	Ezouza - Akhelia	217.6	64.0	5.18	127
1-6-2-80	Mavrokolymbos-Potima	42.9	6.0	0.38	14.5
1-6-4-60	Xeros - Peyia	16.4	2.0	0.11	15.0
2-2-3-95	Khrysokhou - Skoulli	68.5	19.0	0.91	51
2-2-6-90	Stavros-tis-Psoka-Evretou	99.6	39.0	7.20	145
2-3-8-95	Yialia-Kato Yialia	19.4	3.2	0.13	2.2
2-4-7-60	Livadhi-Paleambela	39.1	7.7	0.73	21
2-7-2-75	Pyrgos-Phileyia	41.5	21.0	1.56	37
2-8-3-10	Limnitis-Limnitis	53.9	25.7	1.94	46
2-9-4-90	Kambos-Potamos tou Kambou	42.8	4.1	0.35	11.5
3-2-1-85	Marathasa-Upstream of Kalopanayiotis Dam	34.9	17.5	1.21	25
3-2-2-90	Marathasa-Upstream of Lefka Dam	64.8	21.8	1.21	26
3-2-4-95	Marathasa-Karavostasi	81.5	12.0	0.49	15
3-3-1-70	Ayios Nicolaos-Kakopetria	24.6	22.8	0.72	26
3-3-2-60	Platania-Kakopetria	14.6	6.7	0.16	6.0
3-3-3-95	Karyotis-Evrykhou	77.7	36.0	1.47	47
3-3-5-95	Karyotis-Pendayia	96.6	30.0	2.25	49
3-4-2-90	Atsas-Evrykhou	29.5	8.7	0.66	15.5
3-5-3-90	Asinou-Nikitari	14.9	3.1	0.41	7.4
3-5-4-40	Elea-Vizakia	77.2	27.0	2.76	97
3-7-1-50	Peristerona-Panayia Forest Station	80.9	38.9	7.20	200
3-7-3-90	Akaki-Malounda	85.9	45.0	7.78	240
3-7-5-85	Kokkinotrimithia-Kokkinotrimitha	13.2	0.24	0.19	12
3-7-7-85	Skylloura-Ayios Vasilios	54.7	10.1	1.47	95
3-7-8-60	Ovgos-Kyra	122.2	6.60	1.58	72
3-7-9-50	Serakhis-Morphou Dam Spillway	321.7	51.0	7.78	260
3-8-6-50	Aloupos-Aloupos Chiftlik	45.7	2.8	0.32	12.5
4-4-2-50	Boghaz-Kyrenia Road Forest	5.2	0.74	0.06	5.4
4-7-1-75	Boghaz-Akantou	7.9	0.41	0.02	2.5
4-5-5-90	Alakati-Platymatis	11.9	0.79	0.04	8.9
5-2-3-85	Molini-Ayia Trias	2.8	0.78	0.11	6.2
6-1-1-85	Pedhieos-Kambia	28.9	13.0	1.81	58.0
6-1-1-80	Ayios Onoufrios-Kambia	14.3	8.60	0.99	26

Gauging Station No.	Catchment	Rainfall during 1968-69 10^6cu.m	Discharge during 1968-69 10^6cu.m	Maximum discharge in a day 10^6cu.m	Peak discharge m^3/s
6-1-5-50	Vathis-Athalassa	15.6	0.61	0.07	8.7
6-5-3-15	Yialias-Nisou	68.5	28.4	2.94	120
6-5-2-95	Alikos-Ayios Sozomenos	47.5	4.53	0.23	14.5
6-5-3-95	Yialias-Pyroi	135.7	29.4	3.11	125
7-1-2-80	Ayios Yeorghios-Akhna Police Station	21.0	0.36	0.10	1.6
7-1-3-80	Avgorou-Avgorou	12.2	0.003	0.001	0.02
7-1-4-50	Phrenaros-Phrenaros	5.9	0.017	0.003	0.39
7-1-6-80	Ayios Louka-Ayios Loukas Lake	-	0.043	0.008	0.16
7-2-3-50	Liopetri Upstream of Liopetri Dam	5.4	0.73	0.20	11.
7-2-7-05	Paralimni Lake Out Flow-Paralimni	12.2	2.88	0.11	1.55
8-2-1-90	Aradhippou-N'sia-L'ca Road	16.8	0.80	0.06	2.9
8-2-2-90	Aradhippou-Panayia Yematousa	9.5	0.83	0.05	9.4
8-4-3-40	Tremithios-Ayia Anna	51.7	13.7	1.08	39
8-4-5-40	Tremithios-Kiti Dam Spillway	85.8	8.27	0.65	25
8-5-1-90	Pouzis-Mazotos	34.8	2.21	0.33	14
8-6-3-50	Mavrakis-Alaminos	17.9	2.11	0.12	8.1
8-7-3-60	Mylou-Kornos	22.9	7.70	0.83	66
8-7-4-80	Syrgatis-Skarinou Station	141.8	29.3	2.25	92
8-8-2-50	Maroni-Vavla	28.5	10.6	1.04	25
8-8-3-30	Maroni-Khirokitia	46.3	11.1	0.86	25
8-9-7-20	Vasilikos-Kalavasos Mines	95.0	30.8	1.99	75
8-9-7-50	Vasilikos-Kalavasos	115.8	36.3	2.38	80
9-2-3-85	Yermasoyia-Phinikaria	107.4	50.5	7.72	290
9-2-4-90	Akrounda Downstream of Akrounda Dam	23.7	7.95	0.77	32
9-2-5-95	Yermasoyia-Yermasoyia Police Station	162.5	14.6	0.82	18
9-4-3-90	Garyllis (Mersina) Upstream of Polemidhia Dam	3.7	0.35	0.10	16
9-6-9-05	Kouris&Kryos-Khalassa	210.2	110.0	8.64	250
9-6-7-75	Zyghos-Khalassa	138.9	62.0	4.75	137
9-8-1-95	Evdhimou-Evdhimou	36.6	5.75	0.29	16

2.5.1.4 Spring Discharges

The majority of the observed springs are gauged on a routine basis at different frequencies, while a small number of springs are gauged only for a temporary period after the request of another interested Departmental division.

During the Hydrological year 2508 spring discharges were measured, averaging to 209 measurements every month. The output of 237 springs is being measured regularly, 179 of these every month, 11 every two months, 13 every three months, 12 every four months, 22 every six months; In addition 60 springs were measured for a certain period during the year.

Due to the above normal precipitation during the current hydrological year all over Cyprus, there was a considerable increase of flow of all springs throughout the year; most springs reached their maximum flow ever known.

On the Troodos mountains all springs maintained a high output throughout the year, some of them exceeding the maximum ever measured. On the southern slopes of Troodos range, Trozina Spring, on Pakhna formation, reached its maximum, 330 l/s, which is the maximum discharge ever measured in any other spring in Cyprus.

On the Kyrenia range almost all springs exceeded the maximum ever previously known: Kephalovrysos (Lapithos) 125 l/s, Kephalovrysos (Karavas) 82 l/s, Kephalovrysos (Kythrea) 240 l/s, - this is the maximum since 1945 - Ayios Nicolaos (Dhavlos) 15.5 l/s.

For the purpose of continuous observations water level recorders were installed on Kephalovrysos springs at Karavas and Kythrea; Kythrea spring indicated a steady increase of flow after rainfall, while Karavas spring experienced an immediate response just after rainfall, the high flow receding back to normal after a short period.

In the central Mesaoria Plain the flow of chains of wells followed the same behaviour which was observed in most springs on the Kyrenia and Troodos mountains.

2.5.1.5 Chemical Analyses

During the year 6084 samples of water were sent to the Government Analyst for partial chemical analyses. Of these 744 samples were taken from springs, wells or boreholes which are used or proposed as water supply sources. The remaining 5340 samples derived from springs, observation boreholes and from other miscellaneous sources. In addition 600 samples taken from boreholes and rivers were sent to the Analyst of the Agricultural Department for full analysis including Boron.

Also 789 samples of water taken from observation boreholes in the hydrological survey areas were analysed by the water Resources Division for chloride content.

2.5 1.6 Bacteriological Analyses

Water Supply	Number of samples	Number of unsatisfactory samples
Nicosia	505	89
Famagusta	194	36
Limassol	65	10
Larnaca	196	9
Paphos	20	-
Kyrenia	26	-
T o t a l s	1006	144

At Nicosia most of the unsatisfactory samples came from private boreholes which supply water to Nicosia water Board. All chlorinated samples at all reservoirs were satisfactory.

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

2.5.1.7 Suspended Sediment analysis

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

During the year approximately 270 samples of river water were taken for suspended sediment analysis. Emphasis was given to the rivers in the Paphos area where several samples of flood water were taken and the suspended sediment content was determined. These formed the basis of the report on sediment transport prepared by Ingledow and Associates Ltd.

2.5.1.8 New stream gauging sites

During the year under review 4 new stream gauging sites were completed and automatic water level recorders were installed.

(i) Vasilikos River near the coast: Construction of a broad crested weir V shaped (slope 1:20) 40 ft. wide.

(ii) Pedhieos River near Mia Milia: Stabilization of the river bed under the old bridge on Nicosia - Mia Milia road by V shaped structure.

(iii) Ovgos River on Ovgos Dam : Installation of a water level recorder on Ovgos Dam spillway.

(iv) Tremithos River upstream of Kiti Dam: Installation of a water level recorder on the new bridge on Larnaca - Limassol main road using the stabilized river bed under the bridge.

2.5.1.9 Repairs and improvements to the existing stream gauging stations

(i) Serakhis & Ovgos River near Morphou: The banks of this station were eroded by the floods of December 1968; whilst under repair in March 1969 a second high flood occurred, so the station suffered serious damages and became completely useless.

(ii) Ayios Onoufrios River near Kambia : Repairs to the banks which were eroded by the floods of March 1969.

(iii) Peristerona River near Panayia F.S.: Repairs to the apron which was eroded by the floods.

(iv) Akaki River near Malounda : Improvements to the lower section of the flow gauging station and repairs to the apron which suffered serious damages by the floods.

(v) Ayios Nicolaos River near Kakopetria : Alterations to the lower section of the station, replacing the 4' x 6" notch by a V (slope 1:10) 20 ft wide, and repairs to the apron eroded by the floods.

(vi) Dhiarizos River near Kouklia : Alterations to the lower section of the station, replacing the 2' x 6" notch by a V (slope 1:20) 40 ft. wide, and repairs to the apron which was undermined by the floods.

(vii) Karyotis River near Pendayia : Removal of the gravels accumulated along the station.

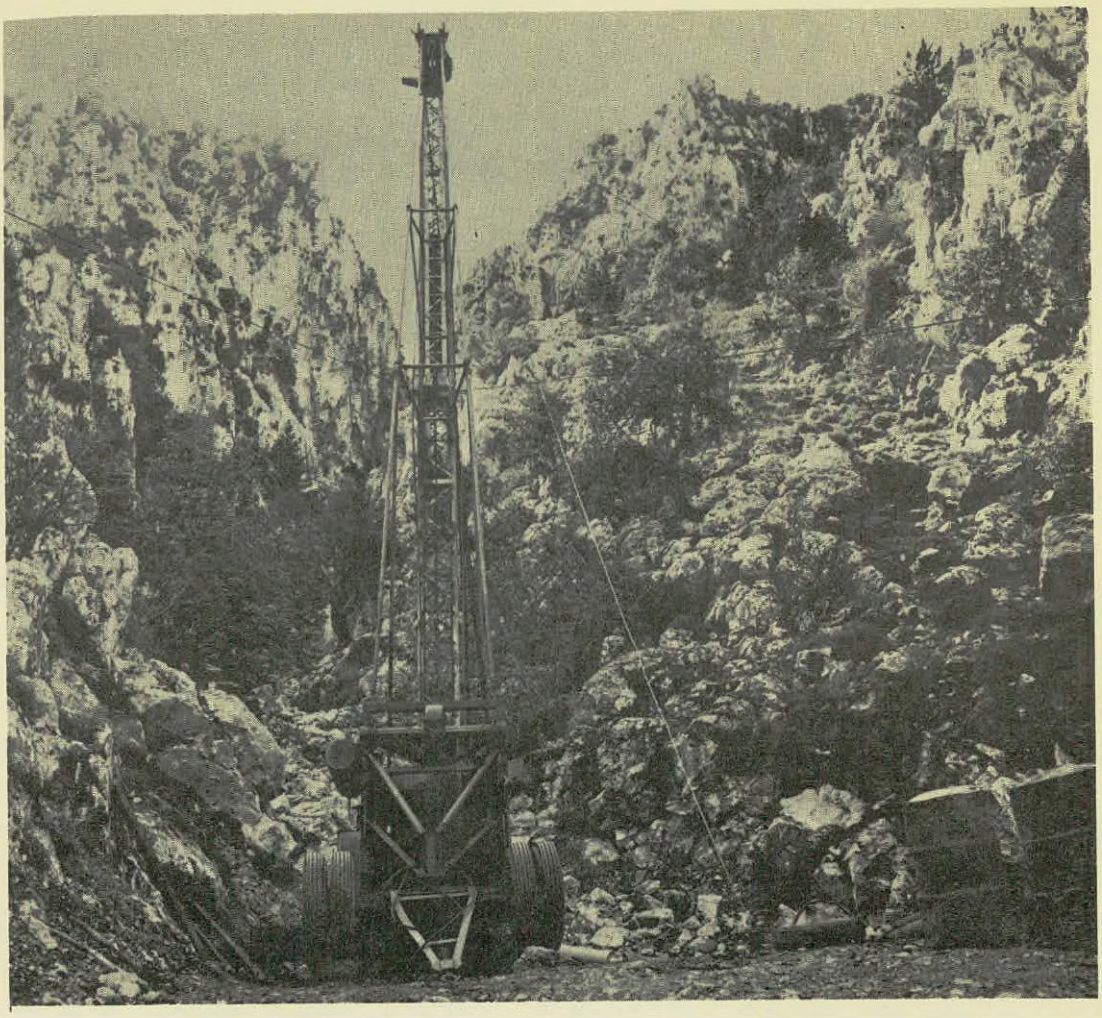
(viii) Karyotis River near Evrykhou : Repairs to the sill and apron which sufferred serious damages by the floods.

(ix) Limnitis River near Limnitis Saw Mill : Repairs and improvements to the lower section of the station.

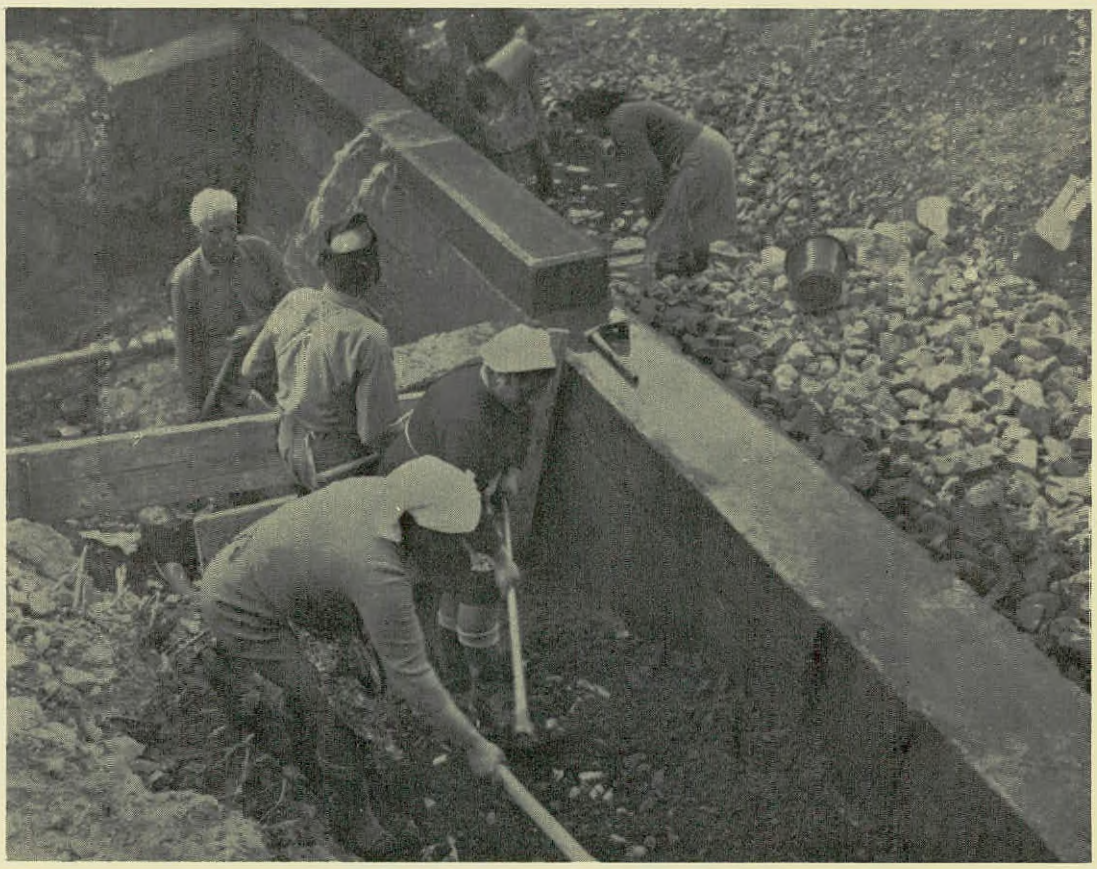
(x) Vasilikos River near Kalavasos : Alterations to the lower section of the station replacing the 2' x 6" notch by a V (slope 1:20) 40 ft wide, and repairs to the apron which was undermined by the floods.

2.5.1.10 Cost of Hydrological Observations & Reserch

	Approved Estimated Cost	Actual Expenditure
a) Hydrological observations & Research	£ 17 500	15 317
b) Construction & Maintenance of Measuring weirs	£ 8 330	7 227
T o t a l	£25 830	22 544



Drilling for water in the limestone of Kyrenia range.



Milikouri Irrigation
Construction of Subsurface Weir.

2.6. Ground Hydrology Work

The Hydrological Surveys of all the water bearing systems of the island which were started at a small scale before 1960 and since then they were progressively amounting in scale, have, by 1969, been completed.

Through the Hydrological Surveys all wells, boreholes, springs and chains-of-wells have been registered and plotted on maps. A dense network of observation boreholes has also been levelled.

The only extension of the Hydrological Survey areas made during the year under review was that of Ayios Amvrosios, Kalogrea and Akanthou where all the wells have been registered and plotted.

The same type of survey also covered the small but important aquifer of Tsakkistra-Kambos villages.

On page 78, it is shown the areas covered by the Hydrological surveys.

The Hydrological Survey areas are covered by a dense network of selected observation wells in which the water level is being measured twice each year, during the dry season (November) and the wet season (March) so that approximate minimum and maximum elevations of the water-table are determined.

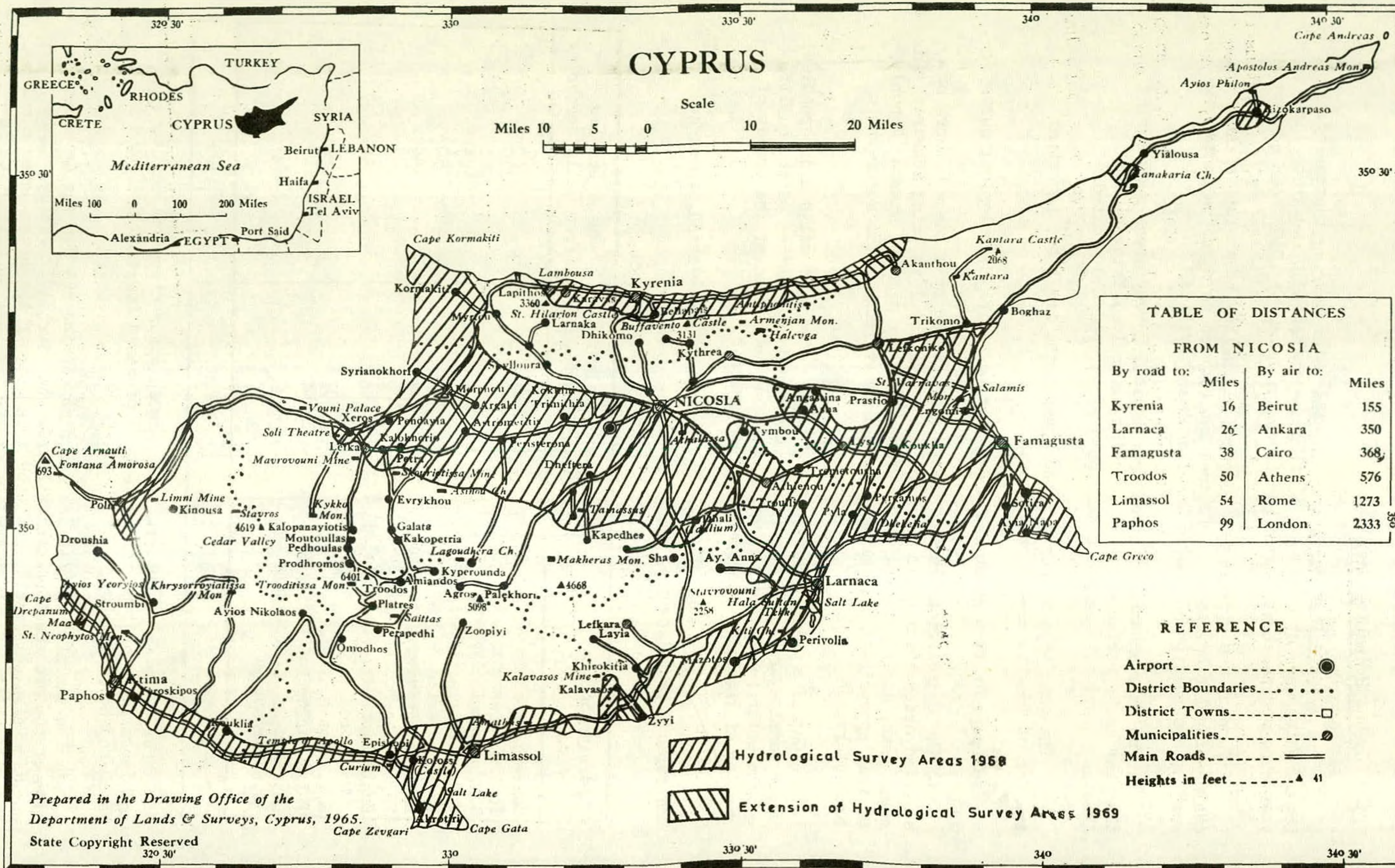
Out of a large portion of the above network of wells and boreholes, water samples are taken twice each year for determination of the quality of the water in the dry and wet season for evaluation of the trends of quality of the water resources of each aquifer.

Analytically the observation network is distributed, throughout the island, as follows:

Hydrological Area	Water levels from wells/boreholes	Water samples from wells/boreholes
Western Mesaoria	516	201
Central Mesaoria	569	170
S.E. Mesaoria (F/sta)	771	282
S.E. Mesaoria (L'ca)	376	165
Kyrenia Region	260	90
Akrotiri-Phassouri	224	144
Yermasoyia-Moni-Pyrgos	153	45
Zygi-Maroni-Kalavassos Ayios Theodhoros	110	30
S.W. Paphos	303	82
Polis Khrysochou Region	92	60
Lapathos-Ay. Andronikos-Rizokarpaso	108	31
T o t a l	3482	1300

From the above observations, Ground water elevation contour maps and isosalinity contour maps have been prepared for each aquifer for March and November 1969.

The annual questionnaire was also carried out for the determination of the groundwater extraction for the year under review. This questionnaire was greatly assisted this year by the water-meter readings. The reliability of the estimation of the groundwater extraction is continuously increasing with the help of the water meters.


CYPRUS
Scale
Miles 10 5 0 10 20 Miles
TURKEY
GREECE
RHODES
CRETE
CYPRUS
SYRIA
Beirut
LEBANON
Mediterranean Sea
Haifa
ISRAEL
Tel Aviv
Miles 100 0 100 200 Miles
Alexandria
EGYPT
Port Said
TABLE OF DISTANCES
FROM NICOSIA
By road to: Miles
Kyrenia 16
Larnaca 26
Famagusta 38
Troodos 50
Limassol 54
Paphos 99
By air to: Miles
Beirut 155
Ankara 350
Cairo 368
Athens 576
Rome 1273
London 2333
REFERENCE
Airport
District Boundaries
District Towns
Municipalities
Main Roads
Heights in feet
Hydrological Survey Areas 1968
Extension of Hydrological Survey Areas 1969
Prepared in the Drawing Office of the
Department of Lands & Surveys, Cyprus, 1965.
State Copyright Reserved
NICOSIA
Kyrenia
Famagusta
Larnaca
Limassol
Paphos
Ktima
Cape Andreas
Apostolos Andreas Mon.
Ayios Philon
Rizokarpaso
Yialousa
Kanakaria Ch.
Kantara Castle
Kantara
Akanthou
Boghaz
Trikomo
Lefkoniko
Salamis
Prastio
Cape Greco
Ayia Napa
Sotira
Salt Lake
Perivolia
Stavrovouni
Lefkara
Khirokitia
Kalavasos
Kalavasos Mine
Zyyi
Mazotos
Cape Kormakiti
Kormakiti
Lamboussa
Lapithos
St. Hilarion Castle
Buffavento Castle
Armenjan Mon.
Halevga
Kythrea
Dhikomo
Myrtou
Syrianokhori
Morphou
Vouni Palace
Xeros
Soli Theatre
Lefka
Mavrovouni Mine
Cape Arnauti
Fontana Amorosa
Polis
Limni Mine
Kinousa
Stavros
Kalopanayiotis
Kykko Mon.
Cedar Valley
Moutoullas
Pedhoulas
Prodhromos
Troodos
Platres
Saittas
Pera Pedhi
Omodhos
Amiandos
Kyperounda
Agros
Palekhori
Zoopiyi
Makheras Mon.
Kapedhes
Evrykhou
Galata
Kakopetria
Lagoudhera Ch.
Droushia
Ayios Yeoryios
Khrysorroyiatissa Mon.
Trooditissa Mon.
Ayios Nikolaos
Stroumbi
Cape Drepanum
St. Neophytos Mon.
Yeroskipos
Kouklia
Temple of Apollo
Episkopi
Curium
Kolossi Castle
Akrotiri
Cape Zevgari
Cape Gata
Amathus
Athalassa
Tymbou
Athienou
Troulli
Pyla
Dhekelia
Ay. Anna
Sha
Dali
Tamassos
Dhali
- 78 -

In general the groundwater extraction was by proportion decreased last year due to the exceptionally wet year. The irrigation period was shorter than the usual.

The effects of the decreased extraction and the exceptionally heavy rainfalls are indicated on the following table which shows a list of representative boreholes with their respective water levels of 1968 and 1969.

Selected observation boreholes where the general groundwater situation is shown.

Serial BH No.	Hydr. No.	Village	Water-level a.m.l.s. in meters				water level increase (+) or decrease (-)	
			1968		1969			
			March	Novem.	March	Novem.	March 68-69	Novem. 68-69
168/50	309	Morphou	+25.34	+21.23	+27.25	+22.32	+1.91	+1.09
44/62	1695	"	+18.90	+10.49	—	+17.07	—	+6.58
150/54	15	Syrianochori	+ 0.74	- 0.07	+ 0.56	+ 0.51	-0.18	+ 0.58
1/55	61	"	+ 1.12	- 3.71	- 1.58	- 1.91	-0.46	+ 1.40
113/56	76	"	- 1.89	- 3.77	- 2.33	- 2.53	-0.44	+ 1.24
209/56	117	"	- 1.64	- 4.06	- 2.36	- 3.23	-0.72	+ 0.83
15/62	875	K. Varosha	- 5.57	- 6.24	- 5.64	- 4.77	-0.07	+ 1.47
18/62	228	Ay. Memnon	- 1.98	- 3.13	- 2.18	- 1.05	-0.20	+ 2.08
27/62	285	Ay. Loukas	- 3.29	- 4.80	- 3.41	- 3.25	-0.12	+ 1.55
50/53	558	Dherynia	- 0.32	- 1.09	—	+ 0.24	—	+ 1.33
50/56	192	Liopetri	+ 4.28	+ 3.63	+ 3.68	+ 3.04	-0.60	- 0.59
49/54	134	Makrasyka	+36.05	+36.47	—	+36.92	—	+ 0.45
20/63	1516	Paralimni	+19.33	+19.33	+20.37	+21.17	+1.04	+ 1.84
22/63	1518	"	+ 5.69	+ 5.57	+ 6.91	+ 6.10	+1.22	+ 0.53
51/51	774	Phrenaros	+10.89	+ 9.89	—	+10.25	—	+ 0.36
76/56	972	"	+ 3.82	+ 1.18	—	- 0.40	—	- 1.58
79/56	975	"	+ 8.04	+ 7.96	—	+ 8.25	—	+ 0.29
246/57	D438	Xylophagou	+15.28	+15.25	+15.35	+15.25	+0.07	+ 0.0
70/51	D 66	Ormidhia	+46.37	+46.90	+46.93	+47.38	+0.56	+ 0.48
12/63	806	Cherkes Chiflic	+ 1.03	+ 0.47	+ 1.50	+ 1.05	+0.47	+ 0.58
88/54	24	Kolossi	—	+ 1.16	+ 3.67	+ 3.25	—	+ 2.09
51/63	813	Limassol	—	+ 0.23	+ 2.38	+ 2.09	—	+ 1.85
13/63	807	Zakaki	—	- 0.54	+ 0.71	+ 0.08	—	+ 0.62
107/61	17	Yermasoyia	+12.42	+ 1.93	+18.94	+17.67	+6.52	+15.74

2.6.1 Control and Conservation of Groundwater

2.6.1.1 a) Water Conservation Areas (Wells Law cap.351)

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

On pag. 80, it is shown the areas which have been declared as "Water Conservation Areas" under the Well's Law Cap. 351.

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 recommendation. 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, chains-of-wells and springs as well as any other Government water-works, are mandatory to the District Officer.

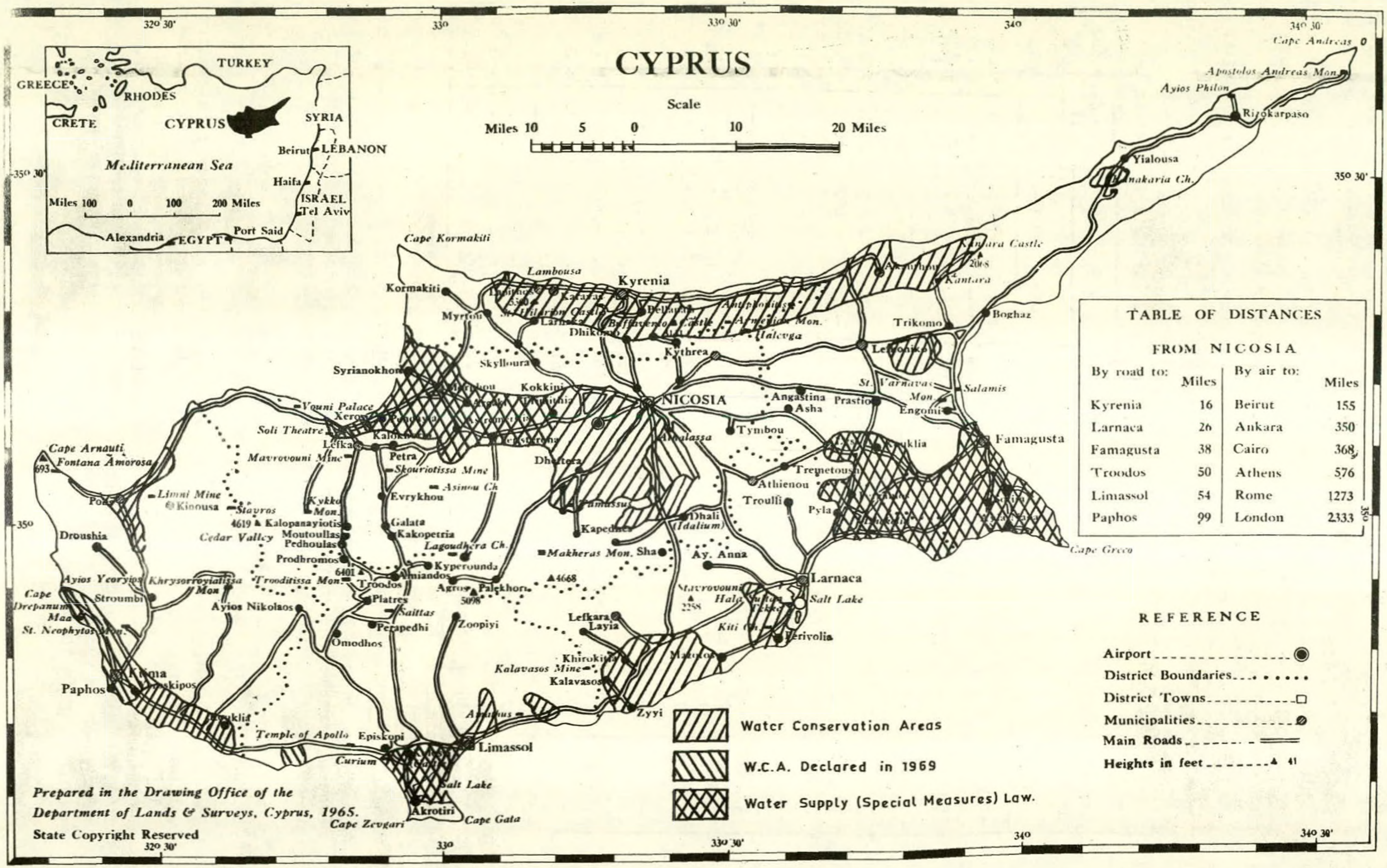


TABLE OF DISTANCES

FROM NICOSIA

By road to:	Miles	By air to:	Miles
Kyrenia	16	Beirut	155
Larnaca	26	Ankara	350
Famagusta	38	Cairo	368
Troodos	50	Athens	576
Limassol	54	Rome	1273
Paphos	99	London	2333

2.6.1.2 b) Water Supply (special measures) Law, 32/64

The major aquifers of South-Eastern Mesaoria, Western-Mesaoria and Akrotiri aquifer, which were declared as water conservation areas in the past, have been covered by the water supply (Special Measures) Law in the last two years, whose purpose is to further and more efficiently protect and control the water resources (see page 80).

(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 extracted water, the conveyance of water and the utilization of water.

Analytically the number of applications received for permits of drilling of new boreholes and cleaning and enlarging of existing boreholes are as follows :

Falling within	No. of applications
Water supply (Special Measures) Law, areas	2096
Water conservation areas	1016
Non-conservation areas	818
T o t a l	3930

2.6.1.3 c) Water-meters

The implementation of the water supply (Special Measures) Law started by reconsidering the conditions of the operation of wells and boreholes and the installation of water meters.

Analytically the following water-meters have been installed:

Region	Water-meters installed by 1968	Water meters installed in 1969	Total
Western Mesaoria	181	217	398
South-Eastern Mesaoria	365	103	468
Akrotiri-Peninsula	322	33	355
T o t a l			1221

2.7 Special Hydrological studies

2.7.1.1 Evaporation control experiment

An experiment on evaporation control was undertaken as part of the Department's activities in Hydrological Research, with the objective of testing the effect of monolayers in reducing evaporation from open reservoirs in Cyprus.

The Yermasoyia dam was chosen as suitable for this purpose, having a relatively large surface area and at the same time offering possibilities for accurate hydrological measurements. A temporary meteorological station was also set up next to the dam for providing control meteorological data.

During the experiment an evaporation retardant under the name Alfol WV 10 was used, 400 kg of which were donated to the Cyprus Government by the Federal Republic of Germany.

The experiment was conducted for two consecutive periods of about 5 days each, at the end of July 1969. The water surface in the dam was covered with Alfol WV 10 only during the second period. During both periods several accurate hydrological and meteorological measurements were taken which were used to work out a water balance for every period leading to conclusions on the quantity of water saved during the second period.

From the above experiment it was concluded that evaporation losses during the Summer months can be reduced by approximately 30%. In the present case, for the period studied, evaporation was reduced by 2.5 mm/day corresponding to about 2700 m^3 of water. The cost of the water saved was estimated to be of the order of 5 mils per m^3.

More details concerning the experimental procedure and the data collected as well as the method of calculation can be found in Report No. H/3 under registration No 4353 of the Department's Library.

2.8 Engineering Geology

The work carried out by the Engineering Geology Branch was in essence a continuation of the work started in 1968. This has as its mainstay the geologic study of proposed sites for dam-construction and can be sub-divided into at least three phases.

In the first phase combined visits, by the engineers and geologist in charge, are made to various river basins where all possible sites for dam-construction are examined. Short geologic reports of a reconnaissance type are submitted and upon consideration of these the most promising sites are selected for further geologic study. At least twenty such visits were made and an equivalent number of reports submitted for streams in various parts of the island.

Geologic mapping of the dam-site and reservoir areas constitutes the second phase of the investigation. This detailed work is carried out on large-scale base maps prepared by the Department and has as its aim the recording of all the geologic features - stratigraphy, lithology, structure, state of bedrock, hydrology - that are likely to affect the stability and watertightness of the proposed structure. All the above data together with the geologic maps prepared, are compiled into a detailed report in which recommendations are made for further subsurface investigations so that more information is obtained on features not apparent at surface. During the year under review six such reports were prepared by C. Xenophontos, Geologist as follows :-

1. Reconnaissance Geological Investigations of Kambos (Upstream) Dam-Site and Reservoir Areas.
2. Reconnaissance Geological Investigations of Phlevas Dam-Site and Reservoir Areas.
3. Reconnaissance Geological Investigations of the Katouris proposed Dam-Site and Reservoir Areas.
4. Reconnaissance Geological Investigations of the Phlasou Dam-Site and Reservoir Areas.
5. Geological Reconnaissance of Sarama Dam-Site-Stavros tis Psokas River - Polis Area.
6. Geological Reconnaissance of Evretou Dam-Site-Stavros tis Psokas River Polis Area.

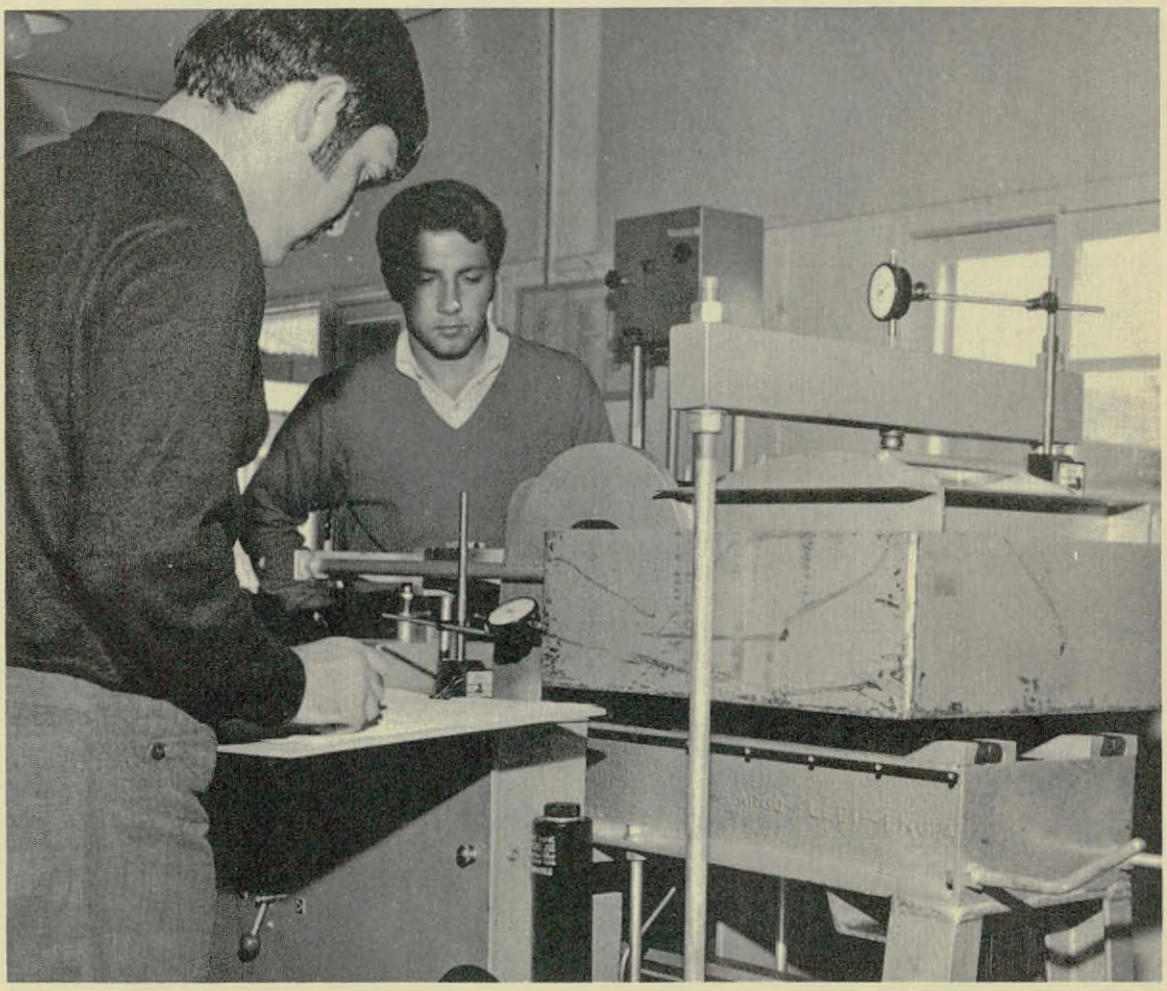
Sub-surface investigations in the form of boreholes adits and trenches constitute the third phase, after which a final geologic report, embracing all the available data, is prepared. One such report was submitted in 1968 , entitled,

Famagusta Water Supply, Khirokitia Project
Phrenaros Reservoir. Geological and
Foundation Investigations.

In addition to the above, the investigations for the Palekhori Dam - Kambi Site - were completed and the report is now under preparation. Within the above field, advice was given to the Canadian Contractors, in the form of borehole logging and borehole siting, in the Paphos Feasibility Study Area.

In the field of General Geology work was carried out as and when requested by the other Branches and the findings were incorporated in short reports or memoranda to the people concerned.

One of the Overburden Drills used in foundation investigations



Large shear box test machine used for finding the shear strengh of cohesionless soils and crushed rock.

III. DIVISION OF PLANNING

By

C.C. Artemis

3.1. General Investigations

These include :-

(a) Material investigations
(b) Detailed geologic map of dam and reservoir sites
(c) Foundation investigations
(d) Laboratory testing
(e) Interpretation of results for design
(f) Reports

Schemes investigated in 1969 were as follows :-

3.1.1 Investigations of Damsites, Reservoirs and Diversion works

1. Asprokremmos dam additional investigations for the C.W.P.P.

Additional investigations at Asprokremmos proposed damsite were started in 1969 and will continue in 1970.

Three percussion and/or diamond rotary boreholes were started. Falling or constant head (Gravity, open ended) permeability tests were carried out in the percussion holes and the usual pressure tests in the rotary drill holes. Samples of the silts and gravels encountered by the percussion holes were recovered and tested for gradation. The materials report on the original investigations at Asprokremmos was prepared in 1969.

3.1.2 Dhiarrizos Diversion to Asprokremmos investigations for the C.W.P.P

Four percussion and/or diamond rotary boreholes were drilled. Permeability tests were carried out in two of the boreholes.

3.1.3 Morokambos dam investigations for the C.W.P.P

These investigations were carried out in 1968. The materials report was completed in 1969.

3.1.4 Kapsala dam investigations for the C.W.P.P.

Investigations started in July, 1968 and were completed by the end of April, 1969.

(a) Material investigations were carried out and the following were found within a reasonable distance from the proposed damsite.

(i) Core material
(ii) Filter material
(iii) Concrete material
(iv) Rip-rap

(b) Detailed geologic maps of the dam and reservoir sites were prepared.

(c) After a study of the geologic maps 10 boreholes were drilled and permeability tests carried out. Two tunnel entrances were also excavated.

(d) Samples of materials were tested

(e) Reports for materials and foundations investigations will be completed in 1970.

3.1.5 Hoglakovounos dam - Slide area investigations for the C.W.P.P.

(a) Access roads of a total length of 4 miles were constructed.

(b) Detailed geologic maps of the dam and reservoir sites were prepared by the Geological Survey Department.

(c) A major slide area located upstream of the proposed damsite was investigated by drilling 3 boreholes of a total length of 678 ft.

(d) A report on the findings was prepared.

3.1.6 Nikoklia Dam investigations for the C.W.P.P.

(a) One percussion hole and 6 No. observation boreholes were drilled with an overburden machine, and a pumping test was then carried out by the Geological Survey Department

(b) Perforated pipes were established in all boreholes.

3.1.7 Karavas Dam investigations

(a) Material investigations were carried out and the following were found

(i) Core material
(ii) Random material
(iii) Rip-rap

All the possible locations of borrow areas for filter and concrete materials have been thoroughlly inspected in the whole area but the results are negative.

(b) Detailed geologic maps of the dam and reservoir sites were prepared.

(c) After a study of the geologic maps 4 No. boreholes were drilled and permeability tests performed. In addition, 4 No. test pits and one trench were excavated and percolation tests were carried out in the test pits.

(d) Samples of materials were tested.

(e) A report on the material and foundation investigations was prepared.

3.1.8 Lefkara Dam investigations

Investigations at Lefkara proposed damsite started in 1968 and were completed in 1969.

(a) Access roads of 14,000 ft. total length were constructed in 1968.

(b) Detailed geologic maps of the dam and reservoir sites were prepared by the Geological Survey Department in 1968.

(c) After a study of the geologic maps 6 No. boreholes of a total length of 865 ft. were drilled and permeability tests carried out. Perforated pipes were established in all boreholes.

(d) A shallow trench and two galleries were excavated.

(e) Materials investigations were carried out and samples were tested. Suitable materials were found within reasonable distance from the damsite.

(f) The foundations report was prepared.

(g) The materials report will be completed in 1970.

3.1.9 Kambi Dam investigations

(a) Access roads of about 1 mile total length were constructed.

(b) Detailed geologic maps of the dam and reservoir sites were prepared.

(c) 5 No. boreholes were drilled and permeability tests were carried out.

(d) Perforated pipes were established in all boreholes.

(e) Two test pits were excavated.

(f) A report on the foundation investigations will be completed in 1970.

3.1.10 Kyperounda earth reservoir

(a) Materials investigations were carried out and samples were tested. The following materials were found in close proximity to the site.

(i) Clay Blanket material
(ii) Random material

(b) 5 No. test pits were excavated at the reservoir site.

(c) The report on the foundations and materials investigations will be completed in 1970.

3.1.11 Foundation Investigations for structures other than Dams.

1. Famagusta Water Supply - Khirokitia Project Filtration Plant and Collection Tank

(a) 16 No. test pits were excavated.

(b) Representative samples were taken from the test pits and tested in the Laboratory.

(c) One borehole of 45 ft. depth was drilled.

3.1.12 Famagusta Water Supply - Khirokitia Project

Phrenaros Reservoir

(a) 8 No. test pits were excavated (total depth 71 ft) and representative samples were tested in the Laboratory.

(b) Three rotary drill holes with continuous core recovery were drilled totalling 174 ft in length.

(c) A geological and foundations report was prepared

3.1.13 Investigations for Other Departments

Requests by other government departments and private firms for site investigations were continuously received throughout the year, most of them, however, had to be turned down because of the lack of extra equipment and personnel.

1. Ministry of Labour and Social Insurance. Foundation Investigations at the Hotel and Catering Institute site

After a request from the Ministry of Labour and Social Insurance the Field Investigations Branch undertook and completed the foundation investigation of the Hotel and Catering Institute site.

(a) 15 No. boreholes were drilled with a total depth of 700 ft.

(b) Two test pits were excavated

(c) Samples from the drill holes as well as from the test pits were tested in the Laboratory.

(d) The report on the investigations will be completed early in 1970.

3.2 Dam Foundations

3.2.1 Kalopanayiotis Dam

Readings continued to be taken on the surface monuments established on the left side of the reservoir (looking downstream) to determine horizontal and vertical displacements. The stabilization works carried out in 1968 appear to have been successful and the magnitude of the movements has been decreasing as predicted.

3.2.2 Polemidhia Dam - Grouting

After completion of the test grouting carried out by the Department in 1968 a final report was prepared with an estimated cost of £100 000 to cover the expenses of all the remaining grouting works required to stop the leakages. Copies of this report were sent to Messrs Sandeman, Kennard and Partners, U.K. and Energoproject, Yugoslavia, consultants who were asked for their views. After their arrival here the matter was discussed with members of the Department and the following course of action was decided :

(a) To aim at reducing the leakages to a minimum acceptable value instead of stopping them altogether , so as to avoid unnecessary expense.

(b) To reduce the originally proposed number of holes

(c) To use more sand and clay and less cement and bentonite in the grout mixture.

(d) To start the grout curtain at a greater depth.

(e) To d vide the grouting programme into two phases.

After considering all the above a revised estimate was prepared.

The 1st phase of the works comprised only the treatment of extension Zone V on the east abutment with one row of holes at 8 ft. intervals. The aim of this phase should be to block up the larger cavities and reduce leakage to the minimum possible. This phase should be completed before the filling of the reservoir for the 1970 irrigation period. The estimated cost of the 1st phase was £28 000.

The 2nd phase of the works should be based on the actual results of the 1st phase. If by executing the 1st phase, the excess seepages were to be reduced sufficiently the 2nd phase would not be required; if not then the 2nd phase would be required and should include the additional extension of the curtain to zone VI and the execution of a second row of holes on zones V and IV The estimated cost for the 2nd phase was £26 500.

After the approval of funds the first phase of the works commenced on the 11th August and continued until the end of the year, when about 80% of the work was completed. The remaining 20% will be completed early in 1970.

It is hoped that after the completion of the 1st phase, all the existing cavities in zone V will be filled with grout, thus decreasing the excessive seepage considerably.

3.2.3 Kalopanayiotis Dam-Tunnel Grouting

The tunnel of this dam was grouted during construction by Foundation Engineering and Paraskevaides Ltd., joint venture in 1965 but there were still leakages at the rate of 28,000 g.p.d.

The Department undertook the regrouting of this tunnel and the work was executed during the period between 24.3.69 and 31.5.69 with the result of reducing the leakages to about 400 g.p.d.

The treatment consisted of contact grouting between the rock and the concrete lining, and two rings (fan grouting) at the zone of intersection of the tunnel and the clay core.

3.4 Laboratory Branch

The high capacity triaxial machine acquired in 1968 has given a lot of trouble. There were mistakes in the positioning of valves in the plumbing system, leakages etc. The plumbing system is now in order after one of the valves, which was incorrectly connected, was removed and relocated in the system.

A new loading piston and bushing have been ordered so that the leakages can be rectified.

A series of drained tests in which consolidation was carried out against a back pressure were performed on core material for Lefkara Dam in order to determine the effective shear strength parameters of the soil. These sophisticated tests were performed for the first time in Cyprus. In addition, a series of tests to check the operation of the machine and determine any faults were carried out. One major fault was discovered in the variable speed loading mechanism, viz. At low speeds necessary for drained tests and consolidated undrained tests with pore pressure measurement on cohesive soils it was found that the rate of strain imposed on the samples was not constant as it should be. To determine the cause of this malfunction a number of 24 hr. tests using a recording voltmeter were performed in collaboration with the Public Works Department in order to find out whether flactuation in the mains voltage was the cause. These tests showed that the root of the trouble lay elsewhere and actually was mechanical. We are now in consultation with the manufacturers and it is hoped that the machine will eventually be repaired and fully commissioned in 1970. This machine will greatly increase the range of tests that can be carried out in the Laboratory and will in fact fill a long felt gap in determining effective shear strength parameters which are so vital in the design and stability analysis of earth and rockfill dams and their foundations.

During 1969 the following testing facilities were available in the Water Development Department Soils and Concrete Laboratories:

3.4 1 Soils Laboratory

(1) High capacity triaxial machine for up to 4 inc. diameter samples.
(2) Norwegian pore pressure apparatus
(3) Triaxial apparatus for $1\frac{1}{2}$ in. diameter specimens.
(4) Shear box test apparatus for 6 x 6 cm. specimens.
(5) Consolidation test apparatus
(6) Unconfined compression test apparatus
(7) Falling and Constant Head Permeameters for horizontal and vertical permeability.
(8) Hydrometers and pippette apparatus
(9) Sets of B.S. Sieves for soil gradation
(10) Sand replacement apparatus
(11) Core cutters
(12) Standard and Modified Proctor Compaction apparatus
(13) Liquid Limit apparatus
(14) Rapid moisture content determination apparatus.
(15) Ovens and moisture content tins
(16) Torsion dial balance
(17) Proctor penetrometers

Item No.(16) was acquired in 1969. In addition a large shear box machine with a wide range of testing speeds has been ordered and is expected early in 1970.

3.4.2 B. Concrete Laboratory

For tests on coarse and fine aggregates, cement and concrete.

(1) Concrete compression testing machines (capacity 250 and 100 tons.)
(2) Sample splitter for aggregates
(3) Sets of B.S. Sieves for aggregate gradation
(4) Aggregate crushing strength apparatus
(5) Silt content, moisture content and specific gravity determination apparatus.
(6) Organic impurities determination apparatus.
(7) Vicat apparatus for testing false set of cement
(8) Vicat needle for testing initial and final set of cement
(9) Le Chatelier apparatus for testing soundness of cement
(10) Moulds of different sizes for concrete cubes.
(11) Slump Test and compacting factor apparatus
(12) Air meter for determination of air content of concrete.
(13) Ovens for moisture content determination
(14) Double burner hot plate
(15) Water Distillation apparatus
(16) Curing facilities

Item Nos. (2) and (14) were acquired in 1969.

The enclosed tables show the number and type of tests carried out in the W.D.D. Laboratories for different jobs in 1969.

Tests carried out in the W.D.D. soils laboratory and on site in 1969

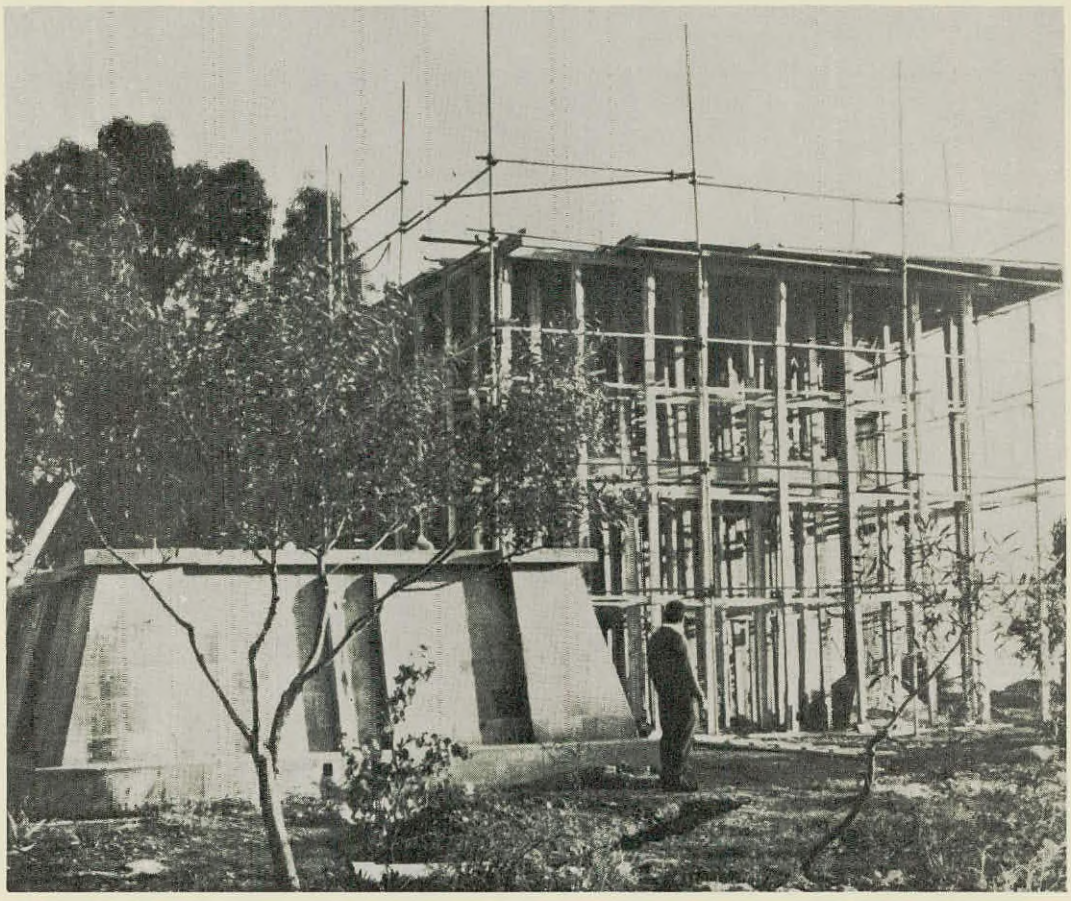
TESTS	CONSTRUCTION FOR W.D.D. Scheme & Number of tests				INVESTIGATIONS FOR W.D.D Scheme & Number of tests								INVESTIGATIONS FOR C.W.P.P. Scheme & Number of tests										INVESTIGATIONS FOR OTHER GOVT DEPARTMENTS Scheme & Number of tests					P.F&I*			
	MORPHOU DAM	SYNGRASIS DAM	VRYSOULLES RECHARGE DAM	POLEMIDHIA DAM	MASSARI DAM	LEFKARA DAM	KYPEROUNDA RESERVOIR	KARAVAS DAM	KHIROKITIA RESERVOIR	RAISING OF MORPHOU DAM	FRENAROS RESERVOIR	AYIA VARVARA STAVROVOUNI	ASPROKREMMOS DAM	KAPSALA DAM	NIKOKLIA DAM	HOGLAKOVOUNOS DAM	MOROKAMBOS DAM	KAMBOS DAM	PANAYIA TIS AGAPIS DAM	SARAMA DAM	KALAVASSOS DAM	SYMBOULAS DAM	MONI DAM	P.W.D.	MINISTRY OF LABOUR & SOCIAL INSURANCE	MINISTRY OF EDUCATION	DEPT. OF ANTIQUITIES	ELECTRICITY AUTHORITY OF CYPRUS	HELLENIC MINING COMPANY	INDIVIDUALS	MISCELLANEOUS	TOTAL OF EACH KIND OF TEST
i Atterberg Limits				3	4	45	20	24	3	6	4	1		14	2			3	1	2	3	1	2	27	5		5		3	4		182
ii Moisture content		2				10			36	13	18		4		8		6							4	4		12	31			242	390
iii Standard Proctor	2	1	8		4	46	26	25		6	4	1		16	3				1	2	3	1	2				3		2			156
iv Sand Replacement	17	2																													19
v Core Cutters			84																												84
vi Hydrometer				3	2	53	30	31		7	4	1	8	17	3	2		3	1	2	3	1	2	30	5		5		3	4		223
vii Permeability				2		49	23	24		6	4	1		17	2				1	2	3	1	2				2		3			142
viii Triaxial Test					27	27			27	6	8 6				9									9	8	3						152
ix Shear Box Test					9	18																									27
x Consolidation						6			4		2														2			2				16
xi Silt Content																														249	249
xii Specific Gravity				3	2	53	30	34		7	4	3	8	17	4	2		3	1	2	3	1	2	30	5		5	2	3	4		228
xiii Acid Test						20	3		10		4																2					39
xiv Insity Density							1		9		5														3							18
xv Relative Density								4																								4
Total	19	5	92	11	48	327	133	145	89	51	85	7	20	81	31	4	6	9	5	10	15	5	10	100	32	3	34	35	14	12	491	1929

Note:

* P.F. & I.: INVESTIGATIONS FOR PRIVATE FIRMS & INDIVIDUALS

Tests carried out in the W.D.D. concrete laboratory in 1969

TESTS	FOR INVESTIGATIONS							FOR CONSTRUCTION						TOTAL OF EACH KIND OF TEST
	Scheme and number of tests							Scheme and number of tests						
	C.W.P.P	C.W.P.P.	C.W.P.P	C.W.P.P.	C.W.P.P.	W.D.D.	W.D.D.	W.D.D.	W.D.D.	W.D.D.	W.D.D.	W.D.D.	W.D.D.	
	KAPSALA DAM	NIKOKLIA DAM	ASPROKREMMOS DAM	KALAMOU DAM	KHIROKITIA DAM	TENDERS FOR CONCRETE AG.	LEFKARA DAM	KHIROKITIA RESERVOIR	PHRENAROS RESERVOIR	MORPHOU DAM	KOKKINOTRIMITHIA CHANNEL CONSTRUCTION	MISCELLANEOUS	TEST FOR PRIVATE FIRMS	
Concrete mix design	9	4	1	5	14		25	3						61
Sieve analysis	24	2	26	11	28	137	44	106	125		95	27		625
Specific gravity	33	7		12	14	11	23	4			10	14		128
Water absorption		7		12	6	11	21	4			10	14		118
Aggregate Crushing test	4	1		2	5	4		5			25	17		59
Los Angeles Abrasion	21			4	6		2	6			5	4		31
Silt & moisture for sand	19	2	3	14	19	88	42	33	63		74	35		394
Organic impuritis	36	1	3	9	19	88	38	33	63		74	35		382
Cubes prepared & crushed	9	18	2	20	60		102	250	140	26	120	78	227	1079
Slump test	6	4	1	5	14		25	62	35					155
Cores crushing strength							23					50		79
Acid test								10						10
Rip - Rap test					4									4
False set test												15		15
Irr. channel loading											35			35
Concrete Air Meter	9	4	1	5	14		25							58
Wet Analysis			22				3	2				18		45
Fineness Modulus	2			2	2		4	2						12
Salinity tests												25		25
TOTAL	205	50	59	101	205	339	377	520	426	26	448	332	227	3315



Phrenaros Water Supply
Construction of 30.000 gallons capacity tower tank to satisfy demands for house - to - house water supply of village.

-Profile - levelling- for Lefkara pipeline.

IV. DIVISION OF DESIGN

By

K.C. Hassabis
Head of Division

4.1 The Design Division includes three branches

(i) The Design Branch for dealing with the detailed design work of major projects undertaken by the Department.

(ii) The Topography Branch which carries out all the surveying work of the Department.

(iii) The Drawing Office which does most of the drawing work of the Department

4.1.1 Design Branch

The Design branch is manned with qualified Civil Engineers and Irrigation Engineers, and during the year has carried out design work on Dams, Irrigation Networks and Water Supply Projects The most important projects on which work was done during the year included the following:-

4.1.1.1 Famagusta Water Supply Project

The construction of the Main Khirokitia - Phrenaros pipeline of the associated pumping schemes and of Khirokitia Reservoir and which were designed by Water Development Department was carried out mainly during this year, under the overall supervision of the Head of the Design Division. The pipeline was substantially completed and was commissioned on the 30th December 1969. It has an overall length of 63.5 kilometers of Asbestos cement pipes as follows:-

500 m.m. dia. (Classes 'B', 'C' & 'D') : 17 440 m.
600 m.m. dia. (Classes 'C' & 'D') : 12 350 m.
650 m.m. dia. (Classes 'B' & 'C') : 33 740

The main Khirokitia - Phrenaros pipeline is a gravity main and has a maximum carrying capacity of 5.0 Million Gallons per day (22700 m^3/day or 945 m^3/hr) up to the Larnaca connection, where a maximum of 1.0 Million Gallons per day (4550 m^3/day) may eventually be abstracted for Larnaca Water Supply. Beyond this point the maximum capacity of the main is 4.0 Million Gallons per day (18200 m^3/day or 758 m^3/hr).

4.1.1.2 Khirokitia Reservoir

This is an underground concrete reservoir with a capacity of 450 000 gallons (2 050 cu.m.). The floor elevation of the reservoir is at 650 000 ft (198 meters) A.M S.L.

Attached to the reservoir, is a chlorination house, for the sterilization of the water from the Boreholes and the Treatment plant. The latter will be built at the same site as the above structures and will include settling tanks and rapid gravity sand filters, to treat the water from the proposed Lefkara Dam.

Construction of the reservoir and chlorination house commenced in April 1969 and is expected to be completed early in 1970.

4.1.1.3 Pumping Scheme

These four schemes will normally provide about 1.0 million gallons per day (190 m^3/hr.) of water from Boreholes in the Khirokitia - Psematismenos-Vassilikos area to the Reservoir at Khirokitia from where it will be conveyed to Famagusta.

(i) Vasilikos Pumping Scheme

This scheme involves the utilization of Boreholes in the Lower Vasilikos River basin, from which it is expected to pump 40,000 gallons per hour (182 cu m/hr) in the winter months and 20 000 gallons per hour (91 cu.m/hr) in the summer months.

From the boreholes the water will be conveyed to a 100,000 gallon (450 cu.m) capacity collecting tank and from these it will be pumped through a 12" steel rising main 24,400 ft. long to Khirokitia Reservoir.

Although originally it was intended to utilize three boreholes lying about 7,000 ft. downstream of the Vassilikos River bridge on the Nicosia-Limassol road, a number of technical reasons nesessitated the drilling of new boreholes upstream of the bridge. This scheme will now include the following:

Two boreholes Nos. 68/69 & 71/69, and the construction of a river cut-off upstream of which water will be collected into a sump well from which it will be pumped to the collecting tank. This change will delay the commissioning of this scheme until 1971

The laying of the 12" pumping main has commenced in June 1969 and will be completed in June 1970.

Borehole Data

BH No. 68/69

Ground elevation	:	147.30 ft (44.80 m)	A.M.S.L.
Depth of borehole	:	58.00 ft (17.38 m)	below ground level
Suction	:	54.00 ft (16.50 m)	" " "
Rising main	:	5" dia.	
Casing	:	10" dia.	
Design Yield	:	20,000 (91 m^3/hr).	

BH No. 71/69

Ground elevation	:	134.86 ft (41.20 m)	A.M.S.L.
Depth of borehole	:	138.00 ft (42.08 m)	below ground level
Suction	:	65.6 ft (20.00 m)	" " "
Rising main	:	5" dia.	
Casing	:	10" dia.	
Design yield	:	14,000 gp.hr. (64 m^3/hr)	

4.1.1.5 Psematismenos Pumping Scheme

In this scheme borehole No. 16/67 which is expected to yield 15,000 g.p.hr. (68 m^3/hr), is utilized.

The pumping main is 5287 ft. of 8" dia. steel pipes and 3976 ft. of 10" dia. steel pipes, and delivers the water to Khirokitia Reservoir. The main has been installed in 1969. It is expected that this scheme will be put into operation in May 1970.

BH No. 16/67 data

Ground elevation	:	434.12 ft.	A.M.S.L.
Suction	:	435 ft.	below ground level
Rising main	:	5" dia.	
Designed yield	:	15,000 g.p.hr (68 m^3/hr)	

Pumping installation

Pleuger 10 stage electrosubmersible pump

Type	:	P8 3-10a + VT8 - 70A
Motor output	:	90 H.P.
Pumping capacity	:	15.000 g.p.h. (68 m^3/hr)
Pumping Head		700 ft. (214 m)
Cost of pumping & Motor	:	£ 1778.-

4.1.1.6 Khirokitia Pumping Scheme

This includes :

Two boreholes just downstream of the Khirokitia River bridge, of which one borehole will be as standby. The yield is expected to be 20000 g.p.h.

Water is pumped through a 10" dia. steel main which joins the Psematismenos Main, to Khirokitia Reservoir.

The pumping installation on borehole 5/68 and the pumping main have been completed at the end of 1969. This borehole has been operating since the end of December 1969. The installation on the other borehole No.6/70 will be completed early in 1970.

BH No. 5/68 data

Ground elevation	:	498.68 ft.	A.M.S.L.
Suction	:	250 ft.	below ground level
Rising main	:	5"	
Pumping head	:	425 ft.	

Pumping installation

Pleuger 10 stage electrosubmersible pump

Type	:	Q82 - 10 + VT 8 - 70A, 90 HP.
Pumping capacity	:	30 000 g.p.h. (136 m^3/hr)
Cost of pump & Motor	:	£ 1,185.500

BH No. 6/70 data

Ground elevation	:	493.85 ft.	A.M.S.L.
Suction	:	250 ft.	below ground level
Rising main	:	5" dia.	
Pumping head	:	425 ft.	

Pumping installation

Pleuger 10 stage electrosubmersible pump

Type	:	Q82 - 10 + VT 8 - 70A, 90 HP.
Pumping capacity	:	30 000 g.p.h. (136 m^3/hr).
Cost of pump & Motor	:	£ 1,185.500

4.1.1.7 Khirokitia New Pumping Scheme

This scheme utilizes two boreholes which may yield the following quantities :

BH No. 11/69	:	8,000 g.p.h. (36 cu.m/hr) and
BH No. 4/69	:	15,000 g.p.h. (68 cu.m/hr)

Water will be pumped through a combined main 2 200 ft of 4" dia galvanised pipes and 2 500 ft. of 6" dia steel pipes to Khirokitia Reservoir. Construction of this scheme is planned for early 1970 as soon as land acquisition formalities are completed.

BH No. 11/69

Ground elevation	:	789.70 ft.	A.M.S.L.
Suction	:	400 ft.	below ground level
Rising main	:	4" dia.	
Pumping head	:	450 ft.	(137 m)

Pumping installation

pleuger 17 stages electrosubmersible pump

Type	:	Q3 - 17 + V8 - 55
Pumping capacity	:	8 000 g.p.h. (36 m^3/hr)
Motor output	:	27 HP
Cost of Pump & Motor	:	£ 930 000

BH No. 4/69

Ground elevation	:	690.60 ft	A.M.S.L.
Suction	:	350 ft.	below ground level
Rising main	:	5" dia.	
Pumping head	:	430 ft.	

Pumping installation

RITZ - 9 stages electrosubmersible pump

Type	:	6610/9 - freeflow (semi-axial)
Motor output	:	50 HP
Pumping capacity	:	15 000 g.p.h. (68 m^3/hr)
Pumping head	:	430 ft.
Cost of Pump & Motor	:	£ 1017

4.1.1.8 Phrenaros Reservoir and Phrenaros - Famagusta Pipeline

These were designed by the Department on behalf of the Famagusta Water Board. They form in fact a part of the new Famagusta Water Supply Project. phrenaros Reservoir is situated at the end of the trunk main from Khirokitia, and is the starting point of the main to Famagusta-Stavros reservoirs. This is a concrete underground reservoir having a capacity of 1 000 000 gallons (4 550 cu.m.). The floor elevation of the reservoir is at 247 00ft(76.3 m) A.M.S.L.

Facilities will be provided for chlorinating the water before it enters the reservoir.

Construction work commenced on the 16.6.1969, and it is expected that it will be completed in July 1970. The work is done by W.D.D.

4.1.1.9 The Phrenaros - Famagusta Pipeline

It is of Asbestos Cement pipes and has an overall length of 30 750 ft. (9 380 meters), as follows :

500 m.m.	Class "B"	9 000 ft.	(33 50 m)
500 m.m.	Class "C"	10 750 ft.	(2 740 m)
600 m.m.	Class "B"	11 000 ft.	(3 280 m)

The excavation of the trenches for the pipeline was undertaken by a contractor while the pipelaying is done by W.D.D. Work on the excavation commenced on the 3rd November 1969, pipelaying commenced on the 16/2/70.

It is expected that the pipeline will be ready for use by the beginning of June 1970.

The pipes for this part of the line were obtained from Eternit, Lebanon (500 m.m. Classes "B" & "C") and from Siegwart, Egypt (600 m.m. Class "B").

4.2 Palekhori Kambi Dam Project

Detailed design work on the proposed dam and distribution system were done during the year. The dam will be of the mass concrete gravity type. It will have a maximum height of 107 ft. (32.6 m) from river bed level to the crest of the dam, and 100 ft. (30.5 m) to spillway crest level. The capacity of the dam will be 132 Million gallons (600 000 m^3).

4.2.1 Massari Dam Project

This project consists of :

(a) The dam
(b) Conveyor pipeline from the dam to the existing irrigation canals of Massari, Vathys (Katokopia-Argaki), and Kyra.
(c) Recharge basins to be constructed in the river bed of Serrakhis between the Massari and Morphou Dams. The scheme will be constructed in two phases. In the first phase the dam and the pipeline will be constructed and in the second phase the recharge basins. The main purpose of the project is to make it possible to recharge larger amounts of water in the aquifer of the Morphou area which is at present overpumped.

4.2.2 Kiti Distribution System

Design work was done on extensions of the distribution system.

4.2.3 Argaka Magounda Project

Design work was done on the distribution system

4.2.4 Yermasoyia Project

Work continued during the year on the design of the distribution system.

4.3 Drawing section

The Drawing Branch was headed by Mr. S.C. Pitsillides. The staff of this Branch numbered 31 i.e. 24 daily paid Technical Assistants, 3 draughtsmen scale 8, 2 Foremen scale 5 & 7, one hourly paid regular employee and the Head of the Branch also on daily wages.

The table, at the end of this section gives the utilization of the staff of the Drawing Branch in 1969.

4.3.1 Drawing Work

In addition to normal Departmental work the Drawing Branch was engaged in the execution of all drawing work needed for the Cyprus Water Planning Project as well as the work needed for the Sub-contractors T. Ingledow and Associates to whom 2 daily paid Technical Assistants were loaned.

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

4.3.1.1 Existing & Proposed Dams

1. Agros
2. Argaka Magounda
3. Athalassa
4. Kafizes
5. Kalavasos mines
6. Kalopanayiotis
7. Kambi (Palekhori)
8. Kandou
9. Karavas
10. Kouklia
11. Massari
12. Mavrokolymbos
13. Morphou
14. Polemidhia
15. Tremithios Kiti
16. Yermasoyia
17. Treatise on Dams & Preparation of Drawings for book on large Dams in Cyprus being prepared by Director. (2482 hours).
18. Dams in Cyprus and progress in Dam construction, graphs charts and I.C.O.L.D. register of Dams Form.
19. Leakage and other observations of Dams.

Total time spent: 3 941 hours.

4.3.1.2 Irrigation Distribution Systems for Dams

1. Argaka Magounda
2. Ayia Marina
3. Kalopanayiotis
4. Kouklia
5. Kourris, Garyllis, Yermasoyia
6. Limpetri
7. Mavrokolymbos
8. Mia Milea
9. Palekhori (380 hours)
10. Polemidhia
11. Ponos
12. Tremithios (Kiti)
13. Yermasoyia Polemidhia
14. Yermasoyia (800 hours)

Total time spent : 2.016 hours.

4.3.1.3 Routine Irrigation Works

1. Agridhia
2. Akaki
3. Akaki Meniko
4. Argaki
5. Athienou
6. Ayios Amvrosios
7. Dhali
8. Ergates
9. Galini
10. Kalavasos
11. Kalokhorio (Kapouti)
12. Kalopsidha
13. Kapouti
14. Karavostasi
15. Katokopia
16. Klirou
17. Kouklia
18. Kyperounda
19. Kyra
20. Lefka
21. Maroni
22. Messaoria (South Eastern)
23. Morphou Teratsias
24. Morphou Aquifer New Project (855 hours)
25. Palekhori
26. Peristerona
27. Prastio (Morphou)
28. Psomolophou
29. Pyrgos (Tyllirias)
30. Syrianokhori
31. Yenagra
32. Yenagra - Marathovouno
33. Zodhia Kato

Total time spent : 3,219 hours

4.3.1.4 Domestic Water Supply Schemes

1. Akaki
2. Akourdalia
3. Arodhes Pano
4. Ayios Amvrosios
5. Ayios Andronikos
6. Famagusta (1784 hours)
7. Kallepia Regional Scheme
8. Kalogrea
9. Kannavia
10. Kantara
11. Karakoumi
12. Karavostasi
13. Katydhata
14. Klepini
15. Kondemenos
16. Korphi
17. Kyrenia
18. Larnaca

19. Linou
20. Mesakhorio
21. Morphou
22. Motidhes
23. Nicosia (Syrianokhori Morphou pipeline)
24. Nikitas
25. Paleambela
26. Paleometokho
27. Piyenia
28. Polemidhia Kato
29. Pomos
30. Potami
31. Potamos-tis-Yermasoyias
32. Sina Oros
33. States-Ayios Photios
34. Strongylos
35. Souskiou
36. Tembria Regional Scheme
37. Tembria
38. Thermia
39. Vatyli
40. Vatyli Regional Scheme
41. Vyzakia
42. Vyzakia Regional Scheme
43. Yialousa
44. Ypsonas

Total time spent : 3,900 hours

4.3.1.5 Recharge Schemes

1. Akhna
2. Ayia Napa
3. Ayios Epiktitos
4. Famagusta
5. Kazaphani
6. Massari
7. Syngrassi
8. Thermia
9. Vasilia

Total time spent : 770 hours

4.3.1.6 Antiflood Schemes

1. Episkopio
2. Gastria
3. Komitis
4. Kythrea
5. Limassol (Ayia phylaxis)
6. Yermasoyia

Total time spent : 303 hours

4.3.1.7 River Training

1. Kelokedhara
2. Nikoklia
3. Pera
4. Syrianokhori

Total time spent : 176 hours

4.3.1.8 Hydrological

1. Estimation of floods in Cyprus (graphs)
2. Rainfall 1968-69 charts
3. Flood discharge curves
4. Surface water resources map
5. Hydrological catchment areas
6. Hydrological year book 1967-1968 drawing (435 hours)
7. Rainfall duration graphs
8. Major Watersheds in Cyprus

Total time spent : 670 hours

4.3.1.9 General

1. Limassol industrial estate catchment
2. Cast iron specials detail
3. Process camera room plan

4. Construction division expenditure curve
5. Cyprus Power System graphs
6. All projects map
7. Monthly returns
8. Limassol Regional Office sign post
9. Expenditure graphs
10. Dam Posters

Total time spent : 268 hours

4.3.1.10 Reports

1. Instructions manual No. S/6. Preliminary estimating data (Drawing).
2. Instructions manual No. S/7. Maintenance of dams
3. Kalopanayiotis dam completion report. (Time spent: 328 hrs).
4. Translation of summary of Director's book "Water Resources of Cyprus etc."
5. F.A.O. Experts reports
6. Kythrea Floods of 2-3rd December 1968 No. H/2. (Preparation of drawings).
7. Yermasoyia dam. Calibration of gates report. (137 hours).
8. Argaka Magounda Distribution System report
9. Lefkara dam planning report
10. Massari dam design report No. D/1. (146 hours)
11. Yermasoyia dam as built report
12. Yermasoyia dam evaporation control experiment
13. Yermasoyia dam distribution system report

Total time spent : 953 hours

4.3.1.11 Progress, Programs & Organization

1. Departmental program for 1969
2. Departmental Organization charts
3. Dam programs
4. Expenditure progress charts in D's Office

Total time spent : 542 hours

4.3.1.12 Odd Jobs

1. Albums, photos, key plans, photo captions & sets of maps

Total time spent : 56 hours

4.3.1.13 Auxiliary Services

1. Library
2. Plan registry
3. Drawing materials store
4. Registry work

Total time spent : 2 022 hours

4.3.1.14 Jobs for other Departments

1. Cyprus map for medical services
2. Public information office posters
3. Staff record card for forest department

Total time spent : 198 hours

4 3 1 15 Initial training of staff

Total time spent : 297 hours

Leave etc

1	Leave with pay	719	hours
2	Leave without pay	963	hours
3	Sick leave	411	hours
4	D C	99	hours

Total time spent : 2 192 hours

4 3 1 16 Summary

	Time spent in hours		
Existing & Proposed Dams	3 941 = 24 3	man	months
Irrigation distribution system for dams	2 016 = 12.3	"	"
Routine irrigation works	3 219 = 19 7	"	"
Domestic water supply schemes	3 900 = 24 0	"	"
Discharge schemes	770 = 4 7	"	"
Antiflood schemes	303 = 1 9	"	"
River training works	176 = 1 1	"	"
Hydrological	670 = 4 1	"	"
General	268 = 1 6	"	"
Reports	953 = 5 8	"	"
Progress programs & organization	542 = 3 3	"	"
Odd Jobs	56 = 0 5	"	"
Auxiliary Services	2 022 = 12 3	"	"
Jobs for other Departments	198 = 1 2	"	"
Initial training of staff	297 = 1 8	"	"
Leave etc	2 192 = 13 4	"	"
Total	21 523 = 132	"	"

For the work required by the Cyprus Water Planning Project 10 Technical Assistants daily paid were engaged throughout the year and for the work required by the Sub-contractors 2 Technical Assistants daily paid were engaged as from the 23rd March 1969 The work done for the C W P P can be listed as follows :

Dam Reconnaissance

1 Akapnou
2 Alethriko
3 Asprokremmos
4 Atsas
5 Ay Mamas
6 Ay Theodoros (Soleas)
7 Ay Therapon
8 Dhelikipos
9 Dhiarizos
10 Dhoros
11 Dhypotamos
12 Ezuza high dams
13 Evdhimou
14 Evretou
15 Farkonias
16 Hoglakovounos
17 Kalamou
18 Kalavasos
19 Kambos
20 Kapsala
21 Kambos
22 Karyotis (Phlasou)
23 Katouris
24 Khirokitia
25 Kourris
26 Krystalla
27 Knodhara
28 Kyra
29 Lania
30 Lazaridhes
31 Lefkara
32 Limnitis
33 Lymbia
34 Moni
35 Nikoklia
36 Panayia-tis-Agapis
37 Potamos-tou-Kambou
38 Phlevas

39 Psevdhas
40. Sarama
41. Vasilikos
42. Vyzakia
43. Xeros
44. Zalatsia
45 Volume charts for earth dams
46 Generalized draft storage valves for dams
47 Cost estimates for dams
48 Evaporation in dam reservoirs Area-capacity figures for computer

Total time spent : 4 410 hours

4.3.1 17 Land Use Section

1 Agricultural production graphs
2 Growing period for main annual crops
3 South west Paphos aerial photos
4 Reconnaissance irrigated land use map of Cyprus
5 Limassol watersheds map
6 Irrigation requirements curves
7 Annual irrigation expenses
8 Present land use maps
9 Eastern Mesaoria land use
10 Irrigated land use areas maps

Total time spent : 532 hours

4.3.1 18 Hydrological

1 Precipitation graphs
2 Average flow for maximum storage volume
3. Flow charts
4. Area classification map
5. Runoff sources map
6 Monthly soil moisture graphs
7 Draft hydrological section report
8. Meteorological map
9 Flood discharge curves

Total time spent : 237 hours

4 3 1 19 Engineering Section

1. Schedule of jobs
2 Dam core volume curves
3 Kourris flow calcs
4. Flow discharge curves

Total time spent : 150 hours

4.3.1 20 Economics Section

1. Domestic water supply projections conversion of co-ordinates of sources

Total time spent : 199 hours

4 3 1 21 Work for Sub-contractors T Ingledow and Associates

1. Two draughtsmen were loaned to the Sub-contractors as from 23rd March 1969.

Total time spent for Sub-contractors : 2 940 hours.

4.3.1.22 General

1. Furrow irrigation
2. Akrotiri Limassol area development (592 hours)
3. Tylliria Morphou area map
4. Base maps 1:25,000 for all Cyprus (494 hours)
5. Small map of Cyprus
6. Monthly returns
7. Yermsoyia, Polemidhia & Mavrokolymbos irrigation schemes.

Total time spent : 1, 402 hours

4.3.1.23 Watershed Surveys

1. Aradhipou river
2. Dhiarizos river
3. Evdhimou river
4. Elea (Koutraphas) river
5. Kambos river
6. Katouris river
7. Khapotami river
8. Khirokitia river
9. Kourris Garyllis rivers
10. Magounda river
11. Myrmikoph river
12. Paramali river
13. Pendaskinos river
14. Pomos river
15. Pyrgos (Limassol) river
16. Pyrgos (Tylliria) River
17. Serrakhis river (3689 hours)
18. Tremithios river
19. Vasilikos river
20. Yialias river
21. Xeros river
22. Pedhieos river
23. Alaminos river
24. Ambelikou river
25. Ayia Marina river
26. Limnitis
27. Mavrokolymbos
28. Pendakomo
29. Pouzis
30. Key map of watershed surveys progress for 1968 annual report

Total time spent : 6,688 hours

4.3.1.24 Regions

1. Region 1. Addition of borehole to 1 : 10,000 maps (for Contractors)

Time spent : 49 hours

2. Region 2.
3. Co-ordinates for Region 1
4. Regions map
5. Reservoir analysis region 1 dams
6. Larnaca region soil map
7. Region 6&7 soil & land suitability map
8. Region 1. Land tunure map
9. Regions 1,2 & 3 final report drawings

Total time spent : 1,183 hours

4.3.1.25 Odd jobs

Typical titles, file titles report covers forms etc.

Total time spent : 48 hours

4.3.1.26 Training of staff

Total time spent : 397 hours

4.3.1.27 Leave etc

1.	Leave with pay	465 hours
2.	Leave without pay	310 "
3.	Sick leave & maternity leave	234 "
4.	D.C.	130 "
	Total time spent	1139 "

4.3.1.28 Summary

	Time spent in hours		
Dam reconnaissance	4 410	= 27.2	man months
Land Use Section	532	= 3.2	" "
Hydrological	237	= 1.5	" "
Engineering section	150	= 1.0	" "
Economics section	199	= 1.3	" "
Work for Sub-contractors	2 940	= 18.0	" "
General	1 402	= 8.6	" "
Watershed surveys	6 688	= 41.0	" "
Regions	1 183	= 7.3	" "
Odd jobs	48	= 0.3	" "
Training of staff	897	= 5.6	" "
Leave etc	1 139	= 7.0	" "
Total	19 825	= 122	" "

The total work carried out by the Drawing Branch is :

Work for Department	:	21 523	= 132 " "
Work for C.W.P.P.	:	19 825	= 122 " "
Grand Total	:	41 348	= 253 " "

Deatailed quarterly reports on the work of the Drawing Branch are issued and can be found in File No. 70/68.

The above time spent on various jobs does not include any time spent by the Head of the Drawing Branch, the 2 Technical Assistants on loan to the U.N. Ground Water & Minerals Project and the 2 Foremen and one hourly paid regular employee working on map reproduction. Also the work of the Storeman (T.A.) of drawing instruments and surveying instruments is not included

Training of staff is given to recruits to the Drawing Branch who underg basic training in Engineering lettering, drawing and in work, map reading scaling etc. This is necessarily non-productive training. After the initial training recruits continue to be trained by doing actual work and producing. In axual fact since 1963 when the Drawing Office was established in the Department 57 employees have received training of whom 22 have left the Department to work elsewhere e.g. CYTA or other Departments of the Government or have gone abroad due to the very low pay offered and the uncertainty in the daily paid post.

4.4 Library & Technical Information Section

During 1969, 40 new books at a total cost of £83 100 mils were purchased by the Department and subscription was continued on 12 Technical Periodicals at a total cost of £39 825 mils. In addition 31 reports were prepared by Officers of the Department (listed in an appendix of this report) and numerous other books and periodicals were received free of charge.

The Library continued to issue monthly or bimonthly reports of material received and of articles from Periodicals of special interest.

4.5 Reproduction Section

Plan reproduction cintinued during 1969 with the automatic continuous process dyeline paper printing machine with the old machine as stand-by. Some 3 700 orders were issued to the Reproduction Section and 35 000 prints were made of various sizes and of all types. This has been a trying year for the plan reproduction staff because of increased demand for prints by the Department, the C.W.P.P. and the Sub-contractors T. Ingledow and Associates. The Sub-contractors were charged for the prints they received @ 150 mils for large Drawings and @ 75 mils for small drawings.

With the increased demand on the reproduction section it is now evident that the printing room is not large enough to allow for efficiency. Also room must be found so that the old machine can operate at times of peak pressure for printing work and a new trimming machine must be provided.

4.5.1. General Remarks

In general the Drawing Branch during 1969 worked with increased efficiency and with maximum production improving greatly on the quality of the drawings and maps produced.

4.6 Topography Branch

This Branch has carried out the Survey Work required by the Design and Planning Divisions of the Department and the Cyprus Water Planning Project. These Surveys mainly consisted of Contour Surveys of Dam-Sites and Reservoirs as well as cross-sectioning and profile-levelling for Distribution Systems.

Another assignment of this Branch is the observation of control markers on completed Dams for detecting Horizontal and Vertical movements.

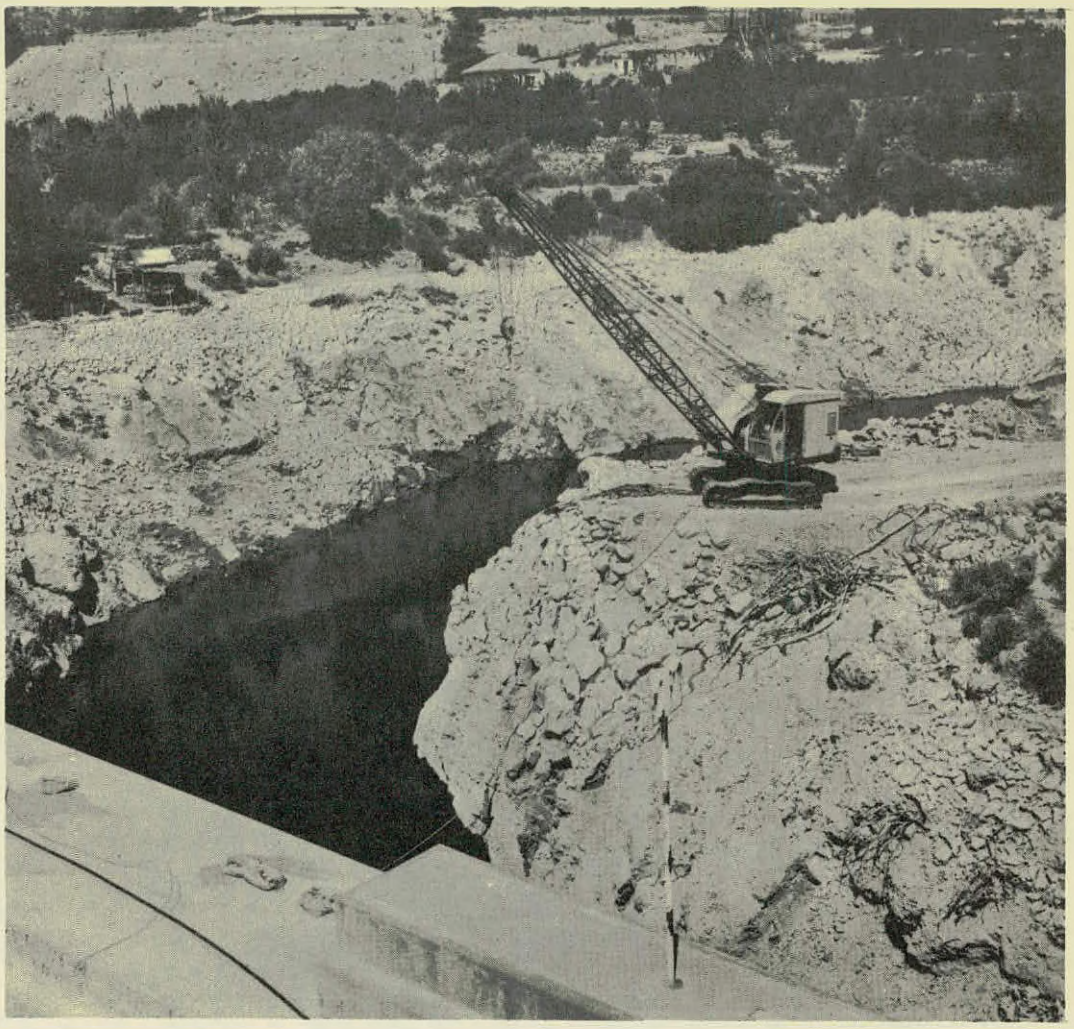
The staff during this year was as follows :

No	Post
2	Inspectors of Work
5	T/Assistants - Monthly paid
7	T/Assistants - Daily paid

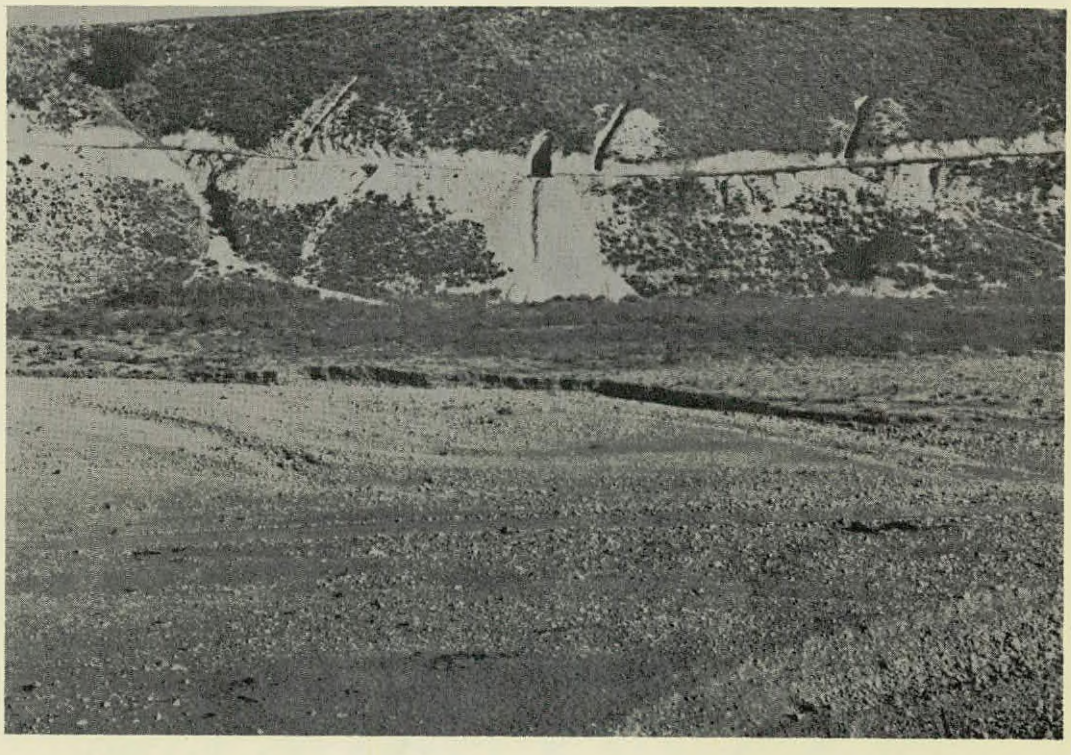
During 1969 this Branch has conducted Surveys for the following Projects :

No.	Project	Type of Survey	Remarks
1	Kythrea floods	Cross-Section and contour survey	Site plan
2	F/gusta Water Supply	Profile levelling	Including site plans for permanent structures
3	Yermasoyia Floods	Contour Survey	Site plan
4	Morphou dam	Cross-sectioning	For raising existing Branch
5	Ayios Minas R.	Contour Survey	Dam site and Rsservoir
6	Kambos R.	Contour Survey	Dam site and Reservoir
7	Mia Milea	Profile-levelling	Conveyor pipeline
8	Katouris R.	Contour Survey	Dam-site and Reservoir
9	Pyrgos R.	Contour Survey	Dam-site and Reservoir
10	Dhelikipos R.	Contour Survey	Extension of Dam-site
11	Kiti	Profile-levelling	Distr. System
12	Sklidros	Contour Survey	Diversion weir
13	Karyiotis R.	Contour Survey	Dam-site and Reservoir
14	Kouris R.	Contour Survey	Dam-site
15	Xeros R.	Contour Survey	Dam-site
16	Lefkara	Contour Survey	Borrow areas
17	Ovgos	Contour Survey	Sedimentation purposes
18	Nikoklia	Contour Survey	Spillway area
19	Moni	Contour Survey	Dam -site and Reservoir
20	Kalamou	Contour Survey	Dam-site and Reservoir
21	Lazaridhes	Contour Survey	Dam-site and Reservoir

No.	Project	Type of Survey	Remarks
22	Pyrgos Limassol	Contour Survey	Dam-site and Reservoir
23	Morphou pipeline	Profile-levelling	Greater Nicosia Scheme
24	Mavrokolymbos	Profile-levelling	Conveyor pipeline
25	Mavrokolymbos	Cross-sectioning	Spillway area
26	Hoghlagovounos	Contour Survey	Sliding area
27	Ovgos (Philia)	Contour Survey	Dam-site and Reservoir
28	Asprokremmos	Contour Survey	Reservoir
29	Pittargour	Contour Survey	Upper Dam-Site
30	Dhiarizos	Contour Survey	Souskiou Diversion
31	Handria	Contour Survey	Reservoir
32	Control Markers	Observations	Detection of movement of Constructed Dams



Trimiklini Dam
View of extensive silting of reservoir. Broken metal structures were fished out by crane.



Proposed Dam on Xeropotamos River in Paphos
View of trenches & galleries part in site.

V. DIVISION OF CONSTRUCTION

By

H.P Karakannas
Head of Division

5.1 This Division embraces all the constructional activities of the Department, in the field of Domestic Water Supplies, Irrigation Works, the administration of Civil Engineering contracts for projects executed by contractors, all other civil engineering departmental contracts, the use of constructional plant, and the Departmental Workshop.

The permanent staff of the Construction Division during 1969 consisted of :

1	No. Engineer Hydrologist (Head)
1	No. Mechanical Engineer
2	Nos. Senior Inspectors of Works
7	Nos. Inspectors of Works
3	Nos. Chief Foremen
10	Nos. Assistant Chief Foremen
88	Nos. Monthly paid and weekly paid Foremen
370	Nos. Weekly Regular Artisans
482	Total

In addition to the above permanent force of the staff of the Division, Executive Engineer Mr. C. Andreou was attached to the Division with regard to the laying of the conveyor pipeline of the Famagusta Town new Water Supply Scheme. Other Executive Engineers were also working with this Division on Specific Schemes.

The Development Programme for 1969 for Domestic Water Supply and Small Irrigation Schemes and Restoration of Flood Damages, included 198 schemes of an estimated cost of £810,928, as shown hereunder :

a) Domestic Water Supply Schemes	-	£ 470 075
b) Small Irrigation Schemes	-	£ 300 691
c) Restoration of Domestic Water Supply and Irrigation Schemes damaged by floods	-	£ 40 162
Total		£ 810 928

Over and above the above development projects, the Division has taken active part in the New Water Supply Scheme for Famagusta Town as regards labour and supervision, civil engineering machinery and contracts. It has also undertaken part of the Major Irrigation Projects such as the finishing works at Yermasoyia Dam, falling outside the contract with Cybarco, the Distribution Scheme of Mavrokolymbos, Polemidhia and Kiti Dams, and the Recharge and other works in the Morphou area.

The total expenditure that incurred on the construction of schemes during 1969 (not including Major Irrigation Works) was £512 025. This amount includes carry over schemes and new schemes. Out of this amount £ 251 805 was spent on 42 Domestic Water Supply Scheme £ 208,371/ on 72 Small Irrigation Works and £36 849 on the Restoration of 60 Domestic Water Supply and Irrigation Schemes which were damaged by floods. An additional amount of about £ 15 000 has also been spent on schemes undertaken for other Government Departments and on Domestic Water Supply Schemes for which funds were deposited by the local Authorities.

5.1.1 Labour Force

For the execution of a project, the labour force consists of the regular employees of the Department, and casuals recruited from the area where the works are executed. During 1969 the number of regular employees engaged was 458 and an average number of 1400 casual workers were employed through the Labour Exchange.

5.1.2 Constructional Plant

Government machinery was used primarily for the construction of projects. As, however, the number of Departmental heavy machinery is limited, it was found necessary to engage machinery from private owners through tenders. In total the Division had 90 tenders of a value of £ 79 913.

5.1.3 Materials

Materials and piping used for the projects were requisitoned from the Government Central Stores. Building materials, such as sand, gravel, aggregate, etc, were purchased through tenders. In all, the Division had 81 tenders on such materials valued at £29 288. Cement was purchased through a general Government tender covering all Departments, from the two local cement factories. For all the constructional works a quantity of 5.195 tons of cement, valued at £ 34 969 was used.

During 1969, for all Domestic Water Supply and Irrigation Schemes executed, a total length of 271 727 meters of galvanized iron, Victaulic, and Asbestos Cement pipes were laid. A list showing in detail all the pipes used during the year is shown on next page:

(a) Galvanized mild steel pipes laid during 1969

Nominal size in inches	½"	¾"	1"	1¼"	1½"	2"	2½"	3"	4"	Total length in meters
Length of pipes laid in meters	25 244	317	22 470	34 003	30 376	34 229	13 106	19 830	24 408	203 983

(b) Steel victaulic pipes laid during 1969

Nominal size in inches	6"	8"	Total length laid in meters
Length laid in meters	881	1 718	2 599

(c) Asbestos - Cement Pressure Pipes

Nominal size in inches	2"	3"	4"	6"	8"	10"	12"	15"	Total length laid in meters
Length laid in meters	780	22 536	13 332	16 512	8 140	2 310	635	900	65 145

Materials and machinery used during 1969 through contract - Labour force used during 1969

Description	Quantity	Expenditure £	Regular artisans skilled	Casual artisans skilled	Casual labourers unskilled	Total No.	Expenditure on wages total in 1969 £
Cement	5195 tons	34 969	Average	Average per	day		
Gravel							
Sand	70209 cu.meters	29 288	370	480	600	1450	545 266
Aggregate							
Heavy Machinery	68458 hours	76 335					
Excavation of trenches	220 863 feet	3 578					
T o t a l		144 170					

5.1.4 Domestic Water Supply Schemes

The Programme of Works for 1969 included 52 schemes, out of which 28 were completed during the year, 14 schemes were put in hand but could not be completed by the end of the year, and were carried over for completion in 1970, and 10 schemes could not be put in hand during the year and were carried over for 1970. These ten schemes could not be put in hand for various administrative and other difficulties such as :

a) Funds were frozen for three schemes and so the work could not be proceeded with,

b) For five schemes, namely Vatyli, Strongylos Arsos, Trometoushia and Meloushia, drilling and test-pumping the borcholes had not been completed until, late in the year,

c) For two schemes, namely Mathikoloni and Statos the work could not be started as decision had been taken on resiting these two villages.

5.1.5 Domestic water supply schemes completed in 1969

By the completion of the 28 Water Supply Schemes a population of 24 124 persons has been served, and 5 460 house connections have been installed. In all cases where a house-to-house service distribution system was implemented ½ inch in diameter water meters were used. For the 28 schemes that have been completed, 30 Nos. reinforced cement concrete circular storage tanks of a total capacity of 906 000 gallons were constructed, and 12 new pumping plants with their pumphouses were installed.

The 28 Domestic Water Supply Schemes that were completed during 1969 are shown in the list that follows :

Domestic water supply schemes completed during 1969
Nicosia & Kyrenia District

Ser. No.	Village	Population 1960 census	Estimated cost £	Type of scheme	Nature of Work
1	Ayia Kebir Kythrea lower villages	418	8 670	Pumping	✱ H
2	Neokhorio	1 387	3 149	Gravity	✱ H
3	Trackhoni	578	5 095	"	✱ H
4	Palekythro	1 113	9 725	"	✱ H
5	Voni	479	4 820	"	✱ H
6	Exometochi	852	5 859	"	✱ H
7	Karo Pyrgos	1 049	15 531	"	+ H
8	Lythrodontas	1 448	2 686	Pumping	+ H
9	Pendayia	1 105	4 073	"	+ H
10	Ayios Epiktitos	1 192	5 102	"	✱ H
11	Klepini	233		"	✱ H
12	Bellapais	725	7 019	"	+ H
13	Kazaphani	1 063			✱ H
14	Dhikomo Pano & Kato	2 592	8 504	"	✱ H
15	Lymbia	1 383	11 600	"	+ H
16	Palekhori (Orinis)	832	5 200	Gravity Pumping	+ H

Domestic Water Supply Schemes Completed During 1969

Ser. No	Village	Population 1960 census	Estimated cost £	Type of Scheme	Nature of work
	Famagusta District				
1	Ayios Khariton-Vitsadha Psillatos	976	800	Pumping	+
2	Phlamoudhi	299	1 379	Gravity	* H
3	Angastina	778	6 800	Gravity &Pumping	
4	Mousoulita	219	1 330	-do-	
5	Patriki	581	7 310	Gravity &Pumping	
6	Phrenaros	1 439	4 000	Pumping	
7	Pyrga	449	3 900	Gravity &Pumping	
8	Ycnagra	578	4 350	-do-	
	Limassol District				
1	Asomatos	340	2 260	Pumping	* H
	Larnaca District				
1	Kornos	859	470	Pumping	+
	Paphos District				
1	Arminou	250	3 100	Gravity &Pumping	* H
2	Tsadha	907	4.000	Gravity	+ H
	T o t a l s	24 124	136 732		

Legend:- *New Scheme + Improvements to existing scheme H House-to-house

Some of the most important Domestic Water Supply Schemes that were completed during 1969 are the schemes for Ayia Kebir, the five Kythrea Lower Villages, Ayios Epiktitos and Klepini, Bellapaise and Kazaphani and Dhikomo Pano and Kato. A short account for each of these schemes is given hereunder

5.1.5.1 Ayia Kebir Water Supply Scheme

The scheme for Ayia Kebir which is a Turkish village, was combined with Troulli and Avdellero and was executed some years ago. At the time of the execution of this scheme neither Avdellero nor Ayia Kebir were interested, and so the scheme was operating for Troulli village only. The share in the cost of the combined headworks for Ayia Kebir and Avdellero villages was borne by Government, so that the other two villages may eventually, if they changed their mind, be supplied with domestic water. The scheme for Ayia Kebir estimated at £ 9 700 was put in hand very late in 1968 after a request from the village.

The scheme involved the laying of an asbestos cement main pipeline of 3 inch in diameter 27 300 feet in length between the distribution box near Troulli, and the new 20 000 gallons capacity R.C.C. circular tank. In the village a house-to-house service system was implemented and 150 water meters were installed.

5.1.5.2 Kythrea Lower Villages Water Supply Scheme

The seven Kythrea Lower villages, namely, Neochorion, Trachoni, Palekythro, Voni, Exometokhi, Bey Keuy and Epikho were deriving their Domestic Water Supply from Kephalovryso Spring in accordance with "The Kephalovryso Water Supply Improvement Law, Cap. 343". Until 1961 these seven villages were served through the same pipeline with Kythrea, but in view of the fact that a number of householders from Kythrea had made unauthorized connections on to that pipeline, the water for the seven Lower Villages was not sufficient. In 1961 an independent 3 inch in diameter pipeline at a cost of £15 000 was laid between Kephalovryso spring and seven villages. The distribution systems of all these villages were very old and unserviceable and the inhabitants encountered great hardships in obtaining their water supply.

In 1968 a new scheme estimated at £51 000 - was prepared for the five Greek villages. The work was put in hand in July 1968 and was completed by the end of 1969. The scheme involved the construction of separate storage tanks for each village and the installation of completely new distribution systems. For Neochorion, Palekythro and Exometochi elevated storage tanks of capacity 30 000 gallons were constructed, in Voni an elevated storage tank of capacity 20 000 gallons was constructed and for Trakhoni a ground level storage tank of capacity 20 000 gallons was constructed.

In all five villages a house-to-house service scheme was implemented, using asbestos - cement presure mains, and 1050 water meters of $\frac{1}{2}$ inch in diameter were installed in all houses.

5.1.5.3 Ayios Epiktitos- Klepini Water Supply Scheme

Before the implementation of this scheme both villages had no piped water supply and had to obtain their water supply from wells situated in the village area whose water was on most occasions contaminated. In summer months especially in years of drought, Government had to supply both villages with water by means of a tanker.

The scheme which was split into two phases was estimated at £32,000. Phase I of the scheme estimated at £25 000 had as source of supply borehole No. B 30 which was drilled by the German Water Mission and was not vertical but had an inclination of 15° and was also of a small diameter, having a casing of only 4 inches in diameter. This first phase included the installation of a small pumping unit of 1000 gallons per hour on borehole B.30, the laying of a 2" ϕ galvanized iron pipeline to the village, the construction of one 60 000 gallons capacity R.C.C. circular storage tank for Ayios Epiktitos, and the installation of a house-to-house service within Ayios Epiktitos. For Klepini this first phase included the laying of a main pipeline between the borehole and the village, the construction of a 10 000 gallons capacity R.C.C circular tank and the installation of a house-to-house distribution system. 320 Nos. water meters were installed in both villages. This part of the Scheme was completed in 1967, but as the quantity of water available was not adequate, prospecting drilling was carried out in order to provide additional water for both villages. In 1967 a successful borehole No. E.B.10 was drilled and phase II of the Scheme, estimated at £7 000 was approved for 1968. This scheme was put in hand during 1968 and was completed by late 1969.

This part of the scheme included the installation of a pumping unit of a yield 8 000 gallons per hour on the second borehole, the provision of electricity at the site of both boreholes, the construction of a 60 000 gallons capacity R.C.C. circular storage tank near the second borehole, and the laying of new mains between the balancing tank near the new borehole and the two villages.

In both cases the operation of the pumping units is effected by automatically controlled float switches and thus a considerable amount of money can be saved by not using a permanent pump attendant.

5.1.5.4 Bellapaise - Kazaphani Water Supply Scheme

This scheme estimated at £22.000 was put in hand in April 1968 and was completed in June 1969. The source of supply is borehole No. B.20, which was drilled by the German Water Mission, and which was supplying Bellapaise with water since 1966. The scheme included the construction of one 30.000 gallons capacity balancing tank near the borehole, common to both villages, the construction of one storage tank of capacity 10 000 gallons for Bellapaise, the laying of a 2 inch in diameter main between the borehole and Kazaphani, the construction of two storage tanks of capacity 30 000 gallons each, and the installation of a new house-to-house distribution system for Kazaphani. Bellapaise had an old distribution system with break-pressure boxes which was modified by the construction of the additional storage tank referred to above, for a number of houses in the highest quarter of the village and the replacement of the break - pressure boxes with water meters.

In the case of Kazaphani two service storage tanks of 30 000 gallons, were constructed to serve the high quarter and the low quarter of the village and thus reduce the pressure in the distribution mains.

In both villages about 450 water meters were installed.

5.1.5.5 Dhikomo Pano and Kato Water Supply Schemes

The scheme for these large villages in the Kyrenia District, estimated at £19 000 was put in hand in August 1968 and was completed in September 1969. Though both villages had as source of their supply a very good borehole situated on the northern outskirts of Pano Dhikomo, yet both the villages faced a shortage of water as a result of the old existing distribution system with public street fountains and the uncontrolled use of water.

The new scheme included the provision of electricity at the site of the borehole, the replacement of the old mechanically driven turbine pump with a new modern elecrosubmersible pump, the installation of an automatic system of pumping, the construction of two additional storage tanks of capacity 30.000 gallons for each village, and the installation of a house-to-house service scheme. In all, 700 water meters were installed in both villages.

5.2 Domestic Water Supply Schemes put in hand in 1969 but not completed carried over for completion in 1970

As it was mentioned above 14 Nos Domestic Water Supply Schemes which were included in the 1969 Construction Programme, were put in hand, but could not be completed by December, 1969. The amount approved for these 14 schemes was £277 773 and an amount of 129 894 was spent for the execution of part of the schemes, and the balance of £147 879 was carried over for 1970 for the completion of all the schemes.

A list showing the 14 Domestic Water Supply Schemes that were put in hand during 1969 but could not be completed by the end of the year and were carried over for completion in 1970 is given on nxxt page :

Domestic Water Supply Schemes put in hand during 1969 but not completed and carried over for completion in 1970

Ser. No.	Village	Amount approved for 1969 £	Amount carried over for 1970 £
	Nicosia & Kyrenia District		
1	Kalokhorio (Klirou)	5 172	4 850
2	Vasilia Regional Scheme		
	i. Vasilia		
	ii. Agridhaki		
	iii. Sisklipos		
	iv. Ayios Ermolaos		
	v. Ayia Marina (Skyl.)	69 229	16 201
	vi. Asomatos		
	vii. Panagra		
	viii. Orga		
	ix. Liveras		
3	Morphou	111 000	93 313
4	Nikitari	5 400	2 229
5	Dhiorios	1 533	643
	Famagusta District		
1	Eastern Mesaoria Dry villages	5 939	1 525
2	Asha	19 500	2 726
3	Aphania	6 680	437
4	Komi Kebir	12 600	5 403
5	Marathovounos	9 900	542
	Limassol District		
1	Pano Kividhes	1 920	1 131
2	Zoopiyi	7 616	16 817
3	Louvaras	11 284	
	Paphos District		
1	Papaloucas scheme		
	i. Phiti		
	ii. Lassa		
	iii. Ayios Dhemetrianos	10 000	2 062
	iv. Kathikas		
	v. Polemi		
	vi. Psathi		
	T o t a l	277 773	147 879

5.3 Domestic Water Supply Schemes approved for execution in 1969 but not put in hand during the year and carried over for 1970

Out of the 52 Domestic Water Supply Schemes which were included in the 1969 Development Programme 10 schemes could not be put in hand for various administrative and technical reasons.

These schemes of an estimated cost of £55,570 were carried over for construction in 1970 and are shown in the list hereunder:

Domestic Water Supply Schemes approved for execution in 1969 but not in hand during the year and carried over for 1970

Ser. No.	Village	Estimated cost £	Remarks
1.	Ayia Anna (L'ca)	1,600	Funds were frozen
2.	Aredhiou	6,700	Funds were frozen
3.	Vatyli)	24,624)	Pending the completion of drilling
	(	(	of new boreholes
4.	Strongylos)	4,252)	
5.	Mathikoloni	2,600	Pending the construction of roads of new village.
6.	Arsos)	4,696)	Combined scheme with Vatyli and
7.	Tremetoushia (	4,770 (	Strongylos. Pending the drilling
8.	Meloushia)	1,908)	of new boreholes
9.	Galataria	820	Funds were frozen
10.	Statos	3,600	Pending resiting of old village
	T o t a l	55,570	

5.4. Small Irrigation Works

The Construction Programme for 1969 included 86 Small Irrigation Schemes of an estimated cost of £300,691. Out of these 86 Schemes, 52 schemes of an estimated cost of £141,864 were completed during 1969, 20 schemes of an estimated cost of £108,420 were put in hand during 1969 but were not completed by the end of the year and were carried over for completion in 1970, and 14 schemes of an estimated cost of £50,407 could not be put in hand during 1969 for various administrative and technical reasons, and were carried over for execution in 1970.

The Small Irrigation Works undertaken by this Division and included in the Construction programme are usually classified in four categories, namely:

5.4.1 Liming of Canals in the Western Mesaoria

As it was stated in previous reports this project was inaugurated in 1966, and its chief aim is to replace all earthern irrigation channels in the Morphou area by reinforced cement concrete channels, or prefabricated channels and thus effect the maximum possible economy in water lossed between the boreholes and the citrus plantations. By the implementation of this scheme it is estimated that an economy of 20 per cent of water is effected every year an appreciable amount is allocated on this project which is considered of vital importance, especially during the past few years when the whole Morphou aquifer is continuously depleting. The Construction programme for 1969 included 16 such schemes of an estimated cost of £104,658, out of which 9 schemes estimated at £58,558 were completed during 1969, two schemes estimated at £10,000 were put in hand during 1969 but were not completed and were carried over for completion in 1970 and 5 schemes estimated at £26,100 were not put in hand during the year and were carried over for execution in 1970.

5.4.2 Recharge Works

The Construction programme for 1969 included seven such schemes of an estimated cost of £36 669. Out of the seven schemes 4 of an estimated cost of £13 469 were completed during 1969, one scheme of an estimated cost of £19 000 was put in hand during the year but was not completed and was carried over for completion in 1970, and two schemes of an estimated cost of £4 200 were not put in hand in 1969 and were carried over for execution in 1970.

5.4.3 Pumping Schemes

The construction programme for 1969 included 12 pumping schemes of an estimated cost of £60 203. Out of these schemes 5 schemes of an estimated cost of £22 533 were completed during 1969, four schemes of an estimated cost of £23 170 were put in hand during the year but were not completed and were carried over for completion in 1970 and three schemes of an estimated cost of £14 500 could not be put in hand during 1969 and were carried over for execution in 1970.

5.4.4 Minor Irrigation Schemes

The construction programme for 1969 included 51 such schemes of an estimated cost of £99 161. Out of these schemes 34 schemes of an estimated cost of £47 304 were completed during 1969, 13 schemes of an estimated cost of £46 250 were put in hand during 1969 but were not completed and were carried over for completion in 1970, and 4 schemes of an estimated cost of £5 607 could not be put in hand during 1969 and were carried over for execution in 1970.

5.5 Small Irrigation Works completed during 1969

As it was stated above in all 52 Small Irrigation Schemes of an estimated cost of £141.864 were completed during 1969. These 52 schemes include works of all four categories and are shown in the lists that follow :

Small Irrigation Works completed during 1969

A. Lining of canals in Western Mesaoria completed during 1969

Ser. No.	Name of Scheme	Amount approved for 1969 £	R.C.channels completed in feet	Prefabricated channels completed in feet	Total R.C.& Pref.channels completed in feet
1.	Katokopia(1968 scheme)	1 525	6.200	-	6 200
2.	Morphou-Ovgos (1968 scheme)	2 323	200	6.800	7.000
3.	Peristerona-Astromeritis	4 710	4 000	-	4.000
4.	Argaki	5.000	6.020	-	6.020
5.	Astromeritis	5 000	5 742	412	6,154
6.	Katokopia	5.000	5 333	600	5,933
7.	Morphou-Teratsia	15 000	17 680	-	17.680
8.	Syrianokhori	15 000	9 000	10 000	19.000
9.	Zodhia - Pano	5 000	4.020	2,910	6,930
	T o t a l	58 558	58 195	20,722	78 917

B. Recharge Schemes completed during 1969

Ser. No.	Name of Scheme	Amount Approved for 1969	Remarks
1.	Ayios Epiktitos	1,232	Construction of 6 Small Recharge Dams (original est. cost £4,000)
2.	Akanthou	1,566	Construction of 6 Small Recharge Dams (original est. cost £7,000)
3.	Akhyritou-Vrysoulles	5,171	Construction of one Recharge Dam (original est. cost £8,000)
4.	Xylotymbou	5,500	Construction of 5 Recharge Dams (original est. cost £5,500)
	Totals	£13,469	-

C. Pumping Schemes completed during 1969

Ser No	Name of Scheme	Amount Approved for 1969	Area of land irrigated		Remarks
			Perennial	Seasonal	
1.	Kyra	5,083	300	200	Revote from 1968. Original est. £10,600
2.	Phylia	5,200	78	60	New scheme approved for 1969
3.	Ayios Theodoros (L'ca)	6,250	63	28	Revote from 1968. Est. cost £6,250
4.	Khirokitia	1,600	120	-	Revote from 1968. Est. cost £3,400
5.	Tripimeni	4,400	70	-	New scheme approved for 1969
	Totals	£22,533	631	288	-

D. Minor Irrigation Scheme completed during 1969

Ser No.	Name of Scheme	Amount Approved for 1969	Nature of Works	Area of land irrigated in donums	
				Perennial	Seasonal
1.	Evrykhou	368	Lining of canals	821	679
2.	Galata	973	Distr. canals	304	256
3.	Kakopetria	8,006	Lining of canals	100	160
4.	Karavas-Platanos	750	Spring&Distr. pipes	29	-
5.	Milikouri	452	Sub-surface weir	25	-
6.	Petra	552	Lining of canals	322	678
7.	Pharmakas-Dexameni tou Kaminiou	340	Distribution pipes	17	-
8.	Sina Oros-Galata	3,130	Distr. pipes&canals	345	70
9.	Tembria	1,298	Lining of canals	242	558
10.	Elea Chiftlik-Kyrenia	2,600	Distribution pipes	40	12
11.	Galini	6,000	Lining of canals	312	-
12.	Karavas-Mezere	600	Distr. pipes	15	45
13	Karavas-Motidhes	1,100	Distr. pipes & channels	3½	4
14.	Agros-Dihalorotsos	930	Irr tank & Distr pipes	10	-
	C/F	£27,099	-	2,585½	2,462

Ser. No.	Name of Scheme	Amount Approved for 1969	Natura of Work	Area of land irrigated in donums	
				Perennial	Seasonal
	B/F	27 099	-	2.585½	2 462
15.	Agros-Mylos Lambada	900	Distributon canals	25	-
16.	Agridhia-Kaouras	73	Distr. canals& pipes	17	-
17.	Agridhia-Pano Ematiko	1 596	Distr. canals& pipes	14	21
18.	Agridhia-Vrysi tou Khoriou	252	Distr. pipes	7	1
19.	Arakapas	1 388	Sub-surface weir Irr. tank,& distr, pipes	62	18
20.	K. Amiandos-Kardama Avgoustidhes	420	Distr. canals & pipes	17	13
21.	K. Amiandos-Appis Kardaki	1 325	Distr. canals	20	-
22.	Kalokhorio	561	Distr. system	44	16
23.	Pelendria-Koumdouridhes	309	Distr. canals	45	-
24.	Pelendria-Pervoloudhia	1.150	Irr. tank & distr. pipes	8	4
25.	Ayios Ioannis Agrou K. Akkros	1 500	Distribution system	30	10
26.	Ayios Ioannis Agrou Peroyia	540	Distribution system	16	-
27.	Agros-Paliotinos	500	Lining of canals & distr pipes	4	-
28.	Agros-K. Erimos	750	Distr. canals&pipes	20	-
29.	Ayios Pavlos-Yiannitsin	510	Distribution system	12	-
30.	Khirokitia	5 400	Distr. system	120	350
31.	Psevdhas	1.050	Distr. system	-	55
32.	Kholetria	143	Lining of canals	-	-
33.	Panayia	528	Distr. pipes	25	11
34.	Gypsos-F'sta	1 310	Construction of R C. channels	-	70 & 730 spate irrigation
	T o t a l s	£47 304	-	3 071½	2.961

5.6 Small Irrigation Works put in hand in 1969 but not completed and carried over for completion in 1970

As it was stated before, 20 such schemes of an estimated cost of £108 420 were put in hand during 1969 but were not completed by the end of the year and were carried over completion in 1970. These 20 schemes include two schemes for lining canals in the Western Mesaoria, one Recharge Scheme, four pumping schemes and 13 Minor Irrigation Schemes and are shown in the lists that follow :

Small Irrigation Works put in hand during 1969 but not completed and carried over for completion in 1970

A. Lining of canals in Western Mesaoria - Schemes started in 1969 but not completed by the end of the year

Ser No	Name of Scheme	Amount approved for 1969 £	Amount carried over for 1970 £
1.	Morphou - Ovgos	5 000	4 452
2.	Prastio	15 000	9 541
	T o t a l	20 000	13 993

B. Recharge schemes put in hand in 1969 but not completed and carried out for 1970

Ser. No.	Name of Scheme	Amount approved for 1969 £	Amount carried over for 1970 £
1.	Famagusta - Dherynia	19 000	5 765

C. Pumping Schemes put in hand in 1969 but not completed during the year and carried over for completion in 1970

Ser. No.	Name of Scheme	Amount approved for 1969 £	Amount carried over for 1970 £
1.	Potami (original est. cost £10 000)	3 970	2,826
2.	Zyyi - Tokhni	8 500	5 338
3.	Anglissidhes	6 400	3 724
4.	Maroni - Phase I	4 300	2,417
	T o t a l	23 170	14 305

D. Minon Irrigation Schemes put in hand in 1969 but not completed during the year and carried over for completion in 1970

Ser No.	Name of Scheme	Amount approved for 1969 £	Amount carried over for 1970 £
1.	Pyrgos Tyllirias	10 000	1 145
2.	Galata (Esso)	4 000	709
3.	Kalopanayiotis-Troullinos	3 300	1 103
4.	Moutoullas - Katouris	4 500	1,188
5.	Psomolophou	6 000	1,512
6.	K. Amiandos-P. Phylagra	1 700	1,040
7.	K. Amiandos-K. Phylagra	2 600	751
8.	Agros - Dihalorotsos	1 200	1 137
9.	Dhierona	300	262
10.	Ephtagonia	2 800	610
11.	Potamiou	2 300	640
12.	Prodhromos	4 350	3 374
13.	Arsos	3 200	2 046
	T o t a l	46 250	15 517

5.7 Small Irrigation Works not put in hand during 1969, and carried over for execution in 1970

As it was mentioned before 14 Small Irrigation Schemes could not be put in hand during 1969 for various Administrative reasons which are,

(a) The delay in the issue of loan funds due to arrears on previous loans
(b) Pending the completion of acquisition formalities
(c) Pending the results of drilling new boreholes
(d) The freezing of funds for some schemes

These 14 schemes of an estimated cost of £50,407 are shown in the list that follows:

Small Irrigation Works approved for execution in 1969 but not put in hand and carried over for execution in 1970

Ser. No.	Name of Scheme	Nature of Work	Estimated cost £
1	Akaki-1968 scheme	Lining of canals	5 550
2	Akaki-1969 scheme	-do-	5 000
3	Peristerona-1968 scheme	-do-	5 550
4	Peristerona-1969 scheme	-do-	5 000
5	Zodhia. Kato-1969 scheme	-do-	5 000
6	Elea Chiftlik-Kyrenia	Recharge Works	3 000
7	Akhna - F'sta	-do-	1 200
8	Kato Koutraphas	Pumping Scheme	7 000
9	Massari	-do-	3 300
10	Angastina	-do-	4 200
11	Ayios Pavlos-Dhima tou khoriou	Minor Irrigation scheme Scheme	500
12	Trimiklini	-do-	907
13	Agros-Kaoukkaris	-do-	600
14	Kato Akourdhalia	-do-	3 600
			£50 407

5.8 Restoration of flood damages

The heavy rainfall over the whole island during the rainfall year 1968-1969, caused considerable damages on a number of Domestic Water Supply and Irrigation Schemes. On some occasions the extend of these flood damages was enormous, and some villages remained without drinking water for some weeks. In the case of Kythrea Town and the 20 villages that derived their water supply from the Kephalovrysos spring, Government had to supply them with water by means of tankers. On other occasions, especially in the Paphos District complete pumping units with their pump-houses were swept away by the flooding river.

To remedy the situation and restore all the flood damages Government allocated an amount of £40 162 for the restoration of 19 Domestic Water Supply Schemes and 41 Irrigation Schemes. In total an amount of £36 849 was spent during 1969 on all 60 Water Supply and Irrigation Schemes. Lists showing the 19 Domestic Water Supply Schemes and the 41 Irrigation Schemes that were restored from the flood damages during 1969 are given on next page :

Restoration of flood damages

A. Domestic water supply schemes damaged and restored during 1969

Ser. No.	Name of Scheme	Amount approved for 1969 £	Remarks
1.	Evrykhou	700	
2.	Ayios Georghios Kafkalou	80	
3.	Palekhori	20	
4.	Peristerona	80	
5.	Ergates	30	
6.	Ayios Theodhoros (L'ca)	90	
7.	Ypsonas-Polemidhia	800	
8.	Trimiklini Regional Scheme	580	
9.	Ayios Amvrosios (L'ssol)	400	
10.	Kissousa	500	
11.	Sotira	400	
12.	Kividhes Pano & Kato	210	
13.	Pakhna	300	
14.	Kolossi - Erimi	800	
15.	Korphi	200	
16.	Kouklia (Paphos)	300	
17.	Polis - Prodhromi	1 100	
18.	Nikoklia	100	
19.	Kissonerga	900	
	T o t a l	7 590	

B. Irrigation schemes damaged and restored during 1969

Ser No.	Name of Scheme	Approved amount for 1969 £	Remarks
1.	Akaki-Meniko (Riatiko)	250	
2.	Peristerona-Astromeritis	350	
3.	Kato Koutraphas	930	
4.	Tymbou	1 275	
5.	Katydhata	850	
6.	Kythrea	2 000	
7.	Vitsadha-Kiordere-Halaza	150	
8.	Limnia-Stylli (Plakos)	200	
9.	Strongylos-Ashia(Toumbes)	1 000	From D.O.Funds (22D-5)
10.	Limnia-Ayios Serghios (Kourouklas)	250	
11.	Trimiklini Dam	650	
12.	Perapedhi Distribution system	480	
13.	Arakapas (Angoulos)	70	
14.	Ayios Pavlos		
	i. Dhomes	300	
	ii. Yiannitzi	90	
15.	Kapilio	660	
16.	Dhymes		
	i. Kambos	55	
	ii. Hji Pelendros-Kardhama	100	
	iii. Livadhi	100	
	iv. Kambos-Kardhama	60	
	v. Hji Physsouni-Kardhama	90	
	C/F	9 910	

Ser. No.	Name of Scheme	Amount approved for 1969 £	Remarks
	B/F	9 910	
17.	Ayios Theodhoros-Agrou		
	i. Vasiliki-Pinakas	82	
	ii. Ayios Georghios	40	
	iii. Maroudhes	150	
18.	Agridhia		
	i. Yeradhia	50	
	ii. Kaminadjia	90	
19.	Agros		
	i. Pano Yitonia	40	
	ii. Kamara-Omiridhes	20	
	iii. Kokkines	75	
	iv. Mylos-Lambada	135	
20.	Ayios Therapon	5 170	
21.	Mathikoloni (Esso Pervolia & Paleomylos)	95	
22.	Mandria (L'ssol)	45	
23.	Moniatis	50	
24.	Kato Amiandos-Pelendri	1,340	
25.	Kilani	3 010	
26.	Arsos	240	
27.	Paleomylos-(Hardji)	200	
28.	Lemythou	240	
29.	Kato Platres	185	
30.	Prodhromos (Kyparissi)	110	
31.	Tris Elies (Dhrakoudas)	250	
32.	Ayios Dhemetrios(Kaloyiros)	140	
33.	Phini	130	
34.	Potamitissa		
	i. Hassanis	30	
	ii. Arsoulou	45	
35.	Polemidhia distribution system	4 000	
36.	Nikoklia	1 650	
37.	Nata-Kholetria	2,000	
38.	Kelokedhara-Ziripillis	1 100	
39.	Amargeti-Ziripillis	1 000	
40.	Odhou (L'ca)	950	
	T o t a l	£32 572	

5.9 Major projects

The activities in this field during 1969, were concentrated on the construction of the Yermasoyia Dam, the extension of the Distribution system of Mavrokolymbos, Kalopanayiotis and Kiti Dams, and the raising of the Morphou Dam.

5.9.1 Yermasoyia Dam

This dam was completed and filled with water at the end of 1968. During 1969, the Department carried out same minor works, such as fencing the reservoir at the north side of the bridge over the radial gates and asphalting the part of the road to Phinikaria over the dam crest.

Several meetings with the contractor Messrs Cybarco were held, for the purpose of settling outstanding claims. Some claims have been settled amicably and other will be dealt with, by arbitration.

5.9.2 Mavrokolymbos Dam

During 1969, this dam was full, and was overflowing during winter and spring. No work was carried out on the dam during the year, except on the distribution system phase II.

The main conveyor pipeline composed of, from 24-8 inch in diameter asbestos-cement pressure pipes 9828 feet in length was laid. Water from the dam was used for irrigation at Kissonerga, Khlorakas and Emba, all through the 1969 irrigation season.

5.9.3 Kalopanayiotis Dam

Some minor works were carried out on the distribution system and some other minor works at the dam.

5.9.4 Polemidhia Dam

Work on grouting in the left abutment of this dam was put in hand in the Autumn of 1969, and continued until and after the end of 1969. An amount of £28 000 was allocated for this work on grouting.

From constructional testings the grouting shows satisfactory results. When the dam is full we will know for certain, whether additional grouting is necessary.

2. Because of the 1968 - 1969 floods part of the main conveyor pipeline from the dam to Zakaki, was damaged at certain points in the riverbed. The parts of the pipeline were repaired, and properly protected.

5.9.5 Morphou Dam

This dam was raised by four feet, for the purpose of increasing the capacity of the spillway. In total 560 cubic metres of concrete was laid also, and 46 000 cubic metres of river aggregate was placed, for the raising of the rest of the dam.

The total expenditure for this work was £12,885.

5.10 Western Mesaoria-recharge works

5.10.1 Protopapas Dam

In the Morphou Serakhis river, one earth dam with a weir consisting of cabions was constructed at a cost of £12,013.

This dam is located in the Serakhis river at the locality known as "Protopapas". It is 15 feet high and has a capacity of 20 million gallons.

For this work the following quantities of materials were used :

i.	River aggregate	32 300	cubic metres
ii.	Clay	3 080	" "
iii.	Cabions	937	" "
iv.	Earthmoving machinery used	4 859	hours

5.10.2 Repairs to the spreading grounds at "teratsia" locality

Those spreading grounds were completed in 1968. The 1968 - 1969 floods caused some damages to the embankment and the inlet structure of these reservoirs and we had to repair them before the 1969 - 1970 rainy season.

In total the materials used were :

i.	River aggregate	15 400	cubic meters
ii.	Concrete	385	" "
iii.	Earthmoving machinery used	2 140	" "

The total expenditure on this work was £ 4919

5.11 Workshop

The workshop of the Department forms a branch of the Construction Division, but it carries out work for other Divisions as well, i.e. the Planning the Maintenances and Operation and Water Resources. It is equipped with all facilities for carrying out all kinds of constructional works, that include earth moving equipment, motor transport, carpentry, plumbing fittings, the slotting and perforation of drilling casing and grinding and electro-welding of drilling bits. Installations and maintenances of pumping units for domestic water supplies and irrigation are carried out by the workshop. The dispatching 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 1969, consisted of an average of 72 regular and 14 casual artisans specialized in all activities of this branch of the Construction Division. 7 regular and 3 casual labourers were employed by the Dispatching Section of the Workshop.

The maintenance of the heavy earth moving equipment and other minor machinery, including the land rovers and drilling rigs, was carried out at a cost of £47 306 and includes replacement of fittings and other accessories.

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

(a)	Heavy earth moving equipment	74 509	hours
(b)	Motor vehicles	893.797	miles

The following machinery was condemned during the year by the appropriate condemnation board.

1 No. Lorry Reg. No. CH 476
3 Nos Air Compressors
1 No tractor buldozers

1 No tractor traxcavator
2 Nos diesel engines
3 Nos Portable pumps

1 No high pressure and piston pump
1 No crane gantry hoisting
2 Nos concrete vibratons
1 No sand grinder

Total 16

The activity of the workshop was extended to :

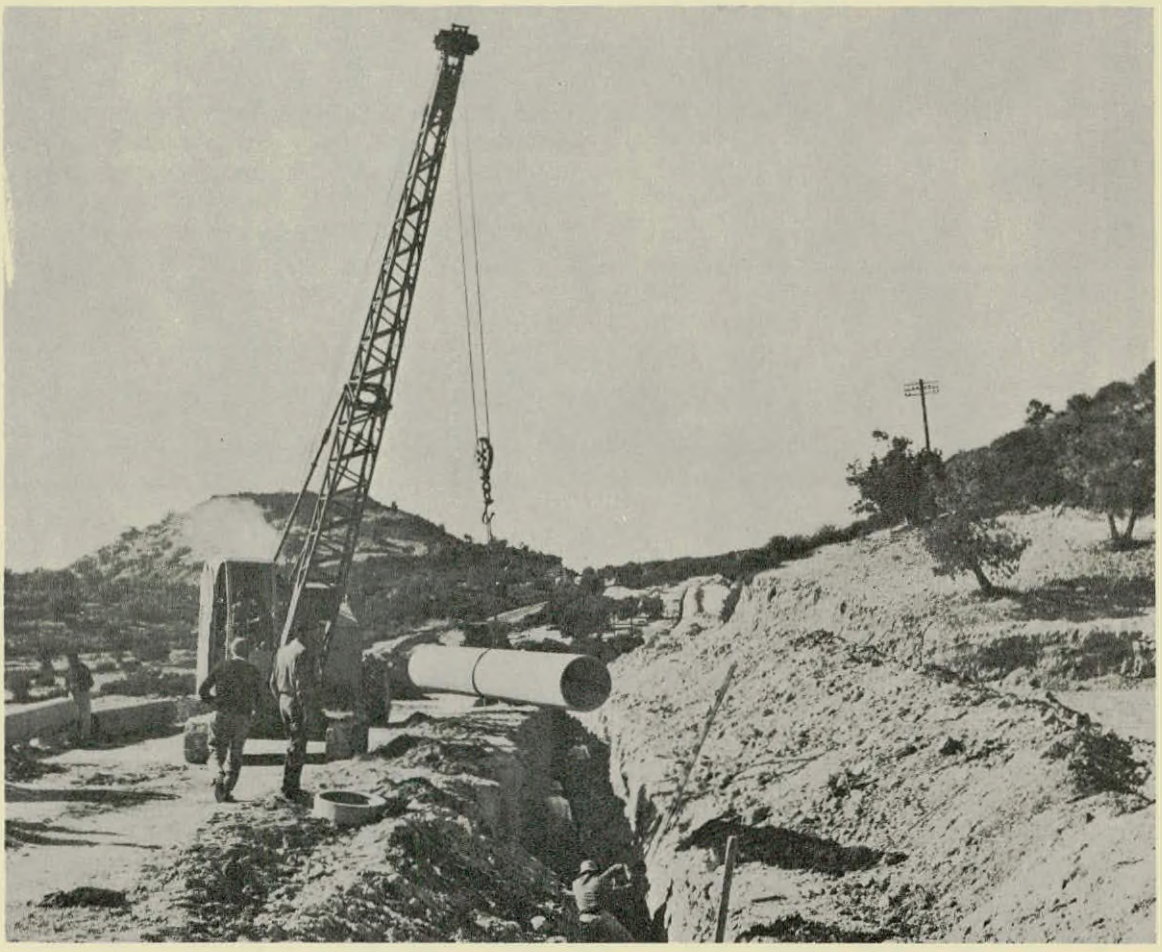
		Amount spent £
(a)	20 new pumping installations for domestic supplies	8 047
(b)	19 new pumping installations for irrigation	2 748
(c)	137 repairs to pumping installations for domestic supplies	2.658
(d)	13 repairs to pumping installations for irrigation	173
(e)	Various castings and fittings	20.473
(f)	Various carpentry works	6 400
(g)	Various masonry works	900
(h)	Dispatching of materials and stores	4 512
(j)	Improvements to the Workshop buildings	5.035
	Total	£ 50 946

The total mechanical equipment as on 31.1.69 is shown below :

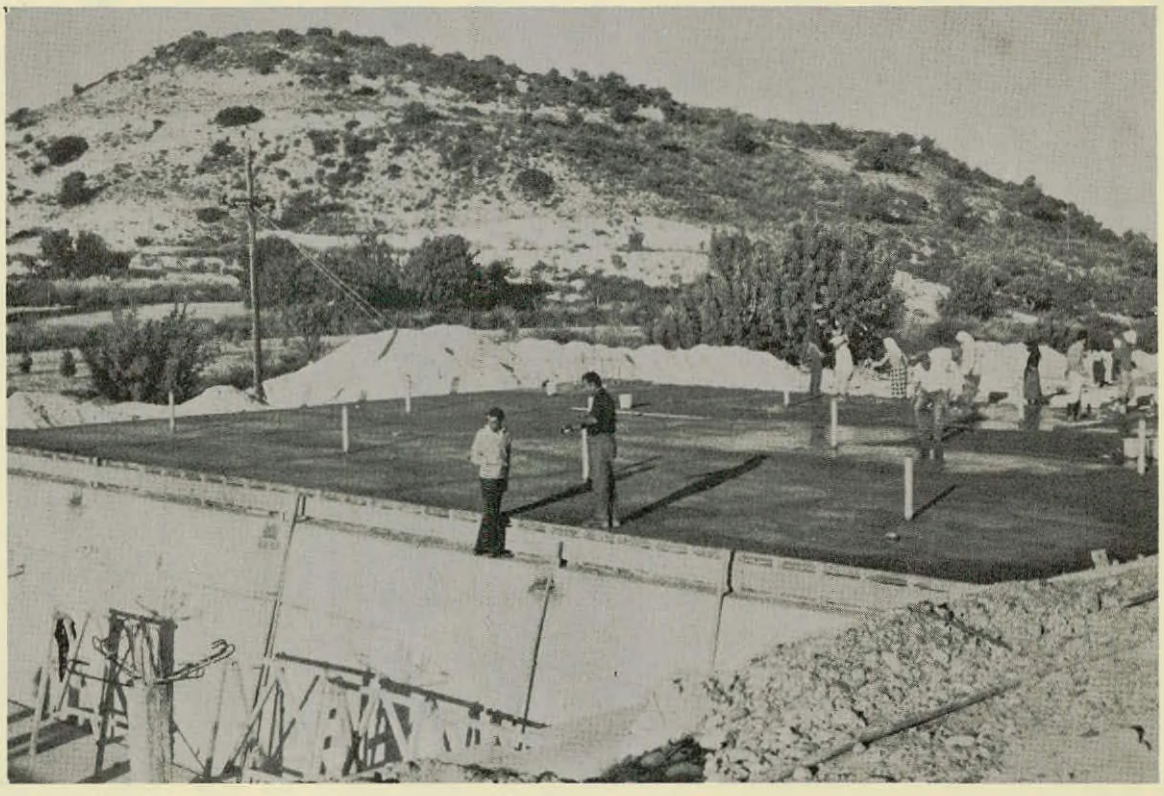
Mechanical Equipment	No
Ruston Bucyrus Drilling Rigs 22 W	10
Ruston Bucyrus Drilling Rigs 60 RL	2
Caterpillar D 8	3
Caterpillar Traxcavators 955	2
Allis Chalmers Traxcavator	1
Ruston Bucyrus Excavator RB 10	1
Ruston Bucyrus Excavator RRB 19	1
Excavator Smith 3/4 cu yd	2
Mobile Plant	
Small Core Drill	1
Core Drill 200 ft. Depth	2
Grouting Drill Pneumatic 150 ft	1
Wagon Drill	1
Overburden	3
Concrete grouting machine	2
Compressors	12
Diesel Alternator	8
Electrosubmersible test pump	6
Turbine deep-well test pumping units	2
Pleuger deep-well test pumping units	2
Centrifugal pumping Units	4
Portable Works Pumps	30
Sheepfoot Rollers	16
Vibrating soil Compactors	3
Vibrating Rollers	3
Vibrators	27
Concrete Mixers	41
Cranes	1
Hoists	3
Lorry mounted portable 3 ton borehole pump cranes	3
Thornycroft Tractive unit low loader	1
Dumpers	2
5 ton Diesel Lorry (Austin)	1
Bedford R.L. Lorry	2
Land Rovers	21
Austing Gibsy	1
Toyota Land Cruiser	6
Toyota Station Wagon	8
Cortina Station Wagon	1
Pumps for Test Pipes	1
Rubber tyred Compaction Rollers	2
Sludge Pump Pneumatic	6
Cutting Machine for Pipes	6
Air Concrete Vibrators	11
Workshop Plant	
Drilling Machine	4
Planning Timber Machine	1
Bandsaw Timber	1
Bar Bender	1
Bar Cutter	2

Mechanical Equipment

	No
Electric Welders	7
Forges	1
Compressor Air (Tecalemit)	2
Grinding Machine	3
Hack - saw Electrical	2
Wood-cutting Machine	2
Plate Bending Machine	1
Spark Plug testing Machine	1
Battery Charging Unit	1
Hydraulic Press 100 ton capacity	1
Band saw Grinding Machine	1
Pipe Slotting Machine	1
Hydraulic Pipe Bending Machine	1
Tractor Track Service Tool	1
Soltering Iron Heater	2
Cast iron, Aluminium of Bronze Casting Forge	1
Tube Vulcanizing Machine	1
Tyre Extracting Equipment	1
Paint Spraying Equipment	1
Letter Printing Machine	1



Famagusta Water Supply
Laying of pipeline from Khirokitia to Phrenaros Reservoir.



Casting of Roof Slab on 450,000 gallons capacity underground
Reservoir at Khirokitia for Famagusta Water Supply.

5.12 Famagusta Water Supply Project Special Construction Report

By

C. Andreou
Resident Engineer

5.12.1 Introduction

The Famagusta Water Supply Project, consists of :

1. One main conveyor pipeline 208 367 feet long, which starts at Khirokitia station and terminates at Phrenaros village.
2. One R.C. Reservoir at Khirokitia having a capacity of 450000 gallons.
3. One R.C. Reservoir at Phrenaros village having a capacity of 1000000 gallons.
4. One break pressure tank (a float valve chamber of 14 x 10 x 11 feet, and a circular tank having a capacity of 100000 gallons).
5. The pumping installations with the following boreholes:
   (a) Two boreholes at Khirokitia.
   (b) One borehole at the junction of the Nicosia-Limassol road and the road leading to Psematismenos village.
   (c) Three boreholes near Vasilikos river.

For the main conveyor pipeline, Asbestos Cement Pipes were used. Steel pipes were used for the pipelines leading from the boreholes to the Khirokitia reservoir.

5.12.1.1 Main Conveyor Pipeline

Excavation-Pipelaying-Testing

(a) Excavation

The whole length of 208367ft(63551 m.) was divided into seven sections. In each section there was one technical assistant who was in charge and was assisted by an assistant chief foreman and by a daily paid technical assistant.

The excavation started late in 1968 at the chainage 103 378 feet, and was completed on the 7th November 1969.

In section one between the chainages 3500 feet and 5000 feet, we had to remove part of a hill along the road which amounted to 40000 cubic meters of earth. This was a laborious task.

The width of the excavated trench was 3'-6" and the average depth was about six to seven feet.

A length of 85000 feet (over 40% of the total length of the trench) was excavated by means of air compressors and explosives as the ground was very hard. The explosives used had a total weight of approximately 21 tons.

For the excavation the following equipment was used

Nine	(9)	Dragshovels
Twelve	(12)	Diggers
Thirteen	(13)	Aircompressors

The maximum number of Foremen used for the excavation was twelve (12). The excavation was delayed for nearly two months due to adverse weather conditions, (January-February).

5.12.1.2 Pipelaying and Delivery of Pipes

The first pipes arrived in September 1968 and were delivered on site.

On arrival, the pipes were inspected thoroughly in the Famagusta harbour. The sound pipes were transported immediately to the site, whilst the damaged ones were checked by the Insurance Company Surveyors before being transported.

The bottom of the trench was trimmed and levelled properly according to the designed levels. On the bottom of the trench we placed a layer of 4" of sand on top of which the pipes were laid.

The pipes used were of Italian (Eternit) and Yugoslavian (Dalmacija Cement) origin.

Pipes of the following diameter and classes were used .

CLASS	DIA. MM	LENGTH FT.	ORIGIN
B 12 kg/cm^2	500	18100	Eternit Italy
C 18 kg/cm^2	500	35202	" "
D 24 kg/cm^2	500	3900	" "
C 18 kg/cm^2	600	12000	" "
D 24 kg/cm^2	600	28500	" "
B 12 kg/cm^2	650	46665	" "
C 18 kg/cm^2	650	64000	Dalmacija Cement Jugoslavia

Total = 208367

The pipe laying started on the 21st November 1968.

Due to the late delivery of pipes during 1968 and to the adverse weather conditions no pipes were laid during December 1968 and January 1969.

The pipelaying was completed on the 22nd November 1969. This was delayed by over one month in section one due to the excavation mentioned in previous page.

The following length of pipes were delivered by the Suppliers at Famagusta harbour.

CLASS	DIAM. MM		LENGTH (ft)	ORIGIN
12 kg/cm^{2}B	500	5810	19024	Eternit Italy
18 kg/cm^{2}C	500	11210	36736	" "
24 kg/cm^{2}D	500	1300	4264	" "
18 kg/cm^{2}C	600	3905	12808	" "
24 kg/cm^{2}D	600	9005	29536	" "
12 kg/cm^{2}B	650	15000	49200	" "
18 kg/cm^{2}C	650	20181	66194	Dalmacija Cement Jugoslavia
	Total	66402	217798	

Steel pipes were used at Road and River crossings.

Six foremen were used for pipelaying. The equipment used for the pipelaying was the following :

(3) Three Lorry cranes
(3) Three Cranes on chains

The cranes were also used for the unloading of the pipes

5.12.1.3 Testing

The pipeline was usually tested in sections of between 1200 feet and 3000 feet long; in some instances we tested sections over 3000 feet long.

Before any pressure was applied, all bends, tees and valves were anchored properly, and the pipeline was backfilled with the joints left exposed for checking purposes.

The testing pressure applied was 1.5 times the required pressure. For pipes class "B" we applied 128 psi (9,0 kg/cm^2) and for class "C" 190 psi (13,5 kg/cm^2).

After the completion of every test, the joints were backfilled and a test was carried out for two hours for checking purposes.

The table below shows the number of sections tested and the tests performed.

CLASS	DIA	No of sections	No. of sucessfull Tests	No of Non successfull Tests	Total Number of Tests
B	500	9	9	7	16
C	500	14	14	10	24
D	500	1	1	3	4
C	600	5	5	3	8
D	600	13	13	24	37
B	650	17	17	3	20
C	650	23	23	10	33
T o t a l		82	82	60	142

The testing of pipes was completed on the 3rd December 1969. A maximum number of nine Foremen were used for testing the pipeline.

5.12.1.4 Construction of Valve Chambers

The number of concrete valve chambers which were to be constructed originally was 140, but due to the changing of the design this number was increased to 193.

The construction of the Valve chambers commenced in October 1969 and it is still going on. Hundred and fifty two valve chambers were constructed during 1969.

Except for the main chambers of the washouts some smaller chambers are constructed at the end of the outflow pipe of each washout which are serving as stilling basins.

The construction of all the chambers will be completed by the end of January 1970. Twenty of the valve chambers were constructed with cement blocks.

5.12.1.5 Pumping Schemes

Pipeline

The works for the excavation and pipelaying started in June 1969. The trench to be excavated has a total length of 31 610 feet long and the total length of the pipeline will be 40 660 feet.

The difference between the trench to be excavated and the pipeline is due to the fact part of the pipeline from Psematismenos and Khirokitia boreholes will be laid in the same trench as the pipeline from Vasilikos river boreholes.

Up to the end of October 1969 we excavated 25 210 feet of trench.

The work could not be completed during 1969 because new boreholes will be drilled in a new area in Vasilikos river.

Up to the end of October 1969 we laid and tested the following length of pipeline.

DIA.	CLASS	LENGTH LAID (ft)	LENGTH TESTED (ft)	REMARKS
8"	Welded	5 287	5 287	Completed
10"	"	4 226	4 226	Completed
12"	"	21 146	8 956	Laying Completed Not yet
12"	Seamles	3 386	—	Completed

In the mean time we started the welding of the copper strip for the cathodic protection and the work of bitumen protection of the joints. This work is still going on.

A total number of twenty three valve chambers must be constructed. Up to the end of the year eight were constructed.

The valve chambers are constructed with cement blocks.

The pumhouses of Khirokitia and Psematismenos boreholes were constructed during the period under review.

The departmental workshop completedduring December 1969 the Electrical installations and istalled the submersible pump in one of the two boreholes at Khirokitia river. On the 9th December 1969 the Electricity Authority of Cyprus inspected and connected the above pump.

On the same date the pump was put in Operation and started to extract water.

5.12.2 Reservoirs

Khirokitia Reservoir

The Khirokitia Reservoir is an underground reservoir and is located on the 30th milestone of the main Nicosia-Limassol road, and has a capacity of 450000 gallons (2050 m^3).

The walls of the reservoir were constructed of mass concrete. The reservoir is separated in two by means of a partition wall. The excavation for the reservoir commenced on the 19th May 1969 and it was completed on the 19th July 1969.

Five thousand six hundred and seventy four (5674 m^3) cubic meters of excavation was carried out.

For the valve chambers and the drainage pipes we excavated 514 m^3. The casting of the foundations started on the 24th July 1969 and of the walls on the 19th August 1969:the walls were completed on the 25th October 1969. At the same time the columns and the bottom slabs were cast.

For the construction of the bottom slab the following materials were used.

A 6" thick layer of sea aggregates
A 4" thick layer of lean concrete and an 8" thick slab of reinforced concrete.

For the drainage of the bottom of the reservoir 4" ∅ perforated asbestos cement pipes were placed as sub drains and 6" ∅ A.C. pipes non perforated as main drains.

The roof slab of the first compartment was cast on the 18th November 1969 we used 90m^3 of concrete. The shuttering and the reinforcement for the roof slab of the second compartment were nearly completed during December 1969.

During December 1969 we commenced and completed the excavation of the chlorination house. We carried out 414 m^3 of excavation.

5.12.2.1 Phrenaros reservoir

This reservoir is located south of Phrenaros village and has a capacity of 1000000 gallons (4540 m^3). This reservoir is also separated in two compartments. The excavation started on the 16th June 1969 and up to the end of the year we carried out 8 500 m^3 of excavation.

After the excavation of top layer (four feet thick) which was of very hard rock the bottom layer was very soft rock and it has been decided to go deeper in order to find suitable ground for the foundations.

The casting of the foundations started on the 23rd October 1969. For the construction of the foundations the mixture used was 1:4:8.

Up to the end of December 1969, 1920 m^3 of concrete was used for the foundations. The north side of the foundations has not yet been completed.

The first casting of the walls took place on the 29th December, 1969. On the above date 42 m^3 of concrete was cast.

5.12.2.2 Break Pressure Tank

The excavation of the Break Pressure Tank, was started and completed in April 1969. Due to alterations to design, the construction of the Break Pressure Tank was delayed by three months.

The Break Pressure Tank consists of one rectangular chamber with a floating valve and an overflow pipe and a circular tank which has a capacity of 100000 gallons.

The casting of the chamber was completed in one phase on the 23rd July 1969. The casting of the roof slab is not yet completed due to the fact that the float valve has not been delivered.

The casting of the foundations of the circular tank started in August, 1969. The first lift of the wall was cast on the 29th August, 1969, and the second on the 8th September, 1969. The roof slab of the circular tank was cast on the 2nd and 3rd October 1969.

General

The work on the main conveyor pipeline was completed during 1969 according to the program.

On the 30th December, 1969, His Excellency the Minister of Agriculture and Natural Resources inaugurated the above pipeline.

At this point I would like to express my sincere thanks to all Technical Assistants, Chief Foremen, Asst Chief Foreman and the Foremen who with hard work contributed to the early completion of of the project.

VI. MAINTENANCE AND OPERATION DIVISION

By

K. C. Hassabis
Head of Division

6.1 The Division is composed of two branches :

i. Maintenance and Operation of Major Irrigation Projects
and
ii. Maintenance and Operation of Domestic (Town) Water Supplies

6.1.1 Maintenance of Major Irrigation Projects

Maintenance of these works may be divided into the following functions :

(a) The regular inspection of the works

This is done by the Engineers of the Department each of whom has been assigned with the inspection of a number of dams. They have to inspect regularly each dam project and report on any prublem that needs special attention or repairs.

(b) The keeping of regular observations and records of the behaviour and condition of the various structures

These observations are taken by a special team of the topography section and by officers assigned to each of the most important dams. The results are plotted and reviewed as necessary.

(c) The actual work of maintenance

The unusually high rainfall which occured in the 1968-1969 rainy season and the resulting high run-off and floods have affected in some degree a number of dam projects, created a number of some serious maintenance problems, and in a few cases caused considerable damage.

The most important maintenance and other reconstruction works executed in 1969 are described in some detail below, while at the end of the section a summary table of the maintenance work is given.

The various projects are divided into :

i. Government Projects

These are built, maintained and operated entirely by Government.

ii. Contributory Projects

These projects belong to the Irrigation Divisions, who contribute a proportion of the cost of construction of the project (varying from $\frac{1}{2}$, $\frac{1}{3}$ to $\frac{1}{4}$ of the cost) the remainder of the cost being borne by Government. Maintenance of such projects is done under the supervision and advice of the Department. In cases of major maintenance work, the Department undertakes the work and Government contributes part of the cost.

i. Government Projects : Maintenance

Argaka-Magounda Expenditure : £ 85.-

No major problems faced. Routine maintenance work carried out.

The tunnel gate is not in working condition. For the repair of the gate it is necessary to empty the dam. Demand for irrigation water late in the year did not allow the emptying of the dam for this work. This will be done in 1970.

Ayia Marina : Expenditure £ 153

Routine maintenance work only

Kiti dam : Expenditure £ 2100

A reinforced concrete retaining wall, 100 ft long by 10 ft. high, was built at the end of the spillway to protect private property from erosion caused by the spillway overflow. Cost of the wall was £ 1400. Kiti dam overflowed on the 14th January 1969, and there was considerable overflow for several days.

A 500 ft. long drain was constructed at the toe of the embankment on the right hand side of the tunnel outlet in order to facilitate draining of water seeping through the dam foundations from the reservoir.

Other work included painting of the bridge and all metal work, repairing of water meters and filling of existing wells within the reservoir.

Mavrokolymbos : Expenditure £ 227

The maintenance work done during the year involved painting and fencing of the guard house, painting of the metal work above W.L., treatment of the bridge timber, and commencement of temporary remedial works downstream of the spillway, which are to be completed early in February 1970.

On the night of 21st and on the 22nd March 1969 a large flood occurred, causing considerable overflow from the spillway.

The maximum height of overflow observed at 5 00 a.m of the 22nd March 1969 was 1.46 ft above spillway weir crest level. The relative rainfall records at Marvokolymbos dam were as follows :

18.3.69	-	0.62"
19.3.69	-	0.66"
20.3.69	-	0.98"
21.3.69	-	2.32"
22.3.69	-	0.60"

As the outlet of the lined spillway is situated about 30 ft. above the river bed level, considerable erosion has taken place between the end of the spillway and the river channel. In order to protect the spillway bucket, the eroded area was filled with rip-rap secured in concrete. However this is only a temporary measure until a proper study and more permanent works are designed. This work commenced late in 1969 and was completed early in 1970.

The remedial works for stabilising the slopes of the reservoir area, which have been executed in 1968 have proved to be quite satisfactory, and no appreciable movement which would reduce the capacity of the reservoir has been recorded, in spite of the heavy rainfall.

Some slides along the main conveyor canal have destroyed part of the canal. This has been temporarily repaired, but more permanent work is necessary

Polemidhia dam : Expenditure

(a)	Routine maintenance	£ 368
(b)	Flood damages repairs	£ 3944
		£ 4312

The maintenance work included painting of the guard house, bridge rails, treatment of timber, repairs of water meters, purchase of spare parts for water meters and other minor routine maintenace works.

Large floods occured towards the end of December 1968 and during January 1969, which damaged and washed away a number of pipes of the main conveyor pipeline. These were replaced and protective measures to secure them against damage from similar future occurrences were taken

The floods washed away the boulders placed at the end of the lined spillway, which stops short and at a higher level than the river bed. No remedial measures were taken in this respect, since the pools created by the erosion of the soft ground, will act as stilling pools for the absorption of energy in future.

Pomos : Expenditure £ 285

Mainly continue maintenance work was done during the year.

Syngrassi : Expenditure during 1969 £ 420

The dam overflowed following the heavy rainfall of the 1968-1969 winter season.

Transverse cracks appeared on the embankment on both sides of the spillway. These were probably due to movements of the retaining walls of the spillway. The depth of the cracks were about 12 ft on the right hand side and about 8 ft. on the left hand side. The fill was removed and replaced and reconsolidated. Other work included the improvement of the Lapathos recharge inlet system i.e. construction of concrete protective walls, lowering of suction sump, repairing of the pump house etc.

Work started in November 1969 and was completed at the end of January 1970. The total cost was about £ 956 = out which £ 420 were spent in 1969.

ii. Contributory schemes

Trimiklini Dam : Expenditure £ 2100

Government contribution £ 1564 (including £650 from flood damages vote).

Village contribution £ 536

The effects of the large floods which occurred in December 1968 and January 1969 were most severe in the case of Trimiklini dam.

This dam had been completely desilted in the first two weeks of December 1969, and the gate was secured in the open position to allow the winter floods which usually carry large amounts of silt to pass unhindered through the tunnel.

However, the floods which occurred later in December, brought large quantities of silt, debris etc., mainly from the wastes of Asbestos Mines. The debris blocked the open tunnel entrance, and silt accumulated to a depth of about 80 ft. In addition the floods washed away the conveyor pipeline joining the dam outlet to the Distribution System Canals

Combined efforts of the Department and the Royal Engineers succeeded in opening the tunnel entrance repeatedly; however, the entrance was blocked again very soon and new efforts were necessary to keep the tunnel entrance open, so that desilting of the reservoir would take place by the flowing water.

Meanwhile other arrangements including the installation of a pump and a temporary pipeline were made to ensure irrigation during the summer.

By the end of the year most of the accumulated silt has been removed from the reservoir.

The conveyor pipeline will be replaced in the early part of 1970, while it is expected that permament repairs of the gate will be done at the end of the summer of 1970, following end of the irrigation period.

6.2 Morphou-Serrakhis Dam and Recharge Works

The winter floods washed away part of the recharge basin below the dam and caused some minor damage to the rip-rap of the dam. The recharge works were repaired at a cost of £ 4900; the dam was raised by 4 ft. to allow a larger flood to pass safely through the spillway and the damaged rip-rap has been replaced. The cost for this work on the dam was £12900.

This work is not included in the list given below, because it was executed from other funds.

6.3. Maintenance of other contributory dam projects

The high river flows of the 1968 - 1969 Winter affected to a smaller degree several other projects. These have been repaired during the year.

The table given on next page summarizes expenditure incurred during the year 1969 on maintenance of dam projects.

MAINTENANCE OF DAM PROJECTS - SUMMARY TABLE OF EXPENDITURE

(i) Government Projects

No.	Project	Expenditure	Remarks
1	Argaka-Magounda dam	£ 85	Routine maintenance. Tunnel gate not in operational condition
2	Ayia Marina dam	£ 153	Routine maintenance
3	Kalopanayiotis dam	-	-
4	Kiti dam	£ 2100	Routine maintenance. Construction of retaining wall for erosion control construction of drains, cleaning of canals etc.
5	Mavrokolymbos	£ 227	Routine maintenance work. Commencement of temporary remedial spillway works. Temporary repairs of canals damaged by slides.
6	Polemidhia	£ 4312	Major repairs to pipeline damaged by floods, and routine maintenance. Of the amount spent £368 was from maintenance vote & £ 3944 from floods damages vote
7	Pomos	£ 285	Routine maintenance
8	Yermasoyia	-	-
9	Syngrassi	£ 420	Repair to embankment near spillway & to recharge intake works. Work continuing
	Sub-total (i)	£ 7582	i.e £ 3638 from maintenance vote and £ 3944 from flood damages vote

(ii) Contributory Projects

No.	Project	Expenditure			Remarks
		Govt.	Contrn	Total	
1	Agros	£ 380	£ 190	£ 570	Major cleaning of irrigation canals
2	Ayios Georghios Kyrenia	295	147	442	Repairs to two recharge dams
3	Kafizes-Lefka	30	-	30	Repairs to distribution main
4	Kalonkhorio Klirou	99	47	146	Repairs to main gate
5	Lefka-Marathasa	10	-	10	Repair of blocked outlet pipe
6	Liopetri	17	8	25	Routine maintenance
7	Lythrodonta lower dam	100	50	150	Installation of new gallery gate
8	Pera - Pedhi	65	65	130	Repairs to gate, outlet system, and trashrack
9	Petra Atsas lower dam	-	40	40	Construction of 8" perforated intake pipe.
10	Petra Atsas upper dam	-	40	40	Installation of new trashrack
11	Trimiklini dam	*1564	536	2100	Reservoir silted up during floods. Work on opening blocked gallery entrance and desilting. Work continuing. *£914 from maintenance. Vote £650 from floods damages Vote.
	Sub-total (ii)	*2560	£ 1123	£3683	*£1910 maintenance vote £ 650 floods vote
	Total (i) + (ii)	*10142	£ 1123	£12265	*£5548-maintenace vote £4594-flood damages vote

6.4 Management and Operation of Government Dam Projects

6 4 1 Each Government dam project is managed by a dam Management Committee appointed by the Council of Ministers. Each committee is composed of the District Officer, of the District in which the dam is situated, as Chairman, with representatives of the Department of Agriculture, of the Water Development Department and of the beneficiaries as members.

6 4.2 During the year 1969 there was a slight improvement in the utilization of water from the dams for irrigation as compared to the previous year.

The gross income from the sale of water (indicating the relative increase in the water utilization) increased by 38%, over that of 1968. However, this increase in utilization :

(a) is far below the maximum possible or even the satisfactory level of utilization of dam water and

(b) it is offset by the sharp increase in the maintenance costs necessary for the repairs of the flood damages to the distribution of Polemidhia Dam (£3944).

6 4 3 Comparative figures of total Income and Expenditure are given below for the years 1968 and 1969.

Year		1968	1969
1	Total Income	£ 15 363	£ 21 241
2	Operation Expenses	£ 3 507	£ 5 911
3	Maintenance Expenses	£ 858	£ 7 582
4	Total Expenses (2)+(3)	£ 4 365	£ 13 493
5	Net Income (1)-(4)	£ 10 998	£ 7 748

6 4.4 There are many reasons for the very low utilization of water the most important of which are indicated in the remarks given below regarding each particular project .

i. Argaka-Magounda dam

No distribution system has yet been constructed, because the question of water rights has not yet been settled. Only limited use of the water from the dam is being made through the existing earthern irrigation canals, for the irrigation of mainly early cucumbers, cow-peas etc. Water was drawn from the dam from 20.6.69 to 31.10.69.

Gross Income		£ 577
Operation Expenses	£ 250	
Maintenance "	£ 85	
Total Expenses		£ 335
Net Income		£ 242

ii. Ayia Marina

Here the distribution system has been completed, and there is a very satisfactory utilization of the water for Irrigation of both early and ordinary vegetables.

At the beginning of the Irrigation Season (5.2.69 - 15.12.69) the Dam was full at 300 000 cu.m.

Amount of water sold :	279.700 cu.m.	
Gross Income		£ 2 351.000
Operation Expenses	£ 780.000	
Maintenance "	153.000	
Total Expenses		933.000
Net Income		£ 1 418.000

iii. Kalopanayiotis dam

Here the distribution scheme as originally designed has been completed. However due to the fact that improved methods of irrigation (hose-basin) are used in this scheme, it is possible to irrigate additional land to that already covered by the existing system, by extending the Distribution System. This is now under study by the appropriate Departments. Up to the end of 1969, 330 donums were land levelled. In 300 donums improved systems of irrigation were installed. Out of these 250 donums have been planted with deciduous trees, compared with 110 donums in 1968.

During the year 250 donums of deciduous trees were irrigated. As the trees are young their water requirements are still low.

Amount of water sold in 1969 :		27 000 cu.m.
Gross Income		£ 352.185 mils
Operation Expenses	£ 160	
Total "		£ 160.000 mils
Net Income		£ 192.185

iv. Kiti dam

Only part of the distribution system has been constructed, due to non availability of the funds required, and thus the area that can be irrigated from the dam is restricted.

There are considerable seepage losses, because the dam foundations lie on pervious strata. Although the water lost in this manner, recharges the downstream aquifer, and indirectly benefits the area it would still be possible to increase appreciably the direct utilization for surface irrigation if the stored water is used over a shorter period (i.e. until the end of June) than now when the irrigation period extends until November.

Further the uncertainty of whether the dam will collect any water, inhibits the beneficiaries from cultivating extensive areas which would depend solely on the supply of water from the dam.

During the year 1969 (irrigation period 7.3.69 - 31.12.69) the following crops were irrigated :

Citrus :	125 donums	(including 45 donums supplementary irrigation)
Other trees :	8 donums	
Artichokes :	175 donums	(including 10 donums supplementary irrigation)
Potatoes :	106 donums	
Melons :	254 donums	(including 12 donums supplementary irrigation)
Other vegetables :	112 donums	
Total	780 donums	

The amount of water sold for irrigation was 242 519 cu. meters

At the beginning of the irrigation season the dam was full at 1 610 000 cu. meters

The following losses were either measured or estimated :

Evaporation losses	:	331 000 cu.m.	(estimated)
Mescellaneous seepage Losses at the dam	:	1.121 000 cu.m.	(estimated)
Flow through meneou Chains of wells	:	1.084 000 cu.m.	(estimated)
Flow through Bekir Pasha chain of wells	:	1.018 000 cu.m.	(estimated)
Losses in irrigation canals	:	48 000 cu.m.	(estimated)

The water flowing in the Meneou chain of wells is fully utilized for irrigation, while the water lost through the seepages recharges the aquifer and is pumped for irrigation.

The flow in the Bekir Pasha Chain of Wells, is partly due to the natural recharge of the aquifer through which the wells are situated, and only partly due to losses from the reservoir.

The gross income from the sale of water during the year was	£ 2.425.200 mils
Operation Expenses were	£ 970.000 mils
Maintenance Expenses	£ 2.100.000 mils
Total Expenses	£ 3 070.000 mils

Thus over this year the expenditure exceeded the income by £ 645.

The maintenance expenditure was particulary high during 1969 because it was necessary to build a concrete retaining wall at the end of the spillway to prevent erosion of valuable property.

v. Mavrokolymbos dam

Here, it is planned to implement land consolidation. Until this is done, it will not be possible to construct the tertiary stage of the distribution system and this necessarily means that the utilization of water from the dam will be very low for a number of years to come.

By the end of 1969 the following parts of the distribution system were completed :

(a) Main conveyor (canals up to Kissonerga and pipeline up to khlorakas)
(b) Secondary main branches (pipes) in Kissonerga and Potima.

The dam was full at the beginning of the irrigation season at 2 180 000 cu.m.

About 140 donums of vegetables were irrigated in Kissonerga, in addition to the area irrigated at Potima where water was given from the dam as water rights.

Gross Income		£ 665.000
Expenses Operation	£ 203.000	
Maintenance	£ 227.000	
Total		£ 430.000
Net Income		£ 235.000

vi. Polemidhia dam

Here the distribution system has been completed in 1968. The floods which occurred early in January 1969 damaged part of the main conveyor. This was repaired at a cost of £ 3944.

Operation of the scheme has proved that since the water from the dam is used mainly for supplementary irrigation, the area served by the distribution system must be extended, in order to utilize all the water stored at the dam.

Provision for this extension is made in the study already prepared for the distribution system of Yermasoyia dam which will be combined with the Polemidhia distribution system.

During 1969 work has commenced on carrying out additional grouting works. It is expected that when these works are completed the considerable seepage losses observed up to now would be considerably reduced.

One of the reasons of the relatively low utilization of water, is the fact that the rates for the water at 15 mils/m^3 for trees and 7 mils/m^3 for vegetables are regarded as unreasonably high by the beneficiaries. It is anticipated that if the rate for trees is reduced to 10 mils/m^3 the utilization of water would increase considerably.

It must be noted however that the actual cost of water is 33 mils/m^3

Until 6.4.69 the dam was full at 3400 m^3.

The irrigation period was from 12.3.69 until 8.12.69.

The area irrigated from the dam was about 2 000 dons. of citrus trees, vines and some vegetables.

The amount of water consumed was			1 270 442 cu.m.
Gross Income			£ 12.687
Expenses :	Operation	£ 2 555	
	Maintenance	£ 368	
	Flood damages & repairs	£ 3 944	
	Total		£ 6 867
Net Income			£ 5 820

At the end of the year there were 480 000 cu.m. in the reservoir.

Losses from the reservoir were :

Seepage (approx.) from 5.4.69 - 31.12.69	:	3 692 000 m^3
Evaporation (estimated)		266 000 m^3

vii. Pomos dam

Here only part of the subsidiary distribution system has been constructed, and thus only part of the total area commanded can be irrigated at present. It is hoped that in 1970 funds will be made available for the completion of the subsidiary network.

From 1967 up to the end of 1969, 1990 donums have been levelled by the Department of Agriculture. It is expected that the land to be finally levelled will be 2 300 donums at a cost of £50 000.

At the beginning of the Irrigation period (17.2.69 - 15.12.69) the dam was full at 860 000 cu m,

During the year about 960 donums, mainly vegetables were irrigated.

The amount of water utilized was			303.700 cu.m.
Gross Income			£2.183.500 mils
Expenses :	Operationn	£ 620.000	
	Maintenance	£ 285.000	
	Total		905.000
Net Income			£1 278.500 mils

viii. Yermasoyia Dam

There was no utilization of water from this dam, due to the fact that the distribution system had not been constructed. Alternative utilization and design studies have been submitted by the Department. The dam was full and overflowing at the end of 1968. Water was released from the dam during the year as compensation for water rights and for recharging the downstream aquifer.

ix. Syngrassi dam

This dam was built primarily for the recharge of the Lapathos aquifer on which the water supply of several villages depends. The dam was completely full during January, 1969, to 1 150 000 m^3.

Water for recharge is pumped from the reservoir through a pipeline into abandoned wells and boreholes.

Recharge pumping commenced on the 7th January and stopped on the 11th April 1969 when the reservoir was empty.

The amount of water recharged was 114 400 cu.m. i.e. about one tenth of the water collected in the dam. The remainder was lost mainly by seepage within the reservoir.

It is estimated that out of the total average rise in the level of the Water Table of 4.25 ft. (1.29 m.) observed, 2.9 ft.(0.88 m) may be attributed to the effect of the artificial recharge, while the remainder 1.3 ft. (0.4 m) to the effects of natural replenishment.

The beneficial effects of the recharge operations during the year under review indicate the desirability of extending the recharge over a larger area of the aquifer.

As there is overextraction from the aquifer while recharge is only possible at infrequent intervals, and in view of the large permeability of the reservoir bed, it is advisable to increase the pumping capacity in order to recharge a larger quantity of water in the shorter possible period of time

The expenses for the year 1969 were :

Operation	£ 372.700
Maintenance	£ 420.318
Total	£ 793.018

Summary Data on Operation of Government Dam Projects

No.	Project	Capacity $m^3 x10^6$	Stored water $m^3 x10^6$	Water used $m^3 x10^6$	Area irrigated donums	Gross Income £	Expenditure			Net Income £	Remarks
							Operation £	Maintenance £	Total £		
1	2	3	4	5	6	7	8	9	10	11	12
1	Argaka-Magounda	1.150	1.150	0.0577	300	577	250	85	335	242	Distribution system not yet constructed
2	Ayia Marina	0.300	0.300	0.2797	820	2351	780	153	933	1418	-
3	Kalopanayiotis	0.390	0.390	0.0270	250	352	160	-	160	192	-
4	Kiti	1.610	1.610	0.2430	780	2425	970	2100	3070	- 645	Distribution system incomplete
5	Mavrokolymbos	2.180	2.180	Not available	140	665	203	227	430	235	Distribution system incomplete
6	Polemidhia	3.400	3.400	1.2704	2000	12687	2555	4312	6867	5320	-
7	Pomos	0.860	0.860	0.3037	960	2184	620	285	905	1279	-
8	Yermasoyia	13.600	13.600	NIL	NIL	NIL	NIL	NIL	NIL	NIL	No Distribution system First impoundment of water 1968-69 season
9	Syngrassi	1.115	1.115	0.114	NIL	NIL	373	420	793	793	Water used for recharge
	TOTALS				5250	21241	5911	7582	13493	7748	

6.5 Domestic Water Supply Branch Management of Domestic Water Supplies under the Provisions of Law cap. 350

6.5.1 Substantially the activities of this Branch of the Division of Maintenance and Operation during the year under review, were the same as those in 1968. Conspicuous place, however, is taken by the following facts closely connected with the task of the Branch.

i. The establishment of a National Committee for corporate membership to International Water Supply Association.

ii. The completion of the laying of the main Conveyor of the New Famagusta Water Supply Scheme.

6.5.1.2 At the meeting held in the Office of the Director on 18th December 1969 with the participation of all water Authorities in Cyprus, it was decided that a National Committee is established and an Application is Submitted for 'Corporate Membership to International Water Supply Association. The committee is made up of :

Water Development Dept. (Chairman)
Ministry of Interior
Water Board of Nicosia
Water Board of Limassol
Water Board of Famagusta
Water Board of Larnaca.

Mr. George Haralambous, Supt. of Works of the Water Development Department was elected as Secretary to the Committee.

6.5.1.3 By the end of the year, the laying of the longest and largest water Conveyor in Cyprus was completed This applies to the main Conveyor of the New Famagusta Water Supply Scheme - 24" and 21" Ø in diameter. On the occasion, an inauguration Ceremony took place at Phrenaros area on 30.12.69 during which His Excelency the Minister of Agriculture and Natural Resources and the Director of Water Development. Department delivered their appropriate Speeches :

6.5.1.4 This Branch Shedule covered:

(a) Administration of the Greater Nicosia Scheme

(b) Water Supply to Nicosia Suburbs

(c) Water Supply to Government residences and Institutions

(d) Technical Advice to Water Boards under the Capacity of an official member.

(e) Technical Advice to Appropriate Authority regarding parcellation of land into building sites.

6.5.1.5 Administration of Greater Nicosia Scheme

With a view to facilitate amalgamation of the Greater Nicosia Scheme with that of the Nicosia Water Board, this Department Submitted an alternative proposal, like the one adopted for Famagusta providing the sale of water to the Nicosia Water Board in "bulk" at cost price. In this way, Government will keep ownership of the sources and main Conveyors whilst Water Board will undertake the distribution of water within the "area of supply concerned".

6.5.1.6 Water Supply to Nicosia Suburbs

By this heading the "area of supply" of the Greater Nicosia Scheme is defined. It applies to nine Communities around Nicosia Town Municipal Area with a population of appr. 40 000 persons and the New Industrial Area, near Mia Milia village. The highest daily consumption was 9 900 c.m. Considering, however, that the water supply, of the whole Nicosia town and suburbs is commonly faced by the three existing authorities more details with regard to availability and consumption of water, are given under heading "Nicosia Town and Suburbs Water Supply".

During 1969, the distribution system of Greater Nicosia Scheme was extended by 19 450 ft. of 4" Ø asbestos cement pipes, mainly laid on new parcellations, and 392 new house connections were made. By 31.12.1969 the total number of the consumers within the "Area of Supply" of the Greater Nicosia Scheme reached the figure of 8 839.

ii. A statement showing expenditure and revenue of the Greater Nicosia Scheme for the year 1969 is given on Appendix

6.5.1.7 Nicosia Town and Suburbs Water Supply

This heading is inserted in this report for the purpose of giving an overall picture of the whole Nicosia Town Water Supply, which, as aforementioned, is faced commonly, by the three Authorities concerned. Due to the rich rainfall in winter 1968 and thanks to Sykhari Adit where a storage of over 60 000 000 gallons could be accommodated, the demand was met satisfactorily. Nevertheless, it should be stated that during Summer, all sources were put into commission at maximum.

i. The total amount of water conveyed from the various sources reached the figure of 7 683 681 c.m. and was distributed as follows :

Greater Nicosia Scheme "Area of supply"	2 419 418 c.m.
Nicosia Water Board "Area of supply"	4 082 295 c.m.
Nicosia Water Commission (Town within walls)	674 844 c.m.

ii. The highest daily consumption was 26 979 c.m. or 5 935 380 gallons which equals to appr. 50 gallons per capita against of a population of 120 000 residing in the three areas as above.

iii. The proposal of extending the boundaries of the Nicosia Water Board in order to include also the old city, so that the execution of water supply and sewerage works may be co-ordinated, has brought the required supplementation of water supply to the level of urgent necessity; within the limits of time for the implementation of these works a quantity of 5 000 c.m. daily will be required in excess of the normal increase in demand. In this direction, although efforts on a short-term basis are in progress yet, in the writer's view, a new scheme on a long-term basis should be planned immediately.

6.5.1.8 Water Supply to Govt. Residences and Institutions

In addition to the water supplied for domestic use, Government houses and Institutions are supplied with water for irrigation by a separate system. The sources of this service consist of a number of wells and boreholes situated within the inhabitated area of Nicosia. The expenditure for such supply is wholly borne by Government. During 1969, without any major improvements to the system an unlimited regular supply could be maintained.

6.5.1.9 Technical advice to Water Boards

Under the capacity as an official member to the four existing Water Boards, this Branch represented the Department and participated ganerally in all activities of these Boards, particularly in technical matters.

i Nicosia Water Board :

Its water supply position has been prescribed under heading "Nicosia Town and Suburbs Water Supply".

ii. Limassol Water Board :

A regular supply could be maintained through existing sources which could safely yield 3,5 m.g d. against a maximum daily consumption of 14 702 c.m. for the purpose of better utilization of the existing pipeline, convoying water from the springs the flow of which diminishes during summer, two boreholes were drilled on Kourris river with the object of connecting these to the said pipeline. By this scheme an additional quantity of 320,000 gallons daily is made available.

iii. Famagusta Water Board :

Restrictions were again imposed during summer due to shortage of water. In an effort to avoid this unpleasant happening in 1970 the Water Development Department could succeed, in rather short time the laying of the main conveyor of the new Famagusta Scheme and water at the rate of over 1.0 m.g. daily could be provided at Phrenaros by the end of the year. Regarding the construction of this scheme, it is expected that a full description would be given by the Division Concerned.

iv. Larnaca Water Board :

Existing sources could suffice maximum demand for this town without the operation of the Alethrico borehole. In view of this even the connection of the Anglissidhes borehole was not materialized. The maximum daily demand reached the figure of 5.175 c.m.

Facts about Water Boards of Nicosia, Limassol, Famagusta and Larnaca are given herebelow under respective headings.

Revenue and Expenditure Account of Greater Nicosia Scheme for the year 1969

Expenditure		Revenue	
(a) Pumping Charges	£16 352.111	(a) Sale of water	£145 194.430
(b) Maintenance charges	3 757.150	(b) Connection fees	1 230.000
(c) Collection fees	16 820.232	(c) Usage of pipelines	5 268.103
		(d) Other revenue	11 558.273
Total	£36 929.493	Total	£163 250 806
(d) Administration	4 000.000		
(e) Amortisation	37 590.000		
Grand total	£78 519.493	Profit for the year	84 731.313

Notes : An approximate amount of £20 000 being value of water supplied to Turks could not be collected due to abnormal situation. This brings the total amount owned by Turks since 1964 to approx. £140 000.

VII. DIVISION OF SMALL PROJECTS PLANNING

By

P. Pantelides (Supt. of Works)
Head of Division

7.1 Introduction

This Division is dealing with the design and planning of all contributory irrigation and water supply projects which are normally financed by Government through the Development Programme.

The preparation of these schemes call for a wide and varied knowledge of local conditions and practical experience in the solution of technical problems, which are encountered locally and are bound up with traditional methods of the island's water supply and irrigation development.

7.1.1 One Senior Inspector of Works is in charge of the preparation of irrigation schemes, including recharge, river-training and antiflood works, and one Senior Inspector of the rural water supply projects. Four technical teams each consisting of one inspector and one technical assistant are operating from Head Quarters, for field surveys and the collection of data, in four combined districts of the island.

7.1.2 Requests for the preparation of schemes are sent through the District Officers and schemes are in return forwarded through District Officers for presentation to the respective Irrigation Divisions or Communal Authorities. Budgetary provisions are planned at sub-ministerial level by the Planning Bureau of the Ministry of Finance. Budget allocations are not always sufficient to cover all schemes which are ready for implementation at the beginning of the fiscal year and a selective method of priorities is being followed which, nevertheless, leaves an outstanding demand for more work.

Selection criteria for irrigation schemes are mainly technoeconomic whereby priority is given to works with a higher factor of benefits.

For Water Supply Schemes the main criterion is the rate of supply reaching individual households in accordance with optimum consumption under rising standards of village life. All villages in Cyprus have a piped water supply system distributed either through public fountains or from house-to-house. At the end of 1969 out of a total number of 628 villages 360 or 57% , representing 78.6% of the rural population had a house-to-house water supply. (see table I on page 155)

Table I - Department of Water Development - Number and percentage of villages with piped water supply 1969

Satisfactory Piped supply									Unsatisfactory piped supply								No piped supply				Total No. of villages	Total population
District	Villages with house-to-house				Villages with fountains				Villages with house-to-house				Villages with fountains				No. of villages					
	No.	%	Popul.	%	No.	%	Popul.	%	No.	%	Popul.	%	No.	%	Popul.	%	No.	%	Pop.	%		
Nicosia	106	59.55	133806	84.24	55	30.90	17893	11.26	1	0.56	717	0.45	16	8.99	6439	4.05					178	158855
Kyrenia	26	55.32	19870	72.21	12	25.53	2553	9.28	1	2.13	3496	12.71	8	17.02	1598	5.80	-	-	-	-	47	27517
Famagusta	61	62.24	59347	74.54	19	19.39	5983	7.52	2	2.04	1893	2.38	16	16.33	12392	15.56	-	-	-	-	98	79615
Limassol	77	67.54	51098	80.20	30	26.32	7628	11.97	-	-	-	-	7	6.14	4987	7.83	-	-	-	-	114	63713
Paphos	55	41.67	28397	57.86	77	58.33	20679	42.14	-	-	-	-	-	-	-	-	-	-	-	-	132	49076
Larnaca	29	49.15	26987	69.49	19	32.20	6324	16.28	2	3.39	2630	6.77	9	15.26	2895	7.46	-	-	-	-	59	38836
Total	354	56.37	319505	76.51	212	33.76	61060	14.62	6	0.95	8736	2.09	56	8.92	28311	6.78	-	-	-	-	628	417612

7.2 Minor Irrigation Schemes

At the end of 1969 a list of minor irrigation schemes which were ready for implementation was proposed by the Water Development Department for inclusion in the 1970 Development Budget. Out of this list a total number of 42 schemes valued at £192 650 was in fact approved by Government and included in the 1970 Development Estimates for implementation.

A list of minor irrigation schemes which were ready in 1969 but not budgeted for implementation is given on Table II, page 157.

A list of schemes which was prepared in a preliminary form in 1969 and forwarded for further investigation to the Agricultural Department through the District Agricultural Officers is given on Table III, page 163.

It should be noted that according to recent procedure laid down by the Director-General Ministry of Agriculture and Natural Resources all proposals for minor irrigation works are examined by the Department of Agriculture with a view to ascertaining the economic feasibility of each particular scheme, and assesing the need for further agricultural extension works for the most profitable use of irrigation water; for this purpose a Committee has been established towards the end of 1969 for co-ordinating the activities of this Division with other Agricultural Services.

Table II - List of Small Irrigation Schemes (ready for construction at the end of 1969 and not included in the 1970 Dev. Estimates)

Nicosia District

Ser. No.	W.D.D. Ref.	Village	Division or Association	Locality	Nature of Proposed Works	Estimated cost £	Village contribution	Remarks
1	105/1963	Pera-Politiko	Division	Pedieos Riv.	Diversion Groyne & intake channel for flood irrigation	4 800	1/5	450 don. seasonal Revised 1970
2	36/42	Ergates	Association	Kourtouji	Regrading & Lining of tunnel & general improvements	7 700	48%	190 don. Winter 266 don. Spring 93 don. Perennial Revised 1970
3	127/40/103	Lagoudera	Association	Affita	Irrigation Tank & Distr. Channels & Pipes	850	44%	10 don. Perennial 3 don. Seasonal Revised 1970
4	42/1948	Apliki	Association	Kalogyros Tourkou	Tank & Pipes	2 900		31 don. Perennial 9 don. Seasonal Revised 1970
5	72/1963	Pendayia	Association	Kalokerinon Neron	Lining of canals	9 900		143 don. Perennial 465 don. Seasonal Revised 1970
6	103/44/II	Xyliatos	Division	Ay Kyriakos	Concrete conveyor canal	600	1/5	10 don. Seasonal

C/F £ 26 750

Table II (contd)

Ser. No.		Village	Division or Association	Locality	Nature of Proposed Works	Estimated cost £	Village Contribution	Remarks
					B/F	£26 750		
7	41/39	Katokopia	Association	Ktirka	Lining of canals	9 200	50%	300 don. Perennial Revised 1970
8	57/41/II	Dhali	Division	Near village	Lining of canals	19 000	-	535 don. Perennial 317 don. Seasonal
9	127/40/98/iv	Kalopanayiotis	Division	-	Distribution Works	9 720	1/3	133 don. Perennial
10	39/44	Vyzakia	Division	-	Lining of canals	11 200	1/3	140 don. Seasonal
11	63/52	Moniko-Akaki	Division	Afxenti-Riatikon	Lining of canals	21 500	1/4	4 000 don. Winter 500 don. Spring
					Total	£97 370		

List of Small Irrigation Schemes (ready for construction at the end of 1969 and not included in the 1970 Dev. Estimates)

Limassol District

Ser No.	W.D.D. Ref.	Village	Division or Association	Locality	Nature of Proposed Works	Estimated cost £	Village contribution	Remarks
1		Kyperounda						
	127/40/49/54	i. Kardama-Solomidhes	Association	K. Solomidhes	Excav. of Spring & distr. works	2 700	50%	14½ don. perennial 13½ don. seasonal Revised 1969
	127/40/36	ii. Frakti-Postani	Association	Frakti	—do—	1 750	-	7 don. perennial 8 don. seasonal Revised 1970
	127/40/49/55	iii. Livadhin-tis-Mossis	Association	Livadhin	Irrig. Tank & Distr. Pipes	1 650	44%	22 don. perennial 18 don. seasonal Revised 1970
	127/40/49/22	iv. Klima	Association	Klima	—do—	1 350	40%	10 don. perennial 5 don. seasonal Revised 1969
	127/40/49/48	v. Appis	Association	Appis	Distribution Works	800		12 don. perennial Revised 1970
	127/40/49/34	vi. Piyi Dhymon	Association	P. Dhymon	Distribution Pipes	1 500	40%	20 don. perennial Revised 1969
	127/40/49/II	vii. Dhalia	Division	Dhalia	Irrig. Tank & Distr. Pipes	900	1/3	12 don. perennial
	127/40/49/47	viii. Khalospi-tia	Association	Khalospitia	—do—	1 800	-	15 don. perennial Revised 1970
	40/49/11	ix. Vassiliko	Association	Vassiliko	Distribution pipes	620	40%	9 don. perennial 5 don. seasonal Revised 1970
						C/F £13 070		

Limassol District (contd.)

Ser. No.	W.D.D. Ref.	Village	Division or Association	Locality	Nature of Proposed Works	Estimated cost £	Village Contribution	Remarks
					B/F	13 070		
2	127/40/134/2	Pelendria	Association	Nikomitis	Distribution Pipes	800	40%	15 don. perennial Revised 1970
	-do-	-do-		Sarakinos	--do--	630	1/3	17 don. perennial Revised 1970
3	61/42	Silikou	Division	Lavrania	Lining of channels & Gen. improvements	3 460	1/3	73 don. perennial Revised 1970
4	127/40/23	Omodhos	Division	Pighadi	Irrig. Tank & Distr. Pipes	1.350	1/3	7 don. perennial 8 don. seasonal Revised 1970
5	127/40/52/III	Ay. Ioannis (Agrou)	Division	Angoulos Dhipotamia	Distribution channels	1 160	1/3	12 don. perennial Revised 1970
	-do-	-do-	Association	Kephalovry-sos	Distribution works	1 700	42 %	16 don. perennial 9 don. seasonal Revised 1970
6	42/43/III	Phini	Division	Dhimma tou Mylou	Distribution works	11 300	1/3	371 don. perennial Revised 1969
	-do-	-do-	-do-	Ambelaki	Irrig. tank & Distr. works	5.000	1/3	28 don. perennial Revised 1969
7	127/40/165/2	Tris elies	Division	Milarga	Extension Distr. Works	3 750	1/3	50 don. perennial Revised 1970
	-do-	-do-	-do-	Drakondas	--do--	7.200	1/3	180 don. perennial Revised 1969
8	43/42/II	Kilani	Division	Asomatos Scotini Ay Mavri etc.,	Distribution works	8 650	1/3	150 don. perennial Revised 1970
					C/F	£58 070		

Limassol District (contd.)

Ser. No.	W.D.D. Ref.	Village	Division or Association	Locality	Nature of Proposed Works	Estimated cost £	Village Contribution	Remarks
9	127/40/59/II	Louvaras		Tsoukalas	Irrig. Tank & Distr. pipes	D/F58 070 800		6 don. perennial 4 don. seasonal Revised 1970
	-do-	-do-	Division	Kato per-volia	—do—	750	1/3	7 don. perennial 5 don. seasonal Revised 1969.
10	127/40/22	Dhymes		Hji Pelen-dreu	Distribution works	1 300		16 don. perennial Revised 1970
11	45/44/2	Pyrgos	Division	Alavrovrysi	—do—	5 700	1/4	80 don. seasonal Revised 1970
	-do-	-do-	-do-	Dhimma-tis-Rigenas	—do—	4 600	1/4	300 don. seasonal Revised 1970
12	127/40/99	Agros	Division	Pano Taliou	Distribution works	1.560	1/3	11 don. perennial 8 don. seasonal Revised 1969
13	91/45	Moniatils	Division	-	—do—	5.300	1/3	134 don. perennial 16 don. seasonal Revised 1969

Total £78 080

List of Small Irrigation Schemes (ready for construction at the end of 1969 and not included in the 1970 Dev. Estimates)

Paphos District

Ser. No.	W.D.D. Ref.	Village	Division or Association	Locality	Nature of Proposed Works	Estimated cost £	Village contribution	Remarks
1	20/42	Kritou-Terra	Division	Kephalovrysos	Composite channel & Distr. system	9.000	1/3	88 don. perennial 162 don. seasonal Revised 1970
2	127/40/115/ii	Statos	Division	Kato Vrysi	Distribution pipes	1 200	1/3	4 don. Perennial 11 don. seasonal Revised 1970
3	65/62	Khoulou	Division	Kartavines	Pumping Scheme	4 000	1/3	30 don. perennial 18 don. seasonal Revised 1970
					Total	14 000		
Famagusta District								
	143/39/ii	Marathovou-nos Pyrga	Division	Neochoritika Merradhes	Diversion weir & earth channels	3 000	1/5	500 don. Winter Revised 1969
					Total	3 000		

Grand Total = £ 192 450

Table III - List of Small Irrigation Schemes Submitted to District Agricultural Officers for Study.

No	Village	Nature of Proposed Works	Remarks
	A. Nicosia District		
1	Kalochorio (Kapouti) "Domadona" Irrig Assoc.	Improvement of distr. Works	Existing Irrig. Works
2	Klirou "Laoura" Irrig. Assoc.	Improvement of distr. Works	Existing Irrig. Works
3	Akaki "Kamena" Irrig. Division	Consolidation of Intake Works	Existing Irrig. Works
4	Dhali "Hji Stavrinos" Irrig. Assoc.	Lining of canals	Existing Irrig. Works
5	Exometochi	Pumping Scheme from B/Hs	New scheme
6	Ay. Yeorghios (Soleas) "Petrasis" Irrig. Division	Lining of canals	Existing Irrig. Works
7	Karavostasi	Pumping Scheme & Distr. Works	
8	Pera	Lining of canals	(Spring & Summer Water)
9	Korakou	Lining of canals	Existing Irrig. Works
10	Linou	Lining of canals	Existing Irrig. Works
11	Phlasou	Lining of canals	Existing Irrig. Works
12	Lakatamia Irrig. Ass.	Lining of canals	Existing Irrig. Works
	Limassol District		
1	Kyperounda	Storage reservoir & Dist Works	Note: "Kyperounda" Scheme has been prepared in connection with a Pilot Project for Development on the Pitsilia area.
2	Lower Kourris Irrig. Works	Consolidation of Intake Works & Lining of canals	
	B. Famagusta District		
1	Liopetri	Pumping scheme from dam	Existing dam. (New scheme).
2	Angastina	Pumping scheme from B/H	New scheme
3	Famagusta-Dherinia (Irrig. Division)	Pumping scheme and pipelines	Extension of existing Works

No.	Village	Nature of Proposed Works	Remarks
	C. Paphos District		
1	Mesakhorio "Livadhia"	Storage Tank & Distr. Works	Existing Irrig. Works
2	Pano Panayia "Vrysi"	Improvement of Spring & Distr. Works	Existing Irrig. Works
3	Goudhi-Kholi	Pumping scheme from B/Hs	New scheme
4	Polis "Djerapia" Irrig. Division	Pumping scheme from 2 B/Hs & Distr. Works	Existing Irrig. Works Existing Irrig. Works
5	Miliou	Distribution Works	Existing Irrig. Works
6	Nata "Dhiala"	Storage tank & Distr. Works	Existing Irrig. Works
	D. Larnaca District		
1	Athienou "Marmarika" or "Makrivounia" Irrig. Division	Pumping scheme from B/H	Additional source to Existing Pumping Works
	Athienou "Athanasi Water" Irrig. Assoc.	Pumping scheme from B/H	Additional source to Existing Pumping Works.

7.3 Recharge and River Training

A number of schemes were in the course of preparation during the year under review but unfortunately none of these was ready in time for inclusion in the Development Budget for 1970. Schemes which were ready for submission to District Officers at the end of 1969 are the following:

1. Ayios Yeorghios (K/nia)
2. Thermia
3. Kazaphani
4. Vasilia
5. Ay Epiktitos
6. Karakoumi

Larger Recharge Works dealt with during the year under review are breefly discribed herebelow :

7.3.1 Famagusta - Dherinia Recharge Works

In the winter 1968-69 this project has operated at maximum capacity. A volume of 1000 x 10^6 gallons of water was impounded in the Fresh Water Lake and Ayios Loukas Lake, and used for recharge and /or surface irrigation in the area of the Division It has been observed that conditions of salinity which was the main set-back in this project have considerably improved because of better control at the intakes and of natural desalting of the bed of the Fresh Water Lake.

The beneficiaries were as usual very anxious to distribute the water for irrigation as quickly as possible to practically all the citrus included in the Division, but this has not been possible because of the lack of a complete and overall distribution system. It is noteworthy that the scheme was designed originally for recharge purposes only. On the request of the Division Committee an extension scheme for surface irrigation on the higher grounds at Sphaghion - Dherinia and further Northeast of Ay. Loukas Lake has been designed and sent for consideration by the Department of Agriculture.

7.3.2 Morphou Recharge Project

The object of this Project is twofold:

(a) To provide safety measures against imminent sea-water pollution in the coastal area of Morphou, by reducing local pumpage,

(b) To save irrigation water by means of water-tight conveyor systems in the whole aquiferous area of Western Messaoria. (Morphou Plain).

The works involved are distinguished in 3 main categories:

(a) The provision of alternative new boreholes further inland for supply to farms situated in the danger coastal zone,

(b) The construction of proper and appropriate works for artificial recharge,

(c) To line earth canals used for conveyance of water from boreholes to citrus farms. A provision of £70 000 in the Prastio-Nikitas area and £48 000 in the Morphou (Teratsia) Division was proposed for budgeting at the end of 1969 for continued implementation of the project in 1970. In Co-operation with the Water Use Section of the Department of Agriculture this Division has been occupied during the last months of 1969 in the preparation of a regional master plan postulating pipe distribution network to organised irrigation divisions for efficient irrigation farm practices in the whole of Western Messaoria. The preparation of this Project which is planned for staged implementation and financed by loan from the International Bank was continuing at the end of 1969.

7.3.3 Kouklia Reservoir Irrigation & Recharge Scheme

This project comprises the use of part of the water impounded in the Kouklia Reservoir during the winter season for irrigation and artificial recharge by pumping to the areas of Kouklia, Kondea and Kalopsidha, where the aquifer is rapidly depleted from overpumping.

The project is divided into two phases. The first phase, which has been been proposed for implementation in 1970, consists of pumping installations at Kouklia Reservoir, a main conveyor pipeline to Kouklia and Kondea areas and a distribution system within these areas to serve the citrus plantations as well as for recharge purposes.

The second phase, proposed for 1971, consists of pumping installations at Kouklia Reservoir, a conveyor pipeline to Kalopsidha area, and a distribution system within the area for surface irrigation of citrus and other plantations.

7.3.4 River Training and Antiflood Works

At the beginning of 1969 the Division has dealt with damages caused by floods to Irrigation and Water Supply systems throughout the island. A total of nearly 100 individual Water Supply and/or Irr. schemes were examined and reports with estimates for repairs were forwarded to District Officers.

A River Training Scheme on the lower Serrachis in the Syrianochori area, estimated at £30,000 was prepared in detail and smaller schemes at Yermasoyi (supplementary River Training Works), Nikoklia of Paphos and Kelokedhara were prepared and submitted.

7.4 Village Domestic Water Supply Schemes

A list of schemes ready for construction at the end of 1969 are shown on Table IV at a total estimated cost of £669,199. Three typical schemes are described in very brief detail here under:

(a) Sina Oros - Tembria - Evrykhou
Regional Supplementary Water Supply Scheme

A new source for supplementary supply, "Handares" spring, has been traced in the area of Troodos. The prepared scheme involves the laying of 34,500 ft. of main pipeline, additional storage tanks and house to house distribution system, at a total estimated cost of £37,300.

(b) Vizakia - Potami
Supplementary pumping scheme

This is a combined scheme from a new borehole situated in the area of Potami village. The pumping scheme involves also the construction of additional storage tanks and house to house service in both villages. The total estimated cost of the scheme is £26,000.

(c) Ypsonas - Pano and Kato Polemidhia
Regional Supplementary Pumping Scheme

The rapid development of these villages necessitated the drilling of a new borehole, in the Kouris river gravels at a yield of 9,000 g.p.h. in order to meet their increasing domestic water requirements.

The new scheme also involves the construction of additional storage tanks and extentions of the distribution systems covering on the development areas of these villages. The total estimated cost is £60,800.

Table IV - Village Domestic Water Supply Schemes Ready for Construction at the end of 1969 (including schemes approved for execution in 1970).

Nicosia & Kyrenia District

Ser. No.	Village	Nature of Scheme	Estimated cost £
1	Alona & Platanistassa	Additional Supply	49 000
2	Kakopetria	" "	19 000
3	Xeri	Supply of Electricity & Motor	1 362
4	Petra	Installation of motor & additional storage tank	6 025
5	Pedhoulas	Improvement of springs	4 500
6	Yerakies	New St/tank & House to house	2.700
7	Sina Oros) Tembria (Evrykhou)	Additional supply & house to house	37 300
8	Malounda	New St/tank & house to house	1 600
9	Ayios Amvrosios)	Supply of Electricity	2.204
10	Kharcha (		
11	Karakoumi	Add. supply & house to house	6.622
12	Kalogrea	Add. supply & house to house	13 200
13	Gourri	House to house	1.900
14	Pyroi	House to house	2.100
15	Apliki	House to house	1 750
16	Sarandi	Improvement & house to house	2.500
17	Varishia	House to house	2 600
18	Vroishia	Improvement & house to house	2 700
19	Pharmakas	Improvement&house to house	3.200
20	Ay Marina (Xyl.)	Improvement & house to house	6 900
21	Kaliana	Improvement & house to house	2 700
22	Mammari	Extentions to the distribution	520
23	Pygenia	Additional supply & house to house	26.000
24	Potami	Additional supply & house to house	9 500
25	Pahyammos	House to house	3 300
26	Katokopia	Extentions	550
27	Peristeronari	House to house	1 300
28	Xyliatos	House to house	1.900
29	Phylia) Massari (	Installation of motor	400
		C/F	213 333

Nicosia & Kyrenia District (contd.)

Ser. No.	Village	Nature of Scheme	Estimated cost £
		B/F	213 333
30	Astromeritis	Extentions	650
31	Ay. Epiktitos	"	300
32	Palekythro	"	440
33	Katydhata	House to house	4 100
34	Vyzakia) Potami (	Additional supply & house to house	26,000
35	Kannavia	Improvement & house to house	3 300
36	Karavostassi	Improvements	3 200
37	Motidhes	New scheme & house to house	2 800
38	Kondemenos	Replacement of the main pipeline & Improvements	5 250
39	Akaki	Improvements	1 350
40	Kormakitis	Improvements	1 200
41	Karpaskia	Extentions	250
42	Kythrea	"	860
43	Ay. Georghios (Kyr)	"	700
44	Ay. Marina (Skyl.)	"	470
45	Livera	Improvements	500
46	Sha	New St/tank & house to house	3 300
37	Nissou	Extentions	850
		Total	278 853

Famagusta District

Ser. No		Nature of Scheme	Estimated cost £
1	Dherinia	Additional supply	1 900
2	Vatili) Strongylos (Arsos) Tremetoushia(Melousha)	Additional supply	96 750
3	Vitsadha	House to house	3 500
4	Trypimeni	Improvements	1 100
5	Ay. Andronikos	House to house	7 200
6	Yialousa	New storage tanks	2 600
7	Yialousa	Improvements to Moni spring	1 900
8	Kondea	House to house	9 000
9	Korovia regional scheme	Improvements	3 600
10	Ayios Serghios	Extentions	800
11	Rizokarpasso	Improvements	700
12	Engomi	Extentions	2 000
13	Marathovounos	Extentions	910
		Total	131 960

Limassol District

Ser No.	Village	Nature of Scheme	Estimated cost £
1	Potamos tis Yermasoyias	New scheme	34 000
2	Paleomylos	House to house	2 000
3	Anoyira	House to house	5 400
4	Phassoula	House to house	5 300
5	Pyrgos	New storage tank	800
6	Yerovasa-Trozena	Improvements	300
7	Ypsonas) Pano Polemidhia (Kato Polemidhia)	Additional supply	60 800
8	Souni-Zanadja	New scheme	4 000
9	Sykopetra	Improvements & house to house	2 800
10	Pendakomo	Additional supply & house to house	11 900
11	Prastio (Evdimou)	Improvements & house to house	3 300
12	Ay. Demetrios	Improvements & house to house	3 900
13	Phini	Improvements & house to house	5 000
14	Kouka	Additional supply & house to house	1 100
15	Phinikaria	House to house	1 200
16	Paramytha	House to house	1 500
17	Apsiou	Improvements	300
18	Kilani	Improvements	400
19	Ay. Amvrosios	House to house	2 900
20	Ay. Constantinos	House to house	1 600
21	Yerasa	House to house	1 600
		Total	150 100

Paphos District

Ser No.	Village	Nature of Scheme	Estimated cost £
1	Nata	Replacement of the engine	410
2	Kallepia) Letymbou (Pitargou)	Replacement of the main pipeline	6 000
3	Emba	House to house	8 100
4	Kritou Terra	House to house	2 300
5	Tsadha	House to house	4 000
6	Peristerona	House to house	2 300
7	Ay. Nicolaos	House to house	3 200
8	Episkopi	House to house	5 600
9	Ay. Ioannis	House to house	2 900
10	Lemona	House to house	1 800
11	Magounda	House to house	700
12	Akoursos	Improvements & house to house	2 200
13	Annadhiou	Improvements & house to house	1 500
14	Kilinia	Improvements	500
15	Kedhares	House to house	3 350
16	Loukrounou	House to house	350
		C/F	45 210

Paphos District (contd.)

Ser. No.	Village	Nature of Scheme	Estimated cost £
			B/F 45 210
17	Pretori	Improvements	720
18	Stavrokonnou	Additional supply	1 000
19	Dhrymou	House to house	4 100
20	Trakhypedhoula	House to house	1 800
21	Skoulli	House to house	1 400
22	Akhelia	House to house	1 200
23	Kelokedhara	Improvements	340
24	Steni	Improvements	100
25	Mesa Khorio	House to house	3 000
26	Kelokedhara	Water to Police Station	170
27	P. Panayia	Replacement of the main pipeline	850
28	Paliambela	Improvements	1 440
29	Pano Arodhes	House to house	5 200
			Total 66 530

Larnaca District

Ser. No.	Village	Nature of Scheme	Estimated cost £
1	Alethriko	Additional supply & house to house	5 106
2	Aradhippou	Improvements	5 400
3	Ora	House to house	1 750
4	Alaminos	House to house	1 200
5	Aradhippou	Extentions	16 500
6	Psevdhas	Additional supply & house to house	7 100
7	Melini	House to house	3 500
8	Ormidhia	Extentions	1 200
			Total 41 756

Summary

1.	Nicosia & Kyrenia	£ 278,853
2.	Famagusta	£ 131,960
3.	Limassol	£ 150,100
4.	Paphos	£ 66,530
5.	Larnaca	£ 41 756
	T o t a l	£ 669,199

Domestic Water Supply
Schemes approved for execution in 1970

Nicosia & Kyrenia	£ 109,713
Famagusta	13,300
Limassol	109,450
Paphos	16,810
Larnaca	13,456
T o t a l	£262,729