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Republic of Cyprus
Ministry of Agriculture and
Natural Resources

WATER DEVELOPMENT DEPARTMENT

ANNUAL REPORT 1982

C St Lytras M Sc DIC B Sc – Director

Nicosia November, 1985

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Abbreviations

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

Conversion factors

Donum	= 0.134	Hectares
	= 0.3306	Acres
	= 14,400	Sq.feet
	= 1,340	Sq. metres
Hectare	= 7.4627	Donums
Acre	= 3.0248	Donums

In 1982 the value of the Cyprus £ on average (daily basis) was:-

$..... 2.1040
£ st. 1.2018
DM..... 5.0931
Drachma.....139.6971

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I GENERAL

Introduction

The year 1982 saw several significant developments in the activities of the Department: The inauguration of the Paphos Irrigation Project; the finalisation of the work of the feasibility studies of the Southern Conveyor Project and the Khrysokhou Watershed Irrigation Project; the connection of Yermasoyia Dam to the Khirokitia Treatment Plant and the undertaking by the Department for the first time of the design and construction of sewage disposal schemes for refugee housing estates.

During 1982 and for the eighth year running all activities of the Department were confined to the southern part of the island due to the continuing occupation of northern Cyprus by the invading Turkish troops, which, since the summer of 1974 has created a situation allowing no access or contact with the occupied north bar for communication through the good offices of the UN peace keeping force for the unified water supply system of Nicosia town.

Precipitation was around 80% of normal in most areas and flow recorded at most river gauging stations was well below normal due to low rainfall in the months of January, February and December. As a result water accumulated in dam reservoirs was very low and a poor ground water recharge was also observed.

The first impoundment of Asprokremmos Dam took place when the dam gate was shut on 1.3.82 and a quantity of 6.3 MCM of water (out of 51 MCM total capacity of the dam) was impounded by the end of the rainy season thus eliminating as far as possible pumping of ground water during the 1982 irrigation season.

The inauguration of the Paphos Irrigation Project by the President of the Republic Mr Spyros Kyprianou took place on the 26th of October 1982 in the presence of the D.G. of FAO Dr Saouma and delegates of the FAO regional conference which was organised in Cyprus for the first time.

By mid 1982 the feasibility study for the Southern Conveyor Project was completed by the British Technical Assistance - WDD team and 19 volumes of the various sections of the report were produced. In the meantime the detailed design for Kouris Dam was continued by SOGREAH. In September 1982 work started on the design of the main conveyor by Sir William Halcrow and Partners and the Water Development Department.

Similarly the Khrysokhou Watershed Irrigation Project FAO - WDD team had, by mid 1982, completed the main feasibility report and its 10 annexes. The detail design of Evretou Dam was completed by consultants Sir William Halcrow and Partners.

By the end of 1982 the connection of Yermasoyia Dam to the Central Water Supply System was substantially completed. Through an emergency scheme a 350 mm dia, 24 km long pipeline was laid between Yermasoyia Dam and Vasilikos river which is already connected to the treatment plant of the system at Khirokitia. This emergency scheme includes new pumping equipment at the Yermasoyia Dam end and at Vasilikos. The Central Water Supply System as outlined on map page is serving Nicosia, Larnaca, Famagusta, several villages, refugee estates and tourist installations as well as industry.

The level of construction work expenditure for 1982 was £9,863,081 compared to £9,038,378 for 1981.

BRIEF DESCRIPTION OF PROJECTS

Major Projects Under Construction

The Paphos Irrigation Project (PIP) is the largest and most important project constructed by the Water Development Department. Its aim is the irrigation of 5000 ha of net irrigable land in the south western coastal plain of Cyprus on both sides of the town of Paphos. The water requirements for the irrigation of this area are estimated at 36 MCM/year and will be provided by the Xeropotamos river flow (22 MCM) regulated at Asprokremmos where an earth dam has been constructed, by the alluvial aquifers in the river beds of Dhiarizos, Xeropotamos (lower reaches only) and Ezusas (10 MCM) and the coastal calcarenite aquifer (4 MCM).

Construction of the civil works of the Project commenced in 1976 and the target date for its full completion was the year 1981 while irrigation supplies from the boreholes in the river aquifers were available to the adjacent areas of the Project where distribution networks were completed as early as 1979. The PIP will be fully completed early in 1983 and the total cost of the Project is estimated to reach £25 million.

The main works of the project are a) Asprokremmos Dam with a 51 MCM capacity reservoir b) 24 boreholes c) the 12km concrete lined trapezoidal canal, max. flow capacity 4.2 m^3/s d) 14 pumping stations, e) 41 km long main conveyor pipelines and canaletti and f) 540km long irrigation distribution networks for all sectors of eastern and western areas.

The Land Consolidation Authority has carried out land consolidation of an area of 2350 ha in 8 villages of the region and by mid 1982 approx. 100 km of farm roads were constructed by the same authority. In addition 26 km of farm access roads were built by the PIP.

The Project beneficiaries are 3500 farm families (mostly small owners), 980 landless families (as seasonal labour) and 320 landless families leasing government land.

The permanent plantations which are planned to be developed in the Project are citrus (47%) avocado (7%) table grapes (8%) bananas (5%) and deciduous fruit trees (5%). The seasonal crops will be vegetables (21%) and summer garden produce (7%).

The Project is financed by the Government of Cyprus and the World Bank which has financed 77% of the foreign exchange component of the project i.e. $14 million US dollars, based on the 1973 estimate which was US $18.2 million.

Pitsilia Integrated Rural Development Project (PIRDP) is a multipurpose project the main component of which is water development but which includes also roads, education, health, agricultural extension services and research, loan facilities for agriculture etc.

The main objective of the Project is to stimulate the economically depressed mountaineous region of Pitsilia aiming at raising the standard of living of the inhabitants thus checking the drain to the towns. The total cost of the Project is estimated to reach approx. £10 million which US $10 million represent a loan from the World Bank.

The construction of water development works started in 1978 and is scheduled to be completed in 1983. The water development component of the PIRDP consists mainly of the construction of a)

one dam at Xyliatos of 1.3 MCM capacity and its irrigation distribution network b) some 9 PVC lined off-stream earth ponds of approx. 1.9 MCM combined capacity and their irrigation distribution networks, c) 30 No borehole irrigation schemes and d) numerous rehabilitation schemes of existing irrigation divisions and village domestic water supply schemes. The earth ponds are fed with water diverted from nearby streams by the construction of concrete diversion weirs and pipelines.

The total expenditure for the water development component of the PIRDP is estimated at £7 million.

The ***Vasilikos – Pendaskinos Project (VPP)*** is located in the southern part of Cyprus between Vasilikos and Pendaskinos Rivers approx. 50 km south of Nicosia and some 40 km east of Limassol.

The basic objective of the Vasilikos - Pendaskinos Project is the development of surface and ground water resources of the region and their use for the agricultural development of the area as well as for the augmentation of the domestic water supply of other areas, particularly the Nicosia, Larnaca and Famagusta water supplies.

The main components of the VPP are a) the Kalavasos Dam with a capacity of 17 MCM b) the Dhypotamos Dam with a capacity of 15 MCM c) a diversion system on the Maroni River for the conveyance of excess flows into the Dhypotamos Dam reservoir d) conveyance and distribution systems covering an area of 9,100 donums e) a pumping station at Dhypotamos, a treatment plant at Kornos, a balancing reservoir and a conveyor pipeline to Lakatamia Service Reservoir for Nicosia Water Supply f) a pumping station at Tokhni g) a conveyor pipeline and a balancing reservoir at Khirokitia Treatment Plant for the augmentation of Laranaca - Famagusta water supply.

The project water will be allocated a) for irrigation of an area of 4390 donums of citrus and 4710 donums of vegetables (8.95 MCM per year) and b) for the augmentation of the domestic water supplies of Nicosia, Famagusta and Larnaca areas (7.00 MCM per year).

The agricultural development of the project will be mainly in two areas a) the Vasilikos area of 6100 donums belonging to Kalavasos, Mari, Zyyi, Tokhni, Psematismenos and Maroni and b) the Pendaskinos area of 2400 donums belonging to Ayios Theodhoros and Skarinou. In addition a substantial area of Maroni village will be irrigated with water from boreholes and artesian wells of the gypsum aquifer.

In order to cover part of the foreign exchange component of the cost of the Project, Government has secured two loans. One from the World Bank for an amount of $11 million and another for KD 2.5 million from the Kuwait Fund for Arab Economic Development. The two loans will be used for a parallel financing of the project, that is financing of separate components of the project.

The cost of the whole project is estimated to be approx. £ 27 million (not including price contingencies) and the construction of the project is scheduled to be completed by 1985/86.

Due to pressing need for additional water supplies to Nicosia the first phase of the Project comprising the pumping station and the pipeline to Nicosia have been accelerated and construction was practically completed by the end of 1981. Through a connection with the Famagusta Water Supply Scheme it was possible as from 1982 to convey to Nicosia treated water from the Khirokitia Water Treatment Plant. The quantity of water to be conveyed during operation of this phase of the Project will depend on the availability of water from Lefkara Dam. It is expected to range between 0.5 and 2.0 MCM per year. Whatever the total quantity actually conveyed in each year the commissioning of this scheme is expected to prove a most important addition to the water supply of the capital. The reason for this is the flexibility introduced into the system by the relatively large conveyance capacity of the pipeline (30,000 m^3/day) coupled with the storage facilities of the dam at one end and of the new 40,000 m^3 capacity Lakatamia service reservoir at the other. Construction of the reservoir was also practically completed by the end of 1981. With these facilities it is possible to convey large quantities of water to Nicosia during particular times when the failure of other sources (pumps, pipelines etc) creates a large temporary shortage.

The total expenditure for the first phase

of the Nicosia Water Supply component of the Project reached £3 million.

Supply contracts for the pipeline materials were entered into by the Department which in turn handed over the materials to the civil works Contractor, Joannou and Paraskevaides for installation. The value of this contract was £1 million. The second major contract for the supply and installation of the electrical and mechanical equipment of the pumping station and the flow-metering, telemetry and control equipment for the complete pipeline was awarded to Mather and Platt (Exports) Ltd of the United Kingdom. The value of this contract was approximately £355,000. The construction of the building of Dhypotamos Pumping Station was undertaken by the Department.

The foreign exchange component of the cost of these works was financed by a DM 10 million loan (=approx. £1.9 million) from Kreditanstalt Fur Wiederaufbau of West Germany who have also financed the construction of Lefkara Dam in the early 1970's.

Major Projects Under Feasibility Study

The Southern Conveyor Project (SCP) area spans practically the whole of southern Cyprus from Dhiarizos river in Paphos (from where water is planned to be diverted to the proposed Kouris Dam reservoir) to the Kokkinokhoria area in the east where water will be conveyed to the main potato producing areas and for the needs of the newly established tourist development in the region. The main works of the SCP will be a) Kouris Dam with a capacity of 120 MCM b) a 110 km long pipeline ranging from approx. 1.5 to 1m dia. from Kouris Dam to Akhna balancing reservoir c) Akhna reservoir of 6 MCM capacity d) distribution networks for 5 main areas to be supplied with irrigation water i.e. Akrotiri (1755 ha), Parekklisha (320 ha), Mazotos (660 ha), Kiti (1600 ha), Kokkinokhoria (5125 ha) and e) the domestic water supply component of the project with three treatment works, some 200 km of treated water pipelines etc.

The main aim of the project is to supply some 38 MCM of water per year for the domestic water supply of the 4 main towns, Nicosia, Limassol, Famagusta and Larnaca as well as over 50 villages up to the year 2010 and approx. 33 MCM of water for the irrigation of over 10,000 ha of land as listed above.

The total investment cost of the project is estimated at £130 million.

The Khrysokhou Watershed Irrigation Project (KWIP) area is located in the north western part of Cyprus. The project will develop the water resources of the region to supply water for irrigation purposes to 3100 ha net in the lowlands of the Khrysokhou river valley and the coastal belt area from Neokhorio to Pomos villages as well as to 1300 ha in the uplands of the Yiolou - Stroumbi - Polemi area.

The main engineering components of the project are: a) The Evretou Dam, on the Stavros tis Psokas river, with a storage capacity of 25 MCM b) the Ezousas Dam near Ayia on the upper Ezousas river, with a storage capacity of 8 MCM c) the lowlands conveyor, a double purpose pipeline of about 60 km length which will divert the winter flow of four north flowing small rivers to the Evretou Dam and during the irrigation period will transport water to the new irrigation areas of the lowlands d) the uplands conveyor, a pipeline approx. 17 km long transporting water from the Ezousas Dam to the uplands irrigation schemes e) over night storage ponds, break pressure tanks and about 220 km long distribution network for the irrigation areas.

The three existing dams in the region namely Argaka, Pomos and Ayia Marina with a combined capacity of 2.3 MCM are integrated into the Project through the conveyor.

The feasibility study estimated cost of the project is about £35 million based on January 1981 prices.

DEPARTMENTAL ORGANISATION

The Water Development Department

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

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

The Government institutional set up for water resources conservation and development and the role of the Department of Water Development is shown on page 6.

A reorganisation of the Department was carried out at the end of 1982 involving mainly two Divisions. The Division of Water Resources which was split into a) the Division of Water Resources Management and b) the Division of Hydrology - Water Resources Management. Similarly the Division of Operation and Maintenance was split into a) the Division of Operation and Maintenance (DWS) and b) the Division of Operation and Maintenance (Irrig). The reorganisation having come late in the year does not reflect on this report. The two Divisions, of Operation and Maintenance are shown as separate in this report as they had already been existing as separate branches.

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

The ***Division of Water Resources*** which groups together all services required for the collection, study and interpretation of hydrological and hydrogeological data both for ground and surface water and control of groundwater extraction.

The ***Division of Planning*** which deals with the preparation of reconnaissance and feasibility studies prior to the detailed design of major projects. The works for planning include field investigations for hydraulic structures, laboratory testing for these structures, water use studies, hydrological evaluations, evaluation of benefits, technoeconomic studies as well as engineering geology problems. Systems analysis and mathematical modelling techniques with the help of electronic computers are widely used in these studies.

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

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

The ***Division of Operation and Maintenance*** which controls the operation and maintenance of the major projects such as dams and town water supplies.

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

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

In these Regional Offices the main works carried out are:

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

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

All ***legal matters*** concerning the day to day operation of the Department of Water Development in particular and the Ministry of Agriculture and Natural Resources in general are being referred to the Legal Adviser of the Department for scrutinization, advice and/or action.

These legal matters are multiform and may involve inter alia, amending laws, handling cases in courts, attending meetings and so on.

FOREIGN TECHNICAL ASSISTANCE

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

United Nations

Technical assistance received from United Nations during 1982 was:

(i) ***Experts – Paphos Irrigation Project***

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

(ii) ***Experts-Khrysokhou Watershed Irrigation Project***

J H Visser, FAO Water Resources Engineer continued his services as Project Manager of the Khrysokhou Watershed Irrigation Project upto mid 1982.

J W F Cools, FAO Associate expert Agro-economist, continued his services with KWIP upto August 1982.

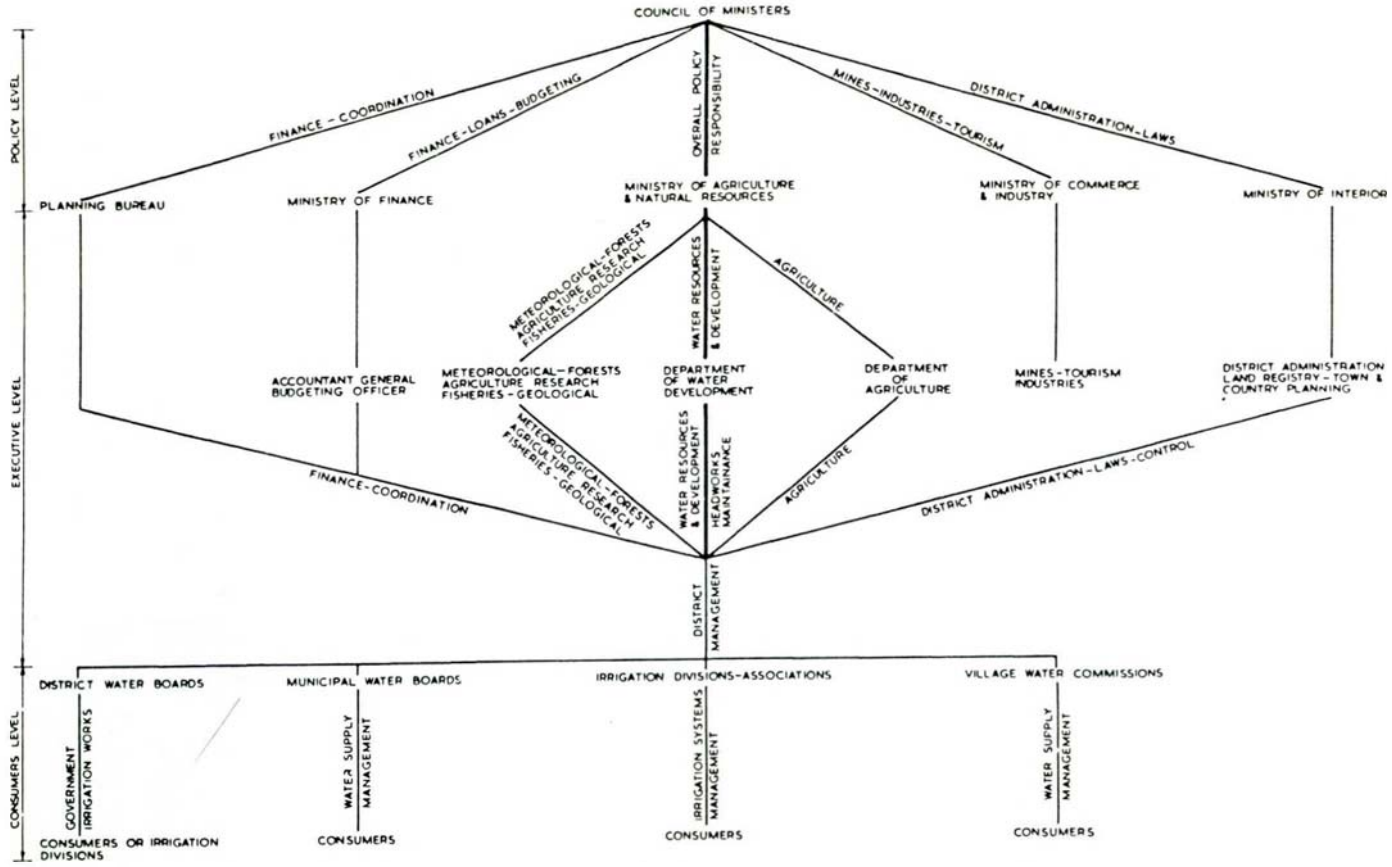
W van der Linden, FAO Associate expert, Hydraulics Engineer continued his services with KWIP upto August 1982.

A detailed description of the work carried out during 1982 is given elsewhere in this report.

Consultants Employed By the Department

The following consulting firms were employed by the Department for the design of various components of projects.

SOGREAH, Grenoble, France for the design and supervision of Paphos Irrigation Project distribution and conveyance systems.



WATER DEVELOPMENT - ORGANIZATION CHART

British Technical Assistance

Southern Conveyor Project

Two experts, from UK Ministry of Overseas Development (ODM) continued upto mid 1982 their work together with Cypriot staff on the preparation of a feasibility study for the Southern Conveyor Project.

They are:

H B Jackson	*Project Manager*
Dr R J Grimble	*Agr. Economist*

Sir M MacDonald and Partners, Cambridge, England for the design and supervision of construction of Asprokremmos Dam, Paphos Irrigation Project.

SOGREAH in association with *Hydroconsult*, Nicosia for final design and contract documents of Kouris Dam, Southern Conveyor Project.

Sir William Halcrow and Partners, Swindon, England in association with *Balfours*, London for the feasibility study of the

TECHNICAL STAFF OF WDD ON 30.6.1982

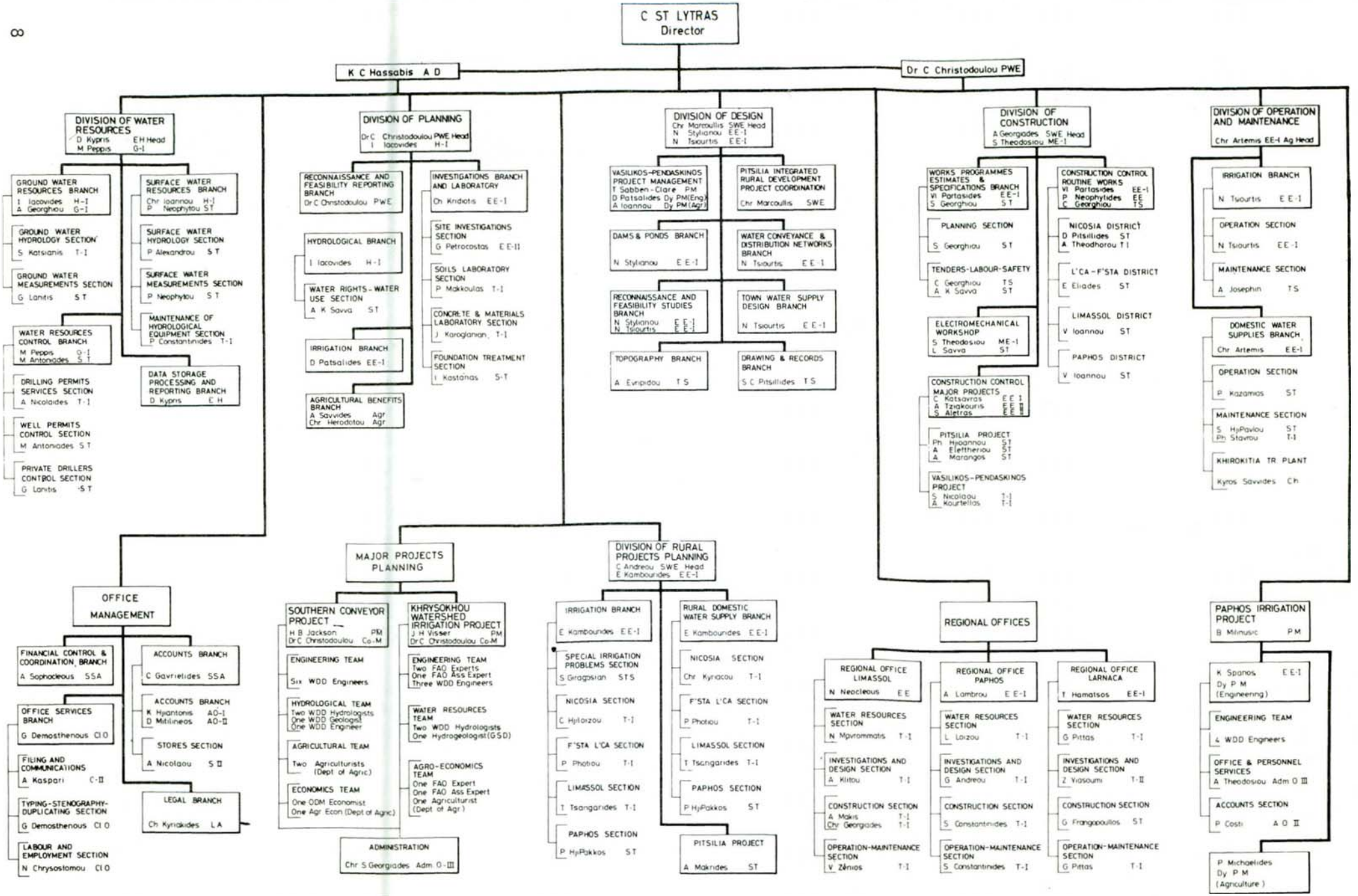
DRG No BM/G/210

	TECHNICAL STAFF		D	AD	PWE	SWE	SH	EH	EE	ME	Geo	H	CH	TIE	STS	TS	ST	T	CF	ACF	F	QS	PR	TOTAL
1	Permanent Ordinary Staff		1	1	1	6	2	1	15	1	2	2			3	7	19	73	4	9	40			187
2	Permanent Development Staff								4			1		1			3	26	2	9	9			55
3	Temporary Development Staff								11	1		1	1	3				27			8			52
4	Casual Staff								11					1				56				2	1	71
	TOTAL NUMBERS		1	1	1	6	2	1	41	2	2	4	1	5	3	7	22	182	6	18	57	2	1	365
	DISTRIBUTION OF STAFF																							
5	Divisions	i Water Resources						1			2	1					3	21			2			30
		ii Planning			1				3			1					1	7		1	1			15
		iii Design				1			6							2		22						31
		iv Construction				1			5	1				2		1	9	7	2	6	18			52
		v Small Projects Planning				1			1						1		2	6	1					12
		vi Operation & Maintenance							2				1			1	2	3	1	1	4			15
6	Major Projects	vii Paphos Irrigation Project (PIP)							6	1								26						33
		viii Southern Conveyor Project (SCP)							5									26						31
		ix Vasilikos – Pendaskinos Project (VPP)							5									6						11
		x Khrysokhou Irrigation Project (KIP)							2			2		1										5
	Note Pitsilia Project staff are listed under construction division which is also involved with VPP																							
7	Administration (Head Office)		1	1																				2
8	Regional Offices (Limassol, Larnaca & Paphos)								3								1	29		9	20			62
9	Various Postings								1*/1•									3*/1•						6
10	Vacancies					3	2		1					2	2	3	4	25	2	1	12	2	1	60
	TOTAL NUMBERS		1	1	1	6	2	1	41	2	2	4	1	5	3	7	22	182	6	18	57	2	1	365

REFERENCE

D Director
AD Assistant Director
PWE Principal Water Engineer
SWE Senior Water Engineer
SH Senior Hydrogeologist
EE Executive Engineer
ME Mechanical Engineer
Geo Geologist
H Hydrologist
CH Chemist
TIE Topographer Irrigation Eng.
STS Senior Tech. Superintendent
TS Technical Superintendent
ST Senior Technician
T Technician
CF Chief Foreman
ACF Assistant Chief Foreman
F Foreman
QS Quantity Surveyor
PR Programmer
EH Engineer Hydrologist

* On transfer to GSD
• Missing since 1974 invasion
• On scholarship



WATER DEVELOPMENT DEPARTMENT - ORGANIZATION CHART - 30.6.1982

View of Ephtagonia Pond No 2 from the air. WDD Photo A50 EN15 (19.6.82)

Southern Conveyor Project together with the SCP team of WDD staff and UK experts of the Ministry of Overseas Development.

Rofe Kennard and Lapworth jointly with *Wallace Evans and Partners* UK in association with *C Chr Ioannides*, Nicosia for the detail design, contract documents and supervision of construction of all engineering components of the Vasilikos - Pendaskinos Project, Phase II.

Sir William Halcrow and Partners in association with *A Prastitis and Associates*, Nicosia for the detail design and contract documents of Evretou Dam, KWIP.

SUMMARY OF ACTIVITIES

Water Resources

The collection and evaluation of hydrological data continued through 1982 especially with reference to the requirements of the major projects.

The general conclusion obtained from the study of 61 river flow gauging stations is that the flow in most of them was well below normal. The same picture prevailed with regard to groundwater recharge where a general drop of all important aquifers was observed.

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

The precipitation during the hydrometeorological year 1981-1982 averaged 425 mm which is 80% of normal. The rainfall was a little above normal (up to 110%) in many places in Kokkinokhoria area and in very few places in the southwestern area of the Island. In all other areas it was below normal ranging from 70-95%.

The maximum amount of rainfall in a 24-hour period was 353 mm reported by Sotira village Elementary School rainfall station on 27th November 1981. It may be noted that this amount is the highest ever recorded by any station in Cyprus.

The first snowfall occurred on Mount Olympus, the highest peak of Troodos mountain range, on the 17th November 1981 and the last snowfall on the 14th April, 1982.

The air temperature was slightly below normal. The extreme maximum temperature was 40.4°C reported by Nicosia town

Climatological Station on the 29th June 1982 and the extreme minimum temperature was -7.0°C reported by Prodhromos Forestry College on the 5th February, 1982.

As extracted from the available data the maximum annual evaporation measured from a USWB pan was 2150 mm reported by Larnaca Airport Synoptic Station and the minimum annual evaporation was 1592 mm reported by Saittas Climatological Station.

Planning and Design of Projects

Planning was concentrated again on the studies for the Southern Conveyor Project and the Khrysokhou Watershed Irrigation Project.

By mid 1982 all 19 volumes of the feasibility study of the Southern Conveyor Project being carried out with the assistance of the UK Ministry of Overseas Development were completed ready for appraisal by the World Bank. In the meantime the consultants *Sir William Halcrow and Partners* working with WDD staff started work on the detailed design of the Southern Conveyor pipeline, the Kokkinokhoria irrigation area distribution network and Akhna Dam.

With regard to the Khrysokhou Watershed Irrigation Project the main report and ten technical annexes of the feasibility study were prepared ready for World Bank appraisal.

During 1982 particular emphasis was placed in the completion of all the necessary procedures which would enable the commencement of construction of the works within the Vasilikos-Pendaskinos Project. Full description of these procedures are given under chapter IV - DESIGN DIVISION.

For the fourth year running the activities of the Design Division focused mainly on the Pitsilia Integrated Rural Development Project on the preparation of feasibility studies and detail designs and contract documents for ponds and borehole schemes.

Construction of Projects

Construction expenditure of the Department during 1982 reached £9,863,081 as against £9,038,378 in 1981. (See table V-I under DIVISION OF CONSTRUCTION).

During the year 1982 works on the ***Paphos Irrigation Project*** comprised again of two fields: a) operation and maintenance of the completed parts of the project covering the whole of the eastern area of 3,500 ha and b) continuation of construction works on the remaining parts.

During the year 1982 about 15,500 donums of land were irrigated using in total 9,400,707 m^3 of water. An additional quantity of 356,447 m^3 was used for industrial purposes. For the first year water from the Asprokremmos Dam reservoir was utilised by the Project. Impounding in the dam reservoir started as from the 1st March 1982 following the closure of the water control gate and the maximum storage level reached was 6.3 MCM at the end of June. Releases from the dam during the reporting year were estimated at 4.6MCM while additional 7 MCM were supplied from boreholes and surface flows in Dhiarizos and Ezusas rivers.

In the field of construction during the year 1982 work continued on the erection of the Asprokremmos Dam which in fact was substantially completed in September 1982 as well as on the installation of irrigation networks and construction of reservoirs in the western sectors which has reached about 85% completion by the end of December 1982.

The expenditure incurred during 1982 amounted to £3,302,930 for construction and £253,667 for operation and maintenance bringing the totals to £23,216,873 and £379,370 respectively.

Full completion of the construction works for the project is expected early in 1983 at the total estimated cost of nearly £25 million.

Pitsilia Integrated Rural Development Project (PIRDP) entered its fourth full year of construction in 1982. It features second in construction expenditure in 1982, reaching £1,759,881 as compared with £1,577,069 in 1981. So far the total expenditure on water development in the Pitsilia Project reached the figure of £4,739,225.

Construction works at Xyliatos Dam were substantially completed in October 1982 at a total cost of approx. £1 million and impounding started on 7.10.82. The distribution network from the dam was completed in Ayia Marina (600 donums) while it was in progress at the Xyliatos

area (1700 donums).

Two PVC lined earth ponds were completed during the year, namely Arakapas Pond No. 1, with a capacity of 191,000 m^3 and Ephtagonia Pond No. 2 with a capacity of 127,000 m^3. During 1982 four other ponds were under construction and are scheduled for completion during 1983. These were Kyperounda Pond (270,000m^3), Agridhia Pond (56,000m^3), Lagoudhera Pond (70,000m^3) and Ora Pond (62,000 m^3).

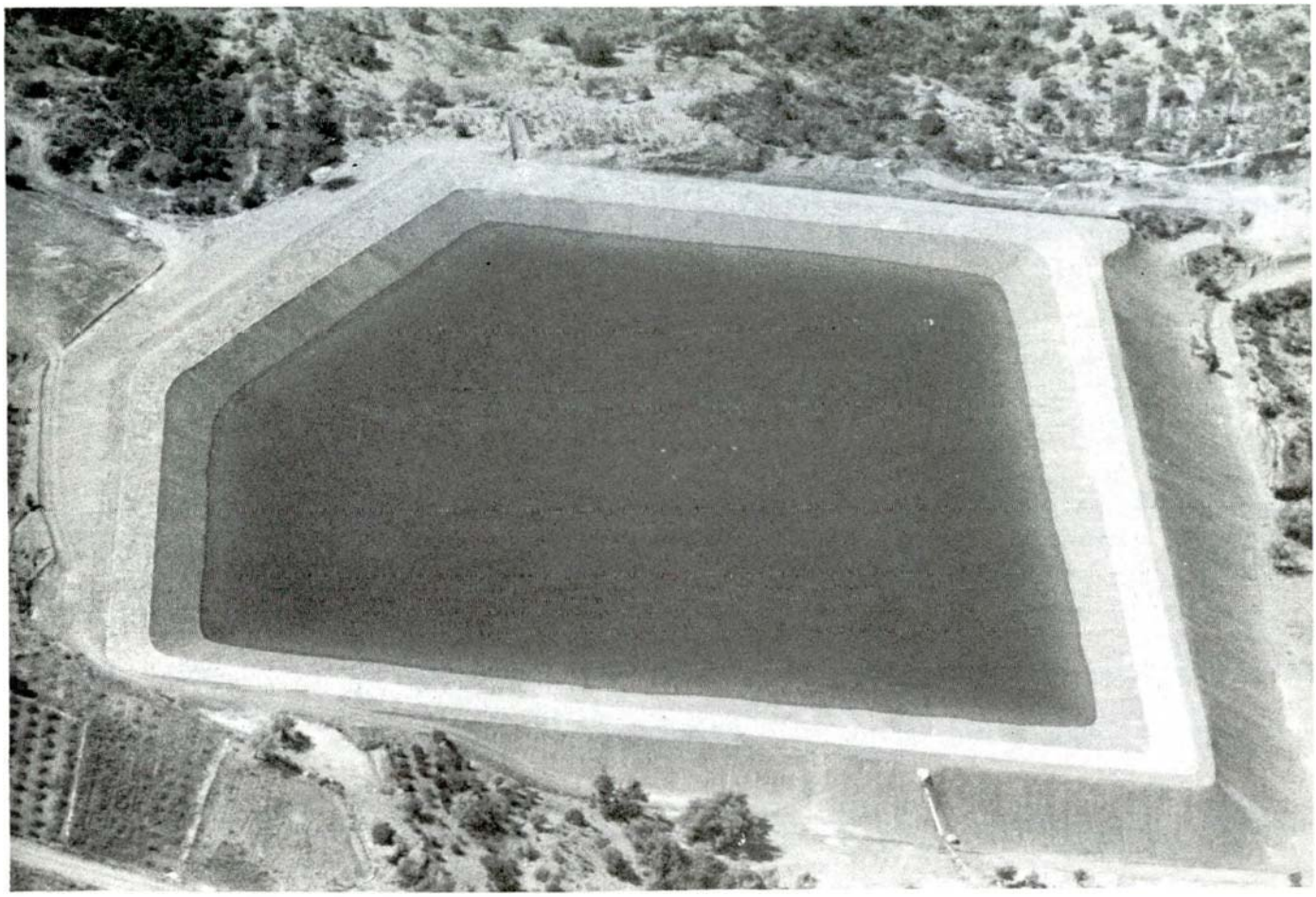
Out of a total number of 20 PVC lined earth ponds included in the PIRDP eleven were completed by the end of 1982, including the small Ayii Vavatsinias Arch Dam (Cap. 53,500m^3) with a total capacity of 1,072,000 m^3.

During 1982 distribution networks were completed for Arakapas Pond No 1, Kato Mylos Pond & BH and Ephtagonia Ponds 2 & 3 while construction works were under progress for Kyperounda Pond and Agridhia Pond distribution networks.

Moreover the development of successful boreholes has continued (it is expected that with the completion of the project some 30 boreholes will be developed) along with construction of water supply and rehabilitation schemes.

Emergency schemes for town water supplies ranked 3rd in construction expenditure during 1982 when £1,540,513 was spent on strengthening the ***Central Water Supply System*** feeding Nicosia, Larnaca, Famagusta and numerous villages. The construction of a pipeline to carry water from Yermasoyia Dam to Vasilikos Pumping Station from where there is an existing connection to Khirokitia Treatment Works has cost £885,558. The remaining expenditure was for the connection of several boreholes to the main conveyor of the system such as the Yeri, Pyrga and Stavrovouni boreholes which were connected to the Khirokitia-Nicosia pipeline and the Klavdhia, Alethriko, Skarinou and Kophinou-Mennoyia boreholes which were connected to the Khirokitia-Famagusta pipeline.

Vasilikos-Pendaskinos Project features fourth on the construction expenditure for 1982 with just over £1 million of which some £640,000 was for Dhypotamos



View of Arakapas Pond No 1 from the air. WDD Photo A 53 EN1 (19.6.82).

Dam, £146,000 for consultants fees and £120,000 for the 1st phase of the project (Nicosia Water Supply) etc.

Other significant works executed were for rural domestic water supply schemes (£560,846), water supply and sewage disposal for refugee estates (£536,233), schemes undertaken for other government departments (£362,558), minor irrigation schemes (£207,709) and water supply distribution networks for private developers of plots of land (£110,510).

Operation and Maintenance of Projects

Town Water Supplies

The Department of Water Development is responsible for the operation and maintenance of all sources of water supply for Nicosia including the conveyance of the water to the service reservoirs on the outskirts of the town. The water is sold in bulk to the Nicosia Water Board at the service reservoirs. The Nicosia Water Board undertakes the distribution of water within its area of supply. This division of responsibility has been in force since early 1980 when, by decision of the Council of Ministers, the Nicosia Water Board extended its Area of Supply to cover the area of the Greater Nicosia Scheme.

The 1981-82 winter season was very poor in rainfall and resulted, in a significant reduction in the yield of existing water supply sources. During the year a number of emergency schemes utilising a total of 17 new boreholes were carried out to augment the production of existing sources of the Nicosia and Central Water Supply Systems.

The 1982 Emergency Schemes were in operation by mid-July and contributed a total of 591,220 m^3 to the Nicosia System and 718,186 m^3 to the Central Water Supply System during the year.

During 1982 a quantity of 9,369.385 m^3 was delivered to Nicosia whilst a further quantity of 520,930 m^3 was produced from sources of the Nicosia Water Commission. The Peristerona-Akaki emergency scheme which was put in operation in 1980 did not face as many problems as last year with the sand content of the water but its yield has been affected by the drought. Thus it averaged a yield of 3360 m^3/day during the year reaching a maximum of 4560 m^3/day in April caused by a certain amount of recharge from the March rainfall and dropping to a minimum of 2500 m^3/day in November.

Restrictions on the hours of supply to Nicosia continued to be enforced throughout the year. The contribution of the emergency schemes, the augmentation of the sources with supplies from Lefkara Dam, the increased service reservoir storage and improvements in the operation of the distribution system to ensure a fair distribution of the quantities available were the main factors which contributed to an improvement of the water supply situation in the capital compared to 1981. At least 18 hours of supply in every 48 were achieved compared to 12 hours during the previous year.

The total expenditure for the operation and maintenance of all sources and conveyance systems supplying Nicosia rose to £708,888 and the revenue generated during the year from the sale of water reached £703,199 (including outstanding accounts).

Water continued to be supplied to the Turkish sector of Nicosia although no payment is being received for this supply. The same holds true for the supply of water to the Turkish occupied town of Famagusta.

The Central Water Supply System comprising Lefkara Dam as its main source of water, the Yermasoyia Dam connection to the system, although almost completed by the end of 1982, is expected to be operational early in 1983. Vasilikos Subsurface Dam, a number of supplementary borehole sources, the water treatment works at Khirokitia and the Lefkara - Khirokitia, Khirokitia-Famagusta and Khirokitia-Nicosia Pipelines managed, operated and maintained by the Department of Water Development. The scheme supplies water to Nicosia, Famagusta and Larnaca towns and numerous villages and refugee housing estates in the districts of Nicosia, Famagusta and Larnaca.

A total quantity of 5,982,443 m^3 was produced by the system in 1982, of which 4,324,548 m^3 was drawn from Lefkara Dam (net of losses at the treatment works).

The total expenditure for the operation and maintenance of the system (excluding

the Khirokitia-Nicosia pipeline) during the year was £208,042 and the revenue generated reached £524,187 (including outstanding accounts).

The town of Larnaca received a total of 1,446,020 m^3 of water from the Central Water Supply System and produced from its own (or hired) borehole sources a further quantity of 1,407,700 m^3. With these quantities at its disposal the Water Board of Larnaca was unable to meet the demand of the town and for the first time had to impose restrictions on supply.

Limassol Water Board has both the sources and the distribution system of the town under its control. Despite the drought, demand was met comfortably during the year. The total production rose to 7,748,927 m^3.

Paphos water supply comes under the jurisdiction of the Municipality. Water shortage problems were experienced during summer mainly due to the limited capacity of main conveyors. Restrictions on supply had to be resorted to during the summer period. Total production was 1,247,972 m^3.

Irrigation Works

The management of major irrigation works is done either by the WDD or by the Government Water Works Committees as the case may be whilst the management of small irrigation and village water supply schemes is done by the District Administration and local committees.

In the year under view the total water available in all dams in Cyprus, in the Government controlled areas, amounted to 38.71 MCM. From this quantity 23.26 MCM were used for the irrigation of 43,857 donums, 4.79 MCM were used for domestic water supplies, 2.67 MCM were used for recharge, 0.97 MCM seeped through or below the dams and 2.92 MCM were lost as evaporation. The remaining 4.10 MCM were retained in the dams as over annual storage.

Water available for utilization from Government projects reached the figure of 35.28 MCM. Out of this only 28.30 MCM was utilized 20.86 MCM for irrigation 4.79 MCM for domestic water supply and 2.65 MCM for recharge. Irrigation water was utilized on 39,509 donums of land planted with citrus, bananas, vines, deciduous, vegetables, potatoes cereals and olives. The gross income from the sale of water amounted to £433,214. The total operation, maintenance and energy cost amounted to £411,614 and the net income to the Government was limited to £21,600. The M+O expenses breakdown is as follows: Operation, £119,906; Maintenance £76,131 and energy cost £215,577.

Water available for utilization from contributory schemes was 3.26 MCM out of which 2.26 MCM was for the irrigation of 4,348 donums.

Recharge works in the Government controlled areas represent only 13.1% of the total recharge capacity available in Cyprus and collected a total quantity of 30,000 m^3 out of which 17,000 m^3 was used for recharge whereas the rest was lost in the form of evaporation.

Regional Offices

Due to the occupation of northern Cyprus by Turkish troops, there are only three regional offices in operation, i.e. Famagusta Larnaca, Limassol and Paphos. The regional offices are mostly responsible for the collection of water resources records and the design and supervision of minor projects.

Legal Adviser

The Department of Water Development, of the Ministry of Agriculture and Natural Resources has been a pioneer in engaging on full time basis the services of a legal adviser. The appointment of legal advisers now in the Government machine is so widespread, that one may safely say that this has become an institution.

The duties of the legal adviser of the Department of Water Development vary and inter-alia consist of providing legal advice on numerous questions which arise from the day to day running on the Department in particular and the Ministry of Agriculture and Natural Resources in general.

The said legal advice may be oral or written and they may involve interpretation of contracts, laws, regulations circulars etc.

The legal adviser has been appointed as counsel of the Republic and he carries out all duties of the counsel of the Republic as he did in the past. That is to say he appears before the various

DAMS CONSTRUCTED UP TO 1960

No	DAM	TYPE	HT	1000m³	YEAR
1	Kouklia	Earth	6	4.545	1900
2	Lymbia •	Gravity	5	18	1945
3	Lythrodhanda	Gravity	11	32	1945
4	Kalokhorio (K1)	Gravity	9	82	1947
5	Akrounda	Gravity	7	23	1947
6	Galini	Gravity	11	23	1947
7	Petra	Gravity	9	32	1948
8	Petra	Gravity	9	23	1951
9	Lythrodhanda	Gravity	10	32	1952
10	Kafizes	Gravity	23	113	1953
11	Ayios Loucas	Earth	3	455	1955
12	Gypsos	Earth	3	100	1955
13	Kandou	Gravity	15	34	1956
14	Perapedhi	Gravity	22	55	1956
15	Pyrgos	Gravity	22	285	1957
16	Trimiklini	Gravity	33	340	1958

Total Storage Capacity 6,174 $m^3 \times 10^6$

MINOR RECHARGE DAMS FROM 1960-70

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

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

(82) Major dam projects from 1981-90

(1) Dams constructed up to 1960

(17) Major dam projects from 1960-70

(65) Major dam projects from 1971-80

(36) Major recharge dams from 1960-70

(47) Minor recharge dams from 1960-70

HT refers to height in meters from foundation

YEAR is the year of completion

Phrenaros (6) means six small dams in Phrenaros area

•Inundated by New Lymbia Dam. See ref. No 69

MAJOR DAM PROJECTS FROM 1960-70

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

Total Storage Capacity 32,041 $m^3 \times 10^6$

MAJOR RECHARGE DAMS FROM 1960-70

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

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

MAJOR DAM PROJECTS FROM 1971-80

No	DAM	TYPE	HT	1000m³	YEAR
65	Lefkara	Rockfill	71	13,850	1973
66	Massari Recharge dam	Earth	15	2,273	1973
67	Palekhori-Kambi	Gravity	33	620	1973
68	Arakapas	Gravity	23	129	1975
69	New Lymbia	Gravity	12	220	1977
70	Ayii Vavatsinias	Arch	14	53	1980
71	Ayii Vavatsinias	Earth	10	55	1980
72	Ephtagonia No 1	Earth	10	92	1980
73	Khandria	Earth	10	70	1980
74	Melini	Earth	10	59	1980
75	Pelendria	Earth	10	123	1980

Total Storage Capacity 17,544 $m^3 \times 10^6$

MAJOR DAM PROJECTS FROM 1981-90

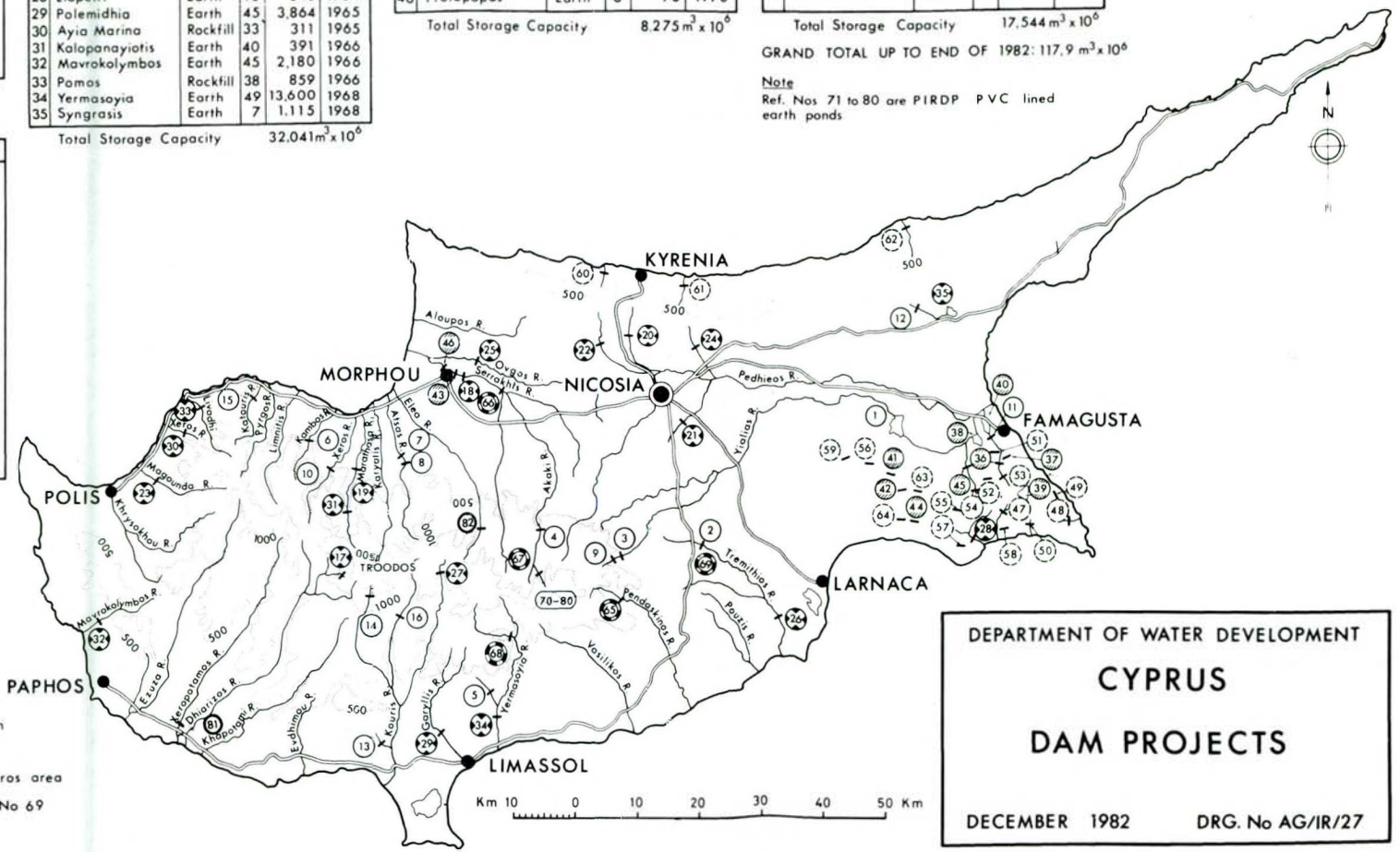
No	DAM	TYPE	HT	1000m³	YEAR
76	Ephtagonia No 3	Earth	10	65	1981
77	Akapnou-Ephtagonia	Earth	9	132	1981
78	Kato Mylos	Earth	10	104	1981
79	Ephtagonia No 2	Earth	8	127	1982
80	Arakapas	Earth	10	192	1982
81	Asprokremmos	Earth	53	51.000	1982
82	Xyliatos	Rockfill	42	1.250	1982

Total Storage Capacity 52,870 $m^3 \times 10^6$

GRAND TOTAL UP TO END OF 1982: 117.9 $m^3 \times 10^6$

Note

Ref. Nos 71 to 80 are PIRDP PVC lined earth ponds



DEPARTMENT OF WATER DEVELOPMENT

CYPRUS

DAM PROJECTS

DECEMBER 1982 DRG. No AG/IR/27

Courts of the Republic of Cyprus and handles all kinds of actions and recourses in favour of and/or against the Republic including arbitration procedures.
Apart from these purely legal duties the legal adviser attends various meetings held in the Department or elsewhere and takes part in the proceedings or makes written contribution to such meetings. He drafts orders, regulations and amendments of laws, if necessary.

CYPRUS NATIONAL, INTERDEPARTMENTAL AND DEPARTMENTAL COMMITTEES

International Hydrological Programme

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

Chairman

C St Lytras, Director, WDD

Secretary

I Iacovides, Senior Hydrogeologist, WDD

Members

Dr V Krentos, Director, Agricultural Research Institute
Dr A Louca, Director, Department of Agriculture
E Michaelides, Director, Department of Forests
Dr G Constantinou, Director, Geological Survey Department
Cl Philaniotis, Head Meteorological Service

The IHP is sponsored by UNESCO and its purpose is to implement and carry on the findings and activities of the International Hydrologic Decade which ended in 1975. Currently and until 1984 the IHP phase II has as a theme the Hydrology and the Scientific Bases for the Rational Management of Water Resources for Economic and Social Development. The local National Committee acts as a focal point for the IHP activities.

As a contribution of the Cyprus National Committee to the phase II of the IHP hosted organised with the support of UNESCO a symposium in Cyprus on the subject "Hydrological aspects of water supply and waste water disposal in coastal urban areas and tourist sites in the Mediterranean Area".

The symposium which was held in Nicosia on 5 to 9 October 1982 was attended by 14 foreign particupants representing Egypt, France, Federal Republic of Germany, Greece, Tunisia, Yugoslavia and the International Organisations of UNESCO, WHO and FAO as well as 26 participants from Cyprus. Fourteen papers were presented, relevant to the subject of the symposium.

The National Action Committee for the International Drinking Water Supply and Sanitation Decade (IDWSSD).

The Cyprus National Action Committee for the IDWSSD was established within the Department in 1981 consisting of officers dealing with aspects of planning, rural and town domestic water supply and water resources to deal with issues arising from our involvement with the IDWSSD and as a focal point for the Decade activities. The committee consists of the following WDD officials.

Chairman

C St Lytras, Director

Secretary

I Iacovides, Senior Hydrogeologist

Members

Dr Christodoulou, Principal Water Engineer
D Kypris, Senior Hydrogeologist
C Andreou, Senior Water Engineer
C C Artemis, Senior Water Engineer

The IDWSSD was launched in 1981 with the main theme of "clean water and adequate sanitation for all by 1990". In launching the decade the Member States of the United Nations recognized that drinking-water and sanitation services are essential for the full development of man as an individual and as an integral part of society and that all people, whatever their stage of development or socioeconomic conditions have right of access to those services in the quantity and quality required for their basic needs.

A main activity of the Decade is the Project and Programme Information System which aims to offer Government an option for increased external support for the Decade.

Studies in cooperation with IAEA and Institute of Geological Sciences (UK)

Technical Assistance Research Programme of the International Atomic Energy Agency (IAEA)

A new study was initiated in 1982 and is to be continued in 1983 under the above programme with the title "Isotopes in

REGISTER OF DAMS IN CYPRUS

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	1
SER No	NAME OF DAM	YEAR OF COMPLETION	LOCATION			TYPE	POSITION AND NATURE OF SEALING ELEMENT	FOUNDATION	HEIGHT ABOVE LOWEST FOUNDATION (m)	LENGTH OF CREST (m)	VOLUME CONTENT OF DAM ($10^3/m^3$)	GROSS CAPACITY OF RESERVOIR / RESERVOIR AREA ($10^3/m^3$) / ($10^3/m^2$)	PURPOSE	MAXIMUM DISCHARGE CAPACITY OF SPILLWAYS (m^3/s)	TYPE OF SPILLWAYS	OWNER	ENGINEERING BY	CONSTRUCTION BY	SER No
			RIVER	NEAREST CITY	STATE PROVINCE OR COUNTRY														
1	KAFIZES	1953	Xeros (Morp.)	Nicosia	Nicosia	PG		R	23	27	4	113 20	I	54	L	Lefka Irr. Div.	W D D	W D D	1
2	KANDOU	1956	Kouris	Limassol	Limassol	PG		R	15	53	2	34 12	I	59	L	Kandou Irr. Div.	W D D	W D D	2
3	PERAPEDHI	1956	Kouris	Limassol	Limassol	PG		R	22	62	4	55 12	I	107	L	Perapedhi Irr. Div.	W D D	W D D	3
4	PYRGOS	1957	Kafouris	Nicosia	Nicosia	PG		R	22	66	5	285 30	I	125	L	Pyrgos Irr. Div.	W D D	W D D	4
5	TRIMIKLINI	1958	Kouris	Limassol	Limassol	PG		R	33	76	6	340 23	I	59	L	Trimiklini Irr. Div.	W D D	W D D	5
6	ATHALASSA	1962	Pedhieos	Nicosia	Nicosia	TE	te	R/S	18	447	103	791 230	I	48	L	Government	W D D	W D D	6
7	GEUNYELI	1962	Pedhieos	Nicosia	Nicosia	TE	he	R/S	15	254	50	1045 276	I	173	L	Geunyeli Irr. Div.	W D D	W D D	7
8	LEFKA	1962	Marathasa	Nicosia	Nicosia	PG		R	35	149	11	368 45	I	246	L	Lefka Irr. Div.	W D D	W D D	8
9	MORPHOU	1962	Serakhis	Nicosia	Nicosia	TE	te	S	13	1436	206	1879 480	I	764	L	Morphou Irr. Div.	W D D	W D D	9
10	PRODHROMOS	1962	off stream	Limassol	Limassol	TE	te	R/S	10	756	73	122 26	I	—	L	Prodhromos Irr. Div.	W D D	W D D	10
11	KANLI KEUY	1963	Pedhieos	Nicosia	Nicosia	TE	he	R/S	19	311	47	1113 390	I	116	L	Kanli Keuy Irr. Div.	W D D	W D D	11
12	AGROS	1964	Kouris	Limassol	Limassol	TE	te & te	R	26	180	61	99 15	I	6	L	Agros Irr. Div.	W D D	W D D	12
13	ARGAKA	1964	Magounda	Paphos	Paphos	ER	te	R	41	173	138	1150 107	I	280	L	Government	Howard Humphreys & Sons of U K	W D D	13
14	KITI	1964	Tremithos	Larnaca	Larnaca	TE	te	S	22	990	183	1614 360	I	602	L	Government	Il Nuovo Castoro of Italy	W D D	14
15	LIOPETRI	1964	Potamos	Famagusta	Famagusta	TE	he	S	18	579	50	340 74	R	150	L	Liopetri Irr. Div.	W D D	W D D	15
16	MIA MILEA	1964	Pedhieos	Nicosia	Nicosia	TE	te	R/S	22	140	54	355 68	I	24	L	Mia Milea Irr. Div.	W D D	W D D	16
17	OVGOS	1964	Serrakhis	Nicosia	Nicosia	TE	te	S	16	745	130	845 260	I	786	L	Morphou Irr. Div.	W D D	W D D	17
18	AYIA MARINA	1965	Xeros	Paphos	Paphos	ER	te	R	33	142	61	311 33	I	161	L	Ayia Marina Irr. Div.	Energoprojekt of Yugoslavia	Med. Constr. Greece – G P Zachariades Cyprus	18
19	POLEMIDHIA	1965	Garyllis	Limassol	Limassol	TE	te	R/S	45	196	215	3864 110	I	581	L	Government	Energoprojekt of Yugoslavia	Mowlem & Ridgway of U K	19
20	KALOPANAYIOTIS	1966	Marathasa	Nicosia	Nicosia	TE	te	R	40	137	156	391 47	I	207	L	Government	Howard Humphreys & Sons of U K	W D D	20
21	MAVROKOLYMBOS	1966	Mavroko-lymbos	Paphos	Paphos	TE	te	R/S	45	528	267	2180 175	I	340	L	Government	Energoprojekt of Yugoslavia	CYBARCO of Cyprus	21
22	POMOS	1966	Livadhi	Paphos	Paphos	ER	te	R	38	302	153	859 83	I	300	L	Pomos Irr. Div.	Energoprojekt of Yugoslavia	Med. Constr. Greece – G P Zachariades Cyprus	22
23	YERMASOYIA	1968	Yermasoyia	Limassol	Limassol	TE	te	R	49	409	539	13600 1100	I	850	V	Government	Energoprojekt of Yugoslavia	CYBARCO of Cyprus	23
24	LEFKARA	1973	Syrkatis	Larnaca	Larnaca	ER	te	R	74	240	820	13850 650	S/I	316	L	Famagusta Water Board & Lefkara Irr. Div.	Howard Humphreys & Sons of U K	L Fairclaugh U K & MEDCON Cyprus	24
25	MASARI	1973	Serrakhis	Nicosia	Nicosia	TE	te	S	15	929	245	2273 620	I	622	V	Government	W D D	W D D	25

FOOTNOTES W D D Water Development Department
Irr. Div. Irrigation Division

REGISTER OF DAMS IN CYPRUS

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	
SER No	NAME OF DAM	YEAR OF COMPLETION	LOCATION			TYPE	POSITION AND NATURE OF SEALING ELEMENT	FOUNDATION	HEIGHT ABOVE LOWEST FOUNDATION m	LENGTH OF CREST m	VOLUME CONTENT OF DAM ($10^3/m^3$)	GROSS CAPACITY OF RESERVOIR / RESERVOIR AREA ($10^3/m^3$) ($10^3/m^2$)	PURPOSE	MAXIMUM DISCHARGE CAPACITY OF SPILLWAYS (m^3/s)	TYPE OF SPILLWAYS	OWNER	ENGINEERING BY	CONSTRUCTION BY	SER No
			RIVER	NEAREST CITY	STATE PROVINCE OR COUNTRY														
26	PALEKHORI KAMBI	1973	Akaki	Nicosia	Nicosia	PG		R	33	131	27	620 110	I	65	L	Government & Palekhori Irr. Div.	W D D	J & P Cyprus	26
27	ARAKAPAS	1975	Yermasoyia	Limassol	Limassol	PG		R	23	97	10	129	I	205	L	Arakapas Irr. Div.	W D D	W D D	27
28	AYII VAVATSINIAS No1	1980	off stream	Larnaca	Larnaca	TE	fp	S	17	125	32	20 55	I			Palambelia - Mosphilimoutti Irr. Div.	W D D	Iacovou Bros. Cyprus	28
29	EPHTAGONIA No1	1980	off stream	Limassol	Limassol	TE	fp	S	16	390	46	11 92	I			Kokkinoyia Irr. Div.	W D D	Iacovou Bros. Cyprus	29
30	KHANDRIA	1980	off stream	Limassol	Limassol	TE	fp	S	35	82	41	17 70	I			Kambos tou Paphiti Irr. Div.	W D D	CYBARCO Ltd.	30
31	MELINI	1980	off stream	Limassol	Larnaca	TE	fp	S	22	116	32	14 59	I			Melini Irr. Div.	W D D	Iacovou Bros. Cyprus	31
32	PELENDRIA	1980	off stream	Limassol	Limassol	TE	fp	S	18	229	59	13 123	I			Ammos Irr. Div.	W D D	FYSCO. Cyprus	32
33	AKAPNOU - EPHTAGONIA	1981	off stream	Limassol	Limassol	TE	fp	S	18	280	67	21 132	I			Akapnou - Ephtagonia Irr. Div.	W D D	Iacovou Bros. Cyprus	33
34	AYII VAVATSINIAS	1981	Vasilikos	Larnaca	Larnaca	VA		R	19	58	2	24 53	I			Palambelia - Mosphilomoutti Irr. Div.	W D D	W D D	34
35	KATO MYLOS	1981	off stream	Limassol	Limassol	TE	fp	S	23	240	41	12 104	I			Vatera Irr. Div.	W D D	Phoenix Constructions. Cyprus	35
36	AGRIDHIA	1982	off stream	Limassol	Limassol	TE	fp	S	18	119	25	20 59	I			Kladhos Irr. Div.	W D D	Iacovou Bros. Cyprus	36
37	ASPROKREMMOS	1982	Xeropotamo	Paphos	Paphos	TE	i e	R/S	56*	700	2097	12 51000	I	1484	L	Government	Sir M MacDonald & Partners U K	Joint Venture J & P and MEDCON Cyprus	37
38	KYPEROUNDA	1982	off stream	Limassol	Limassol	TE	fp	S	27	172	94	2590 273	I			Phterika Irr. Div.	W D D	Iacovou Bros. Cyprus	38
39	XYLIATOS	1982	Lagoudhera	Nicosia	Nicosia	ER	i e	R	42	155	240	36 1250	I	100	L	Government	W D D	General Construction Co Cyprus	39
40	LAGOUDHERA	C(1983)	off stream	Nicosia	Nicosia	TE	fp	S	36	123	63	96 70	I			Axousa Irr. Div.	W D D	Joint Venture Phoenix Constr. & KYKON. Cyprus	40
41	AYII VAVATSINIAS No2	C(1983)	off stream	Larnaca	Larnaca	TE	fp	S	25	130	30	14 43	I			Petalia - Palovato Irr. Div.	W D D		41
42	DHIERONA	C(1983)	off stream	Limassol	Larnaca	TE	fp	S	24	167	59	9 159	I			Dhiastera Irr. Div.	W D D		42
43	KHIROKITIA	C(1983)	off stream	Larnaca	Larnaca	TE	fp	S	16	460	95	27 205	I			Irr. Div. to be set up	W D D		43
44	DHYPOTAMOS	C(1985)	Pendaskinos	Larnaca	Larnaca	ER	i e	R	49	390	1090	31 15000	S/I	1130	L	Government	Rofe, Kennard & Lapworth & W Evans & Partners, U K		44
45	KALAVASOS	C(1985)	Vasilikos	Larnaca	Larnaca	ER	i e	R	57	482	*700	1000 17000	I/S	1268	L	Government	Rofe, Kennard & Lapworth & W Evans & Partners, U K		45
46												875							46
47																			47
48																			48
49																			49
50																			50

FOOTNOTES *3 Concrete cut-off wall 29m deep below lowest foundation

W D D : Water Development Department

J & P : Joannou & Paraskevaides

Irr Div : Irrigation Division

Hydrology-Kouris Delta (1982-83)" with *Mr I Iacovides*, Senior Hydrogeologist as the chief investigator.

The objective of the study is to identify the part of the recharge due to the Kouris River as compared to that of the local rainfall by using the variations in the stable isotopes of oxygen and deuterium in the groundwater of the Akrotiri aquifer.

During 1982 samples from boreholes, wells and from the Kouris runoff and rainfall (total of 120) were collected and sent to the IAEA laboratories for analysis for the tritium and stable isotope content.

Tentative results indicate that about 80% of the recharge is due to the infiltration from the Kouris River and 20% from local rainfall.

This study is of considerable importance in view of the proposed dam on Kouris River and the assessment of the future water balance of the Akrotiri aquifer after the construction of the dam.

Assessment of recharge to aquifers by lysimeter studies

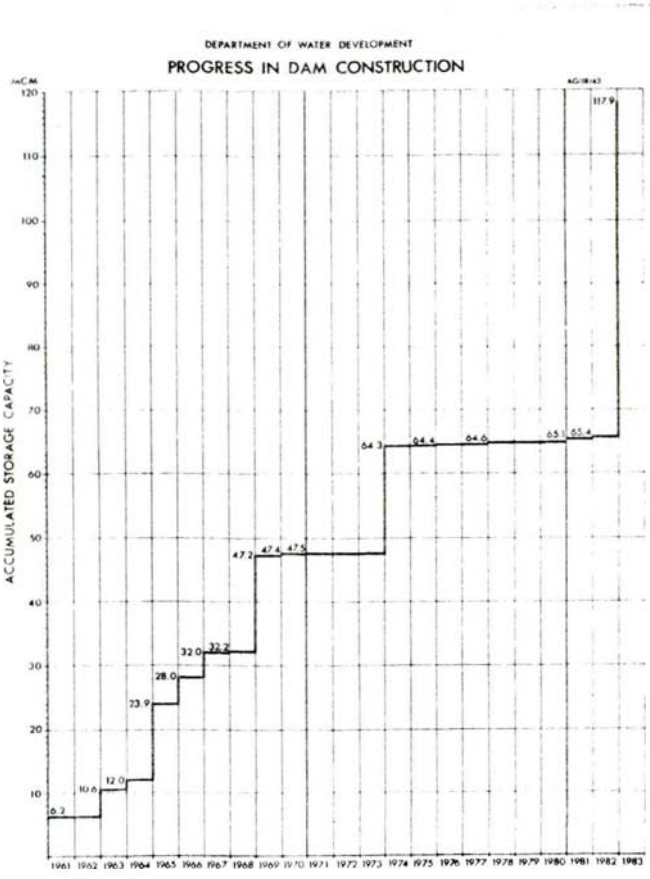
This research which is carried out in cooperation with the Institute of Geological Sciences (UK) in the areas of Paralimni, Xylophaghou, Avgorou and Akrotiri has moved to its fifth year. This research is to be completed in 1983.

Our Department is providing technical support at field level whilst the IGS is providing both financial and technical assistance.

The project investigates a number of different methods for assessing quantitatively the recharge to aquifers in semi-arid areas from rainfall. Large lysimeters purposely constructed have been used in the Southeastern Mesaoria area and Akrotiri as well as geochemical profile techniques. For the Southeastern Mesaoria a small recharge contribution of about 5 mm has been indicated as originating from rainfall whilst a mean annual recharge of 50 mm at Akrotiri has been assessed by the chloride profile method and the mini-lysimeter.

International Commission on Large Dams

The International Commission on Large Dams (ICOLD) is a non-profit seeking organisation with 70 member countries. As set out in its constitution: "The objects of the Commission are to encourage improvement in the design, construction, maintenance and operation of large dams by bringing together information thereon and by studying questions relating thereto".



The Cyprus National Committee on Large Dams (CYNCOLD) was elected to full membership of ICOLD in 1969. During 1982 the National Committee was composed of the following:

Chairman
C St Lytras, Director, WDD

Secretary
C C Artemis, Senior Water Engineer, WDD

Members
Dr C A Christodoulou, Principal Water Engineer, Head, Planning Division, WDD
Chr Marcoullis, Senior Water Engineer, Head, Design Division, WDD
A Papadopoulos, Representative of the Association of Civil Engineers and Architects

The post of the Representative of the Association of Building Contractors remained vacant.

The 50th Executive Meeting of ICOLD and the 14th Congress on Large Dams were held in Rio de Janeiro, Brazil between 28 April and 7 May 1982. Unfortunately the Cyprus National Committee was not represented at this meeting.

The four topics around which technical papers were presented to the Congress are:

- Safety of dams in operation
  Influence of geology and geotechnics on the design of dams
- Reservoir sedimentation and slope stability: Technical and environmental effects
- Materials and construction methods for embankment dams and cofferdams.

No committee meetings were held during the year but the secretary continued the exchange of correspondence with the Central Office of ICOLD in Paris and its technical committees and has both received and supplied technical information on dams and related subjects. The Departmental Technical Library has been enriched by the addition of several recent ICOLD publications.

The 51st Executive Meeting of ICOLD will be held in London, England between 31 August and 3 September 1983. The meeting will be followed by study tours to various dams between 4th and 9th September.

International Commission on Irrigation and Drainage

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

Membership to the ICID totals now 78 National Committees. Cyprus is a member country of the ICID since 1954 and the Cyprus National Committee in its present form was established in 1964. The Cyprus National Committee is now composed of the following:

Chairman
C St Lytras, Director, WDD

Secretary
N. Tsiourtis, Senior Water Engineer WDD

Members, Ex-officio

Director, Department of Forests
Director, Department of Agriculture
Director, Agricultural Research Institute

During the year 1982 the Cyprus National Committee continued the exchange of information with the Central Office of ICID and other National Committees. All publications such as six monthly bulletins, annual reports and other documents which were received from the Central Office of the ICID or elsewhere were distributed to all members of the CNCID.

In the year under review the following activities of the ICID took place:

The thirty third International Executive Council Meeting was held in New Delhi India from the 8th - 12th October 1982. The Executive Council Meeting has dealt with membership, finance and expenditures, publications, regional and international conferences arrangement, cooperation with other international organisations and the recommendations of Special Committees on various aspects.

In the period 5-7 October 1982 at the same place the permanent committees on Finance, on Research and Future Development, on Practices, on Construction Techniques and on Technical Activities, met and prepared reports which were presented to the Executive Council for discussion and further action.

The fourth Afro-Asian Regional Conference on "River Basin Development for food production" was held in Lagos (Nigeria) from 9-14 January 1982 and was attended by the President and Secretary General of the ICID.

Unfortunately Cyprus did not participate in either of the two activities mentioned above but its contribution and participation was limited to the interchange of information.

International Water Supply Association

The Department of Water Development was an associate member of the International Water Supply Association (IWSA) until 1969. Late in 1969 a National Committee was established. During 1982 the National Committee was composed of the following:

Chairman

C St Lytras, Director, WDD

Secretary

C C Artemis, Senior Water Engineer, WDD

Members, Ex-officio

The Representative of the Ministry of Interior. The Managers, Nicosia, Limassol, Famagusta and Larnaca Water Boards.

The Cyprus National Committee of the IWSA exchanged regular correspondence with the Head Office of the Association relative to its activities.

MEETINGS OF THE DIRECTOR WITH THE STAFF

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

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

FINANCE EXPENDITURE AND REVENUE

During the year 1982 the total actual expenditure by the Department from WDD budgeted and other non-budgeted votes amounted to £13,322,740 out of a total budget of £17,166,191.
This is again a record expenditure made since the creation of this Department.
The general picture is as follows:

TABLE I-1

GENERAL BUDGET-EXPENDITURE FIGURES FOR 1982

Description	Budget £	Expenditure £
W D D Development Estimates...	10 846 037	8 722 287
Village loans....	393 126	
W D D Ordinary Estimates.....	2 053 167	1 785 313
Non-budgeted votes for Pitsilia Project, refugee housing estates, works for other Government and village deposits.	3 873 861	2 815 140
Total.....	£17 166 191	£13 322 740

The level of construction works carried out during 1982 was again an all time record expenditure amounting to £9,863,081 from WDD and other votes. See table V-1 under CONSTRUCTION DIVISION.
The largest single item of expenditure was again Paphos Irrigation Project at just over £3.5 million.

Revenue

A sum of £1,092,373 was collected during the year (1981 was £324,509) as revenue mainly from the sale of water for Nicosia and Famagusta Water Supplies and Paphos Irrigation Project (See table I-5)

TABLE I-2

EXPENDITURE FOR THE YEAR 1982

Ser No	Details	Expenditure Government Ordinary £	Government Development £	Village (Loans) £	Total £
A	*W D D Votes*				
1	Administration.....	770 045	786 607	-	1 556 652
2	Greater Nicosia WS scheme running expenses...	680 016	-	-	680 016
3	Famagusta WS scheme running expenses.....	241 230	-	-	241 230
4	Regional village WS schemes running expenses..	41 342	-	-	41 342
5	Irrigation, drainage and dams.....	34 763	5 273 106	92 040	5 399 909

TABLE I-2

EXPENDITURE FOR THE YEAR 1982

Ser No	Details	Expenditure: Government Ordinary £	Government Development £	Village (Loans) £	Total £
A	***W D D Votes***				
6	Town water supplies.....	-	1 540 319	-	1 540 319
7	Village water supply schemes.....	-	371 054	189 792	560 846
8	Drilling & prospecting....	7 980	-	-	7 980
9	Hydrology.....	-	142 021	-	142 021
10	Surveys & investigations..	-	269 739	-	269 739
11	Purchase of machinery and equipment.....	-	32 703	-	32 703
12	Stores.....	9 937	-	-	9 937
13	Others.....	-	4 982	-	4 982
14	Save water campaign.....	-	19 924	-	19 924
	Total.....	£1 785 313	£8 440 455	£281 832	£10 507 600

B Non-budgeted Votes		£
1	Pitsilia Project.....	1 759 878
2	Refugee housing estates.....	536 233
3	Works for other Government Departments.....	362 558
4	Works for private developers.....	110 510
5	Works through village deposits.....	45 961
	Total.....	£2 815 140
	Grand total.....	£13 322 740

(i) Breakdown of Administration

		Ordinary £	Development £	Total £
1	Personal emoluments.....	740 068	586 040	1 326 108
2	Casual technical assistance.....	-	133 294	133 294
3	Travelling.....	5 647	55 314	60 961
4	M'ce & operation of motor transport...	7 900	-	7 900
5a	Office expenses.....	8 030	9 043	17 073
5b	Purchase of drawing materials.....	-	2 916	2 916
6	Government water supply.....	8 400	-	8 400
	Total.....	£770 045	£786 607	£1 556 652

(ii) Breakdown of Irrigation, Drainage & Dams

		Government £	Village £	Total £
1	Minor irrigation schemes.....	146 812	60 897	207 709
2	River training.....	2 564	-	2 564
3	Consultants' fees.....	416 000	-	416 000
4	Paphos Irrigation Project.....	3 556 597	-	3 566 597
5	Vasilikos-Pendaskinos Project.....	1 045 809	-	1 045 809
6	Other major irrigation works.....	105 324	31 143	136 467
7	M'ce of dams & distribution systems.	19 745	-	19 745
8	Government irrigation schemes.....	15 018	-	15 018
	Total.....	£5 307 869	£92 040	£5 399 909

TABLE I-3

W D D ORDINARY BUDGET

STATEMENT OF MONTHLY EXPENDITURE FOR THE YEAR 1982

Head 20A Water Development

	£
1982 Approved.....	1 874 194
Add Special Warrants.....	178 973
Total.....	£2 053 167

Month	Monthly expenditure £	Cumulative expenditure £	%
January...	63 109	63 109	3.07
February..	102 477	165 586	8.64
March.....	155 478	321 064	15.63
April.....	109 350	430 414	20.96
May.....	163 326	593 740	28.92
June.....	162 096	755 836	36.81
July.....	123 853	879 689	42.84
August....	140 134	1 019 823	49.67
September.	115 830	1 135 653	55.31
October...	168 492	1 304 145	63.51
November..	130 459	1 434 604	69.87
December..	350 709	1 785 313	86.95

Summary

	£	%
Amount approved.....	2 053 167	100.00
Less actual expenditure.....	1 785 313	86.95
Balance.....	267 854	13.05

TABLE I-4

W D D DEVELOPMENT BUDGET

STATEMENT OF MONTHLY EXPENDITURE FOR THE YEAR 1982

(Not including village loans)

Head 2D Water Development

	£
1982 Approved.....	7 496 642
Add Special Warrants.....	3 349 395
Total.....	£10 846 037

Month	Monthly Expenditure £	Cumulative Expenditure £	%
January ..	454 516	454 516	4.19
February..	225 331	679 847	6.26
March.....	538 099	1 217 946	11.22
April.....	1 025 754	2 243 700	20.68
May.....	413 665	2 657 365	24.50
June.....	639 326	3 296 691	30.39
July.....	642 333	3 939 024	36.31
August....	819 596	4 758 620	43.87
September.	1 043 092	5 801 712	53.49
October...	548 746	6 350 458	58.55
November..	426 152	6 776 610	62.48
December..	1 663 845	8 440 455	77.82

Summary

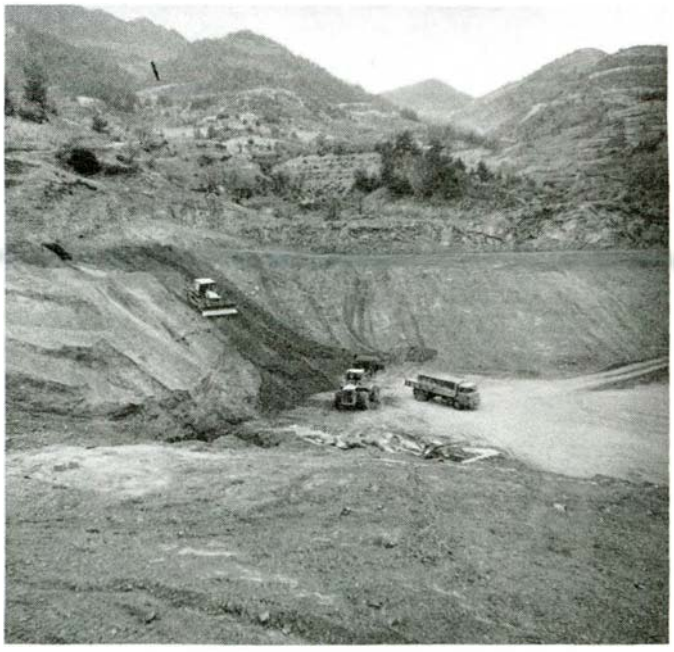
	£	%
Amount approved.....	10 846 037	100
Less actual expenditure.....	8 440 455	77.82
Balance.....	2 405 582	22.18

TABLE I-5

STATEMENT OF REVENUE COLLECTED DURING THE YEAR 1982

Description	£
Drilling charges.....	28
Greater Nicosia Scheme.....	498 050
Paphos Irrigation Project.....	158 033
Famagusta W S scheme.....	336 852
Village water supplies.....	30 111
Khrysokhou Irrigation Project...	7 088
Other fees.....	62 211
Total.....	£1 092 373

For all 1982 construction works expenditure see tables under CONSTRUCTION DIVISION



Lagoudhera Pond under construction. WDD Photo D34-8 (26.11.82).

STAFF MATTERS

Appointments
On a monthly (Unestablished or Temporary) Basis

During the period under review the following were appointed to the posts as indicated:

Constantinos Hadjisavva, Mechanical Engineer II with effect from 15.6.82.
Photios Photiou, Topographer Irrigation Engineer II with effect from 15.12.82.
Demetra Patsalidou, Clerk 2nd Grade General Clerical Staff GCS with effect from 10.7.81.
Maroulla Theodorou, Clerk 2nd Grade, GCS, with effect from 10.7.81.

Emplacement to Permanent (Ord.) posts

The following Foremen who were holding the permanent (Ord.) post on unestablished basis, have been emplaced to the permanent (Ord.) post of foreman with effect from 1.8.82.

Panayiotis Eracleous — *Phidias Metaxas*
Pavlos Aristotelous — *Ioannis Potamaris*
Costas Nicolaides — *Eleftherios Elia*
Phidias HjiXenophontos

The following Technicians 1st Grade who were holding the permanent (Ord.) post on unestablished basis, have been emplaced to the permanent (Ord.) post of Technician 1st Grade with effect from 15.9.82.

Panos Andreou — *Elias Despotis*
Andreas Panayides — *Andriani Nicolaou*
Stelios Constantinides — *Antonis Shellis*

The following Technicians 2nd Grade who were holding the permanent (Ord.) post on unestablished basis have been emplaced to the permanent (Ord.) post of Technician 1st Grade with effect from 15.9.82.

Andreas Phylactou — *Georghios Zachariou*
Nicos Philippides — *Zacharias Yiasoumi*

Promotions

Michael Meletios and *Neoclis Ioannou* were promoted to the permanent (Ord.) post of Assistant Chief Foreman with effect from 1.2.82.

The following officers were promoted to the permanent (Dev.) post of Assistant Chief Foreman with effect from 1.2.82.

Chrysanthos Metaxas — *Michael Olympios*
Panayiotis Andreou — *Christophoros Michael*
Sophoclis Kyriakou — *Demosthenis Stavrou*
Costas Papallis

George Charalambous and *Sam Giragosian* were promoted to the permanent (Ord.) post of Senior Technical Superintendent with effect from 15.3.82.
Theodoros Nicolaides and *Constantinos Katsavras* were promoted to the permanent (Ord.) post of Executive Engineer I with effect from 15.3.82.
Nicodemos Nicodemou was promoted to the permanent (Dev.) post of Executive Engineer I with effect from 15.3.82.
Michalakis Ioannou and *Soteris Paschalides* were promoted to the permanent (Ord.) post of Executive Engineer I on an unestablished basis with effect from 15.3.82.
Vlasis Partasides was promoted to the temporary (Dev.) post of Executive Engineer I with effect from 15.3.82.
Dr Andreas Christodoulides was promoted to the permanent (Dev.) post of Hydrologist I with effect from 15.3.82.
Andreas Aristides was promoted to the permanent (Ord.) post of Clerk 1st Grade GCS with effect from 15.3.82.

The following officers were promoted to the permanent (Ord.) post of Technician 1st Grade on unestablished basis with effect from 15.3.82.

Panos Andreou — *Elias Despotis*
Andreas Panayides — *Andriani Nicolaou*
Stelios Constantinides — *Antonis Shellis*

Adonis Georghiou was promoted to the permanent (Ord.) post of Geologist I with effect from 15.3.82.

The following officers were promoted to the permanent (Dev.) post of Technician 1st Grade with effect from 15.3.82.

Antonakis HjiIoannou — *Eleni HjiKyriakou*
Andreas Aniftos — *Aphroditi Rodosthenous*
Stavros Socratous — *Georghia Markitsi*
Iacovos Tsimittis — *Paraskevi Maratheftou*
Constantinos Stavrou — *Stavroulla Selipa*
Loucas Loizou

The following officers were promoted to the permanent (Ord.) post of Technician 1st Grade with effect from 15.3.82.

Andreas Nicolaides — *Georghios Saparillas*
Phaedon Stavrou — *Georghios Pashiardis*
Savvas Katsianis — *Chysostomos Kambanellas*
Ioannis Mintzides — *Georghios Andreou*
Andreas Theodorou — *Athanasios Klitou*
Sophoclis Nicolaou — *Andreas Karoullas*
Polynikis Constantinides — *Takis Ioannou*
Christodoulos Kyriakou — *Kypros Mourouzides*
Glavkos Stavraki — *Vassos Zenios*
Panayiotis Photiou — *Antonios Papageorghiou*
Christos Georghiades — *Michael Michaelides*
Andreas Makis — *Andreas Sophocleous*
Andreas Kourtellas — *Georghios Dicomitis*
Andreas Pengeros — *Panos Antoniades*
Georghios Pittas — *Nicos Mavrommatis*
Petros Makkoulas — *Andreas HjiPakkos*
Eleftherios Phinikarides — *Charalambos HjiStavrou*
Ioannis Mouskoundis

Charilaos Akritas was promoted to the temporary (Dev.) post of Technician 1st Grade with effect from 15.3.82.
Niki Michael and *Petros Neophytides* were promoted to the temporary (Dev.) post of Topographer Irrigation Engineer I with effect from 15.3.82.
Maria Yiangou and *Eleni Adamidou* were promoted to the temporary (Dev.) post of Technician 1st Grade with effect from 15.6.82.
Dr Stephanos Papatryphonos was promoted to the temporary (Dev.) post of Hydrologist I with effect from 15.6.82.
Ioannis Efstathiou and *Xenia Voskou* were promoted to the permanent (Ord.) post of clerk 1st Grade, GCS with effect from 15.6.82.
Panayiotis Kazamias and *Panayiotis Neophytou* were promoted to the permanent (Ord.) post of

Technician Superintendent with effect from 15.7.82 *Joseph Karoglanian* and *Andreas Nicolaides* were promoted to the permanent (Ord.) post of Senior Technician with effect from 15.7.82.
Antonis Nicola was promoted to the permanent (Ord.) post of Chief Foreman with effect from 15.7.82.
Leonidas Triteos was promoted to the permanent (Dev.) post of the Chief Foreman with effect from 15.7.82.
Andreas Ashiotis, Costas Matheou and *Alexandros Avgousti* were promoted to the permanent (Ord.) post of Assistant Chief Foreman with effect from 15.7.82.

The following officers were promoted to the permanent (Ord.) post of Senior Water Engineer with effect from 1.8.82.

Christos Marcoullis	*Christodoulos Artemis*
Andreas Georghiadhes	*Nicolas Stylianou*
Costas Andreou	*Nicos Tsiourtis*

Dedalos Kypris and *Iacovos Iacovides* were promoted to the permanent (Ord.) post of Senior Hydrogeologist with effect from 1.8.82.
Niki Michael was promoted to the permanent (Dev.) post of Topographer Irrigation Engineer I with effect from 1.8.82.

Appointments on Contract

The contracts of *Georghios HjiIoannou*, Technical Assistant and *Christophoros Georghiades*, Administrative Officer were renewed for one more year.

Retirements

George Charalambous, Senior Technical Superintendent retired from the Government Service with effect from 1.5.82.
Andreas Christodoulou, Assistant Chief Foreman retired from the Government Service with effect from 1.11.82.
Demosthenis Stavrou, Assistant Chief Foreman retired from the Government Service with effect from 1.11.82.
Christophoros Michael, Assistant Chief Foreman retired from the Government Service with effect from 1.12.82.
Anastasis Nicola, Chief Foreman retired from the Government Service with effect from 31.12.82.
Costas Papalli, Assistant Chief Foreman retired from the Government Service with effect from 31.12.82.

Scholarships

Pantelis Eliades, Executive Engineer II who has been granted a scholarship in Civil Engineering at the University of New York, USA, (by the Fulbright Programme in Cyprus) completed his studies and was awarded the MSc degree in Civil Engineering. He resumed his duties on the 12.2.82
Maria Zachariou and *Demosthenis Patsalides*, Executive Engineers I have been granted a three months scholarship (8.3.82 - 7.6.82) by the Italian Government on Research and Utilization of Water Resources.
Panayiotis Scordis, Executive Engineer II has been granted a three months scholarship (14.6.82-11.9.82) by the Government of the Socialist Federal Republic of Yugoslavia on Water Resources Engineering.
Costas Andreou, Senior Water Engineer has been granted a three months scholarship (10.9.82-10.12.82) on Sewage Treatment provided by the UK Government under Technical Cooperation Training Programme.
Soteris Paschalides, Executive Engineer II has been granted a scholarship for the International Course in Hydraulic Engineering which was provided by the Netherlands Government.
Andriani Nicolaou, Technician 1st Grade has been granted a scholarship in Civil Engineering provided by the British Council Undergraduate Fee Support Scheme in UK.
Chrysostomos Kambanellas, Technician 1st Grade who has been granted a scholarship by Ioannou and Paraskevaides to obtain a BSc degree in Civil Engineering at the Catholic University of America, completed his studies and resumed his duties on 23.12.82.

Study Leave

Ioanna Nicolaou, Technician 2nd Grade has been granted one year's study leave without pay to obtain a BSc degree in Civil Engineering at the Catholic University of America.

Transfers

Maria Chrysostomou, Clerk 2nd Grade, GCS, was transferred to this Department from Statistics and Research Department with effect from 5.9.82.
Leandros Markides, Technician 2nd Grade was transferred to Nicosia from Limassol with effect from 1.11.82.
Eleni Papapetrou, Clerk 2nd Grade, GCS was transferred from this Department to Accountant's General Office with effect from 17.5.82.
Gavriel Panayi, Messenger, was transferred from this Department to Inland Revenue Department with effect from 9.8.82.
Kalypso Papanicolaou, Clerk 2nd Grade, GCS was transferred from this Department to District Court Famagusta with effect from 23.8.82.

II DIVISION OF WATER RESOURCES

by
D C Kypris
Senior Hydrogeologist
Head of Division

General

During 1982 we had no possibility again to collect hydrological data in the part of Cyprus still occupied for the eighth year by the Turkish troops amounting to 40% of the Cyprus land. So the behaviour of both surface runoff and groundwater bodies could not be followed or recorded in the northern part of the country during the year under examination.

The new areas brought under hydrological observation during the year have an extent of about 117 square kilometers. A number of 1056 wells/boreholes and springs were plotted or replotted in this area with their relative information recorded. A supplementary plotting was also carried out in the areas already covered for 687 new wells/boreholes.

INTRODUCTION

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

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

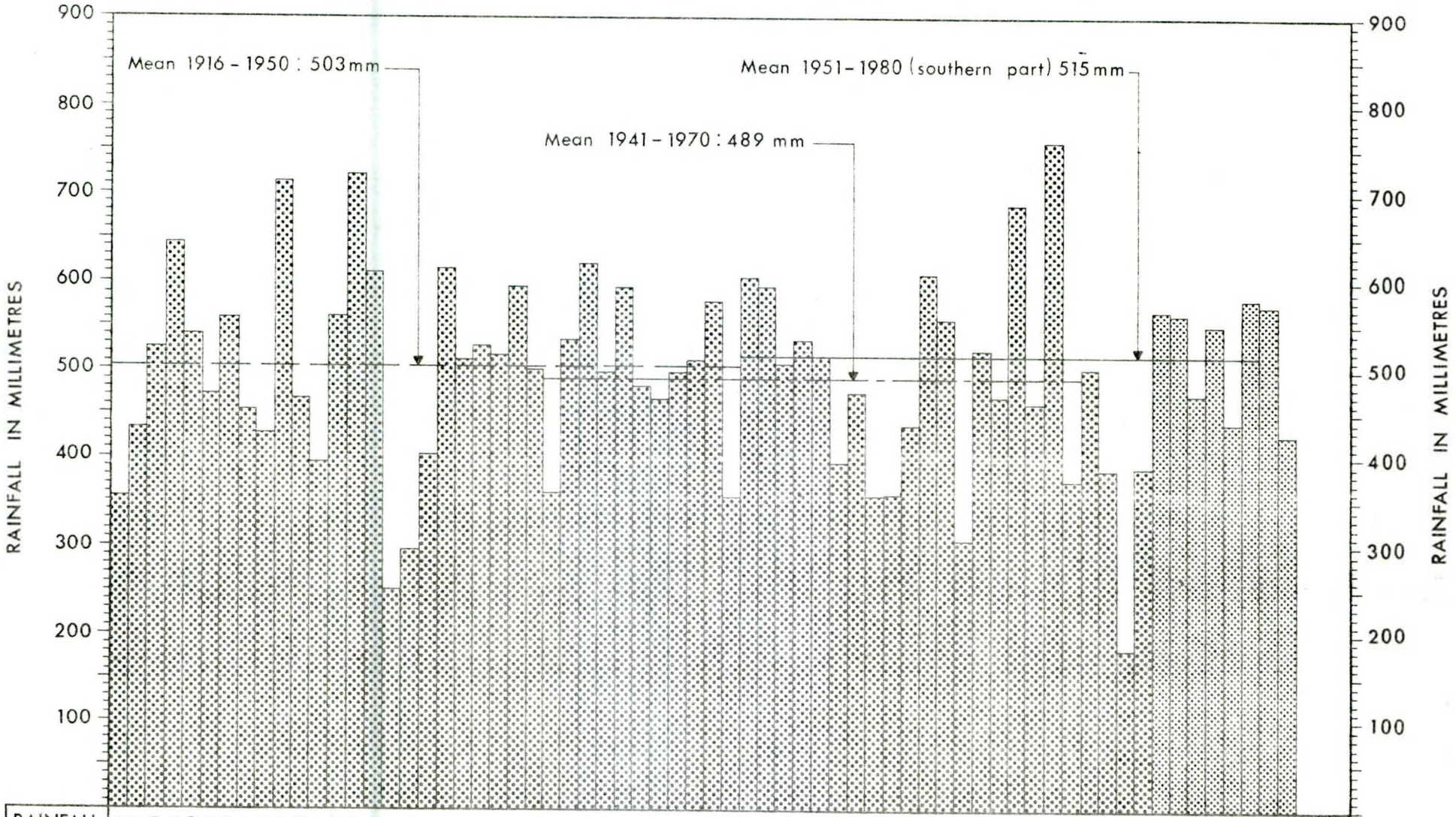
During 1982, D C Kypris, Senior Hydrogeologist, was the Head of Division, M Peppis, Geologist, Class I, was the Assistant Head. He was also Head of the Drilling Permits and Water Control Branch. M Peppis acted also as the chairman of the specially formed advisory committee for the issue of well permits.

DRILLING OPERATIONS

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

- Cleaning of eight existing boreholes.
- Drilling of ten boreholes, one for domestic water supply and nine for engineering geology purposes and the determination of hydrological parameters

ANNUAL AVERAGE RAINFALL OF CYPRUS 1916 - 1982



HYDROL. YEAR	RAINFALL in mm
1916-17	354
1917-18	433
1918-19	523
1919-20	644
1920-21	540
1921-22	472
1922-23	560
1923-24	454
1924-25	428
1925-26	713
1926-27	468
1927-28	395
1928-29	562
1929-30	720
1930-31	610
1931-32	251
1932-33	296
1933-34	402
1934-35	615
1935-36	511
1936-37	527
1937-38	516
1938-39	596
1939-40	500
1940-41	360
1941-42	534
1942-43	620
1943-44	498
1944-45	595
1945-46	482
1946-47	467
1947-48	498
1948-49	511
1949-50	580
1950-51	355
1951-52	605
1952-53	596
1953-54	506
1954-55	533
1955-56	515
1956-57	394
1957-58	474
1958-59	357
1959-60	358
1960-61	437
1961-62	608
1962-63	557
1963-64	306
1964-65	522
1965-66	469
1966-67	688
1967-68	462
1968-69	759
1969-70	373
1970-71	501
1971-72	387
1972-73	182
1973-74	389
1974-75	567
1975-76	563
1976-77	471
1977-78	549
1978-79	439
1979-80	582
1980-81	574
1981-82	425
1982-83	
1983-84	
1984-85	

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

of the aquifers where the Kouris and Evretou dams will be constructed. Total penetrated depth, 355 m.

- Removing pumps stuck or broken in boreholes.

TEST PUMPINGS

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

Pumping tests are also carried out for Government works.

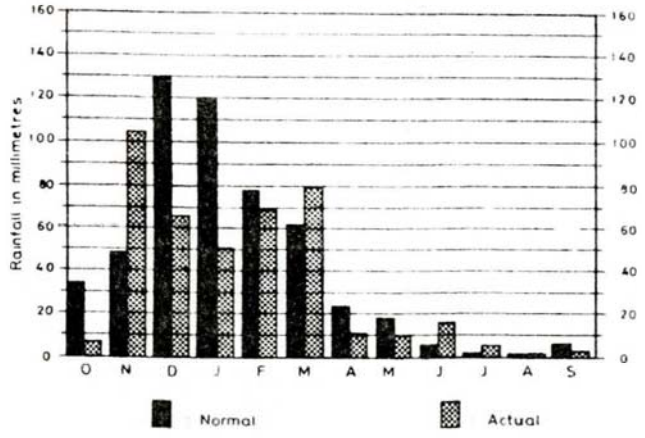
During 1982, 53 test pumpings were carried out as follows:

- 7 for division of land with total hours pumped..... 168
- 39 for building permits with total hours pumped..... 157
- 4 for irrigation divisions with total hours pumped..... 69
- 3 for town and village water supplies with total hours pumped..... 25

METEOROLOGICAL SUMMARY

As it is not possible for the Meteorological Service of the Republic of Cyprus to obtain measurements of various meteorological elements in the northern part of the Island because it is occupied by Turkish troops, the data given below relate to the weather experienced in the southern part of the Island during the hydrometeorological year 1981-1982.

GRAPHICAL PRESENTATION
OF INCIDENCE OF RAINFALL



Precipitation

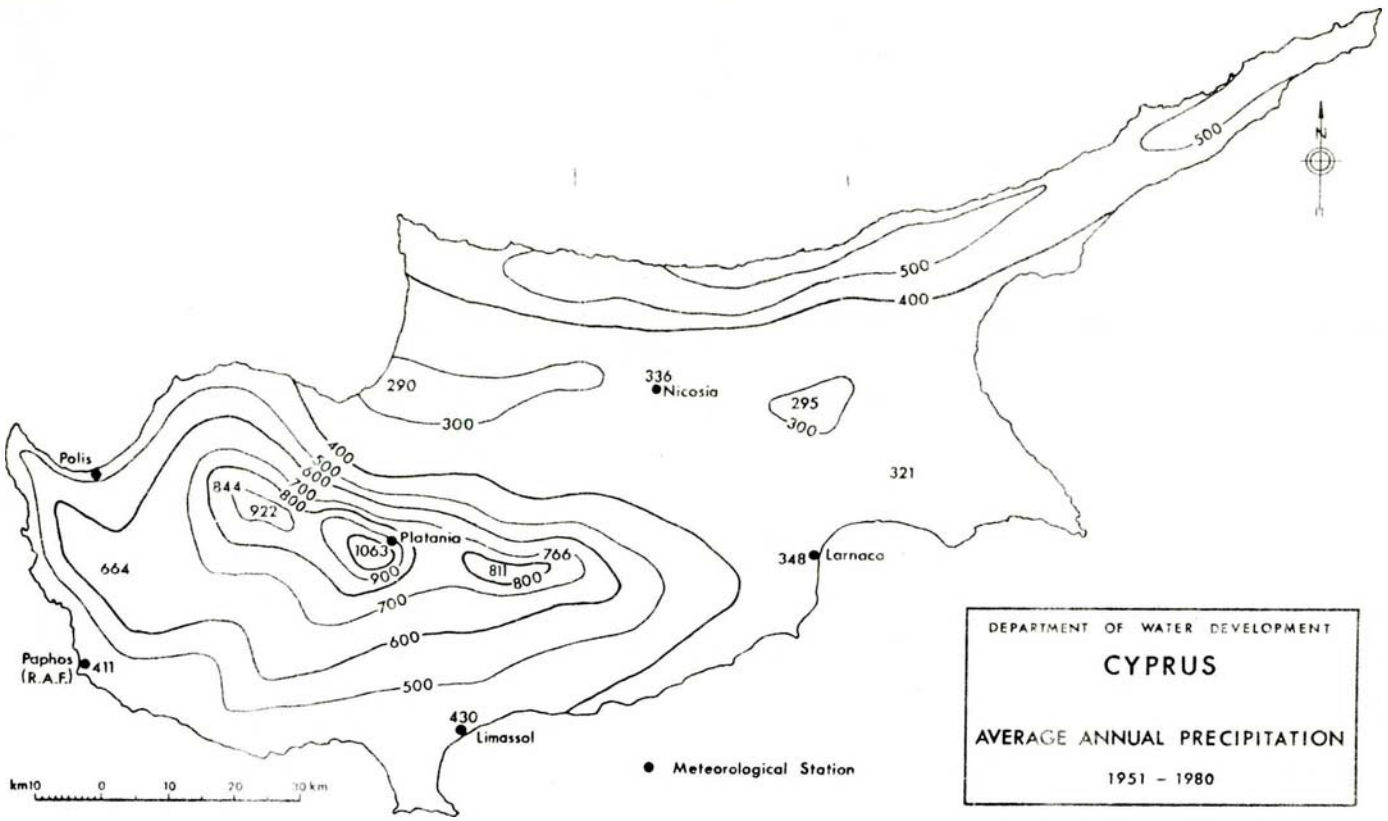
The yearly total precipitation averaged over the southern part of the Island during the hydrometeorological year October 1981 - September 1982 was 425 mm which is 80% of normal.
(Normal is considered the average rainfall over the southern part of the Island during the period 1941-1970).
The total precipitation amounts during the period under review were around normal in Kokkinokhoria area and between 70% and 95% of normal in all other areas.
As regards the monthly distribution of precipitation, it was above normal in November, March, June, July and August and below normal in October, December, January, February, April, May and September.
The following table, giving the incidence of rainfall during the hydrometeorological year 1981 - 1982, illustrates the situation.

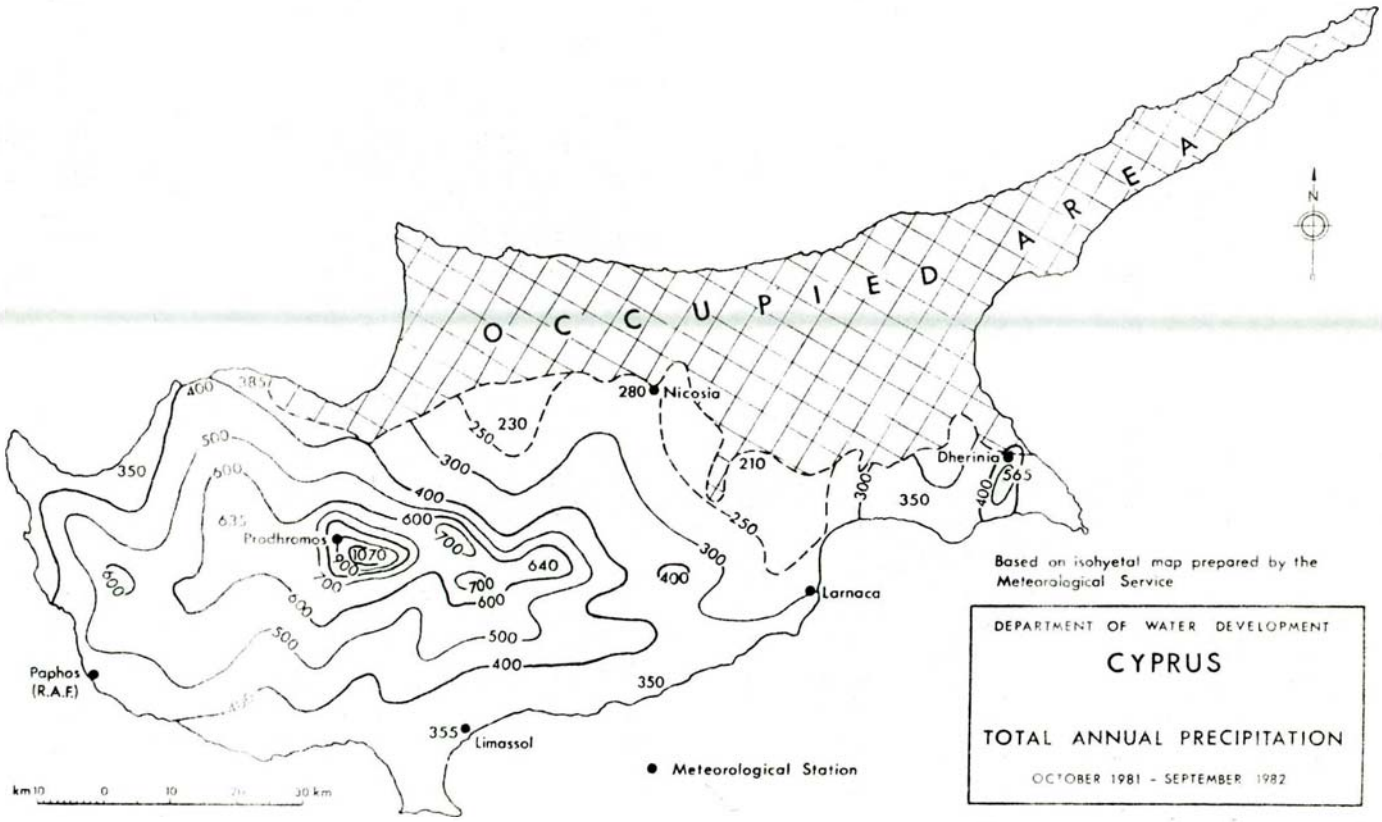
TABLE II-1
INCIDENCE OF RAINFALL DURING THE HYDROMETEOROLOGICAL YEAR 1981-1982

Months	Rainfall (in mm)	Rainfall (in inches)	Percentage of yearly total	Percentage of monthly normal
October.....	7.5	0.30	1.8	22
November.....	104.5	4.11	24.5	217
December.....	66.5	2.62	15.7	52
January.....	51.0	2.01	12.0	43
February.....	68.9	2.71	16.2	89
March.....	79.3	3.12	18.8	129
April.....	10.6	0.41	2.5	46
May.....	9.9	0.38	2.3	53
June.....	15.9	0.62	3.7	273
July.....	5.8	0.23	1.4	347
August.....	1.8	0.07	0.4	129
September.....	3.0	0.12	0.7	45
Totals.....	424.7	16.70	100.0	-

Note: Yearly total as percentage of yearly normal: 80%

The maximum amount of rainfall in a 24-hour period during the hydrometeorolo- year was 353.0mm reported by Sotira village Elementary School rainfall station on 27th November 1981. This amount is the highest ever recorded by any station in Cyprus.
The first snowfall occurred on mount


500
400
290
300
336
Nicosia
295
300
321
Polis
400
500
600
700
800
844
922
1063
900
Platania
766
811
800
664
348
Larnaca
700
600
500
Paphos
(R.A.F.)
411
430
Limassol
km10 0 10 20 30 km
Meteorological Station
DEPARTMENT OF WATER DEVELOPMENT
CYPRUS
AVERAGE ANNUAL PRECIPITATION
1951 - 1980


O C C U P I E D A R E A
400
385
280
Nicosia
230
250
300
210
Dherinia
565
350
500
600
350
400
600
635
Prodhromos
1070
900
700
640
700
600
600
400
300
250
Larnaca
500
400
350
Paphos
(R.A.F.)
355
Limassol
km10 0 10 20 30 km
Meteorological Station
Based on isohyetal map prepared by the
Meteorological Service
DEPARTMENT OF WATER DEVELOPMENT
CYPRUS
TOTAL ANNUAL PRECIPITATION
OCTOBER 1981 - SEPTEMBER 1982

Olympus on the 17th November 1981, which is a fortnight earlier than the median date for the first snowfall in Cyprus. Subsequent snowfalls occurred during the ensuing months till April. The last one occurred on the 14th April 1982 which is about a week beyond the median date of the last snowfall in Cyprus. Hail occurred in all months except April and August.

Temperature

During the hydrometeorological year 1981-1982 the air temperature as a whole was slightly below normal. In particular, monthly mean temperatures were above normal in October, December, January, April and September, they were normal in August and below normal in November, February, March, May, June and July.

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

Evaporation

Monthly total evaporation (in mm) measured from United States Weather Bureau (U.S.W.B.) class "A" pan during the hydrometeorological year 1981-1982 at selected stations is given below.

SURFACE WATER

Permanent Stream Gauging Stations

On important streams and diversion intakes for irrigation, at selected places, permanent flow gauging stations equipped with automatic water level recorders have been established for the purpose of calculating the quantity of water flowing through each station. All these stations have to be inspected regularly i.e. every week, fortnight or month for the purpose of checking and maintenance of equipment, change of charts, velocity measurements of flowing water with current meter for calibration purposes, etc. During the wet season the visits are more frequent for

TABLE II-2

INCIDENCE OF MAXIMUM AND MINIMUM TEMPERATURES 1981-1982

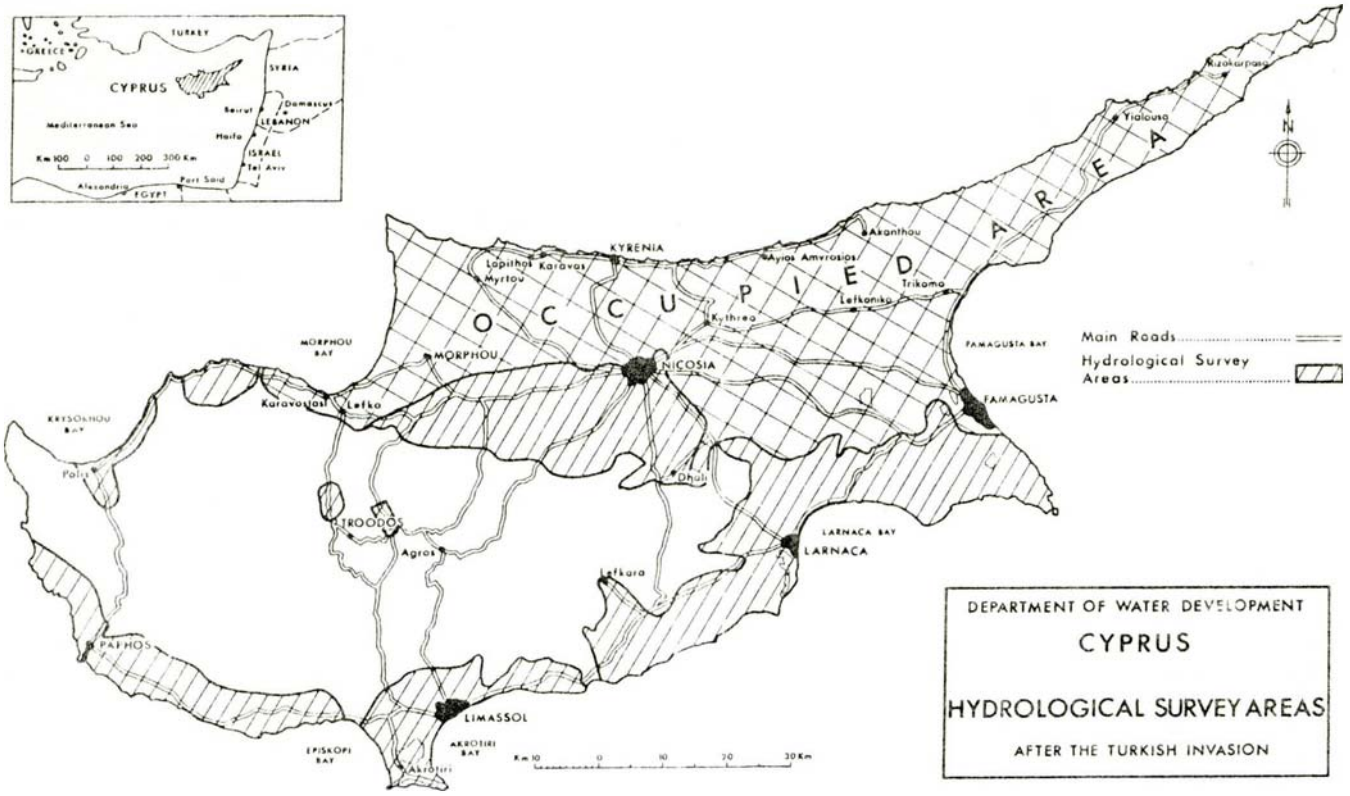
Station	Extreme maximum temperature °C	Extreme maximum temperature date	Extreme minimum temperature °C	Extreme minimum temperature date
Nicosia	40.4	29th June	-0.7	16th February
Limassol	37.9	11th August	2.9	16th January
Larnaca Airport	37.8	26th June	0.2	15th February
Paphos R.A.F Station	36.7	11th May	4.1	11th March
Panayia Bridge	37.6	11th August	-2.8	16th February
Saittas	37.5	12th August	-1.5	16th January
Amiandos	31.0	30th June	-6.7	4th February
Prodhromos	31.0	12th August	-7.0	5th February
Stavros Psokas	36.3	11th August	-2.5	4th February
Kornos	39.0	12th August	-1.0	16th February
Platania	33.7	12th August	-4.5	15th February
Phasouri	36.5	26th June & 11th August	0.0	16th January

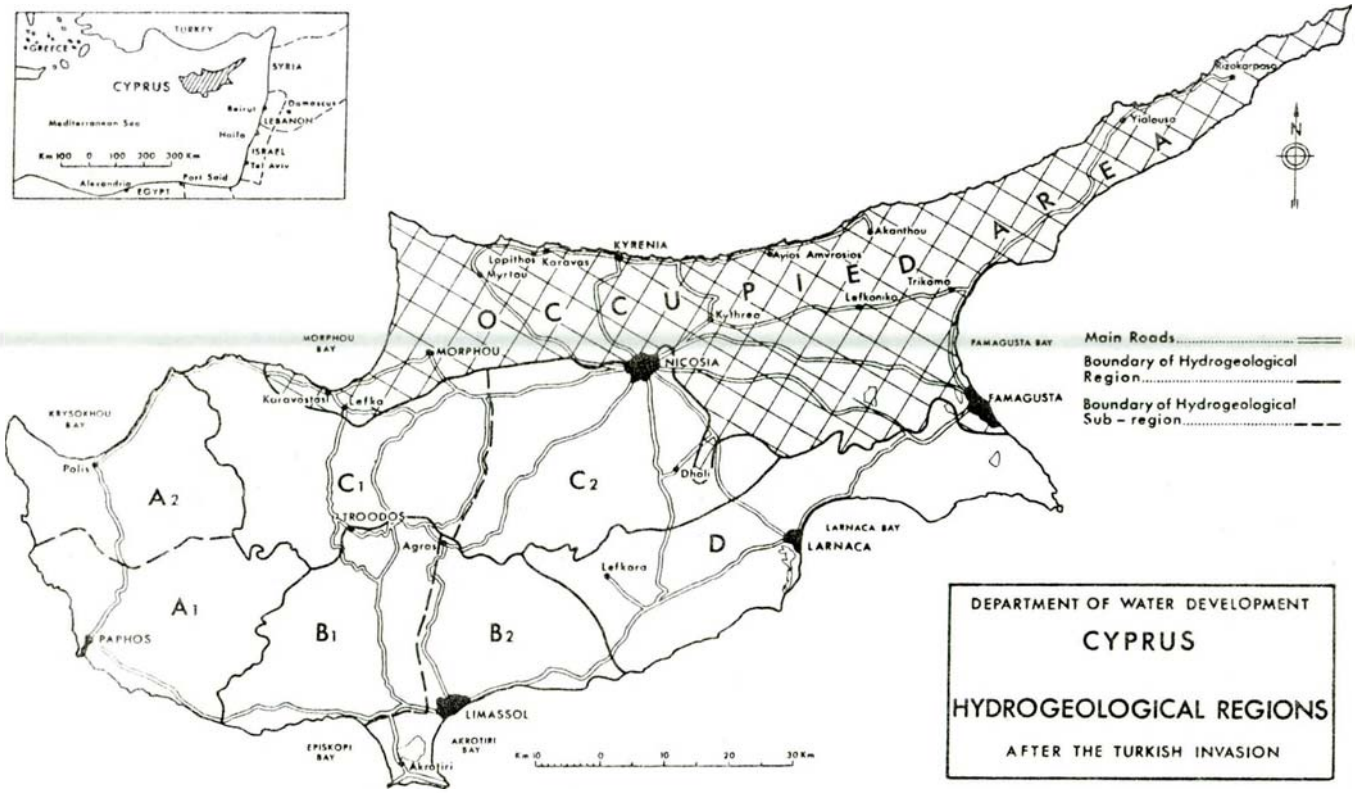
TABLE II-3

TOTAL MONTHLY EVAPORATION

Stations	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	April	May	June	July	Aug.	Sept.
Nicosia	200	191	75	65	53	82	127	214	259	279	270	205
Athalassa	156	77	57	58	57	75	121	222	275	298	300	227
Larnaca Airport	180	120	80	84	85	118	151	239	276	307	281	229
Saittas	136	61	52	60	54	67	130	174	220	234	227	177
Akhelia	144	110	71	74	71	90	127	183	204	218	214	169
Yermasoyia	144	78	46	53	62	78	127	209	271	262	234	189
Polemidhia	139	86	53	55	63	74	*	*	253	250	244	200
Prodromos	110	51	30	*	*	*	101	139	186	179	191	129

* No records


TURKEY
GREECE
CYPRUS
SYRIA
Beirut
Damascus
LEBANON
Mediterranean Sea
Haifa
ISRAEL
Tel Aviv
Km 100 0 100 200 300 Km
Port Said
Alexandria
EGYPT
OCCUPIED AREA
KYRENIA
Lapithos
Karavas
Myrtou
Ayios Amvrosios
Akanthou
Yialousa
Kizilkarpaz
Trikomo
Lefkonika
Kythrea
MORPHOU BAY
MORPHOU
NICOSIA
FAMAGUSTA BAY
FAMAGUSTA
Karavostasi
Lefka
KRYSOKHOU BAY
Polis
Dhali
TROODOS
Agros
LARNACA BAY
LARNACA
Lefkara
PAPHOS
LIMASSOL
EPISKOPI BAY
AKROTIRI BAY
Akrotiri
Km 10 0 10 20 30 Km
N
Main Roads
Hydrological Survey Areas
DEPARTMENT OF WATER DEVELOPMENT
CYPRUS
HYDROLOGICAL SURVEY AREAS
AFTER THE TURKISH INVASION


TURKEY
GREECE
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SYRIA
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Damascus
LEBANON
Mediterranean Sea
Haifa
ISRAEL
Tel Aviv
Km 100 0 100 200 300 Km
Port Said
Alexandria
EGYPT
OCCUPIED AREA
KYRENIA
Lapithos
Karavas
Myrtou
Ayios Amvrosios
Akanthou
Yialousa
Kizilkarpaz
Trikomo
Lefkonika
Kythrea
MORPHOU BAY
MORPHOU
NICOSIA
FAMAGUSTA BAY
FAMAGUSTA
Karavostasi
Lefka
KRYSOKHOU BAY
Polis
A2
C1
C2
Dhali
TROODOS
Agros
LARNACA BAY
LARNACA
D
Lefkara
A1
B1
B2
PAPHOS
LIMASSOL
EPISKOPI BAY
AKROTIRI BAY
Akrotiri
Km 10 0 10 20 30 Km
N
Main Roads
Boundary of Hydrogeological Region
Boundary of Hydrogeological Sub – region
DEPARTMENT OF WATER DEVELOPMENT
CYPRUS
HYDROGEOLOGICAL REGIONS
AFTER THE TURKISH INVASION

Ayios Nikolaos River - measuring weir at Kambia. WDD Photo A 45 EN8 (30.4.82).

high flow measurement and sampling for suspended sediment and chemical analyses. The condition of float wells and weirs is also checked and cleaned when necessary.

Out of all our stations only 61 on streams and 3 on intakes could be regularly inspected because, in the northern part of the Island we have not been able to attend any flow gauging stations, due to the presence of the Turkish invasion troop, still occupying almost 40% of Cyprus for the eighth year now.

The general conclusion obtained from the study of this year's records of the above flow gauging stations, is that the flow at most of them was well below normal because of the low precipitation of January, February and December.

The annual flow of some selected streams at selected flow gauging stations are presented in table II-4.

TABLE II-4

DISCHARGE OF SELECTED STREAMS AS CALCULATED AT SELECTED FLOW GAUGING STATIONS FOR THE YEAR 1981-1982

Ser No	Station No.	Stream	Location	Annual flow $10^6 \times m^3$
1	2-8-3-10	Limnitis.....	Saw Mill.....	6.0
2	3-3-1-70	Ay. Nikolaos.....	Kakopetria.....	8.6
3	3-3-3-95	Karyotis.....	Evrykhou.....	9.1
4	3-5-4-40	Elea.....	Vizakia.....	3.0
5	3-7-1-50	Peristerona.....	Panayia Bridge.....	8.6
6	3-7-3-90	Akaki.....	Malounda.....	4.7
7	6-1-1-80	Ay. Onoufrios.....	Kambia.....	0.6
8	6-1-1-85	Pedhieos.....	Kambia.....	1.6
9	6-5-3-15	Yialias.....	Nisou.....	0.4
10	8-4-5-30	Tremithios.....	Klavdhia.....	0.1
11	8-9-7-95	Vasilikos.....	Coast.....	0.5

TABLE II-5
VOLUME OF WATER ACCUMULATED AND COMMENCING DATE OF INFLOW FOR VARIOUS DAMS DURING THE YEAR 1982

	Dam	Capacity $10^3 \times m^3$	Inflow commencing date (1982)	Maximum volume recorded $10^3 \times m^3$	Date of maximum record (1982)	Minimum volume recorded $10^3 \times m^3$	Date of minimum record (1982)	Remarks
1	Agros.....	72	January	52	April	8	December	
2	Akrounda.....	22	-	22	-	Empty	September	Overflowing since Nov. 81
3	Akapnou-Ephtagonia.....	132	January	132	January	35	December	(Closed 8.12.81) Overflowed 5.2.82
4	Arakapas.....	128	-	128	January	17	November	Overflowing since Dec. 81
5	Arakapas No 2.....	192	February	89	May	51	December	Closed 19.2.82
6	Argaka.....	990	January	990	March	7	December	Overflowed 18.3.82
7	Asprokremmos.....	51000	February	6284	May	1900	December	Closed 28.2.82
8	Athalassa.....	790	March	120	March	Empty	June	
9	Ayia Marina.....	298	January	248	April	18	December	
10	Ayii Vavatsinias Dam.....	53	February	53	March	25	November	(Closed 11.2.82) Overflowed 3.3.82
11	Ayii Vavatsinias No 1.....	55	January	55	January	22	December	(Closed 8.12.81) Overflowed 25.1.82
12	Ephtagonia 1.....	92	February	31	April	Empty	December	Closed 26.2.82
13	Ephtagonia II.....	197	March	46	April	Empty	September	Closed 26.2.82
14	Ephtagonia III.....	65	January	19	March	Empty	October	
15	Kalo Khorio.....	32	January	32	January	Empty	October	Overflowed 30.1.82
16	Kalopanayiotis.....	363	-	363	January	68	September	Overflowed 28.12.81
17	Kandou.....	38	January	31	March	7	November	
18	Kato Mylos.....	104	January	104	January	55	December	Overflowed 15.1.82
19	Khandria.....	70	February	51	April	20	December	Closed 22.2.82
20	Kiti.....	1625	March	100	March	Empty	April	
21	Kyperounda.....	50	January	50	March	9	December	Overflowed 4.3.82
22	Lefka Marathasa.....	368	January	368	January	168	October	Overflowed 3.1.82
23	Lefka Kafizes.....	113	January	113	January	Empty	October	Overflowed Dec. 81
24	Lefkara.....	13850	February	4965	January	1003	December	
25	Liopetri.....	325	-	150	January	Empty	April	No inflow 1982
26	Lymbia.....	220	January	220	March	31	December	Overflowed 13.3.82
27	Lythrodhondas Upper	32	March	16	May	Empty	July	Gate closed 13.3.82 Gate opened 10.7.82

28	Lythrodhondas Lower.....	32	January	22	March	Empty	September	
29	Melini.....	59	March	59	May	23	December	Overflowed 27.5.82 Closed 18.3.82
30	Mavrokolymbos.....	2180	January	639	April	104	July	
31	Ormidhia (Vathys).....	100	-	-	-	Empty	January	No inflow in 1982
32	Pakhyammos...	43	January	35	April	Empty	June	
33	Palekhori (Kambi).....	620	January	620	March	Empty	October	Overflowed 9.3.82
34	Paralimni Lake.....	1365	January	18	January	Empty	May	
35	Pelendri.....	123	January	123	March	52	December	Overflowed 7.3.82
36	Perapedhi.....	55	-	55	January	18	October	Overflowed 27.11.81
37	Petra Upper.....	10	January	10	January	Empty	September	Overflowed 12.1.82
38	Petra Lower.....	25	January	25	February	Empty	November	Overflowed 15.2.82
39	Pomos.....	860	January	860	March	Empty	November	Overflowed 13.3.82
40	Polemidhia.....	3400	January	2044	April	598	December	
41	Prodromos.....	110	January	79	April	8	November	
42	Pyrgos.....	283	January	283	March	10	November	Overflowed 6.3.82
43	Trimiklini.....	340	January	340	May	180	October	Overflowed 5.5.82
44	Xyliatos.....	1220	October	33	December	-	-	Closed 7.10.82
45	Yermasoyia.....	13600	January	11330	April	2812	December	

Repairs and Improvements to Existing Flow Gauging Stations

During the year under review repairs and improvements were carried out on the following flow gauging stations.

- Dhiarizos River near Kouklia: Alterations to the invert of the weir by the construction of a "V" shaped structure 12m wide slope 1:20.
- Ayios Nicolaos River near Kakopetria: Alterations to the invert of weir by construction of a "V" shaped structure, 6m wide, slope 1:10 and construction of a float well.
- Pedhieos River near Kambia: Alterations to the invert of the weir by the construction of a "V" shaped structure 6m wide, slope 1:3 and construction of a float well.
- Garyllis River upstream of Polemidhia Dam: Alterations to the invert of weir by the construction of a "V" shaped structure 6m wide, slope 1:5 and construction of a float well.

Flood Discharges

As the rainfall during the hydrological year was below normal we had no remarkable floods. The most noteworthy floods, however were recorded on the following flow gauging stations.

- Yialias River near Kochati - about 34 m^3/s on the 13th March 1982. Its catchment area is 73 km^2.
- Mylou River near Kornos - about 22 m^3/s on the 13th March 1982. Its catchment area is 32 km^2.
- Tremithios River near Ayia Anna - about 14 m^3/s on the 13th March 1982. Its catchment area is 90 km^2.
- Vathys River near Athalassa - about 11 m^3/s on the 13th March 1982. Its catchment area is 30 km^2.
- Peristerona River near Panayia Bridge - about 10 m^3/s on 13th March 1982. Its catchment area is 78 km^2.

Inflow of Water in Dams

During 1982 out of 62 most important dams and ponds in Cyprus which were under regular observations in the past, only 45 could be observed as the remaining are situated in the northern part of the Island which is still under Turkish occupation.

The water accumulated in the 45 dams under regular observations was very low because of the low precipitation during the hydrological year under review; the maximum volume accumulated was 32 MCM or 33% of the total capacity of these dams, which is 96 MCM. Out of these dams 22 overflowed, most of them in January, February and March. Analytically the situation is shown on table II-5.

Spring Discharges

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

During the hydrological year 1981-82 3,000 spring and minor stream discharges were taken on 225 springs and minor streams; 1020 discharges were taken on 85 springs which are under regular monthly observations and 1980 discharges were taken on 140 springs and minor streams for a certain period at various intervals.

As the rainfall during the hydrological year under review was below normal most of the springs had a low flow during the whole year.

GROUND WATER

Ground Water Hydrological Work

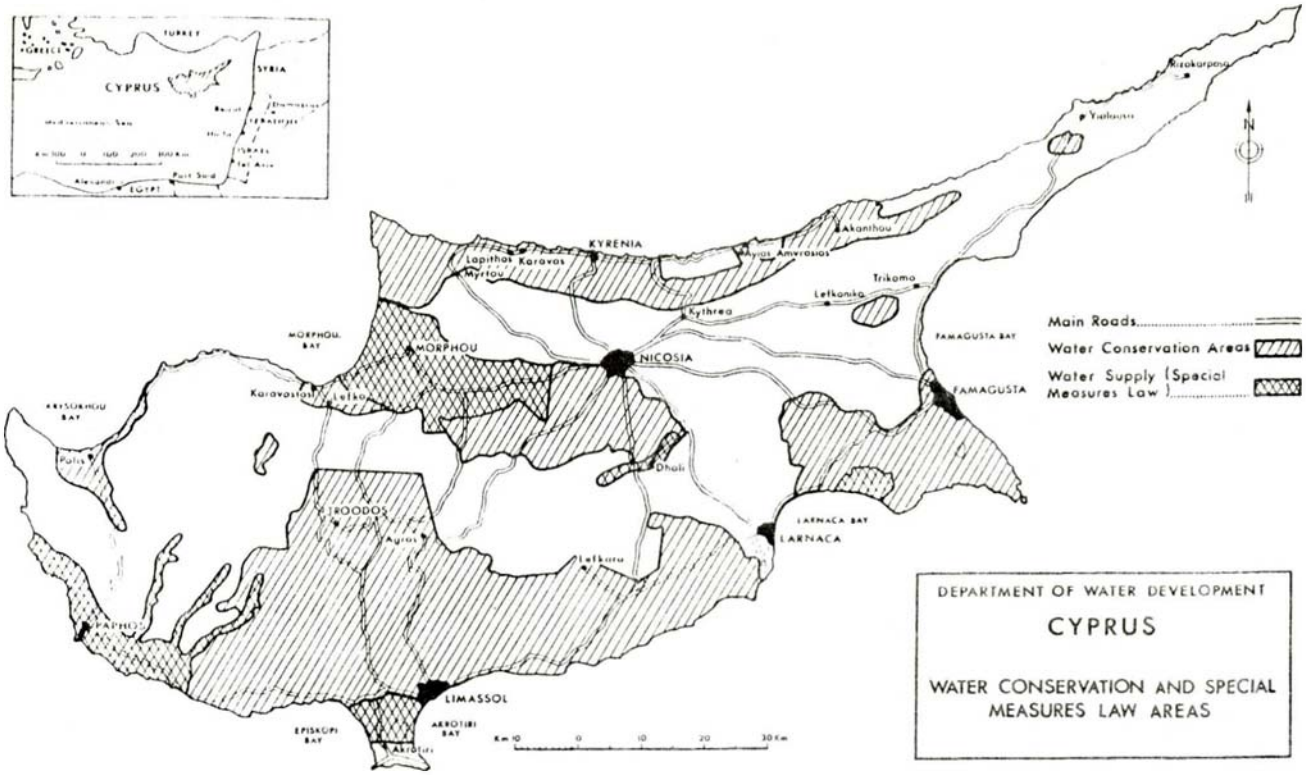
Hydrological surveys of the ground water bearing systems were carried out on small scale by this Department before 1960. Since then, they were rapidly amounting in scale until the most important known aquifer systems were brought in a few years time under Hydrological Observations. It is unfortunate that most of our maps with the well location and other information were destroyed by fire, during the events of 1974, or lost in the area occupied by the Turkish troops. So, during the year under review, the plotting of boreholes/wells and the collection of other hydrological information continued in the free areas, where hydrological work was being carried out before. The area during the current year where such work has been carried out was 2849km² (see map on page 30). The springs wells/boreholes which were on register at the end of 1982 were 24846.

Through the Hydrological Surveys all wells/boreholes, springs and chain-of-wells are registered and plotted on maps. A dense network of observation boreholes, is being levelled.

Through these observation boreholes/wells,

TABLE II-6
SELECTED OBSERVATION BOREHOLES

Serial No.	Hydr. No.	Village	March 1981	November 1981	March 1982	November 1982	Water level increase (+) or decrease (-) March 1981-82	November 1981-82
56/56	192	Liopetri.....	+0.24	+0.45	+0.38	+0.46	+0.14	+0.01
20/63	1516	Paralimni.....	+19.37	+18.31	+19.22	+18.77	-0.15	+0.46
22/63	1518	"	+5.93	+5.67	+5.73	+5.53	-0.20	-0.14
51/51	774	Phrenaros.....	+2.52	+1.68	+1.61	+1.06	-0.91	-0.62
79/56	975	"	+8.33	+8.32	+8.23	+8.43	-0.10	+0.11
88/54	24	Kolossi.....	+3.70	+1.40	+3.50	-0.30	-0.20	-1.70
51/63	813	Limassol.....	+2.18	+1.63	+2.03	+1.03	-0.15	-0.60
45/63	811	Zakaki.....	+1.58	+1.18	+1.28	+0.48	-0.30	-0.70
107/61	17	Yermasoyia.....	+18.08	+1.20	+2.08	-0.30	-16.00	-1.50
108/59	8	"	+35.90	+16.85	+16.55	+13.08	-19.35	-3.77
7/60	22	"	+9.00	+0.70	+1.21	-0.68	-7.79	-1.38
134/59	27	"	+14.86	+0.66	+1.28	-0.72	-13.58	-1.38
161/50	180	K Trimithia...	+187.53	+187.35	+187.68	+187.13	+0.15	-0.22
90/50	105	K Trimithia...	+191.68	+191.40	+191.78	+191.32	+0.10	-0.08
125/60	15	Episkopi.....	+30.96	+20.41	+24.06	+18.06	-6.90	-2.35
EB 94/70	1236	Akrotiri.....	+2.56	+0.51	+1.86	-0.34	-0.70	-0.85
P.B. 12	2671	Kouklia.....	+2.20	+0.20	+1.26	-0.60	-0.94	-0.80
P.B. 17	2673	Akhelia.....	+7.29	+5.72	+6.97	+5.37	-0.32	-0.35



the water level is being measured twice a year, at the end of the dry season (November), when it is expected to be at lowest and at the end of the wet season (March), when it is expected to be at highest level. In areas where more detailed information is necessary, a network has been established of observation boreholes where monthly or bimonthly measurements are taken. The number of observation borehole monitored twice during 1982 is 1387 and, every month or fortnight 575.

For the purpose of establishing the quantity of water pumped from our aquifers a questioning program is carried out once a year, through which information from our farmers is sought as regards the extent and type of plantations, the irrigation system used and other relative information from which the amount of water used is determined, crosschecked wherever possible from water meter readings, or electricity meter readings, and pump output. It has been established through questioning that during 1982 11096 wells/boreholes and springs were in use in our most important irrigating areas.

Out of a large portion of the above network of wells and boreholes, water samples are obtained twice a year (November and March), for chemical analysis to evaluate the trends of any quality change of the water in each aquifer.

During 1982 the number of groundwater samples from observation boreholes analysed for Cl was 1377.

As regards groundwater situation, due to this year's low rainfall and poor groundwater recharge a general drop of the water table in all important aquifers was noted and in some of them considerably. Details may be seen in the table of selected observation boreholes.

Control and Conservation of Ground Water

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

The committee performed during 1980, 34 meetings and examined 3328 applications sent to the Director WDD by the District Officers, as follows:

Water Supply (Special Measures) Law areas.....53
Water Conservation areas.....2110
Non Water Conservation areas.....1165

Water Conservation Areas (Wells Law Cap 351)

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

On map on page 35 the areas which have been declared as "Water Conservation Areas" under the Wells Law Cap 351 are shown. Particulars of these areas are also shown on table II-7.

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

Water Supply (Special Measures) Law 32/64

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

The areas covered by this Law are shown on map page 35 and particulars given in the table II-8.
For the above areas:

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

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

Water Meters

The preservation of the aquifers through the close control of the groundwater extraction and use, which is the object of the declaration of an area under the provisions of the Water Supply (Special Measures) Law, cannot be effected with out metering the water pumped from each borehole or well.

According to the provisions of the above referred law, water meters should be installed in the Water Supply (Special Measures) Law areas. Information about the installation and operation of water meters are not available for Western Mesaoria area, since this area is still under Turkish occupation. For Paphos area the law has not yet been enforced. In Limassol-Akrotiri area during 1982 there were 387 water meters installed of which 263 are in continuous operation. The total volume of water recorded is 12.7 MCM.

Private Drillers (Wells Law, Section 36)

According to the above law, no one is allowed to operate a drilling rig without a Driller's licence. Such a licence is issued by the Director of the Water Development Department, after the interested person to become a Driller applies for it and when the Director of the Department is satisfied that the applicant is competent to carry out such a job. A fee is paid for the licence and each year for its renewal.

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

During 1982 this Department issued 13 Drillers licences and renewed 37 others. The number of private drilling rigs which drilled for water during 1982, was 70 and

TABLE II-7

WATER CONSERVATION AREAS

Ser No	Water Conservation Area	Order No	Date	Gazette No	Date
1	Kokkini Trimithia - Ayii Trimithias, Paleometokho, Mammari.....	556	31.10.51	3584	31.10.51
2	Nicosia.....	556	31.10.51	3584	31.10.51
3	Tersephanou-Klavdhia.....	376	18. 8.52	3639	27. 8.52
4	Laxia.....	374	18. 8.52	3639	27. 8.52
5	F'sta, Phrenaros. Paralimni, Ormidhia, Xylotymbou, Pergamos, Kouklia, Avgorou, etc.....	164	3. 3.56	3924	8. 3.56
6	Akrotiri, Phasouri, etc.....	165	3. 3.56	3924	8. 3.56
7	Morphou, Syrianokhori, Prastio, Nikitas, Elea, Pendayia.....	1052	30.10.56	3995	8.11.56
8	Dhali, Potamia.....	1194	29.11.56	4008	6.12.56
9	Ayios Andronikos, etc.....	916	26. 9.57	4081	3.10.57
10	Morphou, Peristerona, Astromeritis, Akaki, etc.....	314	3. 5.58	4133	15. 5.58
11	Vasilia, Lapithos, Kyrenia, Ayios Epiktitos, etc.....	245	28. 4.59	4228	30. 4.59
12	Makedhonitissa, etc.....	544	16.11.59	4277	26.11.59
13	Moni Pyrgos.....	226	27. 7.61	75	27. 7.61
14	Yermasoyia.....	443	8.12.61	112	8.12.61
15	Dhiorios (Djipi Loc.).....	324	21. 6.62	163	21. 6.62
16	Yialia, Ayia Marina, Argaka, Polis.	359	7. 7.62	168	7. 7.62
17	Yialias River (Potamia, Dhali, Nisou, Mathiati).....	189	25. 4.63	245	25. 4.63
18	Kiti, Pervolia, Meneou, Dhromolaxia.	50	28. 1.65	384	28. 1.65
19	Kouklia, Anarita, Timi, Akhelia....	529	26. 8.65	435	26. 8.65
20	Lapathos, Gypsos.....	545	9. 9.65	438	9. 9.65
21	Moni (Extension).....	642	14.10.65	444	14.10.65
22	Lakatamia, Dheftera, Anayia, Pera etc.....	744	21.11.65	453	25.11.63
23	Ayia Irini.....	280	19. 5.66	499	2. 6.66
24	Paramali, Evdhimou.....	SBA 68	29. 7.67	SBA 212	29. 7.67
25	Lysi, Kondea.....	776	7. 9.67	599	22. 9.67
26	Akanthou.....	777	7. 9.67	599	22. 9.67
27	Pergamos (Extension).....	889	19.10.67	606	3.11.67
28	Ayios Avrosios.....	890	19.10.67	606	3.11.67
29	Kyrenia Range Limestone Mass.....	817	7.11.68	693	22.11.68
30	Vasilikos, Xeropotamos.....	862	28.11.68	697	13.12.68
31	Yeroskipos, Konia, Ktima, Peyia....	741	4. 9.69	748	19. 9.69
32	Karavostasi, Peristeronari.....	50	29.12.69	771	16. 1.70
33	Yeri.....	75	8. 1.70	773	23. 1.70
34	Neokhorio, Androlikou.....	845	14.10.71	904	29.10.71
35	Yiolou, Loukrounou, Skoulli.....	845	14.10.71	904	29.10.71
36	Pissouri, Evdhimou.....	576	10. 8.72	958	25. 8.72
37	Kormakitis, Myrtou, Dhiorios.....	851	7.12.72	979	15.12.72
38	Akanthou (Extension).....	288	15.11.73	1054	30.11.73
39	Ayios Ioannis (Malounda).....	307	25.11.74	1158	25.11.74
40	Kambos Chakistra.....	-	-	1180	4. 4.75
41	Parekklisha.....	206	23.10.75	1233	7.11.75
42	L'ssol-Paphos-L'ca Extension pf W. Conservation Areas.....	215	30. 9.77	1429	3. 3.78

TABLE II-8
WATER SUPPLY (SPECIAL MEASURES) LAW AREAS

Ser No	Area	Order No	Date	Gazette No	Date
1	Western Mesaoria (Pendayia-Morphou-Kokkini Trimithia).....	-	-	331	9. 7.64
2	Akrotiri peninsula.....	-	-	331	9. 7.64
3	South-Eastern Mesaoria (F'sta-Paralimni-Ormidhia-Akhna), later withdrawn.....	-	-	331	9. 7.64
4	Potami.....	89	12. 2.66	479	24. 2.66
5	Dhiarizos River.....	196	23. 5.74	1104	21. 6.74
6	Xeropotamos River.....	196	23. 5.74	1104	21. 6.74
7	Ezousas River.....	196	23. 5.74	1104	21. 6.74
8	Peyia-Aspros River (Ext. of Yeroskipos-Peyia W C A West of Peyia village).....	196	23. 5.74	1104	21. 6.74
9	Mavrokolymbos River (Ext. of Yeroskipos-Peyia W C A).....	196	23. 5.74	1104	21. 6.74
10	Kouklia-Paphos-Peyia.....	111	6. 6.75	1193	6. 6.75
11	Nisou-Potamia valley.....	274	15.12.78	1488	15.12.78
12	Xylophaghou-Ormidhia Area.....	72	12. 3.82	1760	12. 3.82

this Department has been notified about the drilling or cleaning of 209 boreholes. Information from private Drillers have been received by this Department for 230 boreholes.

During 1982, 23 private Drillers were reported to the District Officers for illegal drilling.

WATER QUALITY

Chemical Analyses

During the year, 659 samples of water were sent to the Government Analyst and 1381 to the WDD Laboratory for chemical analyses. Out of these, 888 samples were taken from springs, wells or boreholes, which are used or proposed as water supply sources. The remaining 1152 samples were taken from rivers, springs, observation boreholes and other miscellaneous sources.

Bacteriological Analyses

The bulk of sampling for bacteriological analysis is carried out by the Health Inspectors. However for special purposes samples for bacteriological analysis are taken by this Department as well.

During the year 60 samples were sent to the Government Analyst.

Suspended Sediment Analyses

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

During the year, 86 samples of river water were taken for suspended sediment analyses.

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

The Council of Ministers, at its meeting of the 19th February, 1976-Decision No 14694 - decided the establishment of the above said Committee. The terms of reference of the committee are to accept and examine applications from Greek Cypriot displaced farmers to use wells/boreholes abandoned by their Turkish Cypriot owners and to grant loans for the purchase, repair and installation of pumping plants and pipelines for the irrigation of abandoned fields of Turkish Cypriot ownership. For this purpose, the Government placed at the disposal of the Committee, the sum of £457,500 for the above said loans.

According to the above said decision of the Council of Ministers, the Committee is chaired by the Director-General, Ministry of Agriculture and Natural Resources, who transferred the chairmanship to the

Director of Water Development Department. Other members are the Director-General, Ministry of the Interior, the Director General, Ministry of Finance, the Director-General, Planning Bureau, the Commissioner for Co-operative Development, the Director, Department of Agriculture and the representatives of the Ministry of Agriculture and Natural Resources at the District Committees for the protection of Turkish Cypriot property, or their representatives.

The Committee convened at its first session on 27th March, 1976 and at the beginning, the rules and procedures have been decided upon it would function. Accordingly, special application forms have been prepared, obtainable from the District engineer of the Water Development Department, which displaced farmers could fill when applying to be granted a loan to purchase and install pumping plants and pipelines and/or permission to utilise existing pumping equipment on the specific well/borehole for which application was made. The applications which in most cases are from groups of farmers are at first stage examined by the District Officer and the District Agricultural Officer. When the applicant or applicants are lawful tenants of abandoned by their owners Turkish Cypriot fields, leased to them by the Central Committee for the protection of Turkish Cypriot Property-the District Engineer transmits the application with suggestions as to which fields may be irrigated from the same borehole or group of boreholes accompanied by an irrigation scheme, where necessary, with the estimated cost, to the Committee which decides as to the kind of equipment to be installed, the amount of water to be pumped, the fields to be irrigated and the loan to be granted.

The decisions of the Committee are then notified to the Loan Commissioner who releases the proper amount, to the interested farmers, who sign an agreement for the repayment of loan and the running expenses as well.

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

When part or the whole pumping unit of Turkish Cypriot ownership exists on the borehole/well, a loan may be granted for the purchase of what is missing and the value of the existing equipment with its anticipated life is calculated. Taking into account these parameters and after substracting the residual value which the pumping plant is expected to have after a maximum of eleven years or at the end of its expected life, an amortization rate is calculated which has to be repaid every year by the involved farmer or farmers.

From its establishment the Central Committee for the issue of loans and the reactivation of Turkish Cypriot owned wells/boreholes had 55 meetings during which it approved 430 applications from 1233 displaced farmers for the irrigation of 12064 donums of land. The amount of loans granted by the end of this year was £364,914.- and the pumping plants of Turkish Cypriot ownership to £42,190.

During the year under examination, the Committee had 1 meeting during which it approved 3 applications from 3 farmers for the irrigation of 17 donums of land. The amount of loans granted is £3100.

TABLE II-9

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

Particulars	Nicosia	L'ssol	L'ca	Paphos	TotalS
Applications approved (No).....	2	-	1	-	3
Wells/boreholes allocated (No).....	2	-	1	-	3
Farmers benefited (No).....	2	-	1	-	3
Area to be irrigated (donums).....	3	-	14	-	17
Loans granted (Number).....	2	-	1	-	3
Loans granted (Pounds £).....	800	-	2300	-	3100
Loans issued (Pounds £).....	800	-	2300	-	3100
T/C pumping plant allowed to be used (No).....	-	-	-	-	-
Estimated value of T/C pumping plants (Pounds £).....	-	-	-	-	-
Amortization rate (Pounds £/Year).....	-	-	-	-	-

III DIVISION OF PLANNING

by
Dr C A Christodoulou
Principal Water Engineer
Head of Division

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

- *Reconnaissance and Feasibility Reporting*
- *Investigations and Laboratory*

RECONNAISSANCE AND FEASIBILITY REPORTING BRANCH

SOUTHERN CONVEYOR PROJECT

General

Since the spring of 1978 (March-April) a detailed design study of the water resources of southern catchments of Cyprus known as the Southern Conveyor Project is being carried out by a team in the Water Development Department. This study is being carried out in co-operation with the Overseas Development Administration of the United Kingdom, which has provided for this purpose, the Project Manager, as well as three specialists to augment the local team.

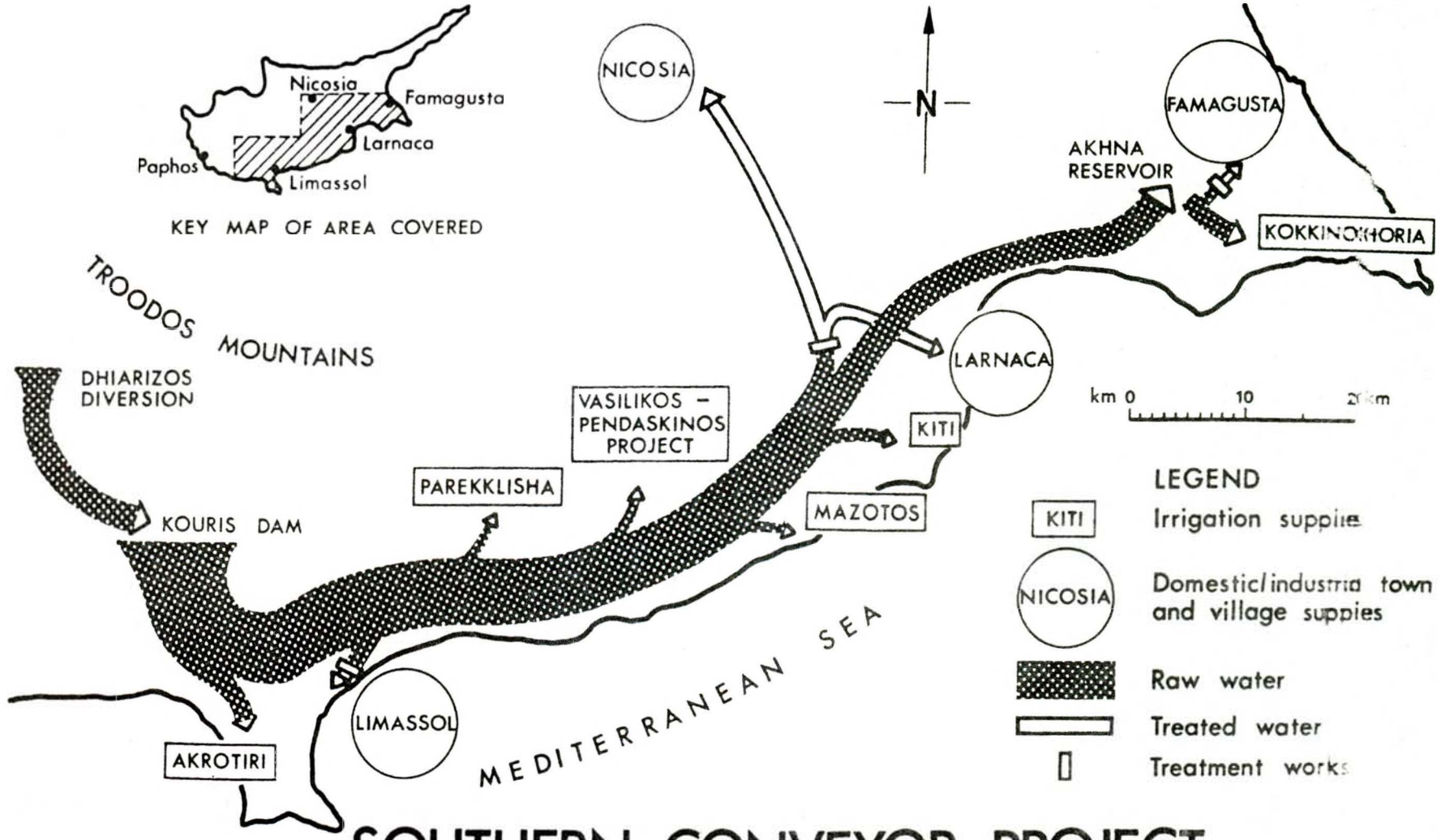
The main objective of the SCP study is to determine how much surplus water is available in south-west Cyprus and whether it would be technically and economically feasible to convey it to areas where it could meet predictable future domestic water needs and the remainder be used for irrigation development. The study was designed to be carried out in two stages. The ultimate objective of stage 1 was to identify different development options and to appraise their respective economic viability. Stage 2 would involve the preparation of a detailed feasibility study-suitable for presentation to funding agencies - of the option which the Government would select on the basis of the findings of stage 1.

Stage 1 has been completed and the Government has selected the option to be implemented. Under this option it is estimated that about 10,000 ha of land will be irrigated in the areas of Akrotiri, Parekklisha, Mazotos, Kiti and Kokkinokhoria.

Stage 2 was completed in August 1982 and for the rest of the year, work has concentrated on the preparation of the final designs as well as on the additional economic analysis which the World Bank had asked for, on their last visit to Cyprus.

The implementation of the Project would require the construction of one main dam on Kouris (120 MCM) and a smaller dam at Akhna (5.8 MCM). Furthermore it would involve the construction of:

- A closed conduit of approximate length of 110 km
- A diversion tunnel from Dhiarizos to



SOUTHERN CONVEYOR PROJECT

Diagrammatic Representation of Water Distribution

XZ/IR/105

Kouris
- Pumping stations and water treatment plants
- Water conveyors for domestic supply to the towns of Limassol, Larnaca, Nicosia and Famagusta
- Distribution network systems

Hydrology

A major part of the team's work during the first six months of 1982 was devoted to the completion of the evaluation of surface water resources along the Southern Conveyor and the synthesizing of the final volume on the surface water resources of the SCP.

For the remaining part of the year the team among other duties continued to provide supplementary information and took part in the discussions during the several appraisal missions of the World Bank.

In total the hydrology of some 24 sites on 12 rivers in the region extending from Ezousas to Tremithos rivers was revised and evaluated.

Hydrogeology

The water resources team of the Southern Conveyor Project spent the first six months of 1982 in rounding up all the hydrogeological studies pertinent to the SCP as well as writing up the volume on the groundwater resources. This was accomplished by July 1982. In total some 400 sq. km of aquifer area was investigated and water balances were drawn. These aquifers are the Dhiarizos, Yermasoyia and Alaminos river beds, the Evdhimou and Paramali coastal aquifers, the Akrotiri, Pyrgos-Parekklisha, Vasilikos Gypsum and finally the Kiti-Pervolia and Kokkinokhoria aquifers. The team continued to provide supplementary information to the project team for the remaining part of the year and more so during the World Bank appraisal missions.

Engineering

By mid-1982 the engineering team of the SCP had finalised all aspects (design drawings, cost estimates, text etc) of the engineering components required for the Project Feasibility Study.

These components were:

- The Dhiarizos Diversion
- The Southern Conveyor pipeline
- The Tersephanou-Nicosia pipeline
- Irrigation networks for the areas of Akrotiri, Parekklisha, Mazotos, Kiti and Kokkinokhoria
- Limassol Tertiary Treatment Works
- Water treatment works at Limassol, Tersephanou and Ormidhia
- Dams at Pyrgos and Akhna and the raising of Yermasoyia Dam

Detailed design of the Kouris Dam was completed by the end of the year by "SOGREAH" Ingenieurs Conseils.

Detailed designs of three major project components were commenced by the team in September. These are:

- The Southern Conveyor pipeline (including 550 metres of tunnel) from Kouris Dam to Akhna Reservoir (110 km)
- The distribution network for the kokkinokhoria Irrigation Area (5125 ha) - this includes five major and forty-eight minor pumping stations
- Akhna Dam (providing 5.8 MCM storage)

In October the Consulting Engineers for this detailed design work, Sir William Halcrow and Partners, commenced additional feasibility studies for alternative diversion and storage works to Kouris Dam, comprising:

- Diversion weir and intake structures on the Kouris and Zyghos rivers
- A pumping station and pipeline to allow SCP water to be pumped to storage into the future Kalavasos Dam (part of the Vasilikos-Pendaskinos Project).

Agricultural Economics

During early 1982 the final economic analysis of the Project was prepared, using mainly the systems model.

In addition, a more detailed economic analysis was done outside the systems model. The domestic water component and the irrigation component were analysed separately and the unit cost of water by sector was estimated. The systems model was also used for the sensitivity analysis tests of the project. More than ten tests were carried out to establish how sensitive the economics of the project were to changes in costs and benefits.

By the middle of the year, four volumes of the Feasibility Study Reports were prepared. More specifically the section prepared the following SCP Feasibility

Study Reports:

- Volume 16, Agricultural Economics Analysis
- Volume 17, Agricultural Economics - Marketing
- Volume 18, Domestic Water Economics
- Volume 19, Project Economics

Following the World Bank's pre-appraisal mission further studies were carried out, in order to analyse various phasing alternatives for the project.

KHRYSOKHOU WATERSHED IRRIGATION PROJECT (KWIP)

General

The study of KWIP began in March 1979 and it was executed jointly by the FAO and WDD with financial assistance from the United Nations Development Programme (UNDP).

The project area is located in the north-western part of Cyprus, covers about 900 square kilometres and includes the Khrysokhou Bay, Akamas, Tylliria and part of Marathasa areas. The study however was confined to the lowlands of the Khrysokhou Bay and adjacent river valleys and the uplands of the Yiolou - Stroumbi - Polemi area.

Feasibility Study

The detailed feasibility study was based on a regional development approach. The team that carried out this study included both local and FAO Engineers, Hydrologists, Agriculturists and Economists.

The main objectives of the KWIP are the optimum development of agriculture in the area through irrigation and the creation of employment.

The area to be irrigated by the project on full implementation is 4,200 ha net.

The main engineering works for this project include the construction of the Evretou Dam on the Stavros tis Psokas river, the Ezousas Dam on the upper Ezousas river, the Lowlands and Uplands Conveyors and the Irrigation Network.

The feasibility study was completed by the end of 1981 in full accordance with the established time schedule. An eight month extention of the project from January 1 to August 31 1982 became necessary to accommodate KWIP supervision and/or participation in the detail design activities.

The Main Report and the 10 Technical Annexes of the completed feasibility study were prepared. They were evaluated by the FAO - Investment Centre in view of their eventual submission to a financing institution. The project was found to be technically sound and economically viable.

Detail Design Works

The detail design of the Evretou Dam, bill of quantities and the relevant tender documents were completed. The work was carried out by the Consulting Firm Sir William Halcrow and Partners , UK in Association with A Prastitis and Associates.

Detail irrigation network layout and tender documents were also prepared for 800 ha allowing immediate tendering for an area of 2,000 ha in the Khrysokhou River Valley and the adjacent coastal plain. This work was carried out by the KWIP personnel with assistance from a Senior Engineer from the Consulting Firm Rendel, Palmer and Tritton , UK.

Hydrometry

Hydrometric observations on groundwater as well as on all rivers in the project area with special emphasis on the five connected to the proposed development schemes in the Khrysokhou area continued throughout the year.

Submission of the Feasibility Report to the World Bank.

Upon completion of the feasibility report and the detail designs these were submitted to the World Bank for appraisal and financing and in November a mission from the World Bank came to Cyprus for appraisal of the study which they have approved.

INVESTIGATION AND LABORATORY BRANCH

General

The work of the site investigation, Laboratories and Grouting Section of the Division of Planning, during the year 1982 related to a number of major and more minor projects undertaken by the Department. Additionally and at the request of other Government Departments and private organizations, a number of projects were undertaken and completed during the year.

TABLE III-1
SITE/MATERIAL INVESTIGATIONS AND GROUTING 1982

Ser No	Project	Aim of investigation	Fieldwork as carried out	Machinery used	Expenditure £
	A. DEPARTMENTAL PROJECTS				
1	***Khrysokhou Irrigation project*** *Evretou Dam*	Subsurface geological and material investigation	Drilling of 11 No. boreholes. Total depth 442.75 m	-Core Drill -Flush pump -Compressor -Wagon drill	
			Drilling and Blasting of 56 No. boreholes	-Traxcavator	103 580 35
		Test grouting	Drilling water testing and grouting of 12 No. boreholes total depth 485 m	-Overburden drill -Flush pump -Compressor -Grout pump -Grout Mixer -Grout Agitator	
2	***Southern Conveyor Project*** *Arminou Diversion*	Subsurface geological and material investigation to establish foundation conditions	Drilling for establishing overburden thickness Total depth 70 m	-Overburden drill -Flush pump -Compressor	
				-Digger	2 749 50
3	***Paphos Irrigation Project*** *Asprokremmos Dam*	Grouting	Grouting of 60 No. boreholes Total depth 175 m	-Wagon drill -Compressor -Flush pump -Grout pump -Grout mixer	
				-Grout Agitator	996 00
4	***Vasilikos-Pendaskinos Project*** *Kalavasos Dam*	Subsurface geological and material investigation to establish foundation conditions and permeability	Drilling of 4 No. boreholes with associated water pressure tests Total depth 167.35m	-Core drill -Flush pump -Compressor -Overburden drill	

TABLE III-1 SITE/MATERIAL INVESTIGATIONS AND GROUTING 1982 (Cont.)

Ser No	Project	Aim of investigation	Fieldwork as carried out	Machenery used	Expenditure £
		Quarry site investigation	Drilling of boreholes on the diversion tunnel & diversion weir. Excavation of trenches and roads. Test blasting at Quarry	-Wagon drill -Traxcavator -Digger	
	Dhypotamos Dam	Subsurface geological and material investigation to establish foundation conditions and permeability	Drilling of 3 No. boreholes with associated water pressure testing, total depth 55.40 m. Drilling and blasting of 19 No. boreholes total depth 219.35 m	-Core drill -Flush pump -Overburden drill -Compressor -Wagon drill -Traxcavator	
	Khirokitia Balancing Reservoir	Subsurface geological and material investigation to establish foundation conditions and permeability	Drilling of 3 No boreholes Total depth 24 m Augering	-Auger drill	21 311 00
5	*Syphilos Dam*	To establish foundation conditions and permeability	Drilling of 2 No boreholes with associated water pressure testing total depth 65.10 m	-Core drill -Flush pump	2 882 00
6	*Vizakia Dam*	To establish foundation conditions and permeability	Drilling of 3 No. boreholes with associated water pressure tests. Total depth 91 m	-Core drill -Flush pump	4 850 00
7	*Kouris Dam*	Trial embankment Site investigation work	Drilling of 12 No boreholes Excavation of trenches Excavation of pits	-Overburden drill -Compressor -Traxcavators -Digger -Vib. roller	15 439 10

TABLE III-2
SOILS LABORATORY TESTS DURING 1982

Project	Kalavasos Dam	Kouris Dam	Southern Conveyor	Khirokitia Balancing Reservoir	Asprokremmos Dam	Evretou Dam	Kyperounda Pond	Lagoudhera Pond	Ayii Vavatsinias Pond	Vizakia Pond	Dhierona Pond	Agridhia Pond	Private Firms	Miscellaneous	Total of each test
Sieve analysis (wet/dry).....	2	33	-	-	-	10	5	10	2	6	-	4	3	2	77
Hydrometer analysis.....	2	57	5	6	5	35	16	-	1	14	1	1	12	1	156
Atterberg limits.....	2	26	5	3	2	26	6	-	2	12	-	-	12	1	97
Specific gravity.....	2	57	-	6	2	34	16	-	1	14	-	-	12	-	144
Moisture content.....	500	11	16	-	-	7	7	-	-	-	-	-	29	-	570
Compaction.....	1	13	-	-	-	1	9	4	1	3	1	2	-	1	36
Field density.....	250	-	-	-	4	9	40	2	-	-	-	-	-	-	305
Permeability.....	-	6	-	-	-	5	-	-	-	-	-	-	-	-	11
Undrained Triaxial.....	1	3	-	-	-	9	-	-	-	-	-	-	12	-	25
Drained Triaxial.....	-	2	-	-	2	5	-	-	-	-	-	-	-	-	9
Pin hole.....	-	3	-	-	1	11	-	-	-	1	-	-	-	-	16
Large shear box.....	3	6	-	-	-	-	-	-	-	1	-	-	-	1	11
Small shear box.....	-	3	-	-	-	-	-	-	-	-	-	-	-	-	3
Consolidation.....	-	-	-	-	-	-	-	-	-	-	-	-	5	-	5
Suspended sediment.....	-	-	-	-	-	-	-	-	-	-	-	-	-	250	250
Relative density.....	-	3	-	-	-	1	-	-	-	-	-	-	-	-	4
Field density.....	-	11	-	-	-	-	-	-	-	-	-	-	-	-	11
Shrinkage.....	-	-	-	-	3	6	-	-	-	-	-	-	-	3	12
Swelling.....	5	-	5	-	2	-	-	-	-	-	-	-	-	-	12
Montmorinolite content.....	-	-	-	-	-	-	-	-	-	-	-	-	-	4	4
Total.....	768	234	31	15	21	159	99	16	7	51	2	7	85	263	1758

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

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

- Khrysokhou Irrigation Project. Evretou Dam (includes extensive test grouting at left abutment).
- Southern Conveyor Project. Arminou Diversion.
- Asprokremmos Dam. Grouting in drainage galleries.
- Vasilikos - Pendaskinos Project. Kalavasos Dam, Dhypotamos Dam, Khirokitia
- Balancing Reservoir.
- Syphilos Dam.
- Vizakia Dam.
- Kouris Dam.

The work of the Soils and Concrete Laboratories may be distinguished into the work performed by the main and field laboratories. In the main (soils/concrete) laboratories in Nicosia, tests were performed in connection with foundation and construction materials investigations relating to Departmental Projects. Tests were also performed at the request of other Government Departments, private organizations and the Cyprus Standards Organization of the Ministry of Commerce and Industry.

Site/Material Investigations, Grounting Works

Table III-1 gives relevant details of all site-construction materials investigations and grounting works performed during the year, giving also details as to the type of work and approximate cost for each project.

Laboratories

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

The work of the concrete laboratory is similarly presented in Table III-3.

TABLE III-3
CONCRETE LABORATORY TESTS DURING 1982

Project	Kouris Dam	Evretou Dam	Kalavasos Dam	Tenders for concrete aggregate	Mescel-laneous	Total of each test
Mix design.....	-	-	2	-	-	2
Sieve analysis.....	8	3	-	90	3	104
Silt content.....	-	1	-	22	-	23
Organic impurities....	-	-	-	22	-	22
Specific gravity.....	16	1	-	-	1	18
Water absorption.....	16	1	-	-	19	36
Cube crushing.....	-	-	300	-	-	300
Soundness.....	3	1	-	-	-	4
Los Angeles.....	11	-	2	-	2	15
Impact value.....	8	-	-	-	-	8
Elongation & lakiness	-	-	-	-	1	1
Total.....	62	7	304	134	26	533

IV DIVISION OF DESIGN

by
Chr. Marcoullis
Senior Water Engineer
Head of Division

Introduction

The Design Division of the Water Development Department deals mainly with the preparation of detailed designs of major projects undertaken by the Department. These projects may involve the design of dams, ponds and other hydraulic structures, irrigation networks and domestic water supply schemes.

In case such works are to be constructed by contract the designs are supplemented with all necessary contract documents.

Although in principle the activities of the Design Division are within the above mentioned frame of works, it is however, often required to extend its activities by undertaking the preparation of feasibility studies for projects of minor or local importance, which cannot be undertaken by the Planning Division or to proceed with the necessary financial arrangements for project implementation, before such projects are proceeded to the Division of Construction. The activities of this Division extend even further into assisting in the supervision of the construction works, either to ensure that construction is carried out in full agreement with the designs and specifications or to help in solving problems encountered during the construction.

Furthermore, in addition to the Branches particular to the above mentioned kind of works, this Division encorporates the Topography and the Drawing and Records Branches of the Department. The first undertakes topographical works of the Department, whereas the second carries out all drawing work of all major and minor projects, keeps the technical records, helps in the preparation of technical reports, runs the library of the Department and undertakes all photographic, reproduction and the photo-process lab work.

During 1982 the following qualified personnel were working with the Design Division.

- *One Senior Water Engineer, Head of the Division*
- *Four Executive Engineers Class I*
- *One Executive Engineer Class II*
- *Two Topographer/Irrigation Engineers Class I*

In addition five Executive Engineers who had been appointed by the end of 1981 for the Vasilikos-Pendaskinos Project, were also assigned to assist in the preparation of the designs for various schemes of the Pitsilia Project.

The personnel of the Topography and

Drawing and Records Branches are given in the respective sections of this chapter.

By the end of the year, certain changes in the structure of the Division were brought about. The Head of this Division undertook as Head of the Planning Division whereas this Division was undertaken by one of the Executive Engineer I who was promoted to Senior Water Engineer. At the same time the Topography Branch of the Division was encorporated in the Planning Division.

MAIN ACTIVITIES

The main activities of the Design Division continued during 1982 being focussed on the Pitsilia Integrated Rural Development Project which was at its fourth year of implementation. In addition the Division continued being involved in the implementation of the Vasilikos-Pendaskinos Project, which entered the construction stage by the end of the year. Furthermore some other major schemes of local importance were under design during 1982.

The main component of the Pitsilia Integrated Rural Development Project, which is also the main input of the Department into the Project, is irrigation. A part of this component provides for the rehabilitation of existing irrigation works which along with the village water supply schemes constitute the input of the Division of Small Projects Planning. The rest of this component, which is the direct responsibility of this Division, includes the construction of Xyliatos Dam and of several pond and borehole schemes.

The implementation of a pond or borehole scheme, involves a very complex procedure which includes a preliminary but quite advanced design and cost estimate, which form the basis for a preliminary approval of the scheme by the Planning Bureau and the World Bank and the preparation of the final designs and construction drawings together with all necessary contract documents. As it is provided in the Loan Agreement with the World Bank the construction of ponds is carried out by local contractors whereas all other works are undertaken by the Division of Construction of the Department. In the case of borehole schemes, before embarking in the above mentioned procedure, a prolonged pumping test is carried out by the Department assisted by the Geological Surveys Department, in order to verify the results of the short period test, which is performed right after the drilling of the borehole.

As it is known the overall coordination of the project works has been undertaken by the Ministry of Agriculture and Natural Resources, whereas the coordination of the WDD input into the project is handled by the Division of Design. An account of the progress achieved up to 1982 on pond and borehole schemes is given in a tabulary form in Table IV-1. Details on the progress of the construction of Xyliatos Dam as well as of ponds which were under construction during the year are given under CONSTRUCTION DIVISION.

PITSILIA INTEGRATED RURAL DEVELOPMENT PROJECT

Pond Schemes

Feasibility Studies

As shown on Table IV-1 feasibility studies were prepared for the following three pond schemes:

- Dhierona Pond
- Arakapas Pond No. 2
- Ayii Vavatsinias Pond No. 2

The feasibility studies of the three schemes were completed in June 1982 and detailed studies followed up right after their approval.

Detailed Studies

The detailed studies and contract documents for the above three ponds were completed in September 1982. Tenders were invited during the same month. The contract documents for Ora pond were completed in February and tenders were invited in June 1982. During the same year the Pharmakas pond scheme was finally accepted by the farmers concerned, which led to a revision of the study and the invitation of new tenders in August 1982.

Detailed designs for the distribution networks were prepared for the following four pond schemes:

- Kyperounda Pond (Gross area: 540 dons, Est. cost: £129,200)
- Agridhia Pond (Gross area: 90 dons, Est. cost: £28,000)
- Lagoudhera Pond (Gross area: 150 dons, Est. cost: £45,000)
- Pharmakas Ponds (Gross area: 135 dons, Est. cost: £37,500)

TABLE IV-1

PITSILIA INTEGRATED RURAL DEVELOPMENT PROJECT

Major Irrigation Works - Progress up to the end of 1982

Scheme	Preliminary Design Pumping test	Preliminary Approval by farmers	Feasibility Studies	Approval by P B and W B	Final Designs Contract Docum.	Tendering	Construction
POND SCHEMES							
Pelendria Pond Borehole and D.S							C
Ephtagonia Pond No 1 and D.S							C
Khandria Pond and D.S							C
Melini Pond and D.S							C
Ayii Vavatsinias Dam, Pond No 1 and D.S							C
Akapnou-Ephtagonia Pond and D.S							C
Ephtagonia Pond No 2 and D.S							C
Ephtagonia Pond No 3 and D.S							C
Kato Mylos Pond Borehole and D.S							C
Arakapas Pond No 1 and D.S							C
Kyperounda Pond					X		
Kyperounda D.S					X		X
Agridhia Pond							X
Agridhia D.S					X		X
Lagoudhera Pond						X	X
Lagoudhera D.S					X		
Ora Pond				X	X	X	X
Ora Boreholes	XP						
Pharmakas Ponds					X	X	
Pharmakas D.S					X		X
Dhierona Pond		X	X	X	X	X	
Arakapas Pond No 2		X	X	X	X	X	
Ayii Vavatsinias Pond No 2		X	X	X	X	X	
BOREHOLE SCHEMES							
Kalokhorio Boreholes							C
Potamitissa Boreholes							C
Arakapas Boreholes (Nos.106 & 107/76)							C
Ayios Theodhoros B/H							C
Agros B/H (No. 63/76)							C
Polystipos B/H							C
Arakapas B/H (No. 124/76)						X	X
Ayios Konstantinos B/Hs		X	X	X	X		
Louvaras B/Hs		X	X	X			
Alona B/H		X	X	X			
Askas B/H		X	X	X			
K. Amiandos B/H	X	X	X	X			
Dhymes B/H	XP	X	X	X			
Lagoudhera B/H	X	Pe					
Dhierona B/H	XP						
Ayii Vavatsinias B/H	XP						
Zoopiyi B/H	XP						
Sykopetra B/H	XP						
Phterikoudhi B/H	XP						

X: Work carried out in 1982
C: Construction completed before 1982
XP: Pumping test in 1982
Pe: Work pending due to administrative problems

P: Pond
B/H: Borehole
D.S.: Distribution System
W.B.: World Bank
P.B.: Planning Bureau

Details of these pond schemes were given in the 1980 annual report. A short description of the pond schemes, the feasibility studies of which were prepared in 1982, are given below:

Dhierona Pond

This is an off-stream pond located north-east of Dhierona village with a storage capacity of 159,000 m³.

The pond will be impounded with water, which will be diverted from the stream of the Yermasoyia River which springs from the Sykopetra area. The pond will share a common diversion pipeline with Arakapas pond No 2. Two diversion weirs will be constructed, one on each of the main tributaries of this stream. Dhierona pond, which is located lower than Arakapas pond, can draw water from both weirs, although under normal conditions it will be impounded from the lower weir. The length of the 200 mm diameter steel diversion pipeline from Dhierona pond up to the lower weir is 2740 m.

Geologically the site is located in a valley of diabase. The total volume of earthworks is estimated at about 121,000 m³ and the total area of membrane lining to be used for watertightness is about 29,200 m³. The topographic conditions of the pondsite are quite favourable but the geologic conditions and particularly the presense of hard rock will adversely affect the cost of the scheme.

The pond will be used for the irrigation of a gross area of 300 donums (253 donums net) of mainly citrus and table olives. Out of this area 112 donums gross, of citrus are presently under irrigate with a water deficit of the order of 40%.

Arakapas Pond No 2

This is an off-stream pond which was designed in combination with Dhierona pond. It is located about 1.5 km east of Arakapas village, very close to the road leading to Ephtagonia. Its storage capacity is 119,000 m³.

Water to the pond will be diverted from the tributary of the Yermasoyia River which springs from the Sykopetra area. A common diversion pipeline was designed for both the Arakapas pond No 2 and the Dhierona pond. Two diversion weirs will be constructed and since Arakapas pond is located higher than Dhierona pond, will only draw water from the higher weir. The length of the 200 mm diameter steel pipeline from the Arakapas pond to the higher weir is 4500 m. Part of this pipeline about 900 m in length near the pond will also be used as the main irrigation conveyor.

Geologically the site is located in a valley of diabase and lavas. The total volume of earthworks is estimated at about 108,600 m³ and the total area to be lined with membrane for watertightness is about 29,000m². The topographic conditions are fairly good but the geologic conditions are not that favorable due to the anticipated presence of hard rock.

The pond will be used for the irrigation of a gross area of 190 donums (170 donums net) of mainly citrus and olives. An area of 60 donums of citrus is presently irrigated from shallow wells but with considerable deficiency in water. Due to the high elevation of part of the area to be irrigated, pumping of water will be necessary in order to provide enough pressure for the use of improved irrigation systems.

Ayii Vavatsinias Pond No 2

This off-stream pond was designed to impound the surplus of the potable water supply of the village.

The pond which is located about 0.5 km south of the village, has a storage capacity of 43,500 m³. The water will be drawn from the overflow pipe of the balancing reservoir of the village water supply and will be conveyed to the pond through a 950 m long, 100 mm dia G I pipe.

Geologically the site is situated in a valley of diabase. The total volume of earthworks is estimated at 58,500 m³ and the total area of membrane lining to be used for watertightness is about 10,500 m². Neither the geological nor the topographical conditions encountered at the site are very favourable. This is indicated by the fact that the total earthworks are much higher than the pond's capacity and most of the excavation is to be done either by ripping or by blasting. This is also reflected in the economic studies, where the obtained interval rate of return of 8.4% is just a little higher than the cut-off rate fixed by the World Bank of 8%.

The pond will be used for the irrigation of a gross area of 55 donums (47 donums net) mainly citrus and deciduous fruits. Almost the whole of this area is not cultivated at present.

Borehole Schemes

Feasibility Studies

During 1982 feasibility studies were prepared for the following six borehole schemes:

- Ayios Constantinos boreholes
- Louvaras boreholes
- Alona borehole
- Askas borehole
- K. Amiandos borehole
- Dhymes borehole

The feasibility studies of the first scheme was completed in May and the detailed design in October 1982.

Louvaras boreholes scheme provides for the utilization of two boreholes (Nos 32/77 and 16/81) having a yield of 30 m^3/hr and 110 m^3/hr respectively. The feasibility study was completed in April 1982 and the derived internal rate of return was 14.47%. The scheme involves land consolidation.

The feasibility study of the *Alona borehole scheme* was completed in August 1982 and the derived internal rate of return was 12.94%. The borehole (No 46/80) has a yield of 30 m^3/hr and the water will be mainly used to cover irrigation defficiency of existing irrigation works.

The feasibility study of *Askas borehole scheme* was completed in November 1982 yielding an internal rate of return of 15.21% The borehole (No 98/80) having a yield of 40 m^3/hr will be mainly used for the irrigation of existing plantations which suffer from water shortage during the last months of the irrigation season.

The *Amiandos borehole scheme* provides mainly for the rehabilitation of the existing Irrigation Division. The scheme includes the utilization of the borehole (No 31/76) having a yield of 35 m^3/hr, the construction of more diversion weirs and storage tanks and the installation of a full pressurized distribution network. The feasibility study which was completed in December 1982 yielded an internal rate of return of 8.59%.

Finally the feasibility study of the *Dhymes borehole scheme* was completed in December 1982 with an internal rate of return of 11.90%. The borehole (No 81/80) having a yield of 50 m^3/hr will be used for the irrigation of mostly existing plantations.

Detailed Studies

During 1982 detailed studies were carried out for the following two borehole schemes;

Arakapas B/H
(No. 124/76)

The scheme provides for the utilization of the third borehole which was drilled for Arakapas village. The feasibility study was completed in July 1981 with an internal rate of return of 29.12%. The safe yield of the borehole was estimated at 30 m^3/hr. The borehole will cover the water deficit of the "Angoulos" Irrigation Division which extends over an area of 60 donums and will allow the extension of irrigation on a new area of 35 donums.

The whole area of 95 donums gross (75 donums net) will be mostly cultivated with citrus mainly mandarins. The cost of the scheme was estimated at £45,000.

Ayios Constantinos B/Hs
(Nos. 123/76 and 8/81)

The feasibility study of the Ayios Constantinos borehole scheme was completed in May 1982 and the internal rate of return was estimated at 13.47%.

The main use of the Ayios Constantinos boreholes, which have a combined yield of 90 m^3/hr (12 m^3/hr and 78 m^3/hr respectively), is to cover the water deficit of several small Irrigation Divisions in the proximity of the boreholes and the extension of irrigation over a new area of 170 donums.

At present the existing irrigation works depend wholly on several small springs for their water supplies. However, due to the lack of proper distribution works and the observed variation in the yield of the springs, the area experiences usually severe water shortage problems, especially during the last months of the irrigation season.

The pressurized distribution system will fully cover the new area. It will also deliver the water to the intakes of the small irrigation works, to supplement their water supplies from the springs.

The whole scheme will cover an area of 300 donums gross (255 donums net), which will be cultivated mainly with citrus and cherries.

The total cost of the scheme is estimated at £125,000.

Pumping Tests

Due to the rather complex conditions of occurence of groundwater in the igneous rock formations of the Troodos range, before embarking into the implementation of borehole schemes, it was decided to verify the results of the short term pumping tests with prolonged pumping tests.

These tests are planned and carried out by the WDD during summer and autumn months and tend to simulate actual scheme pumping conditions. The tests are coupled by observations on any adverse effects on neighbouring springs and wells and are completed by observations on water level recovery during spring of next year. The results are then interpreted and reported by both the WDD and the GSD.

During 1982 such tests were performed on nine boreholes. The derived yields - pending verification by water level recovery- versus those of the short duration tests which are carried out during the drilling of the boreholes are as follows:

TABLE IV-2
BOREHOLE PUMPING TESTS

Village	B/H No.	Prolonged Test Average Yield (m^3/hr)	Short Duration Test Yield (m^3/hr)
Ora	27/81	14	15
Ora	66/81	12	11
Phterykoudhi....	9/82	12	-
Ay. Vavatsinias.	35/81	32	45
Dhymes.....	81/80	50	50
Dhierona.....	14/82	34	27
Zoopiyi.....	9/81	30	-
Sykopetra.....	48/82	25	41
Agros.....	21/82	55	41

Boreholes Pumping Tests

Except for a couple of cases, the results of the prolonged tests verified those of the short tests. In the case of Ora boreholes, inspite of their low yield, their proximity to the Ora pond, will make possible their utilization, since they will share a common distribution network.

VASILIKOS-PENDASKINOS PROJECT

Due to the continuous involvement of this Division in the above mentioned project an account of the progress achieved during 1982 is cited here.

A change in the management of the Project implementation took place in March, with the appointment of a foreign Engineer who replaced the Head of the Design Division who was acting as a Project Manger.

During 1982 particular emphasis was placed on the completion of all the required procedures, which would enable the commencement of construction on those works of the project, which, being on the critical path, would affect the completion time of the whole project.

This involved mainly the finalization of the detailed designs, the construction drawings, the specifications and contract conditions for the construction of the two dams of the project i.e. the Kalavasos and the Dhypotamos dams. After that, tenders were invited, evaluated and awarded. The contracts for the construction of the two dams were signed by the end of the year. The contract sums reached £5,648,000 and £4,270,000 for the Kalavasos and Dhypotamos dams respectively. These sums are bound to increase due to the provision of the contracts for adjustment of the contract prices in accordance with the change of the costs of major construction materials and labour. The construction of Dhypotamos dam commenced on the 23rd of November whereas that of Kalavasos dam will start on the 3rd of January 1983.

In addition to the dams, the tenders for the supply of the electromechanical equipment for the two pumping stations of the project and the Kornos Water Treatment Plant, were also awarded. The two contracts were signed in November and December 1982 for the sums of £747,600 and £810,900 respectively. The award of these contracts will enable the finalization of the designs and drawings for the construction of the civil works of the Tokhni Pumping Station as well as of the Kornos Treatment Plant and Pumping Station.

The detailed designs and construction drawings for the two main conveyors of the Project, that is the diversion pipeline

from Maroni river to Dhypotamos dam and the pipeline from Kalavasos dam to Khirokitia Treatment Plant, were also completed during 1982. All drawings and contract documents will be reviewed by this Department before inviting the already prequalified contractors to submit tenders.

With regard to the irrigation distribution networks at the Pendaskinos valley, the Vasilikos valley and the Maroni coastal area, the detailed designs of the first one are already completed and the construction drawings are expected for review. The designs for the other two areas will be finalized in 1983, due to problems encountered in the implementation of land consolidation in the areas.

Finally a technical memorandum for the telemetry system for the operation of the project has been prepared and submitted for comments.

In addition to all the above activities, which refer to the implementation of the basic components of the project, work was also continued on the following:

The progress of application of land consolidation in the Maroni area and at two areas of the Vasilikos irrigation scheme, was during 1982 retarded, mainly due to the need to combine these operations with the planning of a future coastal road in these areas and also because of some reluctance by the farmers to accept land consolidation especially in the latter two areas.

The Agricultural Research Institute continued its research on the effects of irrigating crops with water with high sulphate and chloride content. During the year more equipment was provided to the substation of the Institute in the project area near Zyyi village, which covers an area of 47 donums. This will enable the Institute to respond more directly and positively to the farmers' requests for advice.

By the end of the year the construction of the project headquarters which is situated at Khirokitia Treatment Plant was substantially completed. The building will first house the supervising personnel of the project and later the personnel which will deal with the operation and maintenance of the project. The main installations of the building and its equipment is still pending and will be completed in 1983.

OTHER PROJECTS

Further to the Pitsilia Project, this Division started or completed the designs of two other schemes. The first one was the Khirokitia Irrigation Scheme, within the Larnaca-Orini Project, a short description of which is given below. The second detailed design was started for two ponds in the Phlasou area within the Solea Valley Project. These were the first two of a series of 13 pondsites located in this valley. Due to the interrelation of these ponds with each other and with the existing water rights in the valley, their implementation will be decided after a thorough examination of the needs of the area in conjunction with the technical possibilities offered and after a general development plan is drawn. Furthermore the Division examined several requests by villages for water works.

Khirokitia Irrigation Scheme

This scheme provides for the combined use of the water of a pond and of a borehole.

The pond will be located about 0.7 km north of Khirokitia village by the road which leads to Vavla village. It will be an off-stream pond with a storage capacity of 205,000 m^3, which makes it the second largest pond ever undertaken in Cyprus.

The pond will draw water from the Maroni river. A 2.5 km long, 200mm dia steel pipeline will deliver the water from the diversion weir to the pond. Geologically the site is located in sedimentary rocks (transition between Lefkara and Pakhna formation) of marls, chalks and sandstones. The total volume of earthworks is estimated at 221,000 m^3 and the total area of membrane lining to be used for watertightness is about 35,000m^2.

The borehole (No. 136/78) is located about 500 m northwest of the pond. After the usual short pumping test, a longer test of about one month during July 1981, was carried out, the results of which verified the initial safe yield of 40 m^3/h.

The borehole will be utilized in conjunction with the pond, that is it will discharge in the pond from where a single distribution system will start. The total gross area to be irrigated will be about 350 donums (290 donums net), cultivated mainly with citrus, table olives and vegetables.

The total cost of the scheme is estimated at £428,000. By the end of 1982, tenders were invited and evaluated. The award will be made early in 1983 after all financial matters are settled.

TOPOGRAPHY BRANCH

The Topography Branch is operating within the Design Division and conducts all the engineering surveys needed by the Divisions of the Department of Water Development. The Branch is headed by a Technical Superintendent and staffed with fifteen Technicians II, fourteen Chainmen and twenty Rodmen.

The surveying work performed, is of the engineering type and consists mainly of cross sectioning, profile levelling, contour surveys, setting out of project outlines, instrumental observations for movement detection or deformation of structures etc. Modern surveying instruments and equipment are available and they are replenished annually according to the needs and demand of the projects undertaken by the Department.

During the year this Branch was engaged mainly with surveying work for all the major projects of the Department, that is the Southern Conveyor Project, the Vasilikos-Pendaskinos Project, the Khrysokhou Irrigation Project and the Pitsilia Integrated Rural Development Project, as well as for other minor or routine jobs. A detailed list of the activities of the Branch is given below:

TABLE IV-3
SURVEYING WORK CONDUCTED DURING 1982

Southern Conveyor Project

- Main Conveyor - Setting out and profile levelling
- Kouris Dam - Extension surveys, monumentation and setting out
- Kokkinokhoria irrigation network - Setting out and profile levelling
- Akhna Dam - Extension of survey, setting out and monumentation

Vasilikos-Pendaskinos Project

- Dhypotamos Dam - Setting out
- Kalavasos Dam - Setting out
- Kalavasos-Khirokitia Pipeline - Setting out and profile levelling
- Kalavasos Break Pressure Tank - Site survey
- Ayios Theodhoros Pipeline - Setting out and profile levelling

Khrysokhou Irrigation Project

Evretou Dam

- Survey of spillway area
- Site survey of borrow areas
- Contour survey for model area
- Setting out, cross sectioning, profile levelling and strip survey for access roads

Pitsilia Integrated Rural Development Project

Ponds :

- Ayii Vavatsinias - Supplementary contour survey and profile levelling
- Dhierona - Supplementary contour survey and profile levelling
- Arakapas No. 2 - Supplementary contour survey and profile levelling
- Kyperounda - Setting out
- Agridhia - Setting out
- Ora - Setting out
- Lagoudhera - Setting out
- Odhou - Profile levelling

Other Surveys

- Karyotis Project

- Panayia Dam contour survey
- Orounda Pond contour survey

- Malounda Dam - Contour survey
- Vizakia Dam - Cross sectioning
- Anaphotia Recharge and Diversion Works - Contour survey and profile levelling
- Peristerona Recharge Works - Contour survey and cross sections
- Yerasa Pond - Contour survey
- Yermasoyia Vasilikos Scheme - Setting out and profile levelling
- Nicosia W.S. Stavrovouni Emergency Scheme - Setting out and profile levelling

Routine Works

Instrumental observations of

- Amiandos mines
- Kalopanayiotis Dam
- Asprokremmos Dam
- Lefkara Dam
- Khirokitia Treatment Plant

DRAWING AND RECORDS BRANCH

The Drawing and Records Branch is made

TABLE IV-4

WORK CARRIED OUT BY THE DRAWING BRANCH DURING 1982

Ref.	Description	Time spent in hours	Man Months	% of total
a	Existing dams (completion plans, sedimentation maps, control monuments etc.) and proposed dams	534	3.4	1.5
b	Irrigation distribution systems for dams	243	2.2	0.7
c	Routine irrigation schemes	896	5.8	2.5
d	Routine domestic water supply schemes	1451	9.4	4.1
e	Paphos Project	1755	11.4	4.9
f	Pitsilia Integrated Rural Development Project	3856	25.0	10.9
g	Vasilikos-Pendaskinos Project	1743	11.3	5.0
h	Southern Conveyor Project	9149	59.4	26.0
i	Khrysokhou Watershed Irrigation Project	1856	12.0	5.2
j	Solea Valley Project	181	1.2	0.5
k	Larnaca-Orini Project	190	1.2	0.5
l	Emergency Schemes for town water supplies (including Yermasoyia-Vasilikos Scheme)	722	4.7	2.1
m	Antiflood and river training works	13	0.1	0.1
n	Sewage disposal for Refugee estates	78	0.5	0.2
o	Recharge works	33	0.2	0.1
p	Hydrological	74	0.5	0.2
q	Programmes and organisation	87	0.5	0.2
r	Agriculture show	656	4.2	1.8
s	Productivity centre course			
t	Training of staff			
u	Completion plans and reports	723	4.7	2.1
v	Reports	365	2.4	1.1
w	General	775	5.0	2.2
x	Odd jobs	18	0.1	0.1
y	Auxiliary services			
	(i) Library	1232	8.0	3.5
	(ii) Plan registry	584	3.8	1.6
	(iii) Plan reproduction	2088	13.5	6.0
	(iv) Drawing materials store	311	2.0	0.9
	(v) Photographic section and photo process lab.	1855	12.0	5.2
	Total for auxiliary services	6070	39.3	17.2
z	(i) Leave paid	2217	14.4	6.2
	(ii) Leave without pay	13	0.1	0.3
	(iii) Sick leave	871	5.6	2.4
	(iv) Maternity leave	313	2.0	0.8
	(v) D.C. (including site visits)	366	2.0	1.1
	Total for leave etc.	3780	24.1	11.0
	Grand total	35248	228	100

up of the following sections:

- *The Drawing and Cartography Section*
- *The Plan Registry and Plan Reproduction Section*
- *The Photographic Section and Photo Process Laboratory, and*
- *The Technical Library and Technical Information Section*

At the end of the year under review the staff of the Drawing and Records Branch numbered 19 i.e. 6 Technicians I, 7 Technicians II, 4 Technician II (on contract) and 2 hourly paid assistants of the plan reproduction section. Two of the Technicians worked with the KWIP for the first half of the year and four with the SCP upto the beginning of December 1982 when 3 of them (on contract) returned to the Drawing Office. The 2 staff with the KWIP carried on with their commendable work up to the finish of the feasibility study of the project but a lot of help was given to the SCP for the preparation of the feasibility report drawings from the Drawing Office main staff.

Due to lack of funds no HTI students were employed during the summer of 1982 bar one who opted out to carry out her training programme without pay.

The work carried out by the Drawing and Records Branch during the year is listed below.

Drawing and Cartography Section

As can be seen from the above table 52% of the time was taken by the five major projects, Southern Conveyor, Paphos, Pitsilia, Vasilikos-Pendaskinos and Khrysokhou. For the first 6 months of the year and until the completion of the feasibility study of the SCP the drawing work load of the project continued to be so heavy that some work was diverted to the Paphos and Limassol Regional Offices of the Department. Between August and October 1982 this section worked hard on the preparation of the PIP inauguration on jobs such as the preparation of bulletins and posters for the project and Asprokremmos Dam, photo display posters, the inauguration monument emblems and plaque etc. Several members worked after office hours both on PIP and on the WDD stand of the 1982 AGRI FAIR. They were given time off in lieu of payment for overtime work. A colour map was prepared for one of the PIP inauguration bulletins and preparatory work was also done on a colour map for a VPP bulletin that may be printed in 1983.

Plan Reproduction and Plan Registry Section

There was an increase in the volume of work of this section also. Some 3,900 orders were executed for 43,550 prints of all types and sizes.

The plan registry work is shared by the Drawing Office Staff.

The Photographic and Photo Process Laboratory

Photographic coverage of all construction works of the Department continued during 1982. Black and white and colour still photography was applied as well as colour cinematography. Monthly visits continued to Paphos Project as well as Asprokremmos Dam. Albums of B and W and colour photos are kept with the Technical Library at WDD HQs.

There was again an increase in demand for photolithographic work, the photo process lab having to cope with the requirements of all the projects for base maps, reproductions, reductions and enlargements of drawings.

In June of 1982 the photographic section of the Department carried out two successful flights on hired light aircraft (a) for the photographic coverage of Asprokremmos Dam after its first impoundment with water and the PIP area to record the progress in agricultural development and (b) for the photographic coverage of water filled earth ponds of the Pitsilia Project. An extensive use has already been made of the aerial photos both by WDD and MANR for the bulletins of the two Projects and for the 1982 AGRI FAIR.

Technical Library and Technical Information Section

In 1982 £583 was spent on the purchase of 20 technical books and subscription to 11 periodicals.

The Library continued to issue monthly notes on material received and of articles of special interest in periodicals. Following are lists of books purchased, and of WDD reports.

Books Purchased (20 No)

Central Board of Irrigation and Power:

- Technical report No. 14. Research scheme applied to river valley projects. Manual on canal lining. New Delhi, 1979. Book No. 9567 US$ 15.00
- Technical report No. 18. Research scheme applied to river valley projects. Manual on ground water and tubewells. New Delhi, 1978. Book No. 9568 US$ 15.00
-Technical report No. 20. Research scheme applied to river valley projects. Sedimentation studies in reservoirs. Volume I & II. New Delhi, 1951. Book Nos. 9569, 9570 US$ 25.00

R A GRACE. Marine outfall systems, planning, design and construction. New Jersey, 1978. Book No. 9572 $55.40

B S I. British Standards Yearbook 1982. London, 1982. Book No. 9573 Stg £15.50

DR ING A FINTER. Μετάφραση Κ. Σαρροπούλου. Πίνακες και κανονισμοί έργων Πολιτικού Μηχανικού. Αθήναι, 1977 Book No. 9574. 1000 δραχ.

G MARTZ. Μετάφραση Γρ. Ευστρατιάδη. Υδραυλική των οικισμών. Μέρος 1ον. Υδρεύσεις. Αθήναι, 1976. Book No. 9575. 600 δραχ.

G MARTZ. Μετάφραση Γ. Χατζηθεοδώρου. Υδραυλική των οικισμών. Μέρος 2ον. Αποχετεύσεις. Αθήναι, 1977. Book No. 9576. 500 δραχ.

G MARTZ. Μετάφραση Μ. Θεολογίτη. Υδραυλική των οικισμών. Μέρος 3ον – Καθαρισμός λυμάτων. Αθήναι, 1977. Book No. 9577. 600 δραχ.

B Z KINORI. Μετάφραση Η. Βασιλοπούλου. Υδραυλική των Ανοικτών Αγωγών. Αθήναι, 1978. Book No. 9578. 700 δραχ.

A LENCASTRE. Μετάφραση Χ. Καργόπουλος. Εγχειρίδιο Γενικής Υδραυλικής. Αθήναι, 1978. Book No. 9579. 1400 δραχ.

O W ISRAELSEN – V E HANSEN. Μετάφραση Β. Νικολαΐδη και Λ. Κομνηνίδη. Αρδεύσεις βασικαί αρχαί και μέθοδοι. Αθήναι, 1968. Book No. 9580. 1300 δραχ.

ASTM. STP 741 Underground corrosion. USA, 1981 Book No. 9657 US$ 26.00

ASTM. E380-82 standard for metric practice. Philadelphia, 1982. Book No. 9658 US$ 5.00

ASCE. Transactions of the american society of civil engineers. Volume 146-1981. New York, 1982. Book No. 9674 US$ 54.50.

G BUGLIARELLO-F GUNTHER. Computer systems and water resources. Amsterdam 1974. Book No. 9701 Dutch guilders 137.00

SAWYER – GILLOTT. The FIDIC conditions. Digest of contractual relationships and responsibilities. London, 1981. Book No. 9801, 9802 Stg £11.00 each (2 copies)

ICID. Canal construction - Open channels construction - Machinery and techniques. India. Book No. 9803. US$ 13.00

WDD Reports (66 No)

P MARATHEFTOU. Pitsilia integrated rural development project. Odhou ponds 1 & 2. Irrigation scheme. Mini feasibility study. Nicosia, December, 1981. Report No. D/109 Book Nos 9434, 9435.

C C ARTEMIS & T E H SABBEN – CLARE. Vasilikos-Pendaskinos Project. Nicosia water supply-First phase. Progress report No. 6 covering period from 1.10.81 to 31.12.81 Nicosia, February, 1982. Report No. D/110 Book Nos 9436, 9437.

B M MILINUSIC. Paphos irrigation project. Progress report No. 24 Covering period from 1.10.81 to 1.1.82. Nicosia, February, 1982. Report No. D/111. Book Nos 9438, 9439.

H B JACKSON. Southern conveyor project. Tenth progress report. Nicosia, March, 1982. Report No. P/28. Book Nos 9440, 9441.

A C ARTEMIS. Vasilikos-Pendaskinos project. Progress report No. 7. Covering period from 1.7.81 to 31.12.81. Nicosia, March, 1982. Report No. D/207. Book Nos 9478, 9479.

N TSIOURTIS-S AFRODISIS. Pitsilia integrated rural development project. Pumping test results-1981. Preliminary results. Nicosia, March, 1982. Report No. D/112. Book Nos 9480, 9481.

B M MILINUSIC. Paphos irrigation project. Progress report No. 25. Covering period from 1.1.82 to 1.4.82. Nicosia, April, 1982. Report No. D/113. Book Nos 9498, 9499.

C C ARTEMIS & T E H SABBEN – CLARE. Vasilikos - Pendaskinos project. Nicosia water supply - First phase. Progress report No. 7. Covering period from 1.1.82 to 31.3.82. Nicosia, May, 1982. Report No. D/207. Book Nos 9502,9503

N MICHAEL. Pitsilia integrated rural development project. Louvaras boreholes irrigation scheme. Mini feasibility study. Nicosia, April, 1982. Report No. D/114. Book Nos 9500, 9501.

N MICHAEL. Pitsilia integrated rural development project. Ayios Konstantinos boreholes irrigation scheme. Mini feasibility study. Nicosia, May, 1982. Report No. D/117. Book Nos 9504, 9505.

M TELEVANTOS. Pitsilia integrated rural development project Arakapas pond No. 2 Irrigation scheme. Mini feasibility study. Nicosia, May, 1982. Report No. D/119. Book Nos 9537, 9538.

Z VOSKARIDOU. Akrotiri village boreholes irrigation scheme Mini feasibility study. Nicosia, May, 1982. Report No. D/118. Book Nos 9506, 9507.

N E NEOKLEOUS. Pitsilia integrated rural development project. Ephtagonia Pond No. 1. Completion report Nicosia, November, 1981. Report No. C/141. Book Nos 9540, 9541.

N E NEOKLEOUS. Pitsilia integrated rural development project. Melini pond No. 1. Completion report, Nicosia, October, 1981. Report No. C/142. Book Nos. 9542, 9543.

N E NEOKLEOUS. Pitsilia integrated rural development project. Pelendria pond. Completion report Nicosia, November, 1981. Report No. C/143 Book Nos 9544, 9545.

N D CHRISTOFIDES. Pitsilia integrated rural development project. Ayii Vavatsinias pond No. 2. Irrigation scheme. Mini feasibility study. Nicosia, June, 1982. Report No. D/120. Book No. 9546, 9547.

M C IOANNOU. Larnaca-Orini project. Khirokitia irrigation scheme. Feasibility study. Nicosia, June, 1982. Report No. D/121 Book Nos 9548, 9549.

K KYROU. Pitsilia integrated rural development project. Dhierona irrigation scheme. Mini feasibility study. Nicosia, June, 1982. Report No. D/122. Book Nos 9550, 9551.

N TSIOURTIS – S AFRODISIS. Pitsilia integrated rural development project pumping test results - 1981. Final results. Nicosia, June, 1982. Report No. D/123. Book Nos 9552, 9553.

S STEPHANOU. Khrysokhou Watershed Irrigation Project. Main Irrigation Conveyance Systems for the Areas of: Khrysokhou valley-Argaka-Magounda-Yialia-Ayia Marina-Pomos Uplands. Project working paper No. IRR/14. Book Nos 9600, 9601.

HERODOTOU – PAPANDREOU – POLYCARPOU. Southern Conveyor Project. Feasibility study. Crop production Inputs (Annex to volume 4) No. D/115. Book Nos 9602, 9603.

Z VOSKARIDOU. Pitsilia Integrated Rural Development Project. Alona Borehole Irrigation Scheme. Mini Feasibility Study. Book Nos 9604, 9605.

B M MILINUSIC. Paphos Irrigation Project. Progress Report No. 26. Covering period from 1.4.82 to 1.7.82. Report No. D/125. Book Nos 9606, 9607.

C C ARTEMIS – T E H SABBEN-CLARE. Vasilikos-Pendaskinos Project. Nicosia Water Supply - First phase progress report No. 8 (Final). Covering period from 1.4.82 to 31.7.82. Report No. D/126. Book Nos 9608, 9609.

WDD – UNDP/FAO. Khrysokhou Watershed irrigation project. Hydro-agricultural development Khrysokhou area-Feasibility study. Main report. Nicosia, March, 1981. Book No. 9582.

WDD – UNDP/FAO. Khrysokhou watershed irrigation project. Hydro-agricultural development Khrysokhou area. Feasibility report. Annex 1. National context. Nicosia, March, 1981. Book No. 9583.

WDD – UNDP/FAO. Khrysokhou watershed irrigation project. Hydro-agricultural development Khrysokhou area. Feasibility report Annex 2. Present resources and their deployment. Nicosia, March, 1981. Book No.9584.

WDD – UNDP/FAO. Khrysokhou watershed irrigation project. Hydro-agricultural development Khrysokhou area. Feasibility report. Annex 4A. Evretou Dam. Nicosia, 1981. Book No. 9586.

WDD – UNDP/FAO. Khrysokhou watershed irrigation project. Hydro-agricultural development Khrysokhou area. Feasibility report. Annex 4B. Conveyors. Nicosia, March, 1981. Book No. 9587.

WDD – UNDP/FAO. Khrysokhou watershed irrigation project. Hydro-agricultural development Khrysokhou area. Feasibility report. Annex 40. Ezousa Dam, Nicosia, March, 1981. Book No. 9588.

WDD – UNDP/FAO. Khrysokhou watershed irrigation project. Hydro-agricultural development. Khrysokhou area. Feasibility report. Annex 5. Irrigation network, Nicosia, March, 1981. Book No. 9589.

WDD - UNDP/FAO. Khrysokhou watershed irrigation project. Hydro-agricultural development Khrysokhou area. Feasibility report. Annex 3. Water Resources Development. Nicosia, March, 1981. Book No. 9585.

WDD - UNDP/FAO. Khrysokhou watershed irrigation project. Hydro-agricultural development. Khrysokhou area. Feasibility report. Annex 6. Agricultural development and production. Nicosia, March, 1982. Book No. 9590.

WDD - UNDP/FAO. Khrysokhou watershed irrigation project. Hydro-agricultural development Khrysokhou area. Feasibility report. Annex 7. Organization and management. Nicosia, March, 1982. Book No. 9591.

WDD - UNDP/FAO. Khrysokhou watershed irrigation project. Hydro-agricultural development Khrysokhou area. Feasibility report. Annex 8. Marketing and prices. Nicosia, March, 1982. Book No. 9592.

WDD - UNDP/FAO. Khrysokhou watershed irrigation project. Hydro-agricultural development. Khrysokhou area. Feasibility report. Annex 9. Financial analysis. Nicosia, March, 1982. Book No. 9593.

WDD - UNDP/FAO. Khrysokhou watershed irrigation project. Hydro-agricultural development Khrysokhou area. Feasibility report. Annex 10. Benefits and justification Nicosia, March, 1982. Book No. 9594.

WDD - UNDP/FAO. Khrysokhou irrigation project. Contract number-tender documents for law lands. Main conveyor sector 1, Vol. 1,2 & 3. Nicosia, March, 1982. Book No. 9595.

WDD - UNDP/FAO. Khrysokhou irrigation project. Contract number tender documents for installation of irrigation network. Sector 1. Part A. General documents. Part B. Specific documents. Nicosia, March, 1982. Book No. 9596.

WDD - UNDP/FAO. Khrysokhou irrigation project. Tender documents for supplies for irrigation network. Sector 1 (Lot S1). Pipes and Fittings. (Lot S2). Valves. (Lot S3). Hydrants and Meters. Part A. General documents. Part B. Specific documents. Nicosia, March, 1982. Book No. 9597.

WDD - UNDP/FAO. Khrysokhou irrigation project. Design note and cost estimate. Lowlands main conveyor. Sector 1. Nicosia, March, 1982. Book No. 9598.

WDD - UNDP/FAO. Khrysokhou irrigation project. Design note and cost estimate. Irrigation network. Sector 1A. Nicosia, March, 1982. Book No. 9599.

Southern Conveyor Project-Feasibility Study Reports

- Volume 1. Main report, Nicosia, July, 1982. Book Nos 9623, 9624.
- Volume 2. Surface water resources. Nicosia, July, 1982. Book Nos 9625, 9626.
- Volume 3. Groundwater resources. Nicosia, July, 1982. Book Nos 9627, 9628.
- Volume 4. Irrigated agricultural development, Nicosia, July, 1982. Book Nos 9629, 9630.
- Volume 5. Agricultural maps. Nicosia, July, 1982. Book Nos 9631, 9632.
- Volume 6. Engineering Kouris dam. Nicosia, July, 1982. Book Nos 9633, 9634.
- Volume 7. Engineering conveyors. Nicosia, July, 1982. Book Nos 9635, 9636.
- Volume 8. Engineering. Akhna, Yermasoyia and Pyrgos dams. Nicosia, July, 1982. Book Nos 9637, 9638.
- Volume 9. Engineering irrigation systems. Nicosia, July, 1982. Book Nos 9639, 9640.
- Volume 10. Engineering domestic water supply. Nicosia, July, 1982. Book Nos 9641, 9642.
- Volume 11. Engineering drawings. Dams and conveyors Nicosia, July, 1982. Book Nos 9643, 9644.
- Volume 12. Engineering drawings. Irrigation systems. Nicosia, July, 1982. Book Nos 9645, 9646.
- Volume 13. Engineering drawings. Domestic water supply, Nicosia, July, 1982. Book Nos 9647, 9648.
- Volume 14. Systems analysis, Nicosia, July, 1982. Book Nos 9649, 9650.
- Volume 15. Organization management and operational control. Nicosia, July, 1982. Book Nos 9651, 9652.
- Volume 16. Agricultural economics analysis. Nicosia, July, 1982. Book Nos 9653, 9654.
- Volume 17. Agricultural economics. Marketing and volume 17 addendum. Updated data on imports into the EEC of grapefruit, lemons and potatoes. Nicosia, July, 1982. Book Nos 9702. 9703.
- Volume 18. Domestic Water. Economics. Nicosia, July, 1982. Book Nos 9655, 9656.
- Volume 19. Project economics. Nicosia, July, 1982. Book Nos 9665, 9666.

CHR MARCOULLIS. Vasilikos-Pendaskinos project. Economic re - evaluation. Nicosia, September 1982. Report No. D/127. Book Nos 9704, 9705.

M IOANNOU. Pitsilia integrated rural development project. Askas borehole irrigation scheme. Nicosia, November, 1982. Report No. D/128. Book Nos 9706, 9707.

D KYPRIS. Water use study in Cyprus coastal hotels in relation to water recycling propositions. Nicosia, 1982. Book Nos 9708, 9709.

P NEOPHYTIDES. Pitsilia integrated rural development project. Dhymes borehole irrigation scheme. Mini feasibility study. Nicosia, December, 1982. Report No. D/129. Book Nos 9722, 9723.

Z VOSKARIDOU. Pitsilia integrated rural development project. Kato Amiandos irrigation scheme. Mini feasibility study. Nicosia, December, 1982. Report No. D/130. Book Nos 9724, 9725.

V DIVISION OF CONSTRUCTION

by
A P Georghiades
Senior Water Engineer
Head of the Division

Introduction

The Division of Construction is one of the major divisions of the Department, and it deals with the planning, supervision and control of all constructional activities of the Department whether by direct labour, or by contract. The Division is sub-divided into four main branches:

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

During 1982 the Division consisted of the following staff:

1	Senior Water Engineer - Head
2	Executive Engineers, Class I
1	Mechanical Engineer, Class I
5	Executive Engineers, Class II
1	Technical Superintendent
9	Senior Technicians
6	Technicians I
3	Chief Foremen
6	Assistant Chief Foremen
3	Technicians II
41	Monthly paid Foremen
47	Weekly paid Foremen
125	Total staff

In addition to the above technical staff, the Division engaged 534 regular employees of various trades mostly skilled and a daily average of 282 casual employees, mostly unskilled, for the execution of the various schemes in the budget all over the free island.

The Division has continued during 1982 the collection of data regarding actual rates of work, standards of materials and equipment, for the up-to-date information of the Construction Unit Cost Manual, which is most essential for planning and cost estimating of future projects.

The commencement of the construction of the new projects approved for execution during 1982 again started late, due to the delay in the allocation of the necessary funds. This delay causes quite a lot of problems and upsets the construction programme, especially in summer and early autumn, when the demand for executing contributory and emergency schemes is at its peak. The delay in the availability of funds is altributed to the late approval of the Development Budget (end of February) by the House of Representatives, the long procedure required for the approval of loans from the Loan Commissioners, the late action taken by District Officers, the de-daggering of funds, etc.

CONSTRUCTION PROGRAMME AND PROGRESS

The planning section of the Division prepared,

as usual, a construction programme including all water projects approved for execution during 1982. These projects were not only those included in our Department's Development Budget, but all water works included in other Ministries or Departments budgets. In general the Division had to deal with the constructional activities relating to all water projects scheduled for execution during 1982, except specific major projects where the role of the Construction Division is rather limited due to financing procedures etc. All these projects may be classified as follows:

- All projects, new and carry over, approved for execution in our Department's 1982 budget.
- All water projects (ponds, boreholes, rehabilitation and water supplies) approved for execution in the Pitsilia Integrated Rural Development Project, under the budget of the Ministry of Agriculture and Natural Resources.
- All water supply schemes for the housing of refugees, approved in the 1982 budget of the Department of Planning and Housing.
- All water works, such as water supply and irrigation schemes for Turkish Cypriot villages, water supplies for new livestock and industrial areas, etc., included in the budgets of other Ministries or Departments.
- Water supply and irrigation schemes for villages non-budgeted, carried out from funds deposited by the villages, and
- Water supply schemes, mostly distribution systems for land developing carried out on behalf of private developers from deposits.

In total during 1982, the Division of Construction had to deal with 601 projects of an estimated value of £9,099,253. The expenditure incurred on all these projects during the year reached the amount of £6,306,484. This figure does not include specific major projects under constract, such as the Paphos Irrigation Project on which the 1982 expenditure reached the amount of £3,556,597 and details are given elsewhere in this report.

Again, during 1982, as in the previous years the Division was under - staffed especially in the lower ranks of Technicians, and this resulted to considerable hardship to the existing staff who had to respond to so many and so urgent requests for the execution of the construction programme.

Table V-I gives an outline of the volume

TABLE V-1

SCHEMES UNDERTAKEN FOR CONSTRUCTION DURING 1982

Ser No	Description	No. of schemes	Amount allocated £	Expenditure incurred £
1	Rural domestic water supplies.....	56	1 029 331	560 846
2	Minor irrigation schemes.....	22	408 959	207 709
3	Vasilikos-Pendaskinos Project.....	1	1 589 243	1 045 809
4	Yermasoyia-Vasilikos pipeline.....	1	1 125 566	885 558
4a	T W S Emergency schemes.....	23	842 733	654 955
5	Pitsilia Integrated Rural Development Project.....	83	2 352 191	1 759 878
6	Other major irrigation schemes (supplementary works).....	15	271 654	136 467
7	Water supply and sewage disposal schemes for refugee estates.....	75	647 906	536 233
8	Schemes undertaken for other Government Departments.....	62	397 043	362 558
9	Water supply and irrigation schemes (non-budgeted) executed from village deposits.....	106	256 735	45 961
10	Schemes executed for private developers from deposits, (mostly distribution systems for land developing).....	181	177 892	110 510
	Total.....	625	£9 099 253	£6 306 484
Note: Paphos Irrigation Project expenditure not included in the above figure is.....				3 556 597
	Grand Total.....			£9 863 081

of work executed by the Division during 1982. More information and detailed lists for each category of projects are given in other tables, further on, in this report.

PLANNING BRANCH

Again, during 1982 it was not possible to staff this branch of the Division adequately due to the shortage of experienced technical officers. It is believed that with proper staffing of this branch its role could be widened and its contribution in respect of construction planning could be enormously enlarged.

The main activities of this branch during the year may be classified as follows:

- The programming and cost control of all schemes under construction.
- The preparation of a monthly report of all schemes budgeted under our Department's votes showing the progress and expenditure which was distributed to the Ministry of Agriculture and Natural Resources, the Planning Bureau, Senior Officers and Technical Officers supervising schemes under construction, etc.
- The assessment of the Department's requirements in materials and equipment, such as pipes, pipe fittings, pumping units, etc and their order through the Government Central Stores (GCS) in time.
- The checking of the estimates of the schemes designed by other Divisions of the Department so as to conform with the current rates and to ensure their execution within the estimated cost.
- The collection of data regarding actual rates, standards of materials and equipment and their appraisal and utilization for the up-to-date information of the Construction Unit Cost Manual.
- The distribution of resources, such as labour force, plant and materials to the various schemes under construction.
- The invitation of direct tenders for the supply of such materials that are not available in the GCS ie building materials, etc and the hiring of machinery from the private sector, when such machinery is not available at the EMS.
- The acquisition of immovable property which is affected by the construction of schemes.
- The supply of services towards the installation of electricity supply, telephone, etc, at the site of various works.

CONTROL BRANCH

The main activity of this branch is to exercise control over the construction of all the schemes. It has to follow up and see that all construction programmes are adhered to, or revised if required by the supervising technical staff, that the progress of the works is attained at reasonable standards and as planned. The quality of the work of all schemes under construction has also to be followed up and be kept always at the highest possible standards.

Another objective of this branch is to ensure that the schemes are completed within the estimated amount and to locate problems and excesses where these are unavoidable and take the appropriate action to remedy the situation. The technical staff of this branch works in association with the technical supervising staff for the construction of the schemes, and the solving of problems arising during the execution.

All other than Nicosia District projects approved for execution, are constructed direct by the three Regional Offices of our Department, ie Limassol, Paphos and Larnaca - Famagusta, in close association with a senior technical officer of our Division who acts as the co-ordinator between the Regional Offices and the Headquarters in Nicosia. In addition, the Head of the Construction Division and other Senior Officers carry periodic visits to the Regional Offices and to the sites of the works under construction. The Construction Division is kept informed on the progress of all schemes through the co-ordinator and periodic progress reports that are submitted by the regional officers.

LABOUR FORCE

For the construction of all the projects the Division engaged a gang, usually consisting of a monthly or weekly paid foreman, regular artisans of the Department of various trades, and casual, skilled or unskilled labour force which is recruited locally through the Government Labour Offices.

The average daily labour force engaged by the Division during 1982 for the construction of all the schemes was 815 persons. Out of this figure 534 persons were regular employees of various trades, mostly builders, pipelayers, carpenters, etc, and 282 persons were casual skilled or unskilled labourers.

TABLE V-2
LABOUR FORCE 1982

Month	Skilled	Unskilled	Regular	Casual	Total
January.....	604	149	513	240	753
February.....	598	170	513	255	768
March.....	700	199	535	364	899
April.....	635	185	535	285	820
May.....	607	176	535	248	783
June.....	645	236	543	338	881
July.....	609	215	542	282	824
August.....	611	210	540	281	821
September.....	628	190	539	279	818
October.....	623	182	537	268	805
November.....	605	182	536	251	787
December.....	608	212	534	286	820
Daily average %.....	76%	24%	66%	35%	100%
Daily average No.....	623	192	534	282	815

The total expenditure incurred during 1982 on wages alone, on schemes constructed by direct labour, reached the amount of £1,590,404.

Table V-2 shows in detail the monthly average labour force engaged direct by the Division of Construction during 1982.

PIPES AND PIPE FITTINGS

Most of the pipes and fittings used by the Division during 1982 have been purchased through the Government Central Stores, where a reasonable stock is kept on a permanent basis for requisitioning.

Our yearly requirements in pipes and pipe fittings are assessed by the Planning Section of the Division as soon as the budget is approved by the Ministerial Council and an order is put through the GCS early before the commencement of the construction programme so that the schemes can be executed uninterruptedly.

In exceptional cases where our requirements cannot be met through the GCS due to the execution of emergency schemes, then pipes and fittings may be purchased by our Department by direct tenders from local or foreign factories.

During 1982 some quantities of special pipes ie ductile pipes and asbestos cement pipes class 25 were purchased direct by our Department for the execution of emergency water supply schemes.

During 1982, a length of 419,160 meters of pipes of various types and diameters were laid all over the island for all schemes other than the Paphos Irrigation Project, at an expenditure of £2,100,973.

Table V-3 shows in detail all types, lengths and value of pipes laid during 1982.

TABLE V-3
PIPES LAID DURING 1982

I GALVANIZED STEEL PIPES

Dia inches	Length m	Value £
1/2	6 540	2 474
3/4	1 128	460
1	4 224	2 283
1 1/4	7 758	5 349
1 1/2	11 352	9 597
2	31 138	46 032
2 1/2	36 870	69 666
3	43 334	83 253
4	32 170	97 643
5	120	398
Total.....	174 634	£317 155

II STEEL PIPES (COATED-PLAIN ENDED OR VICTAULIC)

168.3	22 476	141 928
219.1	28 512	285 666
273.0	12 922	87 073
323.9	2 552	40 882
355.6	4 740	156 133
457.0	16	330
610.0	198	6 488
Total.....	71 416	£718 500

III ASBESTOS CEMENT PRESSURE PIPES-CLASS 15

60	292	40
75	8 295	7 897
100	25 886	51 768
150	14 632	41 342
200	11 548	49 124
250	445	1 825
300	795	10 301
350	10 672	120 599
400	-	-
450	1 002	12 674
500	1 260	26 886
600	1 254	40 502
Total.....	76 081	£362 958

IV ASBESTOS CEMENT PRESSURE PIPES-CLASS 20

Dia inches	Length m	value £
75	3 308	4 595
100	12 581	28 492
150	7 398	28 168
200	9 522	58 098
250	2 293	15 478
300	3 176	35 115
350	9 270	139 073
Total.....	47 548	£309 019

V ASBESTOS CEMENT PRESSURE PIPES-CLASS 25

350	8 688	148 122
Total.....	8 688	£148 122

VI DUCTILE IRON PIPES

350	9 660	182 091
700	900	49 748
Total.....	10 560	£231 839

VII PVC/POLYTHENE PIPES-(6 atm and 10 atm)

12	9 561	3 292
20	2 467	500
25	6 650	1 904
32	399	58
40	461	132
50	38	17
90	10 240	6 673
150	37	86
200	380	718
Total.....	30 233	£13 380

SUMMARY OF ALL TYPES OF PIPES LAID DURING 1982

Ser No	Type	Length m	value £
I	Galvanized steel pipes.....	174 634	317 155
II	Steel pipes (coated).....	71 416	718 500
III	Asbestos cement pressure pipes-class 15.....	76 081	362 958
IV	Asbestos cement pressure pipes-class 20.....	47 548	309 019
V	Asbestos cement pressure pipes-class 25.....	8 688	148 122
VI	Ductile iron pipes.	10 560	231 839
VII	PVC/Polythene pipes.....	30 233	13 380
	Total.....	419 160	£2 100 973

CONSTRUCTION PLANT

For the construction of the schemes approved in the 1982 Budget, and all other schemes undertaken for construction during 1982, the Division had to apply to the Department of Electrical and Mechanical Services (EMS) for any type of machinery considered necessary for the execution of the schemes.

If Government machinery was not available, then the Division had to hire machinery from the private sector through open tenders.

During 1982 the Division had to hire machinery both from the Department of Electrical and Mechanical Services and the private sector. In total, during 1982, an amount of £354,622 was paid for all types of machinery used for the execution of the schemes.

Table V-4 shows in detail all machinery engaged by the Division of Construction during 1982.

BUILDING AND OTHER MATERIALS

As usual all building materials such as cement, aggregates, sand, etc, are purchased locally from the private sector through open tenders. However, materials such as mild steel, water meters, etc, are requisitioned from the GCS.

When cement is required in quantities of over 6 tons, it is purchased direct from

TABLE V-4
MACHINERY HIRED DURING 1982

Ser No	Description	Quantity	Unit	Value £
1	Diggers.....	agreed	-	268
2	Diggers.....	28 367	w/hrs	130 819
3	Diggers.....	25 659	MR	60 561
4	Diggers.....	1 012	m^3	1 002
5	Compressors....	4 887	w/hrs	7 229
6	Compressors....	agreed	-	229
7	Compressors....	agreed	w/days	170
8	Mixers.....	378	w/days	1 206
9	Mixers.....	agreed	-	496
10	Tipper lorries.	agreed	-	26 451
11	Tipper lorries.	800	w/hrs	2 934
12	Buses.....	813	w/days	11 673
13	Electrowelding machines.....	1 380	w/hrs	1 408
14	Traxcavators...	803	w/hrs	7 888
15	Tractors.....	4 437	w/hrs	13 673
16	Turbine Pumps..	4	w/days	100
17	Caterpillars...	1 635	w/hrs	23 174
18	Caterpillars...	agreed	-	355
19	Cranes.....	891	w/hrs	5 832
20	Tractor-mixer-elevator.....	315	m^2	407
21	Tractor-mixer-elevator.....	agreed	-	1 390
22	Cutting machine	27	w/days	108
23	Cutting machine	88	w/hrs	397
24	Saloon cars....	2 234	w/days	8 264
25	Land rovers....	5 360	w/days	39 990
26	Bed Ford.....	2 324	w/hrs	5 681
27	Buldozers.....	220	w/hrs	2 124
28	Water sprinkler	178	w/hrs	623
29	Water carrier..	10	trips	170
Total.....				£354 622

the two local cement factories. However, when cement is required in smaller quantities it has to be purchased through the GCS. During 1982 the Division purchased a quantity of 2,200 tons of cement at a cost of £48,569. During 1982 the Division purchased and used materials of various types at a cost of £159,375. All materials purchased by the Division of Construction during the year are shown on Table V-5.

RURAL DOMESTIC WATER SUPPLY SCHEMES

The construction programme for 1982 included 56 rural domestic water supply schemes of an estimated cost of £1,029,331. The expenditure incurred on all these schemes during the year reached the amount of £560,846. These schemes were

TABLE V-5
MATERIALS PURCHASED AND WATER METERS INSTALLED

I BUILDING AND OTHER MATERIALS USED DURING 1982

No.	Description	Quantity	Value £
1	Cement.....	2200 tons	48 569
2	Shingle.....	3521 m^3	9 221
3	Shingle.....	agreed	56
4	Sand.....	agreed	103
5	Sand.....	4313 m^3	13 985
6	Aggregate.....	agreed	56
7	Aggregate.....	3237 m^3	8 809
8	Havara.....	1694 m^3	919
9	Soil.....	30625 m^3	40 679
10	Stones.....	281 m^3	842
11	Mild steel.....	162 tons	22 217
	Total.....		£145 456

II WATER METERS INSTALLED DURING 1982

Ser No	Dia inches	Number	Value £
1	1/2	2391	7 227
2	3/4	6	21
3	1	17	121
4	1 1/4	9	65
5	2	39	1 409
6	2 1/2	4	179
7	3	32	1 285
8	4	52	2 198
9	6	14	1 221
10	12	1	193
	Total.....	2565	£13 919

split in the five free districts of the island as shown on the summary below:

SUMMARY OF THE RURAL DOMESTIC WATER SUPPLY SCHEMES

District	No. of schemes	Amount allocated for 1982 in £	Expenditure incurred during 1982 in £
Nicosia....	16	377 536	161 168
Limassol...	13	144 071	83 707
Famagusta..	5	148 511	91 733
Larnaca....	9	126 050	88 181
Paphos.....	13	233 163	136 057
Totals	56	£1 029 331	£560 846

A list showing in detail all 56 schemes that were approved in the 1982 budget for construction is given on Table V-6.

TABLE V-6
VILLAGE WATER SUPPLY SCHEMES -EXPENDITURE 1982

Ser No	Scheme	Amount Allocated Govt.	Village	Total	Expenditure Govt.	Village	Total	Remarks
	NICOSIA DISTRICT							
1	*Akaki* - Improvements to existing system.....	5 075	5 075	10 150	4 585	4 584	9 169	Completed
2	*Alambra* - Extensions to distribution system.....	683	683	1 366	651	650	1 301	Completed
3	*Astromeritis* - Improvements to distribution system.....	13 750	13 750	27 500	-	-	-	Rejected
4	*Ayia Varvara* - Improvements to existing system.....	15 000	15 000	15 000	-	-	-	Will commence early in 1983
5	*Ayios Yeoryios (Kafkalou)* - Supplementary supply from Pitsilia....	9 250	9 250	18 500	7 677	7 676	15 353	Completed
6	*Dheftera Pano & Kato* - Supplementary supply from new BH.....	12 667	6 333	19 000	11 985	5 993	17 978	Completed
7	*Dhenia-Mammari* - Supplementary supply from new BH.....	7 630	-	7 630	923	-	923	Completed
8	*Argates* - Supplementary supply from new well.....	8 250	8 250	16 500	3 775	3 775	7 550	Work in progress
9	*Klirou-Mitsero-Kalokhorio-Malounda* - Supplementary supply from new BH.....	9 300	9 300	18 600	-	-	-	Scheme abandoned
10	*Kokkini Trimithia* - Supplementary supply.....	22 150	22 150	44 300	9 190	8 803	17 993	Work in progress
11	*Lakatamia Pano & Kato* - Supplementary supply from new BHs and construction of two new reservoirs.....	42 288	8 534	50 822	13 610	2 367CR	11 243	Work in progress
12	*Laxia* - BH 41/80.....	62 667	31 333	94 000	46 026	23 013	69 039	Work in progress
13	*Laxia* - BH 97/78.....	1 000	1 000	2 000	512	511	1 023	Work in progress
14	*Mathiati* - Supplementary supply from new BH.....	3 044	3 045	6 089	2 264	2 264	4 528	Work in progress
15	*Meniko* - Supplementary supply from new BH.....	19 500	6 500	26 000	1 612	537	2 149	Emergency scheme completed
16	*Nisou - Perakhorio* - Supplementary supply and improvements to distribution system.....	5 079	-	5 079	2 919	-	2 919	Work in progress
	Total for Nicosia District.....	£237 333	£140 203	£377 536	£105 729	£55 439	£161 168	

TABLE V-6 VILLAGE WATER SUPPLY SCHEMES - EXPENDITURE 1982 (Cont.)

Ser No	Scheme	Amount Allocated Govt.	Amount Allocated Village	Amount Allocated Total	Expenditure Govt.	Expenditure Village	Expenditure Total	Remarks
	LARNACA DISTRICT							
1	*Anglisidhes* - Improvements to spring and new conveyor pipeline.	3 334	1 666	5 000	2 905	1 452	4 357	Completed
2	*Aradhippou* - New distribution system.....	15 100	15 100	30 200	10 108	10 108	20 216	In progress
3	*Ayios Theodhoros - Alaminos* - Replacement of main conveyor and storage tank.....	4 028	1 342	5 370	3 361	1 121	4 482	To be completed early in 1983
4	*Famagusta* - Larnaca WS connection of BH 45/61 on to Khirokitia....	7 000	-	7 000	3 430	-	3 430	In progress
5	*Famagusta* - Larnaca WS connection of BH 114/80 & 127/80 onto Alethriko balancing tank at Klavdhia	39 700	-	39 700	36 979	-	36 979	In progress
6	*Kalavasos* - Supplementary WS & new storage tank and distribution system.....	15 465	15 465	30 930	8 360	8 359	16 719	In progress
7	*Pyrga* - Improvements to well.....	775	775	1 550	284	283	567	In progress
8	*Voroklini*.....	2 250	2 250	4 500	-	-	-	Revision of scheme
9	*Voroklini* - Supplementary supply from Famagusta main conveyor.....	1 800	-	1 800	1 431	-	1 431	Complete
	Total for Larnaca District.....	£89 452	£36 598	£126 050	£66 858	£21 323	£88 181	
	FAMAGUSTA DISTRICT							
1	*Ayia Napa* - New distribution system.....	30 465	30 465	60 930	20 759	20 758	41 517	In progress
2	*Liopetri* - Supplementary WS from new BH.....	4 390	4 390	8 780	2 759	2 759	5 518	In progress
3	*Paralimni-Protaras* - Tourist area development. New storage tank 500m³ and main distribution pipeline.....	50 000	-	50 000	35 703	-	35 703	In progress
4	*Paralimni*.....	9 500	9 500	19 000	-	-	-	Carried over to 1983
5	*Xylophaghou* - New distribution system.....	4 901	4 900	9 801	4 498	4 497	8 995	To be completed in January 1983
	Total for Famagusta District....	£99 256	£49 255	£148 511	£63 719	£28 014	£91 733	

TABLE V-6 VILLAGE WATER SUPPLY SCHEMES - EXPENDITURE 1982 (Cont.)

Ser No	Scheme	Amount Allocated Govt.	Village	Total	Expenditure Govt.	Village	Total	Remarks
LIMASSOL DISTRICT								
1	*Amathus* - Supplementary WS from new BH	9 000	-	9 000	6 985	-	6 985	In progress
2	*Asomatos*	2 500	2 500	5 000	-	-	-	Administrative formalities not completed
3	*Ayios Athanasios* - New distribution system	15 000	15 000	30 000	6 919	6 919	13 838	
4	*Omodhos* - Supplementary supply from new BH	5 000	15 000	20 000	-	-	-	Carried over to 1983
5	*Pendakomo* - New BH & storage tank	17 654	10 015	27 669	16 467	9 283	25 750	In progress
6	*Pissouri* - Storage tank & booster pump	1 542	1 542	3 084	1 538	1 538	3 076	Completed
7	*Prastio (Evdhimou)*	-	800	800	-	-	-	Carried over to 1983
8	*Prodhromos*	5 000	5 000	10 000	-	-	-	Carried over to 1983
9	*Sphalangiotissa monastery* - New storage tank	265	-	265	231	-	231	Completed
10	*Trakhoni* - Supplementary WS from BH	17 127	-	17 127	15 235	-	15 235	To be completed early in 1983
11	*Trimiklini* - New distribution system	5 995	5 995	11 990	4 848	4 847	9 695	In progress
12	*Yerasa* - Improvement of spring	326	-	326	326	-	326	Completed
13	*Ypsonas-Polemidhia* - Supplementary WS from BH	6 825	1 985	8 810	6 672	1 899	8 571	Completed
	Total for Limassol District	£86 234	£57 837	£144 071	£59 221	£24 486	£83 707	
PAPHOS DISTRICT								
1	*Argaka-Magounda* - Construction of filter dam and new PVC conveyor main	15 000	10 714	25 714	8 088	5 876	13 964	
2	*Arodhes Pano*	3 880	-	3 880	-	-	-	Carried over to 1983
3	*Emba* - Distribution system & new 275m³ storage tank	15 000	15 000	30 000	4 371	4 370	8 741	In progress
4	*Letimbou* - Replacement of old pipes	7 000	3 000	10 000	6 628	2 841	9 469	Completed

5	*Lyso - Philousa-Peristerona-Xeropiyi-*								
	Replacement of old pipelines.....	9 900	5 742	15 642	7 681	3 558	11 239		In progress
6	*Mesoyi* - New storage tank 135m³.....	6 600	6 600	13 200	2 485	2 484	4 969		In progress
7	*Miliou* - New distribution system....	1 695	1 010	2 705	516	62CR	454		In progress
8	*Paphos Lower Villages* -								
	Compensations.....	3 336	-	3 336	2 694	-	2 694		
9	*Peristerona* - Installation of								
	electrosubmersible pump.....	975	975	1 950	-	84	84		In progress
10	*Peyia* - Replacement of old main								
	conveyor pipeline from spring.....	3 433	3 433	6 866	1 079	1 079	2 158		In progress
11	*Polis-Prodhromi* - Phase A & B								
	new borehole storage tank.....	34 000	34 000	68 000	31 888	31 887	63 775		In progress
12	*Tsadha-Kili* - Supplementary WS								
	from BH new storage tank 135m³.....	25 000	25 000	50 000	8 413	8 413	16 826		In progress
13	*Yeroskipos* - Tourist development...	1 870	-	1 870	1 684	-	1 684		
	Total for Paphos District.....	£127 689	£105 474	£233 163	£75 527	£60 530	£136 057		
	Grand total.....	£639 964	£389 367	£1029 331	£371 054	£189 792	£560 846		

MAJOR PROJECTS APPROVED FOR CONSTRUCTION IN 1982

The construction programme for 1982 included 52 major projects of various types and the amount budgeted for their construction during the year was £4,687,271. The expenditure incurred on all these projects during 1982 reached the amount of £3,368,054. It should be noted that these figures do not include Paphos Irrigation Project for which a detailed report and expenditure is given in another chapter.

These 52 projects, undertaken for construction by our Division cover a wide field of water works, ie supplementary works to existing major irrigation schemes, the Vasilikos - Pendaskinos Project, the Yermasoyia - Vasilikos pipeline, and part of the Pitsilia Integrated Rural Development Project. (Ponds and distribution systems and Xyliatos Dam).

Other schemes, which could be classified as major projects have been included in other chapters of this report.

For all these projects a detailed analysis of the expenditure and a brief report is given further on in this report.

A summary of the major projects undertaken for construction during 1982 is given below:

Ser No	Type of project	Amount allocated in 1982 £	Expenditure incurred in 1982 £
1	Other major irrigation works.....	271 654	136 467
2	Vasilikos-Pendaskinos Project.....	1 589 243	1 045 809
3	Yermasoyia-Vasilikos pipeline.....	1 125 566	885 558
4	Ponds and distribution systems.....	881 379	562 135
5	Xyliatos Dam and distribution system...	819 429	738 085
	Total.....	£4 687 271	£3 368 054

MINOR IRRIGATION SCHEMES

The construction programme for 1982 included 21 minor irrigation schemes of an estimated cost of £405,659. The overall

TABLE V-7
MINOR IRRIGATION SCHEMES - EXPENDITURE

Ser No	Scheme	Amount Allocated Govt.	Village	Total	Expenditure Govt.	Village	Total	Remarks
	NICOSIA DISTRICT							
1	*Akaki* - "Riatiko" "Nero tou Hodja".....	12 090	12 090	24 180	7 006	7 005	14 011	Work in progress
2	*Ayios Epiphanios* - "Maroullena".	17334	8 666	26 000	3 359	1 679	5 038	Work in progress
3	*Ayios Ioannis (Malounda)* - "Pitsillis".....	31 161	15 117	46 278	24 101	15 117	39 218	Work in progress
4	*Chakistra* -"Yephiri"-Two stage pumping scheme and distribution system.....	26 941	8 980	35 921	26 696	8 899	35 595	Completed
5	*Evrykhou - Atsas*-Construction of RC channels.....	564	282	846	246	123	369	Completed
6	*Galata-Sina Oros* - Piped distribution system and RC channels.....	18 633	9 317	27 950	5 910	2 955	8 865	Work in progress
7	*Kambos* - "Potamos Kaloyirou" Two stage pumping scheme and piped distribution system.....	27 693	9 173	36 866	26 598	8 866	35 464	Completed
8	*Katydhata-Linou-Skouriotissa* - RC channels.....	13 334	6 666	20 000	2 056	1 028	3 084	Work in progress
9	*Katydhata* - "Dhimma tis Djamis" RC channels.....	16 467	8 233	24 700	-	-	-	Early in 1983
10	*Meniko* - "Kyra tou Diakou" RC channels.....	600	300	900	197	98	295	Completed
11	*Orounda* - "Maoutsos".....	3 300	-	3 300	3 300	-	3 300	Completed
12	*Pedhieos River Episkopio* - Recharge works.....	9 242	-	9 242	8 308	-	8 308	Completed
13	*Pera (Orini)* - "Phassera".....	2 312	1 156	3 468	1 103	552	1 655	Completed
14	*Potami* - "Sykamos tou Phlouri"..	6 194	3 097	9 291	4 135	2 067	6 202	Completed

TABLE V-7 MINOR IRRIGATION SCHEMES - EXPENDITURE (cont.)

Ser No	Scheme	Amount Allocated Govt.	Village	Total	Expenditure Govt.	Village	Total	Remarks
15	*Yerakies - Xeros* - Two stage pumping scheme and distribution system.....	27 308	9 102	36 410	26 344	8 781	35 125	Completed
	Total for Nicosia District.....	£213 173	£92 179	£305 352	£139 359	£57 170	£196 529	
	LARNACA DISTRICT							
1	*Psematismenos* - Drakonties- Construction of slab on existing storage tank and extension of distribution system.....	14 000	7 000	21 000	6 175	3 088	9 263	In progress
	Total for Larnaca District.....	£14 000	£7 000	£21 000	£6 175	£3 088	£9 263	
	LIMASSOL DISTRICT							
1	*Paleomylos* - Hardji-Ayios Yeoryios.....	1 033	517	1 550	-	-	-	Will be revised
2	*Prodhromos* - Kyparissi.....	814	481	1 295	-	-	-	Will be revised
	Total for Limassol District.....	£1 847	£998	£2 845	-	-	-	
	PAPHOS DISTRICT							
1	*Kato Akourdhalia - Miliou*.....	21 133	25 567	46 700	-	-	-	Not approved
2	*Khoulou* - Phyllarotos - Replacement of main conveyor....	708	354	1 062	76	38	114	Completed
3	*Skoulli* - Installation of pumping unit.....	1 333	667	2 000	1 202	601	1 803	Completed
4	*Yiolou*.....	10 000	20 000	30 000	-	-	-	Suspended
	Total for Paphos District.....	£33 174	£46 588	£79 762	£1 278	£639	£1 917	
	Grand total.....	£262 194	£146 765	£408 959	£146 812	£60 897	£207 709	

SUMMARY OF MINOR IRRIGATION SCHEMES

District	No. of schemes	Amount allocated during 1982 £	Expenditure incurred during 1982 £
Nicosia	15	305 352	196 529
Limassol	2	2 845	-
Larnaca	1	21 000	9 263
Paphos	4	79 762	1 917
Total	22	£ 408 959	£ 207 709

expenditure incurred on all the above schemes during 1982 reached the amount of £207,709. These 22 schemes were split in four districts of the island as shown above.

Table V-7 shows in detail all 21 schemes that were approved for execution during 1982.

VASILIKOS PENDASKINOS PROJECT
Nicosia Water Supply-First Phase

The main conveyor to Nicosia from Khirokitia Treatment Works was substantially completed by the end of 1981. Minor completion works were carried out during 1982 and they included:

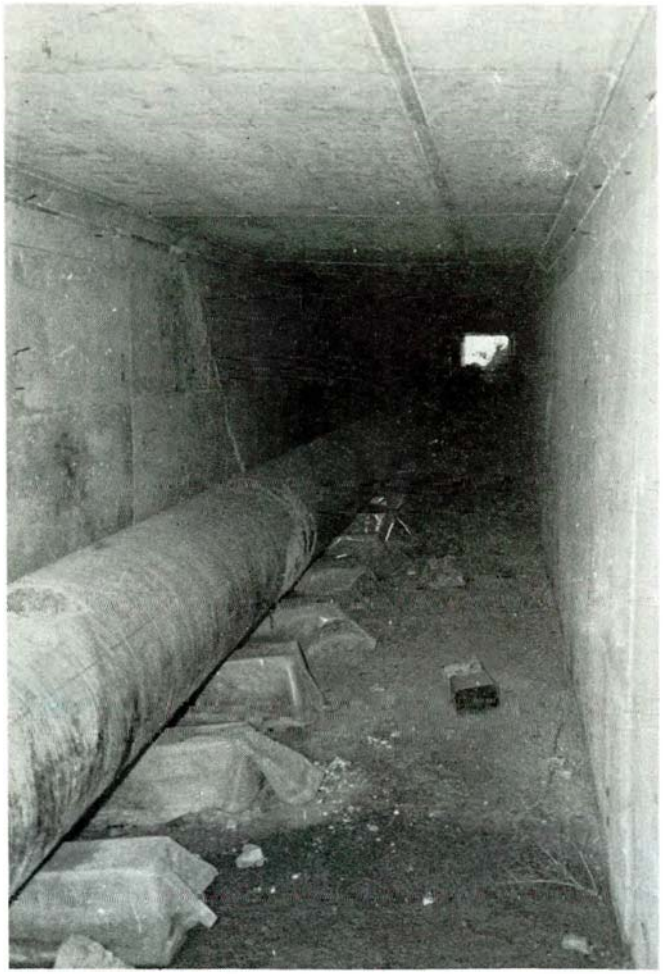
- Final reinstatement works along the main pipeline route.
- Repairs and maintenance to damaged private lands and property.
- Completion of steel pipeline cathodic protection system.
- Third stage testing of main pipeline, and
- Final adjustment of pumps and regulation of surge vessels at Dhypotamos Pumping Station.

The conveyor was put into operation in March 1982. The amount allocated for this Phase for 1982 was £131,794 and the expenditure incurred during the year reached the amount of £127,335.

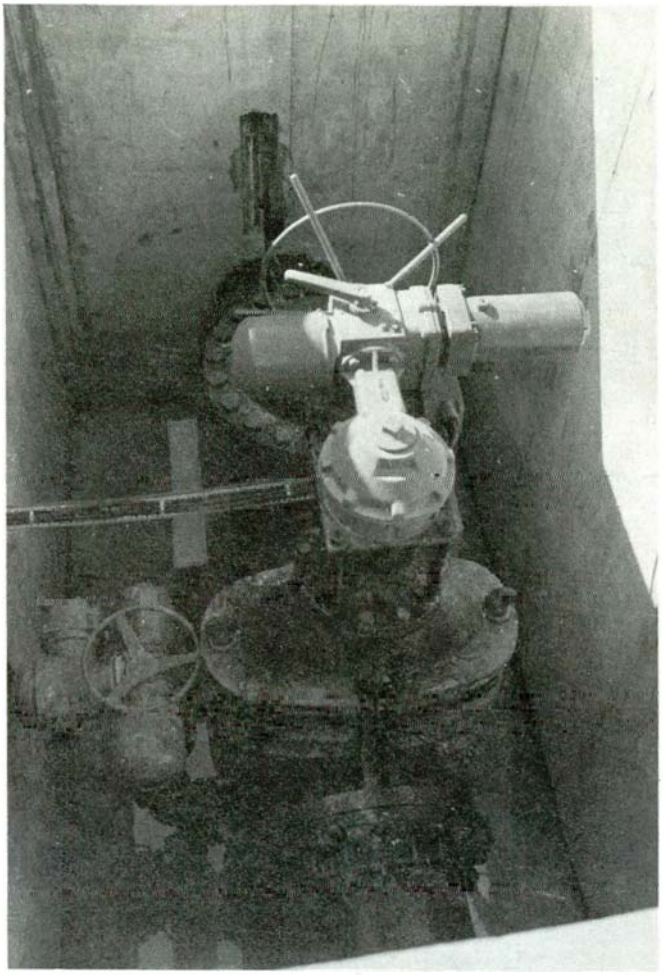
Dhypotamos Dam

Dhypotamos Dam is one of the major elements of the second phase of Vasilikos Pendaskinos Project. This is a rockfill dam having an overall storage capacity of 15 MCM. The dam was designed by Rofe, Kennard and Lapworth jointly with Wallace Evans and Partners in association with C Chr Ioannides. Tenders were invited in Summer 1982 and the Contract was awarded to Shephard Hill - G P Zachariades (Joint

500 mm dia. Suction-Irrigation AC pipe (steel in culvert) with 550 mm dia steel Lefkara- Khirokitia pipeline within culvert under the new Nicosia/Limassol highway at Skarinou bridge. WDD Photo C 99-2 (14.1.82).



500 mm dia steel delivery main from Dhypotamos Pumping Station to Stavrovouni/ Kornos at culvert crossing under new Nicosia/Limassol highway at Kakoradja. WDD Photo C 97-7 (13.1.82).



500 mm dia PN 40 valve with electric actuator and bypass on suction main outside Dhypotamos Pumping Station. WDD Photo C 98-9 (13.1.82).

TABLE V-8

OTHER MAJOR IRRIGATION WORKS - EXPENDITURE 1982

Ser No	Scheme	Amount Allocated Govt.	Village	Total	Expenditure Govt.	Village	Total
1	*Ayios Theodhoros* - BH 64/73.....	3 000	-	3 000	2 718	-	2 718
2	*Erimi - Kolossi*.....	1 437	440	1 877	642	321	963
3	*Kalopanayiotis Dam* - Distribution.	10 000	-	10 000	10 000	-	10 000
4	*Khirokitia pond*.....	20 000	10 000	30 000	1 249	620	1 869
5	*Khrysokhou valley*.....	7 000	-	7 000	4 134	-	4 134
6	*Lymbia Dam*.....	800	-	800	468	-	468
7	*Mavrokolymbos Dam* - Land acquisition.....	833	-	833	577	-	577
8	*Pakhyammos Reservoir*.....	600	-	600	574	-	574
9	*Palekhori* - Sklidros.....	96 750	31 250	128 000	36 237	11 424	47 661
10	*Pissouri - Alekhtora*.....	844	-	844	722	-	722
11	*Pissouri* - Irrigation Yermasoyia Polemidhia Project.....	26 667	13 333	40 000	22 373	11 187	33 560
12	*(i) Kato Polemidhia* - Distribution system.....	16 667	8 333	25 000	11 449	5 725	17 174
13	*(ii) Trakhoni-Ypsonas*.....	10 000	-	10 000	8 749	-	8 749
14	*(iii) Trakhoni - Zakaki*.....	1 700	-	1 700	1 700	-	1 700
15	*(iv) Yermasoyia* - Distribution system.....	8 000	4 000	12 000	3 732	1 866	5 598
	Total.....	£204 298	£67 356	£271 654	£105 324	£31 143	£136 467

Venture) in October 1982. Construction works started in November with the preparation of access roads, erection of site offices, stripping of dam area, drilling and blasting for tunnel drive and general excavation.

The amount allocated for this part of the scheme for 1982 was £1,457,449 and the total expenditure for this project during the year reached the amount of £641,010.

The overall expenditure incurred on both parts of Vasilikos-Pendaskinos project during 1982 reached the amount of £1,045,809.

Details of the amount allocated and the expenditure incurred during 1982 are shown on Table V-9 below:

TABLE V-9
VASILIKOS-PENDASKINOS-PROJECT-EXPENDITURE 1982

Ser. No	Description	Expenditure 1982	Total Expenditure up to 1982
	(i) Nicosia Water Supply First Phase		
1	Electricity and telephone.....	196	70 837
2	Land acquisition.....	-	-
3	Materials handling and storage supervsion, investigations, miscellaneous and contingencies.....	4 365	107 418
4	Civil engineering works Contract No.39/78/38-J & P.....	71 085	922 053
5	Mechanical & electrical Works Contract No. 39/78/39-Mather & Platt.....	36 945	340 868
6	Steel pipes Contract No.39/78/40-P Epiphaniou	-	482 196
7	A C Pipes Contract No.39/78/41-CPI.....	-	610 811
8	Valves Contract No. 39/78/42-Pont-a-Mousson..	-	45 943
9	Valves Contract No. 39/78/42-S Blakeborough..	1 794	39 225
10	Dhypotamos pumping station Irish Bridge.....	991	105 222
11	Consultant fees.....	9 069	66 839
12	Construction of additional pipes & Fittings..	873	5 450
13	Wages for the operation and maintenance of the pumping station Dhypotamos.....	2 017	2 274
		£127 335	£2 779 136
	(ii) Agricultural Development		
1	Groundwater development - Maroni.....	-	-
2	Erection of building - Khirokitia HQ.....	45 756	45 756
3	Agricultural research - ARI building.....	17 568	23 342
4	Purchase of vehicles & machinery.....	21 780	55 827
5	Consultant's fees.....	145 662	292 369
6	Hydraulic model testing.....	2 159	39 930
7	Works by WDD (Topography, Investigations etc)	29 950	68 308
8	Administration/Transport/Supervision.....	7 963	8 039
9	Kalavasos Dam.....	-	-
10	Dhypotamos Dam.....	-	-
11	Kornos Treatment Works.....	-	-
12	Maroni River Diversion.....	-	-
13	Kalavasos-Khirokitia pipeline.....	-	-
14	Commuted allowance to Deputy Project Manager.	908	1 284
15	Land consolidation.....	-	-
16	KALAVASOS DAM - Contract 1.....	-	-
17	Constructional expenditure.....	-	-
18	Supply of materials.....	-	-

TABLE V-9 VASILIKOS-PENDASKINOS PROJECT-EXPENDITURE 1982 (Cont.)

Ser. No	Description	Expenditure 1982	Total Expenditure up to 1982
19	Construction of flow gauging station upstream	-	-
20	DHYPOTAMOS DAM - Contract 2	-	-
21	Constructional expenditure	604 000	604 000
22	Supply of materials	33 313	33 313
23	Laboratory equipment for Dhypotamos and Kalavasos Dam	-	-
24	Lefkara diversion and ancillary pipeline	-	-
25	Permanent access road	1 631	1 631
26	Pipeline construction (inc. 42(14).42(6))	-	-
27	Removal of existing pipeline	-	-
28	Maroni/Pendaskinos Irrigation and domestic pipelines and channel	2 066	2 066
29	Ayios Theodoros diversion pipeline	-	-
30	MARONI DIVERSION - Contract 3	-	-
31	KALAVASOS-KHIROKITIA PIPELINE -Contract 7.	-	-
32	PENDASKINOS IRRIGATION - Contract 9	-	-
33	VASILIKOS IRRIGATION - Contract 8	-	-
34	ELECTROMECHANICAL EQUIPMENT FOR PS - Contract 4A	-	-
35	CONSTRUCTION OF KORNOS WT. WORKS & PS - Contract 5B	-	-
36	ELECTROMECHANICAL EQUIPMENT FOR KORNOS WT. PLANT - Contract 5A	-	-
37	CONSTRUCTION OF KALAVASOS (TOKHNI) PS - Contract 4B	-	-
38	ACQUISITION OF LAND	5 718	5 718
39	TELEMETRY - Contract 6	-	-
	Total	918 474	1 184 583
	Grand total	1 045 809	3 980 719

Yermasoyia - Vasilikos Pipeline

This was an emergency scheme aiming to improve the Nicosia water supply, by conveying water from the Yermasoyia Dam to the Khirokitia Treatment Works.

The design of this project commenced in October 1981 and delivery of pipes, materials, and equipment started in March 1982.

The construction works were undertaken by the Construction Division of WDD. Site work commenced in March 1982 and it was completed in October 1982.

The project consists mainly of 24 km, of 350 mm dia pipeline (asbestos cement, ductile iron and steel pipes), a break pressure tank and pumping equipment.

At the water supply source, ie the Yermasoyia Dam the pumping capacity of the existing pumping station was improved by replacing the electric motors with new, more efficient ones. Water is pumped from this location to the existing Akrounda-Phinikaria storage tanks situated at 242 m amsl. Oxygenation of the water is achieved through a cascade aerator constructed at the storage tanks.

From this point water flows by gravity to Parekklisha break pressure tank (storage capacity 275m³) and then to Vasilikos pumping station which was upgraded with new pumps having an overall pumping capacity of 125 l/s or 450 m³/hr.

From Vasilikos, water is pumped to Khirokitia Treatment Works and after

treatment, it is transferred to Larnaca and Nicosia through the existing conveyors.

The initial cost estimate for pipeline materials and equipment was £620,816 and the cost estimate for construction £504,750. The corresponding actual costs (after completion) were £568,329 and £317,229.

It should be emphasized that the construction of this pipeline, being an emergency scheme, was a record both in time and value which projects the capability of the Construction Division in general, and the calibre of the technical personnel involved in this project in particular.

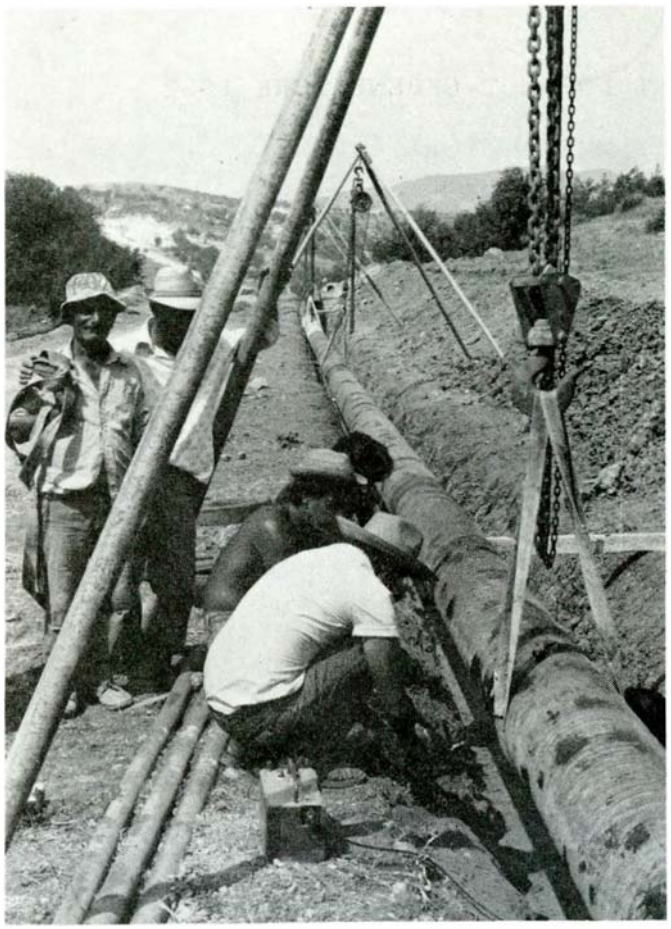
As already stated the combined initial total estimated cost was £1,125,566. The total combined expenditure incurred on materials and construction during 1982 reached the amount of £885,558, thus leaving an overall saving of £240,008.

Table V-10 shows in detail the amount allocated and the expenditure incurred on each item.

TABLE V-10

YERMASOYIA-VASILIKOS PIPELINE - EXPENDITURE 1982

Ser No	Description	Amount allocated for 1982 £	Expenditure incurred during 1982 £
	(I) Materials		
1	Ductile iron pipes and fittings	213 453	190 751
2	Steel pipes and fittings	31 480	32 746
3&4	Asbestos cement pipes and cast iron fittings	234 662	223 400
5	Valves	19 455	18 739
6	Water meters	1 766	1 695
7	For Yermasoyia pumping station	23 205	20 310
8	For Vasilikos pumping station	66 310	61 992
9	Materials supplied by GCS	4 600	2 489
10	Special parts and fittings	13 420	6 616
11	Cascade aerator	500	500
12	EAC charges	7 500	6 924
13	Float switch for Yermasoyia pumping station	1 495	1 481
14	For Vasilikos pumping station	2 970	686
	Total	£620 816	£568 329
	(II) Construction		
15	Preliminary works	70 600	48 863
16	Trenching and laying	153 076	113 972
17	Testing	23 965	17 601
18	Reinstatement and relocation of Pl5	12 000	5 558
19	Cleaning and sterilization of the pipeline	3 000	2 415
20	Chambers	44 800	41 968
21	Parekklisha break pressure tank	10 500	10 652
22	Vasilikos pumping station	6 000	3 836
23	Khirokitia treatment plant	1 555	1 775
24	Yermasoyia pumping station	600	350
25	Yermasoyia balancing reservoir	2 350	1 714
26	Transport	35 000	16 680
27	Supervision	36 345	17 867
28	Contingencies	36 345	8 408
29	Overtime or double shift work in order to meet the programme	43 614	25 570
30	Acquisition of land	25 000	-
	Total	504 750	317 229
	Grand Total	£1 125 566	£885 558



Laying of Yermasoyia - Vasilikos emergency pipeline supplementing the Central Water Supply System. WDD Photo A57 EN 3 (27.2.82).

PITSILIA INTEGRATED RURAL DEVELOPMENT PROJECT

The Pitsilia Integrated Rural Development Project covers 49 villages with a total area of 60,000 hectares and a population of 21,000 people. In the area of the Project a rugged topography prevails and the terrain is dissected by numerous streams and small deep valleys.

The project region is an area of traditional agriculture with a marked trend of depopulation.

The project aims at improving the standard of living of the people of Pitsilia region, by developing the productive resources of the area and improving the social services, such as health and education.

The whole of the Project was initially scheduled to be implemented in a period of five years (January 1978 - December 1982) but it has been decided to extend its implementation period until the end of 1983 to make up for certain delays and with a view to expand its targets, mainly in the Water Development Sector, with the construction of all the technically and economically feasible schemes acceptable by the farmers concerned.

The total investment for the implementation of the project will amount to about £9,000,000 (£4 million secured through a World Bank Loan and the balance will be covered by the Government of Cyprus) out of which about £ 7 million will be expended by the Department of Water Development for the development of the region's water resources to irrigate some 11,000 donums (initially the target was only 8,600 donums) through the following schemes:

- Construction of a rockfill type of dam at Xyliatos with a capacity of 1.25 million cubic metres to irrigate 2,300 donums.
- Construction of about 20 PVC lined earth ponds with a total capacity of 1.9 million cubic metres, to irrigate 2,600 donums.
- Development of some 30 boreholes with a combined yield of 1.3 million cubic metres per year to irrigate about 3,000 donums.
- Rehabilitation of existing minor irrigation schemes to irrigate 1,500 donums.

In addition to the above schemes the domestic water supply of some 23 villages will be improved within the project activities.

By the end of 1982 the total expenditure incurred in the sector of Water Development reached the amount of £4,739,226 as follows:

	£
1978	49 407
1979	471 542
1980	881 326
1981	1 577 069
1982	1 759 881
Total	£4 739 225

For the year 1982, the construction programme included 83 schemes, out of which 32 schemes involved ponds and their distribution networks, 5 schemes involved the development of boreholes, 15 schemes the improvement of domestic water supply, 23 were rehabilitation schemes and 8 schemes involved the construction of Xyliatos Dam, its distribution network and test pumping schemes.

All the 83 schemes that were approved for execution in 1982 at an estimated cost of £2,352,191 are shown in detail on Table V-11.

TABLE V-11

PITSILIA INTEGRATED RURAL DEVELOPMENT PROJECT-EXPENDITURE 1982

Ser No	Description	Amount allocated for 1982 £	Expenditure incurred in 1982 £	Remarks
	A PONDS AND DISTRIBUTION SYSTEMS			
1	*Agridhia pond*.....	83 150	68 432	Completed by 90%
2	*Agridhia distribution system*...	28 000	21 743	To be completed early in 1983
3	*Akapnou-Ephtagonia distribution system*.....	11 323	8 187	Completed
4	*Akapnou-Ephtagonia pond*.....	9 975	-	Completed
5	*Arakapas pond*.....	37 173	34 973	Completed in March 1982
6	*Arakapas distribution system*...	13 386	11 130	Completed in March 1982
7	*Arakapas pond No 2*.....	30 000	-	Works expected to commence in March 1983
8	*Ayii Vavatsinias pond*.....	3 125	8	Completed
9	*Ayii Vavatsinias dam*.....	1 153	272	Completed
10	*Ayii Vavatsinias* (repairs).....	2 700	1 563	Only partial remedial works carried out
11	*Dhierona pond*.....	30 000	-	Works expected to commence in February 1983
12	*Ephtagonia Pond 1*.....	1 485	387	Completed
13	*Ephtagonia distribution system for pond No 1*.....	2 533	1 041	Completed
14	*Ephtagonia pond No 1* (repairs).	3 550	2 634	Remedial works were carried out during January-February 1982
15	*Ephtagonia pond 2*.....	11 840	4 522	Completed in February 1982
16	*Ephtagonia pond 3*.....	8 687	1 830	Completed December 1981
17	*Ephtagonia distribution No 2 and 3*.....	18 526	11 166	Completed in February 1982
18	*Kato Mylos distribution system* borehole 66/76.....	14 766	9 114	Completed in February 1982
19	*Kato Mylos pond*.....	9 755	-	Completed September 1981
20	*Khandria pond*.....	4 375	165	Completed
21	*Khandria distribution system*...	1 299	1 207	Completed
22	*Khandria pond* (repairs).....	1 550	1 540	Completed in May 1982
23	*Kyperounda pond No 2*	251 732	224 804	Completed by 75%
24	*Kyperounda pond No 2 distribution system*.....	106 795	85 147	Expected to be completed in July 1983
25	*Lagoudhera pond*.....	90 000	65 868	Completed by 45%
26	*Melini pond*.....	1 982	546	Completed
27	*Melini distribution system*.....	1 259	650	Completed
28	*Melini pond* (repairs).....	3 200	2 119	Remedial works carried out in February-March 1982
29	*Ora pond*.....	52 500	2 526	Constructional works started late in November 1982

TABLE V-11
PITSILIA INTEGRATED RURAL DEVELOPMENT PROJECT-EXPENDITURE 1982 (Cont.)

Ser No	Description	Amount allocated for 1982 £	Expenditure incurred in 1982 £	Remarks
30	*Pelendria pond*.....	4 146	10	Completed
31	*Pelendria distribution system* and borehole.....	1 414	551	Completed
32	*Pharamakas pond*.....	40 000	-	Construction works to start early in 1984
	Total.....	£881 379	£562 135	
33	*B XYLIATOS DAM*			
	(i) Construction (GCC Ltd)...	382 081	382 081	Completed in October 1982
	(ii) Supervision.....	33 854	30 780	
	(iii) Removal of pipeline Ayia Marina.....	1 788	-	
	(iv) Purchase of valves and water meters.....	736	-	
34	*Xyliatos distribution system phase A*			
	(i) Construction.....	93 576	92 047	Phase I has been substantially completed
	(ii) Purchase of valves.....	46 149	46 137	Purchased during 1982
	(iii) Purchase of valves and water meters.....	9 464	9 446	Purchased during 1982
35	*Xyliatos distributic ı system phase B*			
	(i) Construction.....	110 000	78 386	To be completed late in 1983. Delays due to land consolidation
	(ii) Purchase of pipes and others.....	111 188	69 067	Partly purchased
	(iii) Purchase of valves and water meters.....	30 593	30 141	Purchased during 1982
	Total.....	£819 429	£738 085	
	C BOREHOLE SCHEMES			
36	*Agros* BH 63/76.....	95 919	69 847	Completed in March 1982
37	*Arakapas* BHs 106/76 and 107/76.....	26 591	25 718	Completed in 1981
38	*Arakapas* BH 124/76.....	37 034	27 591	Completed in December 1982
39	*Ayios Konstantinos* BHs 123/76 and 8/81.....	45 000	-	Construction works to start early in 1983
40	*Polystipos* BH 21/77.....	37 473	27 726	Completed in October 1982
	Total.....	£242 017	£150 882	

TABLE V-11
PITSILIA INTEGRATED RURAL DEVELOPMENT PROJECT-EXPENDITURE 1982 (Cont.)

Ser No	Description	Amount allocated for 1982 £	Expenditure incurred in 1982 £	Remarks
	D RURAL DOMESTIC WATER SUPPLY SCHEMES			
41	*Agros*.....	83 814	83 534	Completed in March 1982
42	*Alithinou*.....	4 800	3 550	Completed
43	*Apliki*.....	8 000	6 818	Completed
44	*Ayios Pavlos*.....	6 000	-	Works to commence early in 1983
45	*Gourri*.....	600	-	Works to commence in 1983
46	*Kannavia*.....	1 000	100	To be completed in 1983
47	*Khandria*.....	430	361	Completed
48	*Ora*.....	2 642	1 098	Completed
49	*Palekhori (M)*.....	2 586	1 096	Completed
50	*Palekhori (Orini)*.....	12 520	11 265	Completed August 1982
51	*Pelendria* (old plan).....	812	-	Completed
52	*Pelendria* BH 69/81.....	23 500	11 500	Completed by 75%
53	*Pharmakas*.....	3 320	1 637	Completed
54	*Phterikoudhi*.....	301	8	Completed
55	*Sykopetra* (Profitis Elias).....	196	58	Completed
	Total.....	£150 521	£121 025	
	E REHABILITATION SCHEMES			
56	*Agros* 'Anastasia'.....	2 580	1 138	Completed 70%
57	*Alona* 'Kolymbos tis Pernias'...	9 200	6 139	Completed
58	*Ayios Ioannis-Kato Mylos* 'Angoulos-Dhypotamia'.....	11 406	-	Works to commence in 1983
59	*Ayios Ioannis* 'Yerambelos'.....	660	-	Not yet started
60	*Ayios Ioannis* 'Makheras'.....	742	482	Completed
61	*Ayios Theodhoros* 'Koufes'.....	11 270	11 078	Completed in 1982
62	*Dhierona* 'Mylos'.....	4 800	-	
63	*Dhymes* 'Kambos-Kardama'.....	8 800	7 635	Completed in 1982
64	*Kalokhorio* 'Maramenos'.....	700	693	Completed in 1982
65	*Kato Amiandos-Pelendria* Kardhama-Hji Physouni.....	460	-	Completed
66	*Louvaras* 'Paralonia'.....	294	-	Completed
67	*Odhou* 'Odhou B'.....	5 700	4 044	Completed in 1982
68	*Palekhori* 'Pera Avlaki Halcomotas'.....	264	264	Completed in 1982
69	*Palekhori* 'Mylouri'.....	1 040	-	Not started yet
70	*Pelendria* 'Korypi-Kolokasi'....	13 500	12 761	Completed in 1982
71	*Pelendria* 'Kato phylagra'.....	15 200	-	Works to start in 1983
72	*Pharmakas* 'Ayios Georgios'.....	671	-	Completed
73	*Pharmakas* 'Koskinas'.....	1 456	1 340	Completed in 1982
74	*Potamitissa* 'Hasanis'.....	4 320	1 196	Completed
75	*Savvandi* 'Agrosykia'.....	2 285	-	Works to commence in 1983

TABLE V-11
PITSILIA INTEGRATED RURAL DEVELOPMENT PROJECT-EXPENDITURE 1982 (Cont.)

Ser No	Description	Amount allocated for 1982 £	Expenditure incurred in 1982 £	Remarks
76	*Sykopetra* 'Kountourka'.....	508	-	
77	*Sykopetra* 'Agridhia-Konomidhes'.	1 664	1 715	Completed in 1982
78	*Zoopiyi* 'Kato Votano'.....	3 240	2 280	Completed in 1982
	Total for rehabilitation schemes.....	£100 760	£50 765	
	F OTHER WORKS			
79	*Ayios Ioannis* operation expenses for BH.....	2 322	1 261	
80	*Ayios Ioannis* operation expenses for BH.....	2 000	-	
81	Consultants fees.....	2 582	-	
82	Purchase of membrane.....	116 312	115 799	
83	Test pumping.....	34 869	19 926	
	Total for other works.....	£158 085	£136 986	

SUMMARY OF ALL PITSILIA INTEGRATED RURAL DEVELOPMENT SCHEMES

Description	Amount allocated for 1982 £	Expenditure incurred in 1982 £	Number of schemes
PONDS AND DISTRIBUTION SYSTEMS.	881 379	652 135	32
XYLIATOS DAM AND DISTRIBUTION SYSTEM.....	819 429	738 085	3
BOREHOLE SCHEMES.....	242 017	150 882	5
RURAL DOMESTIC WATER SUPPLY SCHEMES.....	150 521	121 025	15
REHABILITATION SCHEMES.....	100 760	50 765	23
OTHER WORKS.....	158 085	136 986	5
Grand total.....	£2 352 191	£1 759 878	83

TABLE V-12

POND SCHEMES IN THE PITSILIA INTEGRATED RURAL DEVELOPMENT PROJECT UP TO 1982

Ser No	Name of scheme	Capacity m^3	Contractor	Commencement date	Expected completion date	Estimated cost £	Expenditure by the end of 1982 £	Remarks
1	Pelendria Pond.....	123 000	FYSKO contracting Ltd	February 79	December 80	119 887	115 751	Completed
2	Ephtagonia Pond No 1..	92 000	Iacovou Bros Ltd	February 79	July 80	82 238	81 139	Completed
3	Khandria Pond.....	70 000	CYBARCO Ltd	July 79	September 80	106 153	103 146	Completed
4	Melini Pond.....	58 000	Iacovou Bros Ltd	November 79	October 80	66 217	64 719	Completed
5	Akapnou-Ephtagonia Pond.....	132 000	Iacovou Bros Ltd	September 80	September 81	185 653	176 000	Completed
6	Ephtagonia Pond No 2..	127 000	Hadjiconstantis-Fysentzides and Charalambous Ltd	September 80	February 82	162 271	154 952	Completed
7	Ephtagonia Pond No 3..	65 000	Iacovou Bros Ltd	September 80	December 81	97 686	90 829	Completed
8	Arakapas Pond No 1....	192 000	Iacovou Bros Ltd	September 80	March 82	177 995	175 773	Completed
9	Kato Mylos Pond.....	104 000	Phoenix Constructions	September 80	September 81	133 732	124 000	Completed
10	Ayii Vavatsinias Pond No 1.....	55 000	Iacovou Bros Ltd	April 80	March 81	68 497	65 380	Completed
11	Ayii Vavatsinias Arch Dam.....	53 500	Water Development Department	February 80	February 81	83 055	82 173	Completed
12	Agridhia Pond.....	56 000	Iacovou Bros Ltd	March 82	January 83	94 000	68 430	Completed by 50%
13	Kyperounda Pond.....	270 000	Iacovou Bros Ltd	February 82	February 83	345 000	225 000	Completed by 75%
14	Lagoudhera Pond.....	70 000	Phoenix Constructions and KYKON Ltd	June 82	June 83	134 100	65 900	Completed by 45%
15	Ora Pond.....	62 000	Phoenix Constructions Ltd	November 82	September 83	107 400	2 524	Stripping has been completed.
16	Dhierona Pond.....	159 000	Char. Apostolides & Co Ltd	1983		216 200	-	Construction work expected to strart early in 1983 when funds are made available
17	Arakapas Pond No 2..	119 000	Char. Apostolides & Co Ltd	1983		171 100	-	
18	Ayii Vavatsinias Pond.....	43 000	Chr. Charalambous Ltd	1983		80 500	-	
19	Pharmakas Pond No 1.	20 000	)					
20	Pharmakas Pond No 2.	54 000	(Not yet awarded	1983		240 500		
	Totals.....	1 924 500				£2 672 184	£1 595 718	

Xyliatos Dam under construction View from left abutment with concrete spillway in the foreground. WDD Photo D28-12 (5.7.82)

Xyliatos Dam and its Distribution network

Construction works at Xyliatos Dam were substartially completed late in October 1982 and impounding of water started late in the year.

The distribution system of Ayia Marina area (600 donums) was almost completed and the laying of the distribution system of the Xyliatos area (1,700 donums) was in progress. Some delays in the laying of the distribution system in the Xyliatos area are expected because of administrative and legal formalities yet to be resolved as a result of the implementation of land consolidation in this area.

Construction of Ponds

The type of design adopted for these off-stream earth ponds is unique in the sence that waterproofness is achieved by the use of PVC membrane sheets, 0.5 mm thick, glued together using special chemical solvent/adhesives. Fine material (bedding and covering layer) is being placed beneath and above the PVC sheets to act as cushion to the membrane.

A basic design consideration is to choose a site for the location of the pond and to adopt a suitable configuration for the pond such that there is a balance between the volume of cut and fill materials.

Basically every pond scheme consists of a diversion weir, a diversion pipeline, inlet and outlet arrangements, the pond and the distribution system.

Water is impounded into an off stream pond by gravity via a diversion weir (located in a nearby stream at higher elevation than the pond) and through a 100 to 250 mm dia diversion pipeline.

The construction of the ponds is carried out by private contractors after tendering, while the Water Development Department supervises the works. The distribution systems, however, are constructed directly by the Department.

By the end of 1982 a total of ten ponds and a small arch dam at Ayii Vavatsinias were constructed, while four other ponds were under construction.

From the four ponds under construction,

Agridhia Pond was completed by 90%, Kyperounda Pond by 75%, Lagoudhera Pond by 45%, while constructional works for Ora Pond started late in November.

Tenders were awarded late in the year for Dhierona Pond, Arakapas Pond No.2 and Ayii Vavatsinias Pond No. 2. Construction works for these ponds are expected to commence early in 1983 as soon as the village contributions are made available.

More details for these ponds regarding construction dates, expenditure, capacities etc are given in Table V-12.

During the first four months of 1982, remedial works were carried out by the WDD at Khandria Pond, Ephtagonia Pond No. 1, Melini Pond and Ayii Vavatsinias Pond.

These four ponds faced stability problems with their membrane lining, as a result of heavy rainfall during the winter months of 1981. "Bulging" of the covered membrane lining on the excavated slopes was then observed. It was obvious that this was caused by excessive water pressure under the membrane lining due to insufficient drainage and/or poor permeability of the fine material (bedding layer) placed below the lining. The remedial works basically involved the introduction of filter material as bedding layer, the replacement of the damaged PVC lining, covering and backfill layers and some concrete lining of drainage ditches to reduce the seepage of surface water from under the membrane.

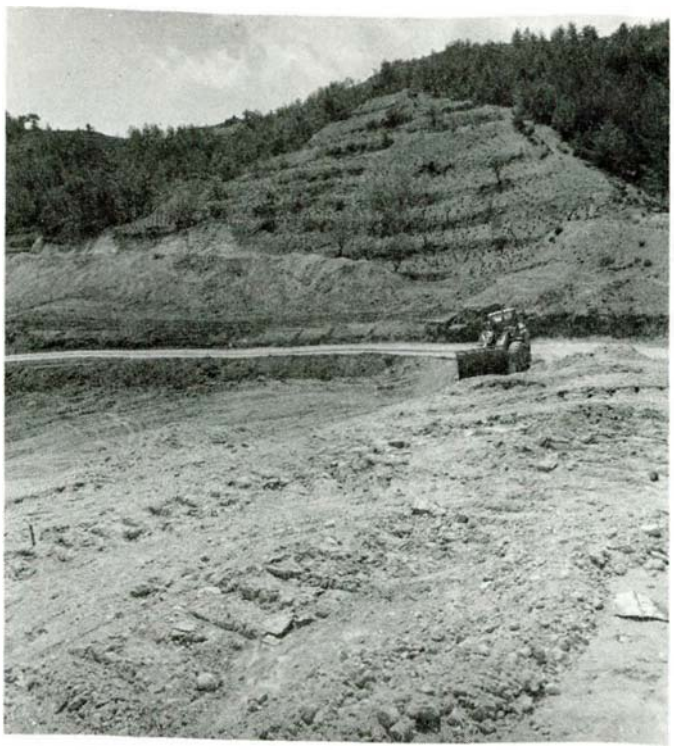
The expenditure for remedial works was borne entirely by the Government, following relevant decision of the Council of Ministers (November 1981).

All the pond contracts so far, have been concluded without any major claims by the contractors, except Pelendria Pond where the contractor has resorted to arbitration on two major claims, ie the supply of rip - rap and the contract prolongation period.

The outcome of this arbitration still remains to be seen.

Borehole Schemes

The development of boreholes has continued during 1982. So far, twelve borehole schemes have been constructed and put into operation. These include three boreholes at Arakapas, two at Kalokhorio, two at Potamitissa, one at Ayios Theodhoros, one at Polystipos, one at Agros, one at Pelendria (combined scheme with pond) and one at Kato Mylos (combined scheme with pond). All these boreholes give a combined yield of some 530 cubic metres per hour. It should be noted that intensive test-pumping to establish the safe yield of each borehole takes place before each feasibility study is prepared, which involves pumping 16 hours a day for a period of two to three months.



Kyperounda Pond No 2 under construction. WDD Photo D20-11 (23.4.82).

Rehabilitation and Water Supply Schemes

During 1982 improvements to existing irrigation schemes were carried out which cover an area of 527 donums, thus raising the total irrigated area which has been rehabilitated within the framework of the Pitsilia Project to 1,380 donums.

So far improvements to domestic water supplies have been carried out to 18 Pitsilia villages while detailed designs are being prepared for an additional 5 villages.

It is worth noting that all the borehole water supply, rehabilitation and pond distribution schemes in the Pitsilia Project are executed directly by the WDD.

REFUGEE HOUSING AND SELF-HOUSING SCHEMES

During 1982 the Division had to respond to the urgent demand for the supply of adequate water for the housing of the refugees. In addition to the execution of the usual water supply schemes, during 1982 we had to deal also with the execution of a number of sewerage schemes for certain Refugee Housing Estates. More details on this subject are given further down in this report.

In total during the year we had to attend to 75 such schemes relating to the housing of refugees. These 75 schemes covered all the fields of constructional activities, ie providing water to Government Housing Estates or self-housing schemes, sewage systems, treatment plants etc. Out of these schemes 31 were related to Government Housing schemes and 44 to self-housing schemes. The amount allocated for all these schemes for 1982 was £647,906 and the expenditure incurred reached the amount of £536,233. Out of this amount £393,598 were spent on Housing Estates, covering water supply and sewage schemes, and £142,635 were spent on water supplies for self-housing schemes.

The Division gave always priority towards the construction of these schemes over all the other works, as was the practice since the Turkish invasion.

Table V-13 shows in detail all 75 schemes and the expenditure incurred on each one.

TABLE V-13
REFUGEE HOUSING AND SELF HOUSING SCHEMES - EXPENDITURE 1982

Ser No	Description	Expenditure incurred in 1982 £
	A SEWAGE DISPOSAL AND WATER SUPPLY FOR HOUSING ESTATES	
	(i) Treatment Plants	
1	Apostolos Loucas (Nicosia)	26 341
2	Khrysospiliotissa (Dheftera)	14 704
3	Kophinou (Larnaca)	12 185
4	Zenon-Kamares (Larnaca)	41 792
	Total	£95 022
	(ii) Sewerage Systems	
1	Apostolos Loucas (Nicosia)	27 670
2	Ayios Ioannis (Larnaca)	4 580
3	Ayios Pavlos A' (Nicosia)	649
4	Ayios Pavlos B' (Nicosia)	20 055
5	Khrysospiliotissa (Dheftera)	25 186
6	Kokkines (Nicosia)	27 962
7	Zenon (Larnaca)	32 173
	Total	£138 275
	(iii) Water supplies	
1	Apostolos Andreas (Nicosia)	6 922
2	Arkhangelos (Phase I) (Nicosia)	4 477
3	Arkhangelos (Phase II) (Nicosia)	1 071
4	Aspres (Nicosia)	15 899
5	Athalassa (Nicosia)	1 890
6	Ayios Ioannis (Larnaca)	4 586
7	Ayios Ioannis (Limassol)	1 367
8	Ayios Pavlos (Nicosia)	4 263
9	Ayios Ioannis Extension (Limassol)	4 531
10	Kamares (Larnaca)	12 469

TABLE V-13
REFUGEE HOUSING AND SELF HOUSING SCHEMES - EXPENDITURE 1982 (Cont.)

Ser No	Description	Expenditure incurred in 1982 £
11	Khrysospiliotissa (Dheftera)	4 133
12	Kokkinies(Larnaca)	7 000
13	Kokkines (Nicosia)	6 742
14	Kophinou (Larnaca)	23 420
15	Mouttalos (Paphos)	36 952
16	Omonia (Limassol)	323
17	Tsakileron (Larnaca)	4 540
18	Tsiflikoudhia (Limassol)	3 495
19	Yerani (Limassol)	179
20	Zenon (Larnaca)	16 042
	Total	£160 301
	B WATER SUPPLY FOR SELF HOUSING ESTATES	
	(i) Nicosia District	
1	Ayii Trimithias	184
2	Kokkini Trimithia	45
3	Nisou C	195
4	Nisou D	5 324
5	Orounda	1 531
6	Paleometokho	19
7	Peristerona A	21
8	Peristerona B	18
9	Peristerona C	21
10	Peristerona D	28
11	Peristerona E	42
12	Trakhoni C	10 150
13	Trakhoni D	17 259
14	Yeri A	90
15	Yeri B	406
16	Yeri C	1 805
17	Yeri D	3 086
18	Yeri E	94
19	Yeri H	559
20	Yeri Z	274
21	Yeri (general)	500
	Total	£41 651
	(ii) Famagusta District	
1	Akhna Forest	25 889
2	Avgorou	1 887
3	Phrenaros	1 280
4	Vrysoulles A	3 002
5	Vrysoulles B	1 000
6	Vrysoulles C	400
7	Vrysoulles D	1 302
	Total	£34 760
	(iii) Limassol District	
1	Ayia Phyla	277

TABLE V-13
REFUGEE HOUSING AND SELF HOUSING SCHEMES - EXPENDITURE 1982 (Cont.)

Ser No	Description	Expenditure incurred in 1982 £
2	Episkopi C	10 348
3	Evdhimou	109
4	Kandou	714
5	Kolossi D	14 353
6	Kolossi E	673
7	Moutayiaka B	87
8	Moutayiaka C	4 821
9	Polemidhia Pano D	536
10	Polemidhia Kato B	27 386
	Total	£59 304
	(iv) Larnaca District	
1	Dhekelia	181
2	Klavdhia A	2 078
3	Kellia	744
4	Kophinou B (Sewerage)	3 365
5	Livadhia Z	424
6	Meneou	128
	Total	£6 920

Ser No	Description	No of schemes	Expenditure incurred in 1982 £
	SUMMARY OF ALL DISTRICTS		
	A Housing Estates		
(i)	Treatment plants	4	95 022
(ii)	Sewerage systems	7	138 275
(iii)	Water supplies	20	160 301
	B Water Supply for Self-Housing Estates		
(i)	Nicosia District	21	41 651
(ii)	Famagusta District	7	34 760
(iii)	Limassol District	10	59 304
(iv)	Larnaca District	6	6 920
	Totals	75	£536 233

REFUGEE HOUSING ESTATES SEWAGE SCHEMES

As already stated, our Division has undertaken the construction of a number of sewage schemes on behalf of the Town Planning and Housing Department. The implementation of sewage projects for the Refugee Housing Estates was inaugurated in 1981 by the construction of five sewerage (collecting) systems for identical number of housing estates. The Expenditure incurred during 1981 on these sewerage schemes was £74,845. Work was continued in 1982 on seven Housing Estates where the expenditure during 1982 reached the amount of £138,275.

During 1982 the Division has also undertaken on behalf of the Town Planning and Housing Department the contract management and/or construction of five sewage treatment plants serving six refugee housing estates.

More specifically we have undertaken the

supervision for the construction and for the installation of the electromechanical equipment. Furthermore in three cases the construction of civil works will be directly executed by our Division.

The treated effluent resulting from these treatment plants is planned to be used for the enrichment of underground water for irrigation purposes (for certain types of grass) or, for watering grass of athletics stadiums.

The completion of these five sewage treatment plants is expected to take place during 1983.

The main information concerning these schemes is presented in table V-14.

SCHEMES UNDERTAKEN FOR CONSTRUCTION FOR OTHER GOVERNMENT DEPARTMENTS

During 1982 the Division of Construction had to respond to the requests of other Government Departments for the construction of water works that were approved in their individual 1982 budgets. Two major groups of such water works are the Pitsilia Integrated Rural Development Project which is budgeted under the Ministry of Agriculture and Natural Resources votes and covers all types of water development schemes in the Pitsilia area and all water works schemes related to the housing of Refugees approved in the Department of Planning and Housing Budgets. For these two major groups of water works a detailed description has already been given in this report.

In addition to these works the Department had also to respond to another 62 water works approved in other Government 1982 budgets. These 62 schemes cover a great variety of projects, such as schemes providing water supplies to new livestock areas, schemes for the maintenance and or protection of Turkish Cypriot properties, water supply or irrigation schemes for villages included in the budget of the Ministry of Interior, installation of fire hydrants all over the island, etc.

For all these 62 schemes an amount of £397,043 has been approved and been allocated to the Department during 1982 for their construction. The expenditure incurred on all these projects during 1982 has reached the amount of £362,558.

TABLE V-14

SEWAGE TREATMENT PLANTS FOR REFUGEE HOUSING ESTATES - EXPENDITURE 1982

No	Name and location of the sewage treatment plant	Population served	Contractor and contract price for the purchase and installation of electromechanical equipment £	Contractor and contract price or cost estimate for the civil works £	Commencement date	Expenditure during 1982 £
1	Apostolos Loucas Laxia	500	Shipshore Ltd 14 930	Shipshore Ltd 13 750	14. 6.1982	26 341
2	Zenon - Kamares II Larnaca	2 600	Shipshore Ltd 82 990	Shipshore Ltd 73 150	23. 9.1982	41 792
3	Khrysospiliotissa Kato Dheftera	600	Shipshore Ltd 17 070	WDD 18 164	11.10.1982	14 704
4	Kofinou	800	Hydrotech Ltd 18 800	WDD 20 337	17.12.1982	12 185
5	Mouttalos Paphos	300	Hydrotech Ltd 13 900	WDD 14 705	27.12.1982	-
	Total					£95 022

Table V-15 below shows in detail all 62 schemes undertaken for construction on behalf of other Government Departments and the expenditure incurred on each one.

SCHEMES UNDERTAKEN FOR CONSTRUCTION FROM VILLAGE DEPOSITS

As already stated in this report the Department had to respond to the requests of village Authorities or Irrigation Associations for any constructional works that might become necessary during the year.

Such works usually relate to maintenance of existing schemes, extensions to distribution systems, repairs or maintenance to pumping units, etc and as the villages do not have the means to carry out the works by themselves they request our Department for their execution. Another important factor is that the standard of these works is maintained at the same standard of the original scheme which was executed by our Division.

During the year we had to respond to 106 such requests from villages for the execution of various types of works. For these works the amount deposited by villages in 1982 was £256,735 and the expenditure incurred by the end of the year reached the amount of £45,961.

SCHEMES EXECUTED FOR PRIVATE DEVELOPERS

For the same reason, as in the case of village Authorities the Department had to respond to the requests of private developers for the execution of water works, mainly in relation with the development of land (parcellation of building sites). All requests are put through the local District Officers, and this is a result of the division permit which always has a condition that the water supply works will be carried out by the Department of Water Development. This condition is considered necessary so that the standard of the workd is kept at the same standard of the remaining original project.

During 1982 the Department had to deal with 181 such schemes of an estimated value of £177,892. The expenditure incurred on all these works by the end of the year reached the amount of £110,510. Most of the works involved the laying of distribution systems for new water supply schemes, for the division of land into building sites in village inhabited areas where usually the water supply is obtained from the village source.

TABLE V-15

SCHEMES UNDERTAKEN FOR CONSTRUCTION FOR OTHER GOVERNMENT DEPARTMENTS DURING 1982

Ser No	Description	Expenditure incurred in 1982 £
1	Yeri livestock	272
2	Margo	3 112
3	Sotira livestock	26 847
4	Geological Department	550
5	Limassol area	198
6	Athalassa	5 280
7	Ayia Napa Ref. Hotel	2 352
8	Kalopanayiotis	3 737
9	Fire Hydrants	2 977
10	Kiti-Meneou-Perivolia	17 531
11	Yiangou Estate	1 030
12	Laxia Cemetery	814
13	Amathus M/ce	6 457
14	Dhenia	1 945
15	Services for the Protection of T/C properties	1 202
16	Lefkara Dam	435
17	Roliko	341
18	Eleni Michael (D O Limassol)	212

TABLE V-15 SCHEMES UNDERTAKEN FOR CONSTRUCTION FOR OTHER GOVERNMENT DEPARTMENTS DURING 1982 (cont.)

Ser No	Description	Expenditure incurred in 1982 £
19	Stavrovouni Monastery	7 323
20	PA.SY.D.Y. Limassol	5 953
21	Eleni Hj Antoni (D O Limassol)	720
22	Moutayiaka	344
23	Aradhippou river	1 899
24	Mari WS	20 281
25	Goshi	45
26	Athalassa	41
27	Nikos Krasides (D O Limassol)	748
28	Alona	714
29	Rita Court (D O Limassol)	499
30	Palekhori road	286
31	Mari irrigation	28 586
32	Akaki WS	5 284
33	Pendakomo WS	3 493
34	Psevdhas WS	135
35	Ypsonas-Polemidhia WS	1 311
36	Kornos	870
37	Mathiati WS	2 167
38	Plataniskia	892
39	Nicos Mara	5 008
40	Pyrga	1 286
41	Tekke	90
42	Mammari	10 613
43	Episkopi	656
44	Kivisil	5 869
45	Phini Vines Irrigation	9 699
46	Moutoullas Irrigation	8 520
47	New Nicosia-Limassol road	23 243
48	Palekhori road	2 145
49	Xyliatos - Lagoudhera	1 200
50	Karvounas road	34 648
51	Limnatis bridge	556
52	Pano Lefkara	1 400
53	Paphos Airport WS	42 094
54	Pyrgos-Piyenia irrigation	21 868
55	Yialia	2 474
56	Pakhyammos	549
57	Philousa-Lyso WS	4 124
58	Argaka-Magounda	2 312
59	Asgata	390
60	Agros	20 160
61	Asomatos-Trakhoni	5 250
62	Agros	1 521
	Total	£362 558

V/I PAPHOS IRRIGATION PROJECT

by
K Spanos
Executive Engineer I
Deputy Project Manager

General

During the year 1982 operation and maintenance of the 1st phase of the project covering all the eastern sectors from Kouklia to Yeroskipos as well as supplies to the irrigated areas from Mavrokolymbos Dam have continued. For the first year Asprokremmos Dam reservoir was used for impounding and it provided about 4.6 MCM of water to the irrigated areas while a further 7 MCM were provided from the project boreholes and diversion of surface river flow from Dhiarizos. Altogether about 5,000 donums of permanent plantations and about 10,500 donums of seasonal crops were irrigated from the project.

In the field of construction the Asprokremmos Dam was substantially completed in September 1982 and the President of the Republic Mr Spyros Kyprianou carried out the inauguration of the project on the 26th October 1982.

The installation of irrigation networks and construction of reservoirs in the western area have continued throughout the year 1982 and about 85% of the work was completed by the end of it.

The remaining works up to full completion of the main farm roads in the eastern area were carried out during the first 3 months of the year and were taken over by the project.

The total expenditure incurred during 1982 for continuation of construction works for the project amounted to £3,302,930 and for operation and maintenance of its completed parts to £253,667. The total expenditure up to the end of 1982 is as follows:
For construction £23,216,873 which is about 92% of the total estimated cost of £25 million and for operation and maintenance of the completed parts £379,370.

By the end of the reporting year the following number of staff of the Department were occupied with supervision of construction works and operation and maintenance of the completed parts of the project:

Hourly	Construction	Operat. and M'ce
3 Foremen.....	1	2
6 Water Inspectors.....	-	6
3 Electricians-Mechanics...	-	3
12 Skilled labourers.....	2	10
21 Unskilled labourers.....	3	18
13 Drivers.....	9	4

Technical Staff
Monthly

1	Executive Engineer I (FAO Senior Irr. Engineer) Project Manager.....	1	-
2	Executive Engineers I ...	2	-
3	Executive Engineers II (one daily).....	2	1
1	Mechanical Engineer II..	-	1
26	Technicians II (monthly or daily).....	23	3
1	Ass. Chief Foreman.....	-	1

Administrative Staff

1 Administrative Officer
1 Accounting Officer
5 Clerical Assistants
1 Telephonist
2 Messengers
10 No. Total Administrative staff

The two Consulting Engineering Firms Sogreah and Sir M MacDonald and Partners continued the supervision of contract works with their respective Resident Engineers. For Asprokremmos Dam the R E was assisted with another two expatriate civil engineers.

PROGRESS OF WORKS

The following three construction contracts were still under execution during the year 1982.

1 Asprokremmos Dam-Contract No C2 39/77/26

Contractor: Joint Venture of J&P and MEDCON

Following the extension of time of 49 weeks granted by the Resident Engineer the contract completion was due at the end of April 1982. In fact however the substantial completion certificate was issued by the Resident Engineer by mid September 1982, while in the meantime reservoir impounding had started as from the 1st of March 1982 following the closure of the water control gate. The total amount of water collected in the dam reservoir by the 28th June 1982 when the releases of water had first started through the irrigation pipeline was 6.3 MCM out of which about 4.6 MCM were released for irrigation purposes during the summer period.

The actual progress achieved on each separate item of the dam during the reporting year was as follows:

Intake Tower - Foodbridge

Concreting of the remaining superstructure of the tower was completed by the end of February. In the meantime by overlapping the installation of the gates with the other ongoing works and reducing the gate test to an absolute minimum it was possible to achieve closing of the gate on the last day of February in order to start reservoir impounding. The Contractor has completed the majority of the finishing work on the water control gate installation, sluice valve control gear and electrical works during March.

The remaining work however to complete fully the above items has been left outstanding till the end of the reporting year.

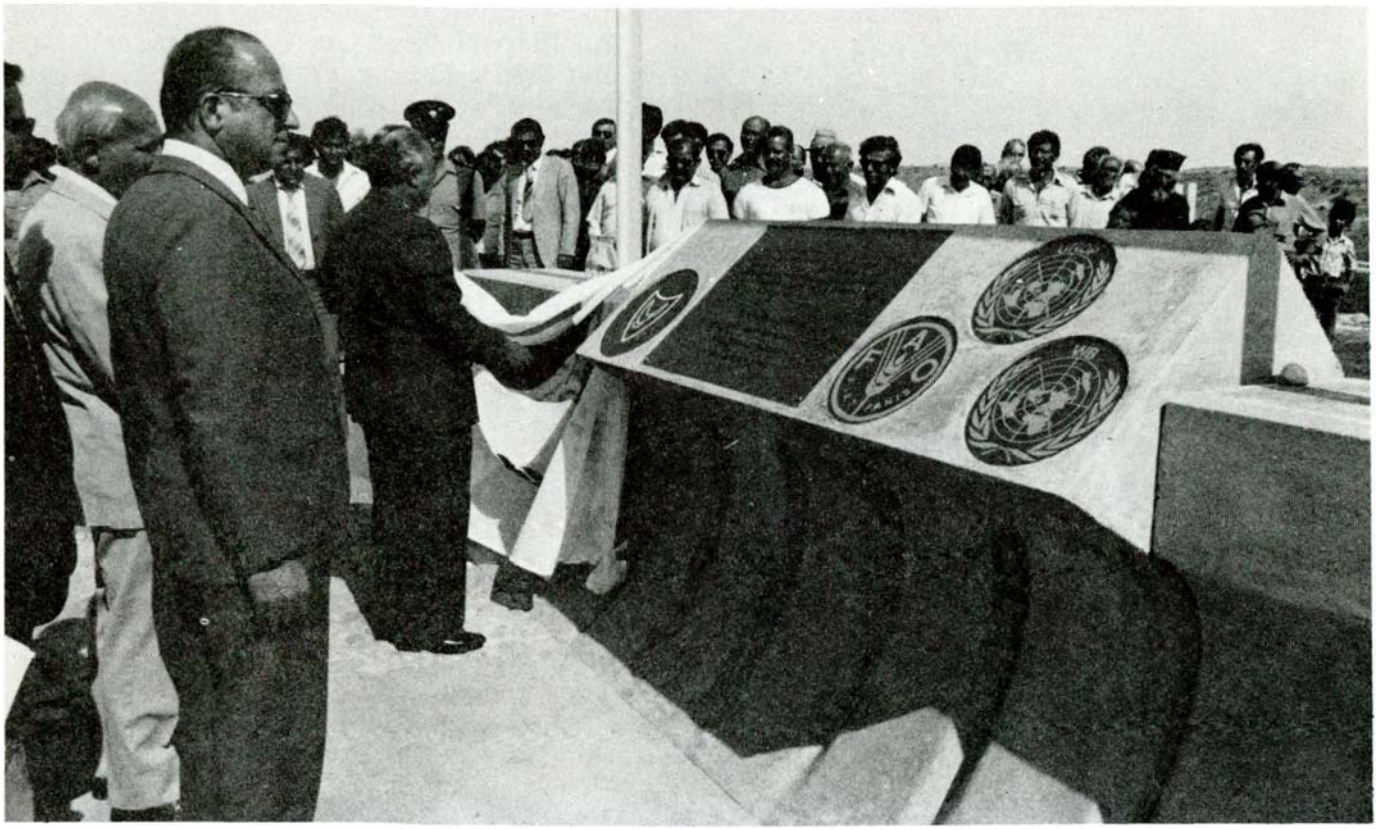
Concreting of the footbridge piers and its abutment block was completed by February and the bridge strusses were erected also by the end of the same month allowing temporary access to the intake tower. Repair of the damaged handrailing and installation of the precast concrete slabs on the footbridge floor were carried out much later and completed in September.

Galleries

Concreting of the washout chamber and irrigation pipe tunnel was completed during the month of February. The concreting gang then moved to the right abutment drainage gallery where 270 meters length remained to be concreted from August 1981.

Laying of both irrigation pipelines in the washout chamber and the pipe tunnel started in March and was finally completed and tested in June up to the flow measuring equipment which is to be supplied under the power station sub-contract. In order to enable the release of water from the dam reservoir in the canal without interrupting the work on the power station, a temporary by-pass arrangement has been constructed and put into operation by the end of June.

Concreting of the right abutment gallery was completed in July. Its grouting was carried out by WDD during the period June-August. The Contractor has then proceeded with the drilling of the drainage holes in the gallery. By the end of the reporting year all galleries were completed except minor outstanding work which includes constructing measuring weirs and completing electrical installation.



Asprokremmos Dam. Inauguration by the President Mr Kyprianou on 26th October 1982. WDD Photo A 65 EN7 (26.10.82).

Embankment

The Contractor has managed to increase slightly his progress on the embankment during the first two months of the year due to favourable weather conditions and the supply of coarse filters from a nearby private crusher. With the placement during this period of about 164,000 m^3 of fill material the general level of the embankment was brought from 67.4 m El. at the end of the previous year to about 74.0 m El. by the end of February which made the early impounding possible.

In March the extensometers were installed in the clay at 75 m El. while the rate of progress for the remaining part of the embankment was dropping as the contractor had to work at higher levels and on narrower working space.

Delivery of rip-rap material from the new quarry at Stavrokono continued normally during the year and was completed by the end of September with a total quantity delivered on site of about 30,000 m^3 measured "on the trucks". During the same month the whole of the main embankment filling was completed and a start was made on the laying of precast concrete crest units. These units were installed on temporary supports for the reason that the embankment had not reached its settlement allowance. It was also decided for the same reason that kerbs and tarmac accross the crest would not be done this year.

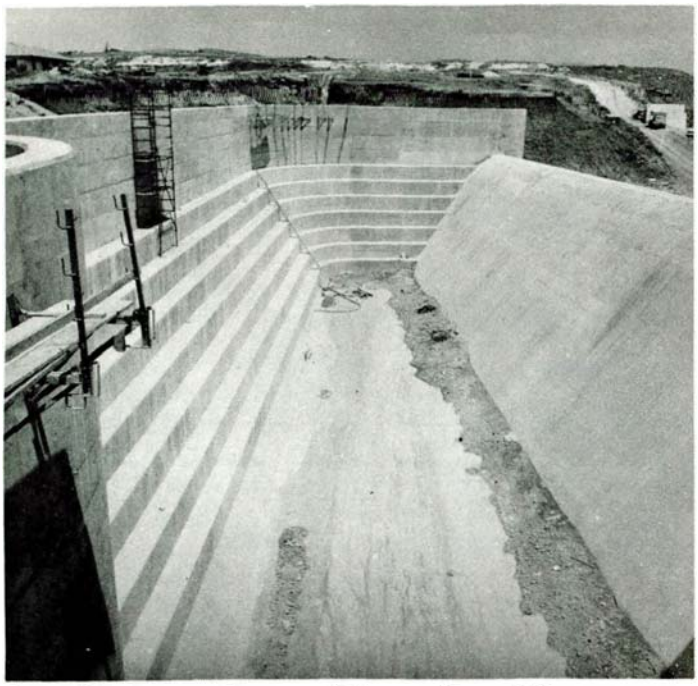
Construction of the dam access road was completed and most sections, except the crest, received the final black top wearing course during September.

Spillway

The remaining concrete work on the spillway was carried out at a slow rate and completed by the beginning of May. The Contractor has then proceeded with outstanding work which included major repairs, berm drains, gallery flooring, ladders and gallery lighting. Due to a major cut down of the Contractor's labour force, progress on the above items has been very slow and some more work has still to be carried out by the end of the year.

Power Station

A start was made in April on the power station and the canal intake basin with its



Asprokremmos Dam. View of spillway entry channel nearing completion. WDD Photo D 22-11 (13.5.82).

100 m length connecting section up to the start of the existing canal. All the works related with the canal were completed by mid June so that water could be released from the reservoir through the temporary by-pass. Works on the power station continued slowly due to its complex nature and the small number of labourers made available for this work. Completion of the works is expected at the end of March 1983 when installation of electromechanical equipment can commence. Manufacturing of this equipment by the suppliers Elin-Union and J M Voith was completed by the end of the year 1982 and was expected to arrive on the site early in 1983.

Finance

The total amount of work certified by the Resident Engineer for the works up to the end of November was £7,355,993 at contract rates while the gross amount paid to the Contractor reached the sum of £10,170,812. Although the remaining part of the work up to completion has a value of about £500,000 only, a large number of claims amounting to a total of about £5 million has still to be settled between the Department and the Contractor through arbitration proceedings. The Resident Engineer's evaluation of the Contractor's claims is of the order of £250,000 only.

2 Installation of Irrigation Networks and Construction of Reservoirs for Western Sectors - Contract No C9 39/77/40

Contractor: G P Zachariades Ltd.

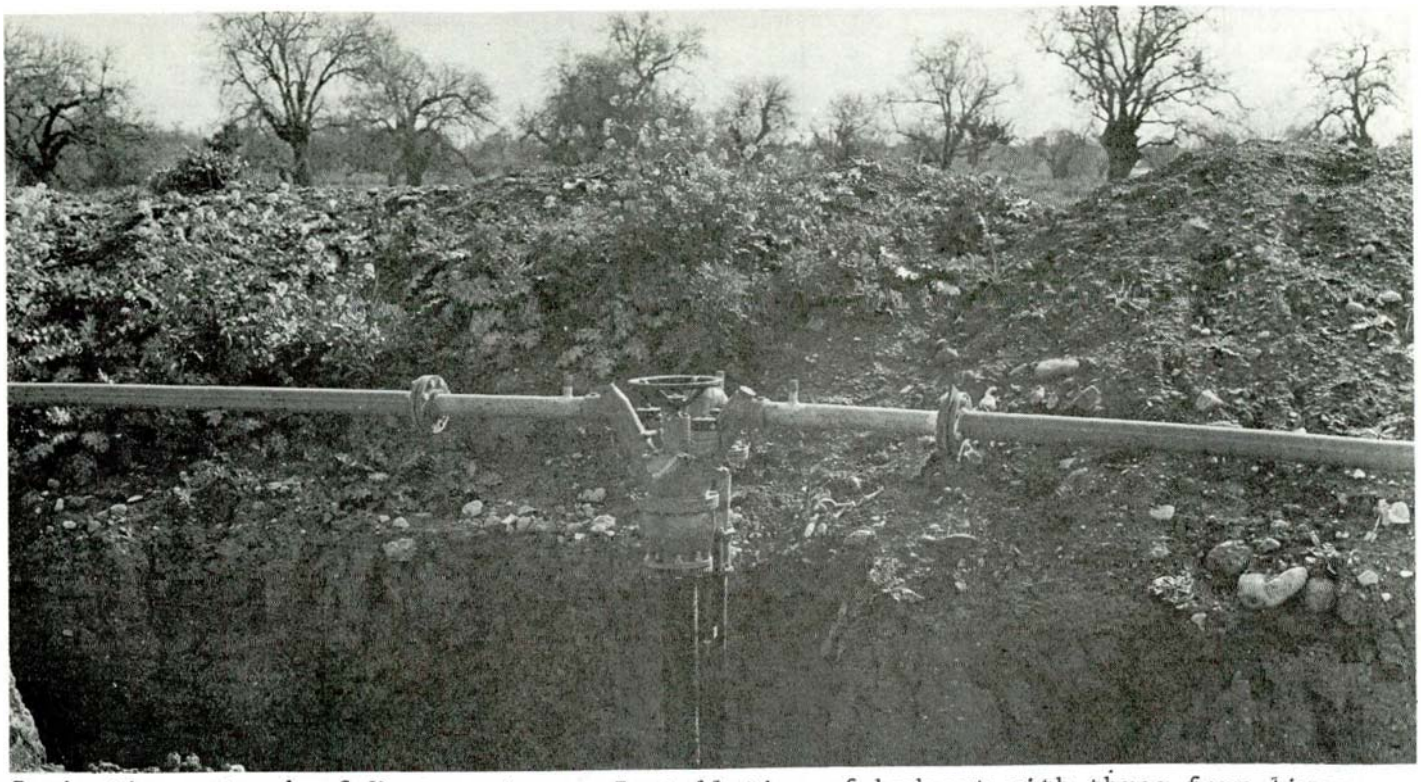
The Contractor has continued from previous year to perform his work in a satisfactory and well organised manner. In spite however of his efforts to increase his output on trench excavations and pipe laying the actual progress of works by the end of the year were behind the original contract program by about 9 months. The main reason for the delay was the large increase in the quantities of hard excavations in the sectors of Kissonerga and Emba North. The overall increase in hard excavation was of the order of twice as much. The reason of underestimating the quantities of ripable or hard materials was mainly because the estimate at tender stage was based only on a general surface survey of the areas without any underground investigations.

According to the progress of the works reached at the end of 1982 it is expected that all the networks of the western area could be operational early in 1983 except the last parts of Ayios Yeoryios which would be connected a few months later. Details of the works executed up to the end of 1982 are given herebelow by sector.

Kissonerga and Kissonerga Extension Sectors

Installation of the irrigation networks in these sectors was completed in the first months of the year while their general

Eastern Project Area in operation. Sprinkler irrigation. WDD Photo A59 EN22 (15.9.82).



Irrigation network of Western Area. Installation of hydrant with three farm lines. WDD Photo D 5-10 (11.2.82).

water tightness test was carried out successfully during the month of May on the basis of which substantial completion certificate was issued for this sector by the Engineer. The works in these sectors comprised mainly of the following:

- Installation of 35,435 meters of A C pipes of diameters from 80 to 450 mm.
- Installation of 69 hydrants with 441 farm risers.
- Installation of 22 air valves and 6 control sluice valves.
- Installation of 4 water hammer protective valves.

Emba South and Emba North Sectors

In both sectors rock excavations for the trenches have progressed slowly because they had to be carried out with the use of hydraulic or pneumatic breakers only as they were very near to residential areas. Finally all works were completed before the end of the year 1982 including the general water tightness test on the network of Emba South.

In total the following installation works were performed in both Sectors:

- Installation of 38,511 m of A C pipes from 80 to 450 mm in diameter.
- Installation of 69 hydrants with 443 farm risers
- Installation of 9 air valves, 9 sluice valves and 8 water hammer protective valves.

Peyia and Ayios Yeoryios Sectors

The Contractor was allowed to move into the Peyia sector in March 1982 and proceeded very quickly with the trench excavations. By the end of the year all the earthworks in Peyia sector were completed and a start was made in the sector of Ayios Yeoryios. It was scheduled that by March 1983 most of the Peyia sector would be fully tested and delivered for operation in order to allow irrigation of vineyards of the area. The actual progress in Peyia sector by the end of the year was as follows:

- Installation of 56,600 m of A C pipes from 80 to 600 mm in diameter. Remaining work about 1,000 m which had to be postponed in order to allow roadworks by Land Consolidation Authority over certain parts of the future farm roads.
- Installation of 96 hydrants and 700 farm risers. Remaining 6 No and 54 No respectively.
- Installation of 34 air valves out of 40, 20 sluice valves out of 25 and 1 water hammer protective valve out of 8.

The works in the sector of Ayios Yeoryios were scheduled to be completed in May 1983.

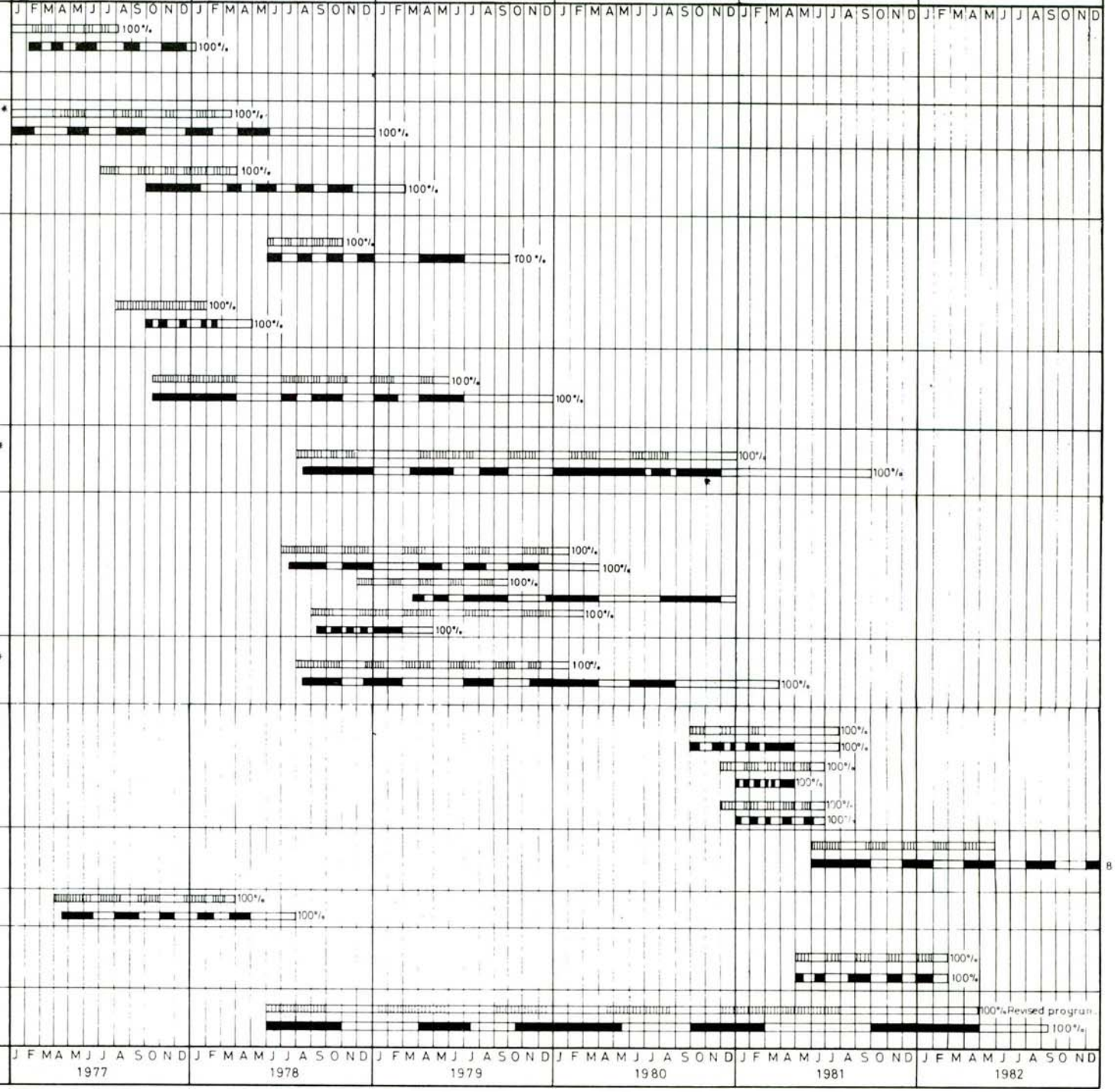
PAPHOS IRRIGATION PROJECT

PROGRESS CHART FOR WORKS UNDER CONTRACT

10 20 30 40% ..... Scheduled

10 20 30 40% ..... Actual Progress

LOT No.	DESCRIPTION OF WORKS	CONTRACT SUM	GROSS PAYMNT TO 31.12.81
		£	£
S 20 S 21 S 22	Supply of Laboratory Equipment Survey Equipment and Vehicles	66,602	67,083
D 1	Drilling, Casing, Testing of B. Hs.	82,000	81,914
1 C 1 S	Main Canal Construction	992,826	908,240 *
2	Supply and installation of Well Pumps	142,372	134,718
	SUPPLIES FOR WELLFIELD CONVEYANCE SYSTEM		
3 S1	1 Canaletti	66,850	59,272
3 S2 3 S3	2 A.C. Pipes with Fittings and Valves	208,402	216,534
4 C1 & 4 C2	Installation of Wellfield Conveyance System and Eastern Main Pipeline	162,889	241,342
6 C	Main Contract—Supply and Installation of Pumping Stations Western Conveyor and Remote Indication	2606.603	3,191,677 *
	SUPPLIES FOR DISTRIBUTION NETWORK OF EASTERN AREA		
S 5.1	1 A.C. Pipes and Fittings	1,267,257	1,261,353
S 52	2 Valves	113,868	108,069
S 53	3 Hydrants	251,052	242,321
7 C1 7 C2	Installation of Irrigation Network and Construction of Reservoirs for Eastern Area	1,640,984	1,580,556 *
	SUPPLIES FOR DISTRIBUTION NETWORK OF WESTERN AREA		
8 S1	1 A.C. Pipes and fittings	456,215	436,791
8 S2	2 Valves	40,824	44,483
8 S3	3 Hydrants	80,385	76,460
9 C	Installation of Irrigation Network and Constraction of Reservoir for Western Area	1229940	335920
10	Central Offices Temporary Buildings	40 413 (31,185)	71,598
11	Construction of Farm Acces Road	183,332	131,790
	ASPROKREMMOS DAM		
12	1 Dam constraction	6,743,837	8,541,141*

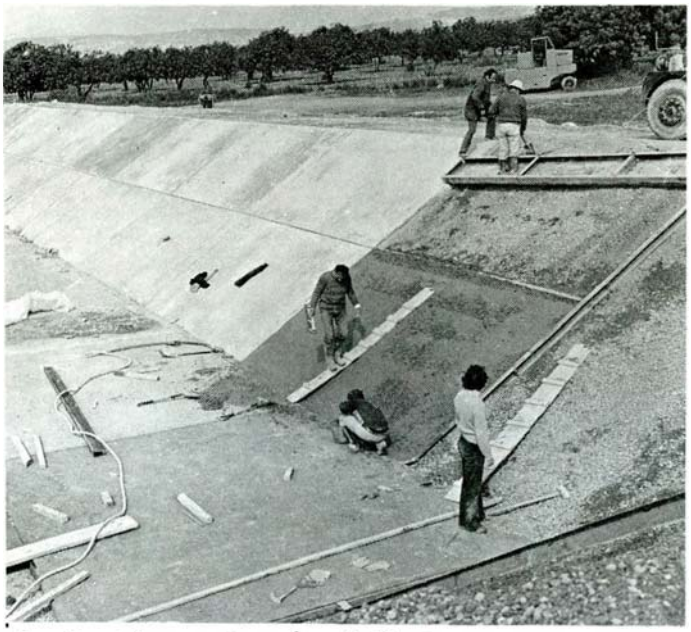


Note* Including adjustment of cost due to variation of prices

Storage reservoirs

Five storage reservoirs, concrete lined, of total capacity of 23,500 m³ were included as part of the works and the following progress was achieved on each one by the end of the year.

- Kissonerga reservoir (storage capacity 4,000 m³) was fully completed and tested successfully on the 1.7.1982.
- Emba South reservoir (storage capacity 3,500 m³) was fully completed and tested successfully on the 23.9.1982.



Irrigation network of Western area. Concrete lining of Kissonerga storage reservoir (4,000 m³). WDD Photo D5-12 (11.2.82).

- Emba North reservoir (storage capacity 2,500 m³) was fully completed and tested successfully on the 5.10.1982.
- Peyia reservoir (storage capacity 10,500 m³) was fully completed and tested successfully on the 3.12.1982.
- Ayios Yeoryios reservoir (storage capacity 3,000 m³). All earthworks had been completed and works for its concrete lining started towards the end of December. Its completion was scheduled for the end of January 1983.

Finance

The amount of work certified by the Resident Engineer to the end of December 1982 was £992,913 at contract rates while the gross amount paid to the Contractor including the retentions and advance payment reached the amount of £1,059,664. The total cost of the works was estimated to be £1.3 million.

3 Access Farm Roads of Eastern Sectors - Contract No 39/79/22

Contractor: Messrs A Papaettis

The Contractor has managed to complete all outstanding works with the last 6 km of roads in Akhelia during the first 3 months of 1982. Maintenance period of 6 months has also elapsed during the year and WDD has officially received all the 26 km of farm roads in September 1982.

The total cost of all works carried out including settlement of all contractor's claims reached the sum of £167,428.

OPERATION AND MAINTENANCE OF COMPLETED PARTS OF THE PROJECT

The operation and maintenance section of the project continued throughout 1982 to carry out all necessary maintenance works and to keep under operation all the works in the eastern area of the project i.e. wellfields, main canal, pumping stations and irrigation networks covering an area of about 3,500 ha between Kouklia area and Paphos town.
The main tasks and difficulties which were faced during the year 1982 in connection with the maintenance of the above parts of the project are summarised herebelow:

In addition to the routine general cleaning of all concrete structures and painting of their metalwork on the wellfield conveyance system the most serious problem was the formation of algae on the inner surface of the canaletti and rectangular concrete canal. The main reasons of algae growth in this case was the sunlight, the clean water and the high velocities of the water. The algae were carried away by the water and as a result many of the screens installed along the canaletti and rectangular canal were blocked very often and had to be cleaned once and sometimes twice a day. Blockages were also occurring on the non - return valves of Kouklia East and Kouklia West pumping stations which again had to be cleaned almost every day and on all the screens of the main canal intake structures. To reduce the formation of such algae the inner surfaces of canaletti and rectangular canal were cleaned by scraping twice during the reporting year. To avoid however the every day cleaning of too many screens it is now considered necessary to install at the end of the wellfield conveyance a movable and self - cleaning screen.

Considerable growth of plants was also appearing on the invert of the Main Canal over which large deposits of silt and sand have been occurring with the result of reduction on the maximum capacity of the canal. General cleaning of the canal invert and slopes was undertaken during the first two months of the year using two backhoe excavators. In the meantime the Fisheries Department has undertaken to introduce fish in the Main Canal in order to eliminate growth of algae.

Apart from the general cleaning of all the installations in the pumping stations and repair of certain electrical failures a lot of work was required in order to keep the non-return valves clean so that water was not returning back to the canal due to leakages through these valves. Algae and other dirt found in the water of the main canal were the cause of the above problems.

The main problems experienced with the operation of the distribution systems were the breakages of A C pipes mainly on the farmlines (122 cases) and some of the main lines (18 cases). The main cause of farmline breakages is considered to be the heavy clayee soils which due to the swelling effects cause dislocation of the pipes. Blockage of the hydrant water meters with algae was another serious problem which was faced during the past year.

Irrigation supplies to the farmers started on the 11th of January mainly for greenhouses and vines. There has been an interruption of about three weeks in February in order to allow cleaning of the main canal and canaletti. Up to the middle of April the demand has been very low and the total quantity of water supplied was of the order of 100,000 m^3 and could be met by diverting the surface flow in Dhiarizos river into the canaletti in order to feed the main canal. With the planting of summer crops such as groundnuts towards the end of April water requirements had increased considerably and the first well pumps had to be put into operation on the 23rd of April. As the water impounded in the reservoir of Asprokremmos after the closure of its gate on the 28th February has reached a maximum by the end of June of about 6.5 MCM it has been necessary to utilize as much as possible the project boreholes most of which were continuously pumped up to the end of the year. The total quantity of water pumped from all project boreholes during 1982 was 5,203,800m^3 at borehole level. Releases from the dam reservoir started on the 28th June and continued up to the 6th November through one of its two 800 mm dia. irrigation pipelines which was temporarily connected with the main canal by making a by-pass of the power station whose construction has just started. The total quantity released from the dam was estimated at 4.6 MCM as no water meter has been installed on the temporary supply line to the main canal.

Apart from the irrigation supplies, the project had provided also certain quantities of water for industrial use mainly for the Anatolikon Co-operative Industries as well as for recharging of the gravel acquifer in Xeropotamos downstream of the Asprokremmos Dam in order to avoid complete drawdown of its ground water table due to the pumping from the three boreholes of the Paphos town domestic water supply scheme. In the future such recharging would not be necessary because soon the above boreholes will be replaced with new ones upstream of the dam reservoir.

Details regarding water utilization and crops irrigated are shown on tables VII-50 and VII-51 under DIVISION OF OPERATION AND MAINTENANCE (Irrigation).

The total gross income from the sale of water at the nominal rates of 20 mils/m^3 for irrigation and 30 mils/m^3 for industrial uses amounted to about £200,000.

The amount of water which was released from the dam was estimated approximately on the basis of reservoir water level measurements because the main water meter on the irrigation draw-off pipeline had not been installed. By comparing the results of these measurements however with the quantity of water pumped out of the main canal as recorded at the water meters of the Pumping Stations, we find a discrepancy of about 10% i.e. Pumping Station recordings give bigger quantity than dam releases by about 10%. The above discrepancy may be attributed to the following reasons:

(a) Pumping Stations' water meters are overecording the flows of water (b) leakages through the non-return valves of the pumping stations' by-passes back to the main canal (c)under-estimation of reservoir capacity of the dam. The first two reasons appear to be more valid due to the fact that the difference between the P S water meters

TABLE V/I - 1
PAPHOS IRRIGATION PROJECT - EXPENDITURE 1982

Ser No	Description	1982 Expenditure £	Total Expenditure upto 31.12.82 £
1	*Wellfield Conveyance System*		
	Drilling and testing of boreholes	-	81 914
	Supply and installation of well pumps	-	143 813
	Supply of pipes and valves	-	212 535
	Supply of canaletti	-	71 013
	Installation wellfield conveyance system (WCS by ASPEM)	-	25 157
	Installation of WCS by WDD	-	239 027
	Topographical control works	-	1 784
	Development of boreholes and lowering well pumps	-	3 015
	Diversion of river water into the canaletti	-	10 413
2	*Construction of Main Canal*		
	Main canal construction (GCC)	22 579	937 363
	Diversion of services	-	9 239
	Main canal investigations	-	17 307
	Alkali activity tests	-	1 759
	Compensation to field crops	-	1 472
	Fencing of main canal	-	4 665
	Repairs and additonal works	1 150	14 159
3	*Irrigation Network Eastern Area*		
	Installation of irrigation network (SOCEA)	175 074	2 087 385
	Supply of AC pipes (CPI)	-	1 264 533
	Handling of AC pipes	-	41 577
	Topographical control works	-	18 476
	Inspection of cast iron fittings	-	316
	Survey works eastern area	-	2 595
	Preparation of steel fittings (WDD Workshop)	-	8 227
	Compensation of damages to field crops	517	4 632
	Inspection of CPI factory	-	1 570
	Reinstallation of AC pipes at Akhelia	2 289	5 899
	Inspection of hydraulic equipments installed by SOCEA	-	1 086
4	*Main Contract. Western Conveyor, Pumping Stations and Remote Indication*		
	Supply and installation of pumping stations western main pipeline and remote indication (COSTAIN)	224 104	3 615 484
	Topographical control works	-	5 944
	Compensation to damages	-	449
	Investigation western conveyor	-	444
	Installations of four private wires-remote	-	8 978
	Supply and Installation of louvers for 13 pumping stations for ventilation	-	2 161
	Roofing of pumping stations	-	601
	Installation of steel gates	-	3 745
	Connection of main pumping station with the canal	6 498	10 857
	Asphalting roads	-	10 152
	Overhead line for connection Ayia Varvara PS	-	205

TABLE V/I-1 PAPHOS IRRIGATION PROJECT - EXPENDITURE 1982 (cont.)

Ser No	Description	1982 Expenditure £	Total Expenditure upto 31.12.82 £
5	*Asprokremmos Dam*		
	Construction of Asprokremmos Dam J&P and MEDCON (Joint Venture)	1 599 446	10 170 812
	Model Testing	-	18 834
	Investigations	-	21 610
	Diversion of services	-	1 509
	Laboratory triaxial tests	-	-
	Design of spillway	-	530
	Supply of progress photographs	830	1 985
	Topographical control works	2 761	12 532
	Pentonic clay dispersion tests Alkali activity reaction tests abroad	-	1 500
	Compensations: Water supply to Mandria	132 153	159 454
6	*Erection of Building and Offices*	-	72 232
7	*Electricity Supply*		
	Electricity supply	-	225 298
	Metering units	-	-
8	*Other works by WDD*		
	Purchase of equipment	-	74 744
	Agriculture research activities	-	36 191
	Agriculture development	188	7 833
	Land acquisition	1 101	11 713
	Installation of six automatic recorders	-	4 118
	Soil and concrete laboratory	19 732	61 720
	Operator drawing/printing machine	2 092	5 054
	New agriculture research station at Akhelia	21 078	48 216
	Green house Akhelia	-	14 749
9	*Management*		
	Furniture and fittings	-	4 625
	Office requirements	8 552	40 167
	Wages of drivers	39 765	165 340
	Operation of motor transport	10 915	46 213
	Maintenance of project vehicles	4 487	19 922
	Trading programme	-	5 417
	Travelling	7 739	53 552
	Purchase of tools	-	-
	Advertisements	1 185	3 743
	Overtime fees	17 171	101 462
	Poster "Paphos Irrigation Project"	298	633
	Computer charges	-	291
10	*Consultants Fees*		
	SOGREAH	49 334	507 956
	Sir M MacDonald & Partners	94 599	483 217
	PAC	-	2 626
	G Post	-	4 256
	Extension services (J Hanan-Dr Providenti)	-	14 651
	F Sabarly	-	1 748

TABLE V/I-1 PAPHOS IRRIGATION PROJECT - EXPENDITURE 1982 (cont.)

Ser No	Description	1982 Expenditure £	Total Expenditure upto 31.12.82 £
11	*Maintenance & Operation of the Project*		
	Wellpumps & Conveyance System		
	(a) Operation and maintenance.....	11 523	20 830
	(b) Electricity.....	35 840	71 422
	Main canal		
	(a) Cleaning.....	4 406	6 766
	(b) Maintenance & Operation.....	4 037	17 334
	Purchase of equipment.....	44 169	50 677
	Operation of vehicles.....	1 596	2 182
	Electrotechnician & Mechanic.....	–	9 389
	Pumping Stations & Western Conveyor		
	(a) Operation and maintenance.....	6 453	9 533
	(b) Electricity.....	146 540	201 440
	Maintenance of irrigation network.....	43 047	50 631
12	*Irrigation Network & Reservoirs Western Area*		
	Installation of irrigation network.....	724 245	1 059 664
	Supply of pipes.....	44 428	481 219
	Handling of pipes.....	5 168	33 573
	Supply of valves.....	1 131	55 154
	Supply of hydrants.....	–	76 460
	Topographical control works.....	4 079	6 024
	Compensations.....	2 088	2 088
13	*Road Network*		
	Construction of roads.....	31 884	163 675
	Topographical control works.....	322	1 708
	Total.....	£3 556 597	£23 596 243

and the sum of all the networks' water meters was bigger than expected and on average it was found to be between 11% and 12% higher at the level of P S.

The operation and maintenance cost, including power cost, totalled £253,667. Breakdown regarding this expenditure is given on tables VII-52 and VII-53 under DIVISION OF OPERATION AND MAINTENANCE (Irrigation)

FINANCIAL INFORMATION

A total amount of £2,400,000 has been allocated as a daggered provision in the 1982 Development Estimates for the Paphos Irrigation Project. This however had to be supplemented with an additional provision through the issue of a special warrant as the actual expenditure during the year reached the total of £3,556,597 including the operation and maintenance costs of the completed parts of the project amounting to £253,667. A detailed breakdown of the expenditure incurred during 1982 is shown on the table V/I-1 of page 99 of this report.

The up to date expenditure for the Project in December 1982 reached the total of £23,216,873 for its construction while the projected total estimated cost at full completion is of the order of £25 million.

VI DIVISION OF OPERATION AND MAINTENANCE - TOWN WATER SUPPLY

by C C Artemis
Senior Water Engineer
Head of Division

Introduction

The main activities of this Division are the administration, operation and maintenance of Government Town Water Supply schemes and Rural Regional Water Supply schemes. Presently, the following Government schemes are in operation:

- All sources of supply and conveyance systems for the water supply of Nicosia town and suburbs.
- The (non potable) water supply system of Government residences and institutions in Nicosia.
- The Central Water Supply System consisting of:

- The Larnaca-Famagusta Water Supply Scheme which is the main source of water supply of the towns of Famagusta, Larnaca and of over 30 communities and refugee housing estates in the above two districts and
- The First Phase of the Nicosia Water Supply component of the Vasilikos-Pendaskinos Project. This phase of the Project comprises Dhypotamos Pumping Station, Stavrovouni Balancing Reservoir and the pipeline from Dhypotamos Pumping Station to Nicosia. It was commissioned early in 1982 and now forms part of the Central Water Supply System supplying supplementary water to Nicosia and a number of villages en route.

- The Government Rural Water Supply Schemes namely:

- Paphos Lower Villages Regional Water Supply Scheme
- Arminou Regional Water Supply Scheme
- Timi Water Supply Scheme
- Ambelitis Water Supply Scheme.

Another activity of this Division is its participation in the administration of the Nicosia, Limassol, Famagusta and Larnaca Water Boards. Senior officers of the Division attend water board meetings as representatives of the Director of the Department. In its capacity as a member of the Water Boards, this Department acts as their technical adviser and also undertakes the design and construction work for major developments in their distribution systems.

Water Supply Situation in General

The 1981-82 winter season produced unsatisfactory rainfall both from the point of view of its volume as well as its temporal and geographical distribution. This resulted in unusually low river flows affecting both the volume of water collected in dams and the recharge of the aquifers. Thus, from the point of view of water supply, the year 1982 was recognised quite early on as a year of drought. In order to counter the effect of the resulting reduction in the

yield of the various water supply sources a series of emergency borehole schemes were put forward in collaboration with the Geological Survey Department as part of a more general plan which included also a campaign to save water. The emergency schemes were approved by the Council of Ministers together with the necessary funds and a Special Committee was set up under the chairmanship of the Director-General of the Ministry of Agriculture and Natural Resources with wide powers to decide on all relevant matters and by-pass certain procedures in order to achieve their timely implementation.

This arrangement proved very effective and by the end of July 17 new successful boreholes had been connected into the conveyors of the Nicosia Water Supply Schemes or the Central Water Supply System serving Nicosia, Larnaca and Famagusta towns and numerous rural communities. The total expenditure on the 1982 schemes rose to £558,000 by the end of the year leaving further work to be completed early in 1983 as part of the second phase. The 1982 Emergency Schemes produced a total of 1,309,406 m^3 of water during the latter half of the year. This quantity proved invaluable in supplementing the reduced yield of existing sources and maintaining the water supply at acceptable levels.

As a further measure to save potable water in Nicosia a scheme was implemented for subsidising the drilling of private boreholes for watering gardens and other similar uses and thus saving a corresponding volume of potable water. A £50 subsidy was granted for new boreholes drilled within the area of supply of Nicosia Water Board. A total of 757 applications were received by the end of the year of which 601 were approved and the subsidy was actually paid for 375 cases totalling £18,750.

More details of the emergency schemes implemented in 1982 are given elsewhere in this chapter.

Restrictions on the hours of supply continued to be imposed in Nicosia and were imposed in Larnaca for the first time as well.

Despite the effects of the drought the water supply to the town of Limassol was adequate to meet the demand and no problems were encountered.

Paphos experienced some problems due to limited pipeline capacity and restrictions on supply had to be imposed during the summer.

Table VI-1 gives some useful statistical data on the water supply of the towns over the last ten years.

New Water Rates

Towards the end of 1981 this Department prepared and submitted to Government a detailed report on water production costs.

TABLE VI-1
URBAN WATER SUPPLY IN CYPRUS

Year	Consumers* Number at end of year	Increase %	Input into System (at Service Reservoir Outlets)‡ m^3
Nicosia			
1972	17 601	-	7 564 804
1973	18 989	7.9	7 460 286
1974	20 796	9.5	7 550 913
1975	21 978	5.7	7 532 363
1976	23 628	7.5	8 137 580
1977	25 646	8.5	8 551 570
1978	27 944	9.0	8 307 170
1979	30 337	8.6	8 559 184
1980	34 181	12.7	8 152 909
1981	35 366	3.5	8 676 120
1982	37 518	6.1	9 001 875
Larnaca			
1972	5 812	-	1 659 680
1973	5 950	2.4	1 313 750
1974	6 065	1.9	1 528 990
1975	6 023	0.7	1 819 820
1976	7 515	24.7	2 015 900
1977	8 133	8.3	2 315 590
1978	9 513	17.0	2 523 680
1979	10 578	11.2	2 669 100
1980	11 776	11.3	2 593 540
1981	13 487	14.5	2 931 690
1982	15 047	11.6	2 770 700
Limassol			
1972	17 927	-	4 952 521
1973	19 015	6.1	4 999 405
1974	19 435	2.2	4 990 401
1975	19 800	4.1	4 175 035
1976	20 305	2.6	5 181 567
1977	20 989	3.4	5 935 146
1978	21 908	4.4	6 342 758
1979	23 840	8.8	6 560 782
1980	26 416	10.8	7 214 542
1981	28 392	7.5	7 411 301
1982	30 311	6.7	7 692 378

TABLE VI-1 URBAN WATER SUPPLY IN CYPRUS

Year	Consumers* Number at end of year	Increase %	Input into System (at Service Reservoir Outlets) m^3 ‡
Paphos			
1972	-	-	-
1973	-	-	-
1974	2 258	-	669 191
1975	2 332	3.3	645 228
1976	2 500	7.2	777 800
1977	2 706	8.2	808 772
1978	2 939	8.6	889 668
1979	3 851	31.0	973 361
1980	4 413	14.6	1 119 059+
1981	4 921	11.5	1 200 597+
1982	5 602	13.8	1 247 972

* Due to lack of information on the number of consumers in the turkish occupied sector the figures in these columns now refer to the Government controlled area only.

‡ These figures cover the whole of Nicosia.

\+ These figures have been corrected by substracting quantities supplied to Mandria village en route.

It was evident from this report, that, due to the increases in electricity and fuel costs, wages etc, the chargeable water rates were for too low and Government was in effect subsidising the various water boards and communities to which water is sold from Government water supply projects.

The Council of Ministers by its decision No. 21.023 dated 12.11.1981 approved the adoption of new water rates to recover the full costs with effect from 1.1.1982 for the various consumers and communities, and by its decision No. 21.445 dated 25.2.82 approved the request of the Water Boards of Nicosia and Larnaca for the new rates to come into effect from 1.3.1982.

NICOSIA WATER SUPPLY

Institutional Arrangements

The water supply of Nicosia town and suburbs is faced jointly by three authorities:

- The Water Development Department which is responsible for all sources and conveyors upto the service reservoirs and sells the water in bulk to the Nicosia Water Board
- The Nicosia Water Board which has the responsibility for the distribution of water to Nicosia town and suburbs, and
- The Nicosia Water Commission which has the responsibility for the distribution of water to the old town of Nicosia within the Walls. The commission operates its own sources which are the boreholes P1 and P2 and the Arab Ahmet chain of wells.

Several important sources and conveyance systems serving the town of Nicosia are located within the Turkish occupied area. These sources are the Morphou-Pendayia boreholes which make a very significant contribution to the total water requirements of the capital and the Dhikomo boreholes and Sykhari Adit. There is a common distribution system for the whole of the town which serves both the Greek and Turkish sector. There are service reservoirs in both sectors. The water supply of the whole town thus operates as a single unified system and the co-operation of both sides is necessary to achieve the desired results.

Two meetings were held with the turkish side in May and October 1982 to review the water supply situation and to plan for the operation of the common water supply system in order to face the severe shortage by the imposition of agreed restrictions on supply and by speedy repairs in the event of breakdowns. The meetings were held under the auspices of the United Nations Force in Cyprus at the Ledra Palace Hotel in Nicosia.

At these meetings it was agreed to continue the daily telephone communication between the two sides, in order to facilitate the exchange of information on production and consumption. This was implemented and any break-downs and faults were reported to the United Nations who undertook the transport from and to the Turkish side of the necessary equipment making it possible to face and rectify promptly such emergencies. The Government repairs or replaces damaged pumping equipment installed on sources of the system within the area under Turkish occupation and also provides the Turkish side with repair materials for the pipelines conveying water to Nicosia in order to secure continuous supplies to the town.

A good spirit of co-operation is maintained between the two sides in their genuine effort to face the common problem of water shortage facing Nicosia as a whole. The contribution of the United Nations personnel to this end is much appreciated.

Demand Estimates

For many years now restrictions have had to be imposed on the hours of supply to the consumers of Nicosia. For this reason the unrestricted demand of the town is not known accurately. Nevertheless, it is estimated that this demand was of the order of 12.6 MCM per annum during 1982 which corresponds to an average daily demand throughout the year of 34,500 m^3. The seasonal variation in demand would push this figure to about 41,000 m^3 during the summer months with single day maximum peaks as high as 48,000 m^3.

Source and Production

The main water supply sources of Nicosia town and their production, over the years 1979 to 1982 are given in table VI-2.

Thus the total quantity of water produced in 1982 was 10,202,324 m^3 of which 7,580,007 m^3 came from Government sources, 520,930 m^3 was the yield of the Nicosia Water Commission Sources and 2,101,387 m^3 was purchased from private sources.

Although the operation of the First Phase of the Vasilikos Pendaskinos Project conveying water from Lefkara dam to Nicosia and the 1982 Emergency Schemes of Stavrovouni and Dhenia added 1,481,760 m^3 to the existing sources of the Nicosia System, the increase compared to 1981 production was only 484,378 m^3.

There was therefore a reduction in yield of the old sources of about 1,000,000 m^3 as a result of the drought. Most affected were the Dhali and Peristerona-Akaki Sources which are located in river aquifers and are dependent on direct recharge from river flows. The decrease in their annual production was 251,000 m^3 and 276,000 m^3 respectively.

The production of the Dhikomo-Sykhari Source also showed a dramatic reduction of 303,000 m^3 down to 198,000 m^3 compared to a normal yield of around 900,000 m^3 per annum.

Restrictions on Water Supply

Of the total 1982 production of 10.2 MCM only 9.9 MCM reached Nicosia. The remaining 0.3 MCM was partly consumed en-route by various villages, camps and industries connected to the system and partly unaccounted for.

Thus, compared to the estimated unrestricted demand of Nicosia of 12.6 MCM there was a shortage of 2.7 MCM or 21% during the year, and restrictions on the hours of supply continued to be enforced throughout the year. Contrary to the summer of 1981

TABLE VI-2

NICOSIA WATER SUPPLY
YIELD OF SOURCES IN MCM PER ANNUM 1979-1982

Ser No	Source	Year 1979	1980	1981	1982
1	Morphou Bay Scheme	3 232	3 349	3 252	3 198
2	Dhikomo-Sykhari	1 007	0 960	0 501	0 198
3	Paliometokho, Kokkini Trimithia, Dhenia, Airport	0 659	0 548	0 568	0 565
4	Tseri	1 028	0 940	0 891	0 812
5	Dhali	-	0 294	0 268	0 017
6	Peristerona-Akaki	0 211	1 195	1 316	1 040
7	Laxia Athalassa, Makedonitissa	0 401	0 296	0 367	0 268
8	Nicosia Water Commission Sources	0 633	0 768	0 689	0 521
9	Purchased from private boreholes	2 013	1 528	1 866	2 101
10	Lefkara Dam (CWSS)	-	-	-	0 891
11	1982 Emergency Schemes				
	a. Stavrovouni	-	-	-	0 277
	b. Dhenia	-	-	-	0 314
	Totals	9 184	9 878	9 718	10 202

when the hours of supply during the summer fell down to 12 in every 48 giving rise to serious consumer complaints the supply was maintained during 1982 atat least 18 hours in every 48.

This represents a significant improvement which was evidenced by the lack of complaints to the Water Board. The main reasons for the improvement in the service provided were: (a) the commissioning of the First Phase of the Vasilikos-Pendaskinos Project which made it possible to convey large quantities to Nicosia during days of increased demand or failure of other sources, (b) the operation of the new Lakatamia Service Reservoir of 40,000 m³ capacity which doubled the storage available to meet short term peaks etc. (c) the operation of the 1982 Emergency Schemes and the effects of the campaign to save water and finally (d) the subdivision of large areas of supply in Nicosia into smaller areas of more uniform elevation so that the restrictions could be imposed more effectively whilst at the same time ensuring that all consumers received their fair share of the quantities available.

The significant increase in water rates imposed early in the year has also had its effect on reducing demand.

Per Capita Consumption

The lack of information on population served in the Turkish controlled part of the Area of Supply makes it difficult to calculate accurate figures for per capita consumption of the town. Nevertheless, based on information available on the number of consumers within the Government controlled part of the Area of Supply and assuming an average of 3.5 persons per consumer connection it is estimated that an average supply of 161 litres per capita per day was delivered to the service reservoirs of Nicosia this year. (The corresponding figure for Limassol which enjoyed unrestricted supply was 205 litres per capita per day).

Villages and Other Consumers Served by the Nicosia Water Supply System

Table VI-3 below gives the communities and other consumers served by the Nicosia Water Supply System and the quantities supplied to them over the years 1979-1982.

NEW SCHEMES

Yermasoyia - Vasilikos Project

By decision of the Council of Ministers, based on a proposal submited by this Department, design of this project commenced in September 1981 and was almost completed by the end of that year. Construction by direct labour commenced in April 1982 and was practically completed by the end of the year. The project comprises the laying of a 350 mm steel/A C/ductile iron pipeline to convey up to 3.5 MCM of water per annum from Yermasoyia Dam to Khirokitia Water Treatment Works and includes new

TABLE VI-3
NICOSIA WATER SUPPLY SYSTEM
VILLAGES AND OTHER CONSUMERS SERVED

Community Served	Consumption in MCM 1979	1980	1981	1982
Kokkinotrimithia	0.050	0.057	0.063	0.091
Mammari - Dhenia	0.046	0.064	0.040	-
Mosphiloti (26.8.82)	-	-	-	0.017
Psevdhas (14.9.82)	-	-	-	0.009
Pyrga (25.9.82)	-	-	-	0.006
Lymbia, Sha, Kornos regional W S scheme (1.11.82)	-	-	-	0.018
Alambra (22.11.82)	-	-	-	0.004
Various Camps, Industries and miscellaneous consumers	0.024	0.034	0.041	0.049
Totals	0.120	0.155	0.144	0.194

Note: The dates given in parentheses are the dates when these villages were connected to the Dhypotamos-Nicosia Pipeline due to the serious water shortage experienced by these villages as a result of the 1981-82 drought.

equipment for the existing pumping stations at Yermasoyia and Vasilikos which will be utilized for the purpose. The project was given top priority and it is expected to be operational early in 1983. It will, of course, be a useful addition to the sources of water of the Central Water Supply System as a whole and will thus be beneficial not only to Nicosia but also to the other demand centres being fed from this system.

1982 Emergency Schemes

The following is an outline of the various schemes carried out during 1982 in order to supplement the water supply sources of both Nicosia and of the Central Water Supply System as a whole. They are all presented under the Nicosia Water Supply section even though many of the schemes are not directly connected to the Nicosia system for two reasons:

- A unified and complete picture of the 1982 Emergency Schemes is presented and
- The implementation of schemes in the Larnaca Area has by substitution enabled the conveyance of more water to Nicosia from Lefkara Dam which would normally be allocated to Larnaca-Famagusta demand centres.

Dhenia Scheme

This scheme involves the utilization of four boreholes with nos 93/81, 4/82, 23/82 and 24/82. Steel mains of 4", 6", 8" and 10" dia of total length 5200 m connect the boreholes with existing mains from Kokkini Trimithia-Paleometokho area to Nicosia. This scheme has been operating since June 1982.

Stavrovouni Scheme (Phase 1)

Originally this scheme utilized three boreholes with nos 29/82, 26/82 (39/82) and 27/82. The three boreholes were connected directly to the Dhypotamos-Nicosia pipeline with steel mains of 4", 6" and 10" dia of total length 3650m. At a later stage, however, borehole 29/82 was disconnected because of low yield.

Klavdhia Scheme

Originally this scheme was intended to utilize four boreholes with nos 110/80, 121/80, 112/80 and 26/80 (replaced by 38/82). Finally boreholes 110/80 and 121/80 were not connected because of low yield. Water from the other two boreholes i.e. 112/80 and 38/82 is being pumped into the Alethriko Break Pressure Tank on the Khirokitia-Famagusta pipeline. Two other boreholes in this area with nos 114/80 and 127/80 which were originally part of a separate scheme were also connected and embodied in the emergency schemes.

Alethriko Scheme

This scheme utilizes one borehole no. 73/80. A.C. mains of 6" and 8" dia of total length 1500 m convey the water from the borehole into the Alehriko Break Pressure Tank as in the Klavdhia scheme.

Kophinou-Menoyia Scheme

This scheme includes two boreholes with nos 19/75 and 25/75. Water from the boreholes is being pumped directly into the Khirokitia-Famagusta pipeline through 4" and 6" dia A.C. mains of total length 1150 m. The two boreholes were put into operation in June 1982 but in December 1982 they were abandoned because they became very salty.

Skarinou Scheme

The scheme includes two boreholes with nos 125/80 and 133/80. Steel mains of 6" and 8" dia of total length 3250 m connect the boreholes directly to the Khirokitia - Famagusta pipeline.

Tokhni Scheme

This scheme utilizes one borehole with no. 72/76. Water from the borehole is being conveyed to the Vasilikos Pumping Station through 6" dia steel mains of total length 1500 m.

Tables VI-4 and VI-5 give details of the boreholes and the pumping installations and of their production during 1982 respectively.

Construction of the following schemes has commenced in 1982 and will be completed in 1983.

Dhali (Kattoudhia) Scheme

This scheme utilizes three boreholes with nos 33/82, 34/82 and 149/80. Steel mains of 4", 6" and 8" dia of total length 4500m will convey the water from the boreholes directly into the Dhypotamos - Nicosia pipeline. It is expected that this scheme will yield 85 m^3/hr approximately.

Yeri Scheme

In this scheme B/H No. 79/80 is utilized. Steel mains of 6" dia and total length 3500 m will connect the borehole directly to the Dhypotamos-Nicosia pipeline. It is expected that the scheme will yield 40 m^3/hr.

TABLE VI-4
EMERGENCY SCHEMES
DETAILS OF BOREHOLES AND PUMPING INSTALLATIONS

Scheme B/H No.	Design Yield (m^3/hr)	Ground Elevation (m)	Pump Suction (m)	Rising Main (in)	Borehole diameter (in)	Total Manometric Head (m)	Turbine Pumps Make	Turbine Pumps Head Type	Turbine Pumps Body Type	Diesel Engines Make Type	Diesel Engines Continuous output rating bhp/r.p.m.
Dhenia											
93/81.....	60	186.16	73	5	9	143	NEMITSAS	K12	13/8M/5/1"	PERKINS/6.354	90/2250
4/82.....	20	185.00	70	3	8	141	"	K10	16/8S/3/7/8"	" /3.152	37/2250
23/82.....	60	194.24	73	5	8	135	"	K12	12/8M/5/1"	" /6.354	90/2250
24/82.....	25	194.00	73	3	8	133	"	K10	15/8S/3/7/8"	" /4.236	65/2250
Stavrovouni (Phase I)											
29/82.....	30	362	110	4	8	147	"	K10	17/8S/4/7/8"	" /4.238	65/2250
26/82 (39/82)..	30	348	110	4	8	147	"	K10	17/8S/5/7/8"	" /6.354	90/2250
27/82.....	80	318	100	5-6	9	160	"	K12HD	17/8N/5/1"	" /T6.354	117/2250
Klavdhia											
112/80.....	30	124.56	100	4	8	117	"	K10	14/8S/4/7/8"	" /4.236	65/2250
26/80 (38/82).	30	109.75	120	4	8	120	"	K10	14/8S/4/7/8"	" /4.236	65/2250
Alethriko											
73/80.....	25	130.50	130	3	8	141	"	K10	16/8S/3/7/8"	" /4.236	65/2250
Kophinou-Menoyia											
19/75.....	28	150.51	100	4	8	136	"	K10	16/8S/4/7/8"	" /4.236	65/2250
25/75.....	30	136.70	75	4	8	145	"	K10	17/8S/4/7/8"	" /4.236	65/2250
Skarinou											
125/80.....	30	227.88	92	4	8	133	"	K10	16/8S/4/7/8"	" /4.236	65/2250
133/80.....	45	203.87	107	4	8	107	"	K10	15/8S/4/7/8"	" /4.236	65/2250
Tokhni											
72/76.....	100	48	106	5-6	12	147	"	K12HD	19/8N/5/1/3/16"	" /V8.540	180/2600

TABLE VI-5
EMERGENCY SCHEMES
MONTHLY YIELD OF BOREHOLES (IN M³) - 1982

Ser No	Scheme B/H No.	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Total
1	Dhenia													
	93/81.....	-	-	-	-	-	10 920	27 080	36 760	31 130	-	-	-	105 890
	4/82.....	-	-	-	-	-	1 460	3 440	2 340	4 640	4 980	4 950	4 200	26 010
	23/82.....	-	-	-	-	-	9 600	23 010	23 120	17 960	-	12 380	16 710	102 780
	24/82.....	-	-	-	-	-	5 680	14 110	14 640	13 650	12 270	10 190	9 320	79 860
	Total.....	-	-	-	-	-	27 660	67 640	76 860	67 380	17 250	27 520	30 230	314 540
2	Stavrovouni (Phase I)													
	29/82.....	-	-	-	-	-	2 270	17 340	5 760	-	-	-	-	25 370
	26/82 (39/82).....	-	-	-	-	-	-	5 180	23 520	19 560	12 180	8 450	6 880	75 770
	27/82.....	-	-	-	-	-	6 260	36 340	43 970	36 700	20 410	16 700	15 160	175 540
	Total.....	-	-	-	-	-	8 530	58 860	73 250	56 260	32 590	25 150	22 040	276 680
3	Klavdhia													
	112/80.....	-	-	-	-	-	-	10 140	15 930	11 950	11 670	9 000	8 390	67 080
	26/80 (38/82).....	-	-	-	-	-	-	13 600	18 730	13 870	16 190	14 110	24 270	100 770
	114/80.....	-	-	-	1 620	8 740	-	11 810	15 770	14 990	13 820	12 640	14 240	93 630
	127/80.....	-	-	-	-	10 200	14 650	14 080	12 710	11 170	8 790	7 980	7 570	87 150
	Total.....	-	-	-	1 620	18 940	14 650	49 630	63 140	51 980	50 470	43 730	54 470	348 630
4	Alethriko													
	73/80.....	-	-	-	-	-	-	8 680	13 200	11 820	10 720	9 780	9 900	64 100
5	Kophinou-Menoyia													
	19/75.....	-	-	-	-	-	4 190	11 740	10 710	9 350	8 840	5 430	-	50 260
	25/75.....	-	-	-	-	-	4 436	8 840	6 690	4 830	2 720	-	-	27 516
	Total.....	-	-	-	-	-	8 626	20 580	17 400	14 180	11 560	5 430	-	77 776

TABLE VI-5 EMERGENCY SCHEMES
MONTHLY YIELD OF BOREHOLES (IN M³) - 1982 (cont.)

Ser No	Scheme B/H No.	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Total
6	Skarinou													
	125/80	-	-	-	-	-	590	13 420	8 910	5 770	3 130	2 540	700	35 060
	133/80	-	-	-	-	-	760	28 590	30 390	25 850	25 290	22 040	21 980	154 900
	Total	-	-	-	-	-	1 350	42 010	39 300	31 620	28 420	24 580	22 680	189 960
7	Tokhni													
	72/76	-	-	-	-	-	-	2 160	8 390	17 390	6 390	2 510	880	37 720
	Grand Total	-	-	-	1 620	18 940	60 816	249 560	291 540	250 630	157 400	38 700	140 200	1 309 406

nos 42/82, 47/82 and 55/82. Steel mains of 6", 8" and 10" dia and total length 3350 m will convey the water from the boreholes into the Stavrovouni Balancing Reservoir. It is expected that the scheme will yield 220 m³/hr.

Pyrga Stavrovouni Scheme

This scheme utilizes three boreholes, two in the Pyrga area with nos 19/82 and 99/79 and one in the Stavrovouni area with no. 100/79. Steel mains of 6" and 8" dia of total length 4400 m will convey the water first into a circular collecting tank and from there through centrifugal booster pumps the water will be pumped into the 10" dia main connecting borehole 26/82 with the Dhypotamos-Nicosia pipeline. It is expected that the scheme will yield 110 m³/hr approximately.

Prospects for the Solution of the Water Shortage Problem

The operation of the first phase of the Nicosia Water Supply component of the Vasilikos-Pendaskinos Project in 1982 and of the Yermasoyia-Vasilikos Project in 1983 will prove invaluable short term contributions to the solution of the water shortage problems of the capital. However, due to the continuous increase in demand for water and the equally continuous reduction in the yield of the boreholes presently supplying Nicosia, the water shortage will persist until the Vasilikos-Pendaskinos Project become fully operational in 1986. Even this addition, however, is likely to prove adequate only for a short while, after which deficits will again develop. The long term solution of the problem will come about only when the Southern Conveyor Project comes on stream towards the end of the present decade. This Project is planned to meet the water supply deficits not only of Nicosia but also of Famagusta, Larnaca and Limassol towns and numerous villages up to the year 2010.

Expenditure and Revenue

A statement showing expenditure for the operation and maintenance of sources and conveyors and revenue from the sale of water for the year 1982 is given in table VIII-6.

TABLE VI-6

NICOSIA WATER SUPPLY

Expenditure and revenue account for 1982

Expenditure

Morphou Bay Scheme:

	£
Maintenance	1 810
Electricity	222 078
Wages	15 314
Total	£239 202

General pumping and maintenance charges:

Maintenance expenses	6 044
Electricity and fuel	91 449
Wages	57 888
Miscellaneous expenses	14 108
Total	£169 489

Peristerona - Akaki Scheme:

Maintenance expenses	5 058
Electricity and Fuel	68 280
Wages	9 135
Miscellaneous expenses	306
Total	£ 82 779

Tseri Scheme:

Maintenance expenses	2 470
Electricity and fuel	49 279
Wages	14 105
Miscellaneous expenses	1 280
Total	£ 67 134

Vasilikos-Pendaskinos Project-Phase I:

Maintenance expenses	649
Electricity	20 933
Wages	7 945
Miscellaneous expenses	245
Total	£ 29 772

Purchase of water from private sources	120 512
Grand Total	£ 708 888

Revenue

Revenue generated

	£
Value of water delivered to Nicosia Water Board in 1982	666 974 *
Value of water delivered directly to other consumers in 1982	36 225
Total value of water delivered in 1982	703 199
Amount actually collected in 1982 in respect of water delivered in 1982	286 934
Amount outstanding on 31.12.82 for water delivered in 1982	416 265
Amount outstanding by 31.12.81	473 253
Less amount collected in 1982 in respect of water delivered before 31.12.81	204 694
Amount outstanding on 31.12.82 for water delivered before 31.12.81	268 559
Total amount outstanding by 31.12.82	684 824
Total amount collected in 1982	491 628

*This figure is calculated at the actual rates at which the Water Board is charged. As from 1.3.82 these rates represent only about 75% of the actual cost of the water. The balance is a government grant to the Water Board on account of the quantity it supplies to the Turkish-occupied sector of Nicosia for which no payment is received by the Board.

This statement does not include for the amortization of the Government installations and equipment of the scheme.

The amortization cost of these installations and equipment is estimated at £440,715 annually as given in Table VI-7. Without taking into account office overheads the deficit for the year 1982 amounts to £446,404. If outstanding payments are not considered as revenue then the deficit rises to £862,669.

Water Supply to Government Residences and Institutions in Nicosia

In addition to the water supplied for domestic use by the Nicosia Water Board, Government houses, offices and other institutions are supplied free of charge with water for irrigation and cleaning purposes by a separate water supply system. The sources of this system are four boreholes situated within the inhabited area of Nicosia. The total

TABLE VI-7

NICOSIA WATER SUPPLY
AMORTIZATION COSTS

Installations	Capital Costs	Discount rate	Period (Years)	Annual Amortization Cost £
Pre-1982 installations.....	1 784 300	8%	Various	107 760
Vasilikos-Pendaskinos 1st Phase				
- Civil works.....	2 650 000	9%	40	246 344
- E & M plant.....	350 000	9%	15	43 420
1982 Emergency Schemes				
Dhenia.....	90 000	9%	5	23 138
Stavrovouni.....	78 000	9%	5	20 053
Total.....				£440 715

quantity of water produced from these sources during 1982 was 115780 m³ which met satisfactorily the demand. The total expenditure, (which is borne by Government) for the operation and maintenance of this system for 1982 was £8,200 as follows:

	£
Electricity.....	1 932
Wages.....	4 348
Maintenance expenses.....	580
Miscellaneous expenses.....	1 340
Total.....	8 200

Note: Expenditure under the heading "Wages" includes also the wages for the maintenance and repairs to large water meters which are carried out by the same gang operating this system.

CENTRAL WATER SUPPLY SYSTEM

The System

The Central Water Supply System (CWSS) is the former Famagusta Water Supply Scheme which has gradually been expanded and enlarged with the addition of new sources and the connection of new demand centres to a point where it serves the towns of Nicosia, Larnaca and Famagusta and more than 30 communities in the respective districts.

The system draws both on surface water and groundwater resources. Surface water is drawn from the 13.85 MCM capacity Lefkara Dam and with the completion of the Yermasoyia-Vasilikos Project by the end of 1982, water can also be drawn from the Yermasoyia Dam. Ground water is obtained from the Vasilikos Subsurface Dam constructed in gravels across the Vasilikos river and from five boreholes in the areas of Psematismenos, Khirokitia and Alethriko villages.

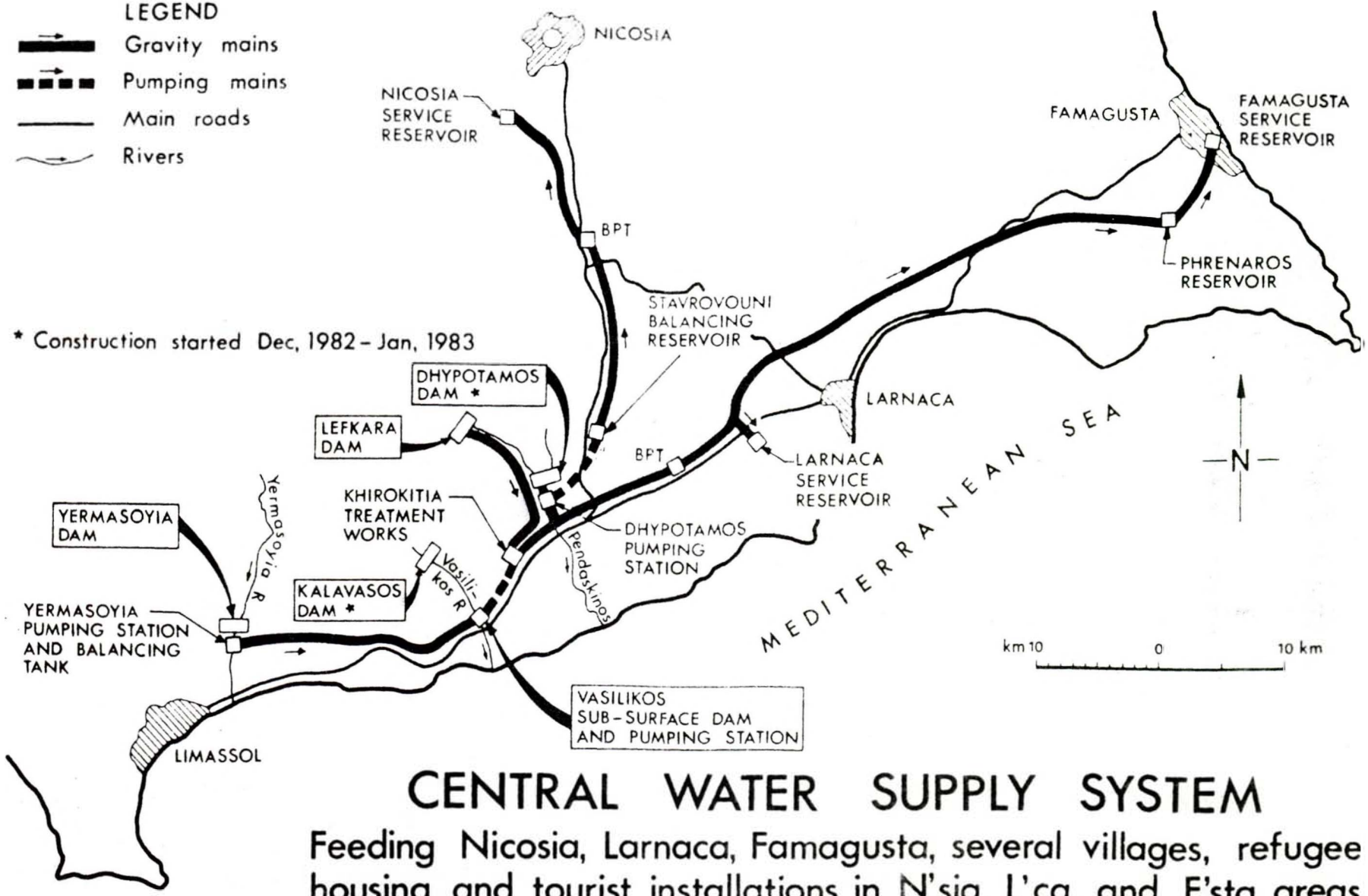
As from mid - 1982 and within the framework of the Emergency Schemes implemented to counter the effects of the 1981-82 drought ten new boreholes have been added to the sources of the system. The boreholes are in the area of Tokhni, Skarinou, Menoyia, Alethriko and Klavdhia villages. Full details of these schemes are given under the Nicosia Water Supply Section of this report.

Surface water is treated at the Khirokitia Water Treatment Works which has a capacity of 21,800 m³ per day. Treated and borehole water is conveyed along a 70 km pipeline from Khirokitia up to Phrenaros reservoir south of Famagusta. Borehole sources and communities are connected at various points along the Famagusta pipeline which in effect forms the backbone of the CWSS.

As from January 1982 the first phase of the Nicosia Water supply component of the Vasilikos-Pendaskinos Project has been commissioned. This scheme is connected to the Famagusta pipeline at a point near Skarinou station and conveys treated water to Nicosia. More details are given elsewhere in this report.

Institutional Arrangements

The CWSS is operated and managed entirely by Government. Water is sold in bulk to the town Water Boards of Larnaca and Nicosia and to the various Village Water Commissions which are presided over by the District Officers and which take responsibility for operating their own sources where such



CENTRAL WATER SUPPLY SYSTEM

Feeding Nicosia, Larnaca, Famagusta, several villages, refugee housing and tourist installations in N'sia, L'ca, and F'sta areas

DU/G/1

sources exist and of distributing the water to their consumers and collecting water rates. Water is also supplied to Turkish occupied Famagusta town.

The Turkish side makes no payments in respect of the cost of the water supplied to Famagusta town.

Demand

With the exception of Nicosia and Larnaca towns no restrictions were imposed on the supply of water to communities served by the CWSS during the year. Thus their consumption reflects their net demand on the system. For the first time this year restrictions were imposed on Larnaca with the result that consumption was held down to approximately 92% of the estimated unrestricted demand of 3.1 MCM. The total demand on the system during 1982 was 5.4 MCM.

Sources and Production

The main sources of the Central Water Supply System and their production over the years 1979 to 1982 are given in table VI-8.

The total quantity of water produced shows a steady increase over the years. It was 32% higher in 1982 over the corresponding 1981 figure. Closer examination of the figures, however, indicates that the old ground water sources of the system were drastically affected by the 1981-82 drought and it was the implementation of the 1982 Emergency Schemes that was effective in maintaining the groundwater production at levels similar to previous years.

The quantity drawn from Lefkara Dam was significantly increased in order to meet the increased demand. This was done at the expense of storage in the dam which, due to the small quantities impounded during the year, showed a dramatic reduction from 4.850 MCM on 1.1.1982 to 1.009 MCM on 31.12.1982.

In order to meet the demand on the System the Water Treatment Works at Khirokitia was in continuous operation since the groundwater available even during the winter period of low demand was not adequate to meet that demand.

TABLE VI-8
CENTRAL WATER SUPPLY SYSTEM
YIELD OF SOURCES IN MCM PER ANNUM 1979-1982

Source	Year 1979	1980	1981	1982
Khirokitia Treatment Works (drawing from Lefkara Dam).....	2 807	2 107	3 035	4 325
Vasilikos subsurface dam.....	0 579	0 833	0 762	0 449
Boreholes				
-Psematismenos.....	0 179(1)	0 124(1)	0 101(1)	0 127(1)
-Khirokitia.....	0 320(2)	0 278(2)	0 243(2)	0 206(2)
-Alethriko.....	0 190(1)	0 338(2)	0 399(2)	0 158(2)
Subtotal Vasilikos & old BH's....	1 268	1 573	1 505	0 940
1982 Emergency Schemes				
-Tokhni.....				0 038(1)
-Skarinou.....				0 190(2)
-Menoyia.....				0 078(2)
-Alethriko.....				0 064(1)
-Klavdhia.....				0 349(4)
Subtotal 1982 Emergency Schemes..				0 719
Totals.....	3 338	3 680	4 540	5 984

Notes: -Figures in parentheses indicate the number of boreholes.
-The quantities for the treatment works production are given net of treatment losses.

Bulk Consumption

Table VI-9 shows the bulk consumption of the various communities served by the CWSS over the years 1979-1982.

Expenditure and Revenue

A statement showing expenditure and revenue of the Central Water Supply System for the year 1982 is shown in table VI-10.

TABLE VI-9

CENTRAL WATER SUPPLY SYSTEM
BULK CONSUMPTION IN MCM PER ANNUM 1979-1982

Community Served	Consumption from CWSS in MCM 1979	1980	1981	1982	Approximate yield of other community sources during 1982 in MCM
Nicosia (via Dhypotamos)...	-	-	0 014	0 891	9 312
Larnaca.....	1 292	0 796	1 182	1 446	1 408
Famagusta.....	0 973	1 017	1 058	1 060	No information
Subtotal - Towns.....	2 265	1 813	2 254	3 397	n.a.
Western Region Villages					
Pano Lefkara.....	0 036	0 033	0 025	0 044	0 011
Kato Lefkara.....	0 013	0 009	0 009	0 010	-
Kato Dhrys.....	0 008	0 010	0 009	0 008	-
Vavla.....	0 008	0 008	0 007	0 007	-
Alethriko.....	0 017	0 017	0 018	0 028	0 009
Mazotos.....	0 025	0 026	0 035	0 042	-
Kivisil	0 016	0 020	0 019	0 020	-
Tokhni.....	0 045	0 041	0 031	0 035	-
Menoyia.....	0 001	-	-	-	n.a.
Khirokitia.....	0 013	0 019	0 024	0 033	-
Maroni.....		0 027	0 031	0 039	-
Zyyi.....	0 059	0 019	0 029	0 029	-
Psematismenos.....		0 010	0 012	0 013	
Subtotal Western Villages..	0 241	0 239	0 249	0 308	0 020
Easterm Region Villages					
Aradhippou.....	0 043	0 097	0 175	0 131	0 200
Xylotymbou.....	0 147	0 154	0 158	0 158	-
Dherinia.....	0 130	0 147	0 153	0 152	-
Avgorou.....	0 115	0 113	0 134	0 133	0 024
Phrenaros.....	0 008	0 015	0 051	0 053	0 120
Livadhia.....	0 071	0 085	0 104	0 134	-
Voroklini.....	0 054	0 059	0 062	0 065	-
Sotira.....	0 088	0 082	0 097	0 091	0 070
Paralimni.....	0 086	0 127	0 210	0 207	0 100
Ayia Napa.....	0 032	0 049	0 161	0 217	0 200
Kellia.....	0 012	0 018	0 015	0 024	0 004
Troulli.....	0 023	0 033	0 036	0 038	-
Klavdhia.....	-	-	-	0 001	0 131
Aradhippou-Livestock.....	0 007	0 020	0 021	0 017	-
Anzio Camp.....	0 122	0 082	0 084	0 047	-
Akhna Forest.....	0 077	0 103	0 095	0 098	-
Displaced persons Service..	0 027	-	-	-	-
Subtotal Eastern Villages..	1 042	1 184	1 556	1 566	0 849
Irrigators & Minor consumers.....	0 052	0 047	0 055	0 076	n.a.
Grand Total.....	3 600	3 283	4 114	5 347	n.a.

Note: n.a. = Not applicable

Operation of the Vasilikos Pendaskinos - First Phase link to Nicosia is not included here as it is included in the accounts of the Nicosia System.

TABLE VI-10

CENTRAL WATER SUPPLY SYSTEM
Expenditure and revenue accounts for 1982

Khirokitia and Lefkara Installations

	£
Electricity	4 530
Wages	33 079
Materials and others	16 319
Total	£53 928

Pumping and Maintenance Charges

Electricity	94 368
Wages	37 223
Materials and others	6 975
Total	£138 566

Khirokitia Regional Water Supply Scheme

Electricity	15 243
Maintenance	305
Total	£15 548
Grand Total	£208 042

Revenue
Revenue generated from sale of water in 1982

	mils/m³	£
1 851 910 m³ of water @	104	192 598
201 338 m³ of water @	85	17 114
752 590 m³ of water @	82	61 712
158 490 m³ of water @	50	7 924
60 658 m³ of water @	35	2 123
83 480 m³ of water @	25	2 087
5 182 m³ of water @	21	109
Total amount collected		283 667
Amount outstanding		240 520*
Total		£524 187*

* Includes an amount of £110,269 representing the value of 1060,280 m³ of water @ 104 mils/m³ supplied to Famagusta area occupied by Turks.

Outstanding Account upto 31.12.82

	£
Upto 31.12.1981	469 482
For the year 1982	240 520
Total	£710 002**
Less amount collected in 1982 from outstanding account of previous year	53 442
Total outstanding on 31.12.1982	£656 560

** Includes an amount of £462,115 representing the value of 7,036, 929 m³ of water @ 50 mils/m³ and the value of 1060,280 m³ of water @ 104 mils/m³ supplied to Famagusta area occupied by Turks during the years 1974-1982.

Notes on expenditure and revenue account of the Central Water Supply System for 1982

a) The Capital Cost of the CWSS installations up to the end of 1981 was £2,979,900. Roughly the amortization of this capital investment at 9% for 40 years is £277,010 annually. The capital cost of the 1982 Emergency Schemes added to the System and commissioned in 1982 was £169,080. Amortized at 9% over 5 years only this adds a further annual cost of £43,470 bringing the total annual amortization of capital investment to £320,480. Thus without taking into account office overheads for the management of the scheme, the deficit for the year 1982 amounts to £4,335 only. If outstanding payments are not considered as revenue then the deficit rises to £244,855.

b) Expenditure under heading "Khirokitia and Lefkara installations" refers to the following installations.

- Khirokitia Treatment Works
- Lefkara Dam

The total quantity of water treated during the year reached 4,324,548 m³ and the unit running cost was 12.5 mils/m³.

c) Expenditure under heading "Pumping and maintenance charges" refers to the following installations.

- Borehole No. 16/67 in Psematismenos area
- Borehole NO. 11/69, 4/69 in Khirokitia area
- Borehole No. 35/73, 45/73 in Alethriko area
- Vasilikos subsurface dam pumping scheme

1982 Emergency Scheme Installations

- Borehole No. 73/80 in Alethriko area
- Borehole No. 114/80, 127/80, 112/80, 38/82 in Klavdhia area
- Borehole No. 19/75, 25/75 in Menoyia area
- Borehole No. 133/80, 125/80 in Skarinou area
- Borehole No. 72/76 in Tokhni area

The total quantity produced by these sources during 1982 was 1,657,895 m^3.

The unit cost of pumping and maintenance was therefore 83.5 mils/m^3.

d) Expenditure under heading "Khirokitia Regional Water Supply Scheme" refers to the running expenses of two boosters, pumping treated water to Pano Lefkara, Kato Lefkara, Kato Dhrys and Vavla villages.

The total quantity of water boosted during the year was 68,464 m^3.

Chemical Laboratory at Khirokitia Water Treatment Plant

The Khirokitia Water Treatment Plant was commissioned in 1974. For the period 1974-78 the operators at the plant carried out some simple chemical tests (analyses) of the water to check its chlorine content, turbidity, pH and conductivity.

In early 1978 the WDD set up a modern chemical laboratory at Khirokitia Water Treatment Plant which was to cater for the needs of the treatment plant and to a large extent of WDD in respect of Drinking Water Supplies.

The laboratory is presently staffed with two persons only, one chemist and one labourer who works as a laboratory assistant. The laboratory undertakes all the chemical analyses of drinking water and carries out chemical tests for water conductivity, pH total dissolved solids, total hardness, chlorides, sulphates, carbonates, bicarbonates, nitrates, sodium, potassium, calcium and magnesium. All the bacteriological tests of raw and drinking water are presently being carried out by the Government Laboratory in Nicosia.

Samples of water from existing boreholes and reservoirs being used for urban water supply are collected monthly by the WDD district offices and are tested at the laboratory. Also samples of the water used for village water supply are tested annually.

In addition to the above analyses,the laboratory also carries out several chemical tests in connection with new projects undertaken by the WDD (Such as the Vasilikos-Pendaskinos Project, the Southern Conveyor Project etc.) and in cases where water from a new borehole will be used for drinking purposes.

During the year 1982, 1246 chemical analyses of drinking water, were carried out, at the laboratory of Khirokitia Water Treatment Plant. Details of the chemical analyses are shown in table no. VI-11.

In addition to the chemical analyses mentioned above, samples of water from the Lefkara Dam were collected monthly, and jar tests for estimating coagulant dosing requirements were carried out.

During 1982, Dr Timothy J Lack from the Water Research Centre, Buckinghamshire and Mr Edward Howarth from the Yorkshire Water Authority, visited Cyprus, on a five-day assignment in order to offer advice on the odour and taste problems of the water from Yermasoyia Dam. The visit took place between 28.11.82 and 5.12.82.

This water is used mainly for irrigation purposes, but recently due to acute water shortages, in the Nicosia and Larnaca districts, it was decided to use some of this water for drinking purposes after being treated at Khirokitia Water Treatment Plant.
The two Experts visited the Yermasoyia Dam from where samples of water were collected, and two jar tests and four chemical analyses of the water were carried out at the Khirokitia laboratory.

Before leaving, the Experts submitted two preliminary reports in connection with the odour and taste problems of dam water, and gave suggestions as to the most suitable method of solving them.

During the year samples of water from various points in the Vasilikos river were collected and 30 chemical analyses were carried out at the laboratory in order to investigate the relatively high level of sulphates observed in the water pumped from the Vasilikos collecting well.

The main source of sulphates was found to be the discharge of water with high sulphate content from old mine workings upstream. The problem is more pronounced during periods of low flow.

TABLE VI-11

SUMMARY OF CHEMICAL ANALYSES CARRIED OUT AT THE WDD CHEMICAL LABORATORY

Month/Area*	Number of samples analysed during 1982						
	Larnaca	Nicosia	Limassol	Paphos	Polis	Khirokitia	Total
January.....	29	-	-	-	-	-	29
February.....	6	4	-	-	-	-	10
March.....	21	-	-	-	-	-	21
April...	187	7	-	-	-	-	194
May.....	78	8	-	-	-	-	86
June.....	-	30	-	20	-	-	50
July.....	95	11	-	-	17	-	123
August.....	-	-	51	-	-	-	51
September.....	166	-	-	-	-	8	174
October.....	48	-	-	51	-	25	124
November.....	134	-	102	26	-	23	285
December.....	22	-	-	-	57	20	99
Total.....	786	60	153	97	74	76	1246

* Area from which samples were taken

FACTS ABOUT THE TOWN WATER BOARDS

Nicosia Water Board

Water shortage was again this year the basic problem of this Water Board, and restrictions on the supply were in force throughout the year 1982.

Nevertheless due to the increased quantities of water delivered to this Water Board from the 1982 Emergency Schemes and Lefkara dam during the Summer and other reasons explained elsewhere in this report, the water supply situation, in comparison with last year, has improved.

The Nicosia Water Board enforced new increased water rates as from 1.3.1982 to reflect its increased costs especially in the purchase of water in bulk from Government.

Water Supply Data

- Total quantity of water delivered to the service reservoirs or directly into the distribution system ..... 9 854 235 m³
- Total quantity of water consumed as registered by area meters (adjusted)..... 9 435 393 m³ (including Nicosia Water Commission)
- Total consumption during 1982 as registered by individual consumers meters in the Greek sector only..... 5 941 852 m³
- Unaccounted for water..... 17.9%
- Maximum daily summer consumption ..... 43 300 m³ (Based on area meter readings and including Nicosia Water Commission. Registered on 5.7.82 for 16 hours of supply in every 48 hours)
- Total number of consumers on 31.12.1981 (Greek Sector only)..... 36 087 m³
- Total number of consumers on 31.12.1982 (In Greek Sector only)..... 37 518 m³
- Average number of consumers during 1982..... 36 863 m³ (Excluding consumers in the area under Turkish control)
- Average gross supply per connection..... 539 l/day
- Extension of distribution system ..... 5 200 m³ (100 mm and 150 mm dia. A.C. pipes)
- Total number of Fire Hydrants installed during 1982..... 20 m³

From analysis of the information available it has been deduced that the consumption in the part of the Nicosia area of supply under Turkish control was 26.6% of the total consumption.

Limassol Water Board

The Water Board sources met satisfactorily the water demand and the town enjoyed a regular supply throughout the year 1982. Underpressure supply was observed at the high parts of the town in the summer months which is attributed to the under-

capacity of the existing distribution system. The improvement of the distribution system and service reservoirs were studied by Consulting Engineers and their report was submitted last year. The estimated cost of the improvement works proposed by their report is £2.34 million and envisages the construction of two new service reservoirs and the laying of a number of trunk mains within the distribution system for improving its conveyance capacity.

As from March this year the Water Board raised its water rates to reflect its increased costs.

Water Supply Data

- Total quantity of water produced from all sources during 1982..... 7 748 927 m³
- Total quantity of water consumed during 1982 as registered by area meters..... 7 692 378 m³
- Total consumption during 1982 as registered by individual consumers meters.. 5 640 527 m³
- Unaccounted for water..... 27.21%
- Maximum daily summer consumption. (Registered by area meters on 2.8.1982)..... 30 253 m³
- Total number of consumers on 31.12.1981..... 28 392
  and on 31.12.1982..... 30 311
- Average number of consumers during 1982..... 29 352
- Average gross supply per consumer..... 723 l/day
- Extension of distribution system..... 14 900 m
  (100 mm, 150 mm and 200 mm A.C. pipes)
- Total length of distribution system as at 31.12.1982..... 335 985 m
- Total number of Fire Hydrants installed during 1982..... 39 No.
- Total number of Fire Hydrants installed as at 31.12.1982..... 1 232 No.

Famagusta Water Board

Since the Turkish occupation of Famagusta town in 1974 the Cyprus Government is supplying water free of charge, to the Turkish residents of the town. The total quantity of water supplied during 1982 was 1, 060, 280 m³.

Larnaca Water Board

The water supply of this town was supplemented throughout the year from the Central Water Supply System. The total quantity of water delivered to Larnaca Water Board from this system, during 1982 was 1, 446, 020 m³. Because of the increased demand on the one hand and the reduced production of the water board sources, due to the dry year, on the other hand, the town faced a water shortage problem and restrictions on the supply had to be imposed in May. These restrictions, which provided for a supply every other day, stayed in force till the end of the year. As a relief measure this Water Board launched a water saving campaign, by publicity and the distribution of nylon bags to be placed by consumers in W.C. cisterns to bulk out water.

As a result of the increased rates introduced by this Department for the water delivered to Water Boards from the Government Water Supply Schemes, this Water Board increased its own water rates as from March 1982.

Water Supply Data

- Total quantity of water supplied to service reservoirs during 1982..... 2 853 720 m³
- Total quantity of water consumed as registered by area meters during 1982..... 2 770 700 m³
- Total consumption as registered by individual consumer's meters in 1982..... 2 094 047 m³
- Unaccounted for water..... 26.6%
- Maximum daily summer consumption (Registered on 24.8.82)..... 11 800 m³
- Total number of consumers as at 31.12.81..... 13 487 No
- Total number of consumers as at 31.12.82..... 15 047 No
- Average number of consumers during 1982..... 14 267 No
- Average daily gross supply per connection..... 548 l/day
- Extension of distribution system during 1982..... 11 850 m
  (100mm, 150mm and 200mm A.C. pipes)
- Fire Hydrants installed during 1982..... 53 No
- Total number of Fire Hydrants installed as at 31.12.82..... 681 No

Paphos Water Supply

The water supply of the town is administered by the Municipality. Although the capacity

of the Municipality's sources could have met the demand, carrying capacity limitations of the pipeline feeding the town have necessitated the augmentation of the town's supply from the Paphos Lower Villages Government Water Supply Scheme by 72 740 m^3. Despite this augmentation, the demand during the summer months was greater and restrictions on the water supply had to be imposed. The restrictions provided for a supply every other day. Parallel to the restrictions the Municipality launched also a water saving campaign by publicity and the distribution of literature, urging consumers to make frugal use of water.

Water Supply Data

- Total quantity of water produced during 1982..... 1 247 972 m^3
- Total quantity of water consumed during 1982..... 895 340 m^3 (As registered by consumer meters)
- Unaccounted for water..... 28.26 %
- Average daily summer production (for July-August).. 4 615 m^3
- Total number of consumers on 31.12.1981..... 4 921 No
  and on 31.12.1982..... 5 602 No
- Average number of consumers during 1982..... 5 262 No
- Average gross supply per consumer..... 650 l/day
- Extension of distribution system..... 5 540 m (100 mm dia)
- Total length of the distribution system as at 31.12.1982..... 135 540 m
- Number of Fire Hydrants installed during 1982..... 28 No
- Total number of Fire Hydrants installed as at 31.12.1982..... 59 No

GOVERNMENT REGIONAL WATER SUPPLY SCHEMES

These schemes supply water to rural population on a regional basis. Water is supplied in bulk to the service reservoir of each community and the distribution is the responsibility of the village water supply committee. These schemes are composed of the sources, balancing tanks, conveyor pipelines and associated pumping installations and are wholy financed by Government. The schemes operate with automatic control equipment. Periodic supervision as well as maintenance work are carried out by the Regional Offices of the Department.

During 1982, the following regional water supply schemes were in operation.

Paphos Lower Villages

This scheme supplies water to 21 communities, to Mesoyi Industrial Estate, Anatoliko Industrial Estate, Paphos Airport and supplements the Paphos Town water supply.

The sources of this scheme are two boreholes Nos 57/72 and 56/75 situated in Xeropotamos river. The total quantity of water supplied from these sources during 1982 was 506, 138 m^3. The total expenditure for the operation and maintenance of the scheme was £33,863 and the revenue generated was £27,837. More details on expenditure and revenue are given on Table VI-12.

Arminou Regional Scheme

This scheme supplies water to eight communities. The source of this scheme is Borehole No. 56/72 in Dhiarizos river near Arminou village. The total quantity of water distributed to the eight villages in 1982 was 34,724 m^3.

The total expenditure for the operation and maintenance of this scheme was £5384 while the revenue generated for the same year was £1736. More details on revenue and expenditure are given in Table VI-13.

Timi Water Supply Scheme

This scheme supplies water to Timi village only. The source is borehole No. 2821, and the total quantity of water produced during 1982 was 19765 m^3.

The total expenditure for the operation and maintenance of the scheme was £542 and the revenue generated was £395. The water is sold to this community at the price of 20 mils per m^3.

Ambelitis Water Supply Scheme

This scheme supplies water to Ambelitis village only. The source is Kephalovrysos spring near Vrecha village. The water is conveyed to the village by a booster pump installed near the spring.

This year the scheme was operated by the District Officer, Paphos. This Department took over the responsibility for the operation and maintenance of the scheme at the end of the year.

TABLE VI-12
PAPHOS LOWER VILLAGES WATER SUPPLY
Expenditure and Revenue Account for 1982

Expenditure

	£
Electricity cost	31 873
Maintenance expenses	1 990
Total	£33 863

Revenue

Amount collected for 1982	21 393
Outstanding accounts for 1982	6 445
Total	£27 838
Outstanding accounts by 31.12.1981	15 440
Less amount collected in 1982	6 316
Less discounts authorized by Ministry of Finance	2 074
Total amount outstanding by 31.12.1982	£13 495

Note: This statement does not include for the amortization of the capital expenditure of the scheme. The amortization cost of the installation is estimated at £ 30,823 p.a. Without taking into account administration expenses and other overheads, the total deficit for the year 1982 amounts to £36,848.

Amathus Scheme

This scheme has been established under the Government Water Works Law to supply water to Amathus Tourist Development Area. The scheme is administered by a committee composed of the Director General of the Ministry of Interior as chairman and the Director Generals of the Ministries of Agriculture and Natural Resources, Finance, Communication and Works and Commerce and Industry, as members. The scheme is operated by the Limassol District Engineer of the Department in cooperation with the District Officer, Limassol.

The sources of this scheme are two boreholes Nos 946 and 993, situated in Yermasoyia River. The total quantity of water distributed during 1982 was 230,723 m^3. The total cost for the operation and maintenance of the scheme was £8,863 and the revenue generated for the same year was £136,584.

More details on expenditure and revenue are given on Table VI-14.

TABLE VI-13
ARMINOU REGIONAL SCHEME
Expenditure and Revenue account for 1982

Expenditure

	£
Electricity cost	4 273
Maintenance expenses	1 111
Total	£5 384

Revenue

Amount collected for the year 1982	440
Amount outstanding for 1982	1 296
Total	£1 736
Outstanding accounts by 31.12.1981	2 244
Less amount collected in 1982	291
Total	£1 953
Total amount outstanding by 31.12.1982	£3 249

Note: This statement does not include for the amortization cost of the capital expenditure of the scheme. The amortization cost of the installations is estimated at £6 895 p.a. The total deficit for the year, without taking into account administration expenses and other overheads, amounts to £10 543 p.a.

TABLE VI-14
AMATHUS WATER SUPPLY SCHEME
Expenditure and Revenue account for 1982

Expenditure

	£
Electricity cost	6 429
Maintenance expenses	2 434
Total	£8 863

Revenue

Sale of water	25 387
Connection fees	108 253
Interest	2 944
Total	£136 584

Moutayiaka Regional Scheme

This scheme supplies water to 10 Communities of a total population of 12,800 persons. The sources of this scheme are two boreholes Nos 64/64 (Hydr. No. 287) and 180/59 (HYdr. No. 8) situated in Yermasoyia River.

The operation and maintenance of the scheme is the responsibility of the District Officer, Limassol.

The total quantity of water distributed in 1982 was 517,684 m³.

The total expenditure for the operation and maintenance of the scheme was £43, 855 and the revenue generated was £44 , 120. More details on expenditure and revenue are given on Table VI-15.

TABLE VI-15
MOYTAYIAKA REGIONAL SCHEME
Expenditure and Revenue account for 1982
Expenditure

	£
Electricity cost	36 368
Maintenance and operation	7 487
Total	£43 855

Revenue

Amount collected in 1982	12 959
Amount outstanding for 1982	31 161
Total	44 120
Amount outstanding by 31.12.1981.	3 886
Total amount outstanding by 31.12.82	35 047

Zakaki Water Supply Scheme

This scheme supplies water to Zakaki village with a population of 4, 300 persons.

The source of the scheme is borehole Hydr. No. 815 situated at the outskirts of the village. The operation and maintenance of the scheme is the responsibility of Limassol Municipality.

The total quantity of water supplied from this source during 1982 was 127, 882 m³. The total expenditure for the operation and maintenance of the scheme was £4406 and the revenue generated was £8, 347. More details on expenditure and revenue are given on Table VI-17.

Yermasoyia Water supply Scheme

This scheme supplies water to Yermasoyia village and Potamos tis Yermasoyias, with a total population of 4 , 800 persons. This scheme supplies also a number of hotels and other touristic installations in the coastal area of Potamos tis Yermasoyias.

The sources of the scheme are three boreholes Hydr. Nos 286, 948 and 858 situated in Yermasoyia river. The operation and maintenance of this scheme is the responsibility of Yermasoyia Improvement Board.

The total quantity of water distributed during 1982 was 470,000 m³.
The total expenditure for the operation and maintenance of the scheme was £45, 241. While the revenue generated was £59, 362. More details in expenditure and revenue are given on Table VI-16.

TABLE VI-16
YERMASOYIA WATER SUPPLY SCHEME
Expenditure

	£
Electricity cost	16 137
Maintenance and operation cost	29 104
Total	£45 241

Revenue

Amount collected in 1982	48 262
Amount outstanding for 1982	11 100
Total	£59 362

TABLE VI-17
ZAKAKI WATER SUPPLY SCHEME
Expenditure

	£
Electricity cost	3 195
Maintenance and operation cost	1 211
Total	£4 406

Revenue

Amount collected in 1982	8 347

VII DIVISION OF OPERATION AND MAINTENANCE IRRIGATION BRANCH

by
N Tsiourtis
Senior Water Engineer
Head of Division

Introduction

This Division includes the Branches dealing with:

- The management, operation and maintenance of Government irrigation works.
- The maintenance of contributory irrigation projects.

Definitions

Government Waterworks: These are the projects constructed under the Government Waterworks Law Cap. 341. These projects are listed in Tables VII-1 and VII-7.

Contributory Waterworks: These are projects constructed under the Irrigation Division Law Cap. 342. A list of these projects is given in Table VII-6.

MANAGEMENT AND OPERATION PROCEDURES

The management and operation of the various categories waterworks are carried out as follows:

1. Government Waterworks

The management and operation of these projects are carried out by:
(a) Waterworks Committees established according to the provision of the relevant Law. The Waterworks Committees are usually composed of the following:

Chairman
District Officer of the district in which the projects are situated.

Members
Director of the Water Development Department or his representative. Director of the Lands and Surveys Department or his representative. Two or more farmers elected by the farmers.

The Committee is responsible for the overall administration and management of the Government Waterworks Projects such as:

To make recommendations on the development, conservation, management and efficient use of the available water resources of the project.

- To manage and operate the project with a view to:
  - Improve the standard of agricultural practices
  - Improve the methods of irrigation
  - Increase the revenue from land and water utilization to the full economic value
  - To sell the water at the nominal rates approved by the Government and see that the fees and charges are collected (see Table VII-1).

(b) The Director of the Water Development Department who undertakes to operate, manage and maintain the Government waterworks. The only Projects whose operation and maintenance are with the Director of the WDD is the Paphos Irrigation Project, and the Khrysokhou valley project.

The Committees and the Director of WDD have their own budgets, approved by the Minister of Finance and the Council of Ministers accordingly.

The water selling rates approved by the Council of Ministers are shown on Table VII-3.

2. Contributory Irrigation Projects (Major and Small)

The operation of the contributory projects is carried out by the Irrigation Division Committees. These committees are chaired by the District Officer and members to the committees are beneficiaries elected by the general assembly meetings of the Irrigation Division beneficiaries. The Water Development Department in such cases gives technical advice both to the District Officer and to the Committees. The costs of the operation of these projects is born in total by the beneficiaries.

3. Government Recharge Works

These are managed directly by the Water Development Department (See Table VII-7).

MAINTENANCE PROCEDURES

The maintenance of the irrigation waterworks is carried out by the Water Development Department but depending on the type of the project the expenses are either paid in full by the Government or are shared between the Government and the Irrigation Divisions.

TABLE VII-1
GOVERNMENT IRRIGATION PROJECTS - DATA FOR 1982

Ser No	Project	Capacity $m^3 x10^3$	Area commanded donums	Water available for utilization $m^3 x10^3$	Water used for irrigation $m^3 x10^3$	Water used for D.W.S. $m^3 x10^3$	Water used for recharge $m^3 x10^3$	Total quantity used $m^3 x10^3$	Evaporation losses $m^3 x10^3$	Seepage losses $m^3 x10^3$	Area Irrigated donums	Water utilized index %	Land utilized index %
1	Argaka.....	990	2 340	1 022	1 018	Nil	Nil	1 018	77	4	1 276	89.5	54.5
2	Ayia Marina.....	300	1 500	331	290	Nil	Nil	290	27	45	325	87.6	21.7
3	Kalopanayiotis.....	363	435	363	222	Nil	Nil	222	36	150	435	61.1	100.0
4	Kiti.....	1 610	6 200	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil
5	Lefkara**.....	13 850	615	5 522	64	4 437	Nil	4 501	311	25	130	81.5	19.2
6	Mavrokolymbos***.....	2 180	3 355	943	628	Nil	Nil	628	59	Nil	2 440	66.6	72.7
7	Pomos.....	860	2 850	1 035	914	Nil	Nil	914	63	110	990	88.3	34.7
8	Polemidhia.....	3 430	15 440	13 052	7 010	Nil	1 983	8 993	1 152	639	15 440	68.9	100.0
9	Yermasoyia.....	13 500											
10	Athalassa.....	791	310	Nil	Nil	Nil[a]	Nil	Nil	Nil	Nil	Nil	Nil	Nil
11	Paphos.....	51 000	35 000	11 699	9 401	356[a]	665	10 422	921	NA	13 536	89.1	38.7
12	Khapotami.....	1	4 235	1 006	1 006	Nil	Nil	1 006	-	-	4 235	100.0	100.0
13	Khrysokhou valley.....	2	1 770	274	274	Nil	Nil	274	-	-	469	100.0	26.5
14	Ayios Theodhoros (Larnaca).....	2	460	31	31	Nil	Nil	31	-	-	233	100.0	50.6
	Total.....	89 874	74 510	35 278	20 858	4 793	2 648	28 299	2 646	973	39 509	80.22	53.02

* This is the water that possibly may be utilized: Storage+overflow or seepage that may be utilized after deducting evaporation and seepage losses.
** Water allocated mainly for water supply.
*** A quantity of 1 115 666 m^3 was bought from Paphos Project and used for irrigation
1 Diversion on river
2 Groundwater scheme
a Sold for industrial use

The procedures are as follows:

Government Waterworks: The maintenance of these projects is carried out by the Water Development Department being the Government's Agency for waterworks and the costs are born in full by the Government. By the term maintenance we mean routine dam and pipeline maintenance, valves and watermeters repair or replacements, paintings of metal works or woodworks etc.

Contributory Irrigation Projects: The maintenance of these projects is carried out by the Water Development Department but the costs are shared between the Government and the specific Irrigation Division usually at a ratio of 2 to 1. Some minor maintenance or repair works are carried out by the respective ID directly.

WATER DEVELOPMENT DATA

Cyprus is an island and all available water resources are those that result from overall precipitation. The total precipitation in an average year is estimated at 4,600 MCM, where 1,270 MCM/annum are lost in the form of evaporation, 900 MCM/a are lost in the form of evapotranspiration from cultivated crops, 1,480 MCM/a are lost in the form of evapotranspiration from forest pasture and grass and irrigated crops. The annual surface runoff is estimated at 600 MCM and the groundwater and springs another 350 MCM. As it is seen from the above only 950 MCM or 21% of the total precipitation are available for development both surface and groundwater. The groundwater resources being easier to develop are at present overpumped. The annual extraction from the boreholes is estimated at 370 MCM and the total springs yield is around 30 MCM. Out of these quantities 300 MCM are used for irrigation where the rest 100 MCM are used for domestic and industrial uses.

The surface water resources being much more expensive to develop remained undeveloped until the beginning of the 1960's. By the beginning of 1960 the total water storage capacity of dams all over the island amounted to 6.2 MCM commanding an area of 11,400 donums of irrigated land. Soon after this (after independence) the Government of the Republic started a construction program to develop as much as possible more surface water resources. Many projects were constructed which increased the water storage capacity of dams, to 116.4 MCM, 98.3 MCM for irrigation or domestic water supply and the rest 18.1 MCM for recharge purposes where the commanded area has risen to 111,166 donums

Details on the projects and the rate of storage development are given in Drg. No. A G/IR/27 "Cyprus Dam Projects" page 14 and "Progress in Dam Construction" page 18.

SUMMARY OF MANAGEMENT, OPERATION AND MAINTENANCE DATA

The overall average precipitation during the hydrological year under review was 425 mm or 80% of the 51 year average of the Government controlled area, where the total volume of water available in the dams in the Government controlled area amounted to 38.709 MCM. From this quantity 23.258 MCM was used for irrigation, 4.793 MCM was used for domestic water supplies and industries, 2.665 MCM was used for recharge 0.973 MCM seeped through or below the dams and another 2.921 MCM was lost as evaporation. The rest 4,099 MCM remained in the dams for over year storage or lost as overflow. Projects in the Turkish occupied area are not included here as we cannot collect the necessary information.

The total area commanded by the irrigation projects is estimated at 111,166 donums where an estimated area of 43,857 donums, has been irrigated, planted with citrus, bananas, deciduous, vegetables, potatoes etc.

Maintenance works totalling £78,632 were carried out on sixteen projects. These include routine maintenance on the dam structures and the distribution systems. For the government waterworks (irrigation and recharge works) a total of £76,131 were spent where the rest £2,501 were spent on the contributory projects.

GOVERNMENT WATERWORKS

In the year under review, the total quantity available from government irrigation projects reached the figure of 35.278 MCM.

From this total, a quantity of 28,299 MCM or 80.2% was utilized, 20.858 MCM for irrigation, 4.793 MCM for the domestic water supply and industries and 2 648 MCM for recharge purposes. The rest of the water remained in storage or was lost in the form of overflow. In the same period 2.646 MCM was lost in the form of evaporation where another 0.973 MCM were lost as

seepage or deep percolation (see Table VII-1).

The irrigation water was used to irrigate fully or partly 39,509 donums of land planted with citrus, bananas, vines, deciduous, vegetables, potatoes, cereals and olives (See Table VII-2).

The gross income from the sale of water amounted to £433,214 being the income from the sale of water at the rates shown on Table VII-3. The operational expenses amounted to £119,906 being the cost for the payment of the watermen, and the bill collectors etc. which amounted to 6.14 mils/m³ of water sold or 4.24 mils/m³ of water utilized. The maintenance expenses on government projects amounted to £76,131 i.e. 3.90 mils/m³ of water sold or 2.69 mils/m³ of water utilized. The power expenses amounted to £215,577 i.e. 11.03 mils/m³ of water sold or 7.62 mils/m³ of water utilized.

The total annual operation, maintenance and power expenses amounted to £411,614 which amounts to 21.06 mils/m³ sold or 14.54 mils/m³ utilized.

Evaporation losses from the reservoirs amounted to 2.646 MCM or 2.94% of the total storage capacity available. The seepage losses were estimated at 0.973 MCM or 1.08% of the total storage, mostly from the Polemidhia and Yermasoyia dams.

The overall water utilization and land utilization indexes are 80.22% and 53.02 % respectively. Of the 20.858 MCM used for irrigation 19.186 MCM was sold at the nominal rates, (91.98%) where the rest 1.672 MCM, (7.87%) was given free of charge as water rights or overflows.

A summary of the above data in detail is given in tables VII-1, VII-4, and VII-5 where more details are given for each project under separate headings.

Table VII-5 gives data on the operation and maintenance of the government irrigation projects for the last 10 years.

Table VII-8 gives data on the operation and maintenance for the last two years.

CONTRIBUTORY IRRIGATION PROJECTS

In general there are 37 contributory irrigation projects with total capacity of 8.479 MCM commanding an area of 36.656 donums. Nine projects of total capacity 5.296 MCM or 62.5% of the total capacity of contributory

TABLE VII-2
CROPS AND AREAS IRRIGATED BY GOVERNMENT IRRIGATION PROJECTS

Ser. No.	Crop	Area in donums
1	Citrus	11 613
2	Bananas	1 954
3	Vines	9 219
4	Deciduous	770
5	Vegetables	6 708
6	Potatoes	2 491
7	Cereals	100
8	Olives	101
9	Ground-Nuts	3 113
10	Beans	2 845
11	Tobacco	120
12	Avocadoes	13
13	Others	462
	Total	39 509

TABLE VII-3
GOVERNMENT IRRIGATION PROJECTS AND APPROVED WATER CHARGES IN MILS/M³

Ser. No.	Project	Overflow	Industrial	Flat Rate
1	Argaka	Free	-	20
2	Ayia Marina	-	-	20
3	Kalopanayiotis	-	-	20
4	Kiti	-	-	-
5	Lefkara	-	-	10
6	Mavrokolymbos	-	-	20
7	Pomos	10	-	20
8	Polemidhia	-	-	25
9	Yermasoyia	-	-	25
10	Athalassa	-	-	-
11	Paphos	-	30	20
12	Khapotami	-	-	free
13	Khrysokhou	-	-	25
14	Ayios Theodhoros	-	-	free

schemes, commanding an area of about 22,630 donums are situated in the Turkish occupied area and on which no data are collected. From the rest of the projects the total water collected amounted to 3.263 MCM out of which 2.262 MCM are used for the irrigation of 4.348 donums where the rest are lost in the form of evaporation (see Table VII-6).

GOVERNMENT RECHARGE WORKS

On the island there are about 34 recharge works of total capacity 18.063 MCM. Out

TABLE VII-4

DATA ON MANAGEMENT, OPERATION AND MAINTENANCE OF GOVERNMENT IRRIGATION PROJECTS 1982

Ser No.	Project	Dam reservoir capacity $m^3 x10^3$	Area commanded donums	Water available $m^3 x10^3$	Water used $m^3 x10^3$	Water sold $m^3 x10^3$	Area irrigated Donums	Gross income £	Expenditure				Net income
									Power £	Oper. £	Maint. £	Total £	
1	Argaka.....	990	2 340	1 022	1 018	915	1 276	18 293	-	8 839	880	9 719	8 574
2	Ayia Marina.....	300	1 500	331	290	290	325	5 796	-	3 431	741	4 172	1 624
3	Kalopanayiotis.....	363	435	363	222	222	435	4 434	-	3 678	809	4 487	- 53
4	Kiti.....	1 610	6 200	Nil	Nil	Nil	Nil	Nil	-	Nil	536	536	-536
5	Lefkara.....	13 850	615	5 522	4 501	64	130	642	-	-	1 183	1 183	-541
6	Mavrokolymbos***....	2 180	3 355	943	628	528	2 440	10 567	-	14 143	1 840	15 983	-5 416
7	Pomos.....	860	2 850	1 035	914	914	990	17 862	-	12 046	1 116	13 162	4 700
8	Polemidhia.....	3 430	15 440	13 052	8 993	6 578	15 440	170 054	28 062	55 200	11 700	94 978	5 076
9	Yermasoyia.....	13 500											
10	Athalassa.....	791	310	Nil	Nil	Nil	Nil	Nil	-	Nil	80	80	- 80
11	Paphos.....	51 000	35 000	11 699	10 422	9 757	13 536	198 707	179 641	18 959	55 067	253 667	-54 960
12	Khapotami.....	1	4 235	1 006	1 006	Nil	4 235	-	-	-	-	-	**
13	Khrysokhou valley...	2	1 770	274	274	274	469	6 859	7 874	3 610	2 163	13 647	-6 788
14	Ayios Theodhoros (Larnaca).....	2	460	31	31	Nil	233	Nil	-	-	-	-	**
	Total.....	89 874	74 510	35 278	28 299	19 542	39 509	433 214	215 577	119 906	76 131	411 614	21 600

* These costs are included in the Lefkara dam in the Report on D.W.S.

** All the expenses were undertaken by the irrigators

1 Diversion on river

2 Groundwater scheme

*** A quantity of 1 115 666m^3 was bought from Paphos Project and used for irrigation

TABLE VII-6
DATA ON CONTRIBUTORY IRRIGATION WORKS

Ser No.	Project	Capacity $m^3 x10^3$	Area commanded Donums	Water available for utilization $m^3 x10^3$	Water used for irrigation $m^3 x10^3$	Water used for DWS $m^3 x10^3$	Water used for recharge $m^3 x10^3$	Total quantity used $m^3 x10^3$	Evaporation losses $m^3 x10^3$	Seepage losses $m^3 x10^3$	Area irrigated donums
1	Agros	72	300	52	40	-	-	40	4	-	69
2	Akrounda	22	60	22	20	-	-	20	2	-	29
3	Akapnou-Ephtagonia	132	185	132	86	-	-	86	11	-	176
4	Arakapas	128	200	128	101	-	-	101	10	-	171
5	Arakapas No. 2	192	190	89	31	-	-	31	7	-	119
6	Ayii Vavatsinias (Dam)	53	180	53	24	-	-	24	4	-	71
7	Ayii Vavatsinias (Pond)	55		55	29	-	-	29	4	-	73
8	Ephtagonia I	92	150	31	29	-	-	29	2	-	41
9	Ephtagonia II	197	175	46	42	-	-	42	4	-	61
10	Ephtagonia III	65	90	19	17	-	-	17	2	-	25
11*	Galini	22	1 300	-	-	-	-	-	-	-	-
12*	Geunyeli	1 000	850	-	-	-	-	-	-	-	-
13	Kalokhorio (Klirou)	32	1 350	32	29	-	-	29	3	-	43
14	Kandou	38	563	31	21	-	-	21	3	-	41
15*	Kanli	1 100	4 000	-	-	-	-	-	-	-	-
16	Kato Mylos	104	180	104	41	-	-	41	8	-	139
17	Khandria	70	140	51	27	-	-	27	4	-	68
18	Kyperounda	50	80	50	37	-	-	37	4	-	67
19*	Lefka Marathasa	368	1 300	368	171	-	-	171	29	-	491
20*	Lefka Kafizes	113	770	113	104	-	-	104	9	-	151
21	Lymbia	220	940	220	171	-	-	171	18	-	293
22	Lythrodhontas Upper	32	115	16	15	-	-	15	1	-	21
23	Lythrodhontas Lower	32	115	22	20	-	-	20	2	-	29
24	Melini	59	110	59	31	-	-	31	5	-	79
25*	Mia Milea	330	1 300	-	-	-	-	-	-	-	-
26*	Morphou	2 000	6 740	-	-	-	-	-	-	-	-
27*	Ovgos	250	6 370	-	-	-	-	-	-	-	-
28	Pakhyammos	43	400	35	32	-	-	32	3	-	47
29	Palekhori (Kambi)	620	1 000	620	570	-	-	570	50	-	827
30*	Gypsos	113	-	-	-	-	-	-	-	-	-
31	Pelendri	123	198	123	61	-	-	61	10	-	164
32	Perapedhi	55	195	55	33	-	-	33	4	-	73
33	Petra Upper	10	4 690	10	9	-	-	9	1	-	13

TABLE VII-6 DATA ON CONTRIBUTORY IRRIGATION WORKS (Cont.)

Ser No.	Project	Capacity $m^3 x10^3$	Area commanded Donums	Water available for utilization $m^3 x10^3$	Water used for irrigation $m^3 x10^3$	Water used for DWS $m^3 x10^3$	Water used for recharge $m^3 x10^3$	Total quantity used $m^3 x10^3$	Evaporation losses $m^3 x10^3$	Seepage losses $m^3 x10^3$	Area irrigated donums
34	Petra Lower.....	25	-	25	23	-	-	23	2	-	33
35	Prodhromos.....	110	170	79	65	-	-	65	6	-	104
36	Pyrgos.....	283	1 600	283	250	-	-	250	23	-	377
37	Trimiklini.....	340	650	340	133	-	-	133	27	-	453
	Total.....	8 479	36 656	3 263	2 262			2 262	262		4 348

* Project in Turkish occupied areas

TABLE VII-5
DATA ON WATER USE FOR THE LAST 10 YEARS FOR THE GOVERNMENT PROJECTS

Ser No	Description	Unit	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982
1	Capacity.....	$1000m^3$	2 340	37 890	37 890	37 890	37 890	38 061	37 874	37 874	37 874	89 874
2	Water available.....	"	1 858	6 367	27 612	28 000	32 003	27 380	28 282	34 408	50 660	35 278
3	Water utilized for irrigation.....	"	NA	NA	7 776	8 388	9 704	9 457	10 847	27 109	19 634	20 858
4	Water used for DWS...	"	NIL	NIL	1 000	1 365	2 058	2 856	2 936	2 210	3 356	4 793
5	Water used for recharge.....	"	NA	NA	NA	6 016	3 323	1 982	1 623	6 579	14 627	2 648
6	Total water used.....	"	NA	NA	8 776	15 769	15 085	14 295	15 426	23 609	37 617	28 299
7	Evaporation losses...	"	NA	NA	2 854	2 570	2 662	2 683	2 409	2 587	2 618	2 646
8	Seepage losses.....	"	NA	NA	NA	428	359	3 367	1 024	5 087	5 424	973
9	Water sold.....	"	11 137	26 138	60 600	73 747	93 485	8 447	12 642	11 748	18 644	19 542
10	Gross income.....	£	971	2 544	5 222	6 624	7 999	101 367	128 281	169 418	253 307	433 214
11	Power cost.....	£	-	-	-	-	-	-	-	-	117 689	215 577
12	Operation cost.....	£	6 450	11 048	12 619	18 627	34 500	33 592	55 197	84 496	207 738	119 906
13	Maintenance cost.....	£	4 278	4 603	3 174	4 496	8 059	8 165	7 202	18 563	50 539	76 131
14	Total expenditure....	£	10 728	15 651	15 793	23 123	42 559	41 757	62 399	103 059	258 277	411 614
15	Net income.....	£	409	10 487	44 808	50 264	50 926	59 610	65 882	68 159	-4 838	21 600
16	Area irrigated.....	Donums	NA	NA	12 458	17 376	15 459	14 905	20 084	27 109	37 340	39 509

TABLE VII-7

RECHARGE WATERWORKS DATA

Ser No.	Project	Capacity $m^3 x 10^3$	Water available $m^3 \times 10^3$	Water used for recharge $m^3 \times 10^3$	Water lost in evap. $m^3 x 10^3$
1*	Kouklia.....	4545	-	-	-
2*	Ayios Loucas.....	455	-	-	-
3	Sotira.....	45	Nil	Nil	Nil
4	Panayia (F).....	45	Nil	Nil	Nil
5	Paralimni.....	115	Nil	Nil	Nil
6	Ayia Napa.....	55	Nil	Nil	Nil
7*	Famagusta Antiflood.....	50	-	-	-
8	Phrenaros.....	115	Nil	Nil	Nil
9	Dherinia.....	23	Nil	Nil	Nil
10	Phrenaros.....	45	Nil	Nil	Nil
11	Avgorou.....	68	Nil	Nil	Nil
12*	Kondea.....	82	-	-	-
13	Xylophaghou.....	86	Nil	Nil	Nil
14	Sotira.....	32	Nil	Nil	Nil
15*	Lysi.....	77	-	-	-
16*	Ayios Yeoryios (K)....	68	-	-	-
17*	Ayios Epiktitos..	34	-	-	-
18*	Akanthou.....	45	-	-	-
19*	Akhna.....	40	-	-	-
20	Xylotymbou.....	50	Nil	Nil	Nil
21*	Syngrasis.....	1115	-	-	-
22*	Ayios Yeoryios (F)	90	-	-	-
23*	Famagusta Recharge.....	165	-	-	-
24*	Ayios Nicolaos (F)	1365	-	-	-
25	Paralimni Lake...	1365	18	17	1
26*	Fresh Water.....	4545	-	-	-
27*	Makrasyka.....	195	-	-	-
28*	Akhna Mesania....	90	-	-	-
29	Vrysoulles (F)...	140	-	-	-
30*	Morphou Recharge.	130	-	-	-
31*	Morphou Protopapas.....	90	-	-	-
32	Ormidhia (Vathys)	100	Nil	Nil	Nil
33*	Masari.....	2273	-	-	-
34	Liopetri.....	325	150	**	12
	Total.....18063		168	17	13

* Projects in Turkish occupied area. Gate constantly open for recharge.

** A quantity of 138000m^3 was used for irrigation instead for recharge.

of these projects 19 of the total capacity 15.694 MCM or 86.9% of the total recharge capacity are situated in the Turkish occupied areas. On these, no government control is possible and no data on their use is available. For the projects in the Government controlled area out of 168,000 m^3 collected, 17,000 m^3 were recharged where 13,000 m^3 were lost as evaporation and the rest 138,000 m^3 were used for irrigation. For information on individual projects in the Government controlled areas see Tables VII-7 and VII-10B.

COST OF OPERATION ON SOME GOVERNMENT PROJECTS

The operational cost of a number of important projects are shown on Table VII-9. This Table shows the running costs (O+M and Power) and the unit cost of water.

TABLE VII-8

DATA ON MANAGEMENT AND OPERATION OF GOVERNMENT IRRIGATION PROJECTS FOR THE LAST TWO YEARS

Item No	Data	Unit	1981	1982	% change on 1981
1	Capacity.....	$1000m^3$	37 874	89 874	137.30
2	Water available...	"	50 660	36 461	-28.03
3	Water utilized for irrigation.....	"	19 634	21 237	+8.16
4	Water utilized for DWS.....	"	3 356	4 437	+32.21
5	Water utilized for recharge.....	"	14 627	2 648	-81.90
6	Total water used..	"	37 617	28 322	-24.71
7	Evaporation Losses.....	"	2 618	2 646	+1.07
8	Seepage Losses....	"	10 848	973	-91.03
9	Water sold.....	"	18 644	19 565	+4.94
10	Gross Income.....	£	253 307	430 105	+69.80
11	Power Cost.....	£	117 689	215 577	+83.18
12	Operation cost....	£	90 049	119 906	+33.16
13	Maintenance cost..	£	50 539	76 131	+50.64
14	Total expenses....	£	258 277	411 614	+59.37
15	Net income.....	£	-4 838	18 491	+482.20
16	Area irrigated....	donums	37 340	39 645	+6.17
17	Area commanded....	"	74 510	74 510	Nil

TABLE VII-10A

CONTRIBUTORY IRRIGATION WORKS MAINTENANCE COSTS

Ser No.	Project	Maintenance Cost Govt. Contrib. £	I D Contrib. £	Total Cost £
1	Palekhori.....	250	125	375
2	Pyrgos.....	697	348	1045
3	Lefka Kafizes (special case)	-	-	124
	Total.....	£947	£473	£1544

TABLE VII-9
GOVERNMENT IRRIGATION PROJECTS - COST OF WATER

Ser No	Project	Water sold m³	Total water utilized m³	Operation & Maintenance cost £	Power cost £	Total annual cost £	Cost of water mils/m³ Sold water	Cost of water mils/m³ Total utilized
1	Argaka.....	914 652	1 018 129	9 719	-	9 719	10.62	9.54
2	Ayia Marina.....	289 789	289 789	4 172	-	4 172	14.40	14.40
3	Kalopanayiotis.....	221 703	221 703	4 487	-	4 487	20.24	20.24
4	Kiti.....	Nil	Nil	Nil	Nil	Nil	Nil	Nil
5	Mavrokolymbos.....	528 359	628 359	15 983	-	15 983	30.25	25.44
6	Pomos.....	913 968	913 968	13 162	-	13 162	14.40	14.40
7	Polemidhia.....	6 578 372	8 993 642	66 916	28 062	94 978	14.44	10.56
8	Yermasoyia.....			74 026	179 641	253 667	25.94	24.29
9	Paphos.....	9 779 920	10 444 920	5 773	7 874	13 647	49.74	49.74
10	Khrysokhou valley....	274 376	274 376	194 238	215 577	409 815	21.01	17.99
	Total.....	19 501 139	22 784 886					

TABLE VII-10B
RECHARGE WATER WORKS MAINTENANCE COST

Ser No.	Project	Maintenance cost £
1	Famagusta Recharge.....	957

DETAILS ON OPERATION OF GOVERNMENT WATERWORKS

ARGAKA PROJECT

The Argaka Irrigation Project consists of a dam reservoir of maximum capacity at spillway crest 0.990 MCM and a distribution system made of closed conduits commanding an area of 2,340 donums. Irrigation in the Project area started late in January and lasted until mid December, 1982. An area of 1,276 donums was irrigated by utilizing about 1.018 MCM of water.

The area irrigated was planted with citrus, bananas, vines deciduous, vegetables, cereals and potatoes. Out of the 1.018 MCM of water utilized 914,652 m³ were sold to the farmers at the nominal rates and an amount of 103,477 m³ was taken from the overflow, free of charge. The gross income from the sale of water was £18,293 The expenditure for management was £8,839 where that for maintenance amounted to £880. Net income to the Project was £8,574.

TABLE VII-11
ARGAKA DAM-HYDROLOGY FOR 1982

Item No.	Description	Qty m³	% storage capacity
1	Initial amount in storage.....	145 400	14.67
2	Inflow - Seepage-Overflow.....	854 334	86.30
3	Total release.....	835 047	84.35
4	Leakages.....	3 809	0.38
5	Evaporation.....	77 447	7.82
6	Overflow.....not measured		-
7	Final amount in storage.....	34 875	3.52
8	Minimum quantity in storage (Dec.).	7 250	0.73
9	Storage capacity..	990 000	100.00

Project Hydrology

The project hydrologic data, as recorded during the year, are tabulated on Table

VII-11. The dam reservoir was filled to spillway crest on March 20th and overflow continued until April 30th 1982. The overspilled quantity could not be measured. The minimum level of water in storage ever reached was in December with total quantity in storage around 7,250 m³.

Water Utilization and Crops Irrigated

The project is built for irrigation purposes and as such, a quantity of 1018,129 m³ of water was utilized for the irrigation of 1,276 donums of land planted with various crops as indicated in Table VII-13.

Table VII-12 shows the utilization of the project water and Table VII-13 shows the crops irrigated.

TABLE VII-12
ARGAKA DAM-WATER UTILIZATION

Item No.	Description	Qty m³	% storage capacity
1	Water used for irrigation.....	1 018 129	102.84
2	Water used for recharge.....	NIL	NIL
3	Total water utilized.....	1 018 129	102.84

TABLE VII-13
ARGAKA DAM-CROPS IRRIGATED

Ser No.	Crop	Area Donums
1	Citrus.....	630
2	Bananas.....	230
3	Vines.....	40
4	Deciduous.....	70
5	Vegetables.....	180
6	Potatoes.....	6
7	Careals.....	70
8	Others.....	50
	Total.....	1 276

Water Sale, Income, Operation and Maintenance Costs

The water released for irrigation was 914,652 m³. The total quantity utilized for irrigation water released from the dam reservoir, water pumped from the boreholes and water taken from overflow, amounted to 1,018,129 m³. Out of this 914,652 m³ was sold to the farmers at the nominal rates and the rest 103,477 m³ was given free of charge because it was taken from the overflow. From the sale of water a total of £18,293 was collected. For the operation of the project an amount of £8,839 was paid to the water men and bill collectors where for the maintenance of the project another £880 was spent.

Net income for the benefit of the project is £8,574. All the data concerning water sale, operation and management costs are shown on Table VII-14.

TABLE VII-14
ARGAKA DAM-INCOME AND EXPENDITURE DATA

Item No.	Description	Qty m³	Amount £
1	Water sold at nominal rates.....	914 652	18 293
2	Water sold at reduced rates.....	Nil	Nil
3	Water given free of charge*.....	103 477	Nil
4	Total quantity utilized and gross income.....	1 018 129	18 293
5	Operation cost.....	-	8 839
6	Maintenance cost...	-	880
7	Net income.....	-	8 574

* This quantity was taken from the overflow

Project Performance for the last two years

Table VII-15 shows the performance of the project for the last two years. As shown there was a decrease in the total volume of water used for irrigation by 14.02% and the area irrigated was decreased by 24.00%. The net income to the project was increased by 20.70%.

TABLE VII-15
ARGAKA DAM-DATA ON PROJECT FOR THE LAST TWO YEARS

Item No	Data	Unit	1981	1982	% change on 1981
1	Capacity.....	1000m³	990	990	Nil
2	Water available in storage.....	"	1 334	1 022	-23.39
3	Water utilized for irrigation.....	"	1 184	1 018	-14.02
4	Water sold.....	"	847	915	+ 8.03
5	Water given free..	"	337	103	-69.44
6	Water used for reacharge.....	"	150	Nil	-100.00
7	Gross income.....	£	11 685	18 293	+56.55
8	Operation cost....	£	3 665	8 839	+141.17
9	Maintenance cost..	£	917	880	-4.03
10	Total expenses....	£	4 582	9 719	+112.11
11	Net income	£	7 103	8 574	+20.70
12	Area irrigated....	donums	1 679	1 276	-24.00

AYIA MARINA PROJECT

The Ayia Marina Irrigation Project consists of a dam reservoir of capacity at spillway crest of 0.300 MCM and a distribution system commanding an area of 1,500 donums. The distribution system consists of a main conduit at the terminal of which tertiary pipes branch-off to distribute water to each individual plot. Irrigation in the project area started late in March 1982 and continued throughout the year until early in December. An area of 325 donums was irrigated by utilizing about 0.290 MCM. The area irrigated was planted with bananas, vines, deciduous and vegetables. The water utilized was sold to farmers at the approved rates. The total gross income from the sale of water amounted to £5,796. The expenditure for the operation was £3,431 and that for maintenance £741. Net income to the project was £1,624.

Project Hydrology

The project hydrologic data as recorded during the year, are tabulated on Table VII-16.

The dam was not filled up to the spillway crest. The maximum quantity stored was 249,000 m^3 on the 18th of April 1982. Minimum quantity of water ever stored during the year under review, was 17,818 m^3 and this occurred in December 1982.

TABLE VII-16
AYIA MARINA DAM-HYDROLOGY FOR 1982

Item No.	Description	Qty m^3	% Storage capacity
1	Initial amount in storage.....	68 180	22.73
2	Inflow-Seepage.....	314 067	104.69
3	Total release.....	289 789	96.60
4	Leakages.....	24 719	8.24
5	Evaporation.....	26 795	8.93
6	Overflow.....	Nil	Nil
7	Final amount in storage.....	26 363	8.79
8	Minimum quantity in storage (Dec.)..	17 818	5.94
9	Storage capacity...	300 000	100.00

Water Utilization and Crops Irrigated

During the year under review, a total quantity of 289,789 m^3 of water was utilized for the irrigation of approximately 325 donums planted with various crops. Details about the water utilization and the crops irrigated and their extent are shown on Tables VII-17 and VII-18.

TABLE VII-17
AYIA MARINA DAM-WATER UTILIZATION

Item No.	Description	Qty m^3	% Storage capacity
1	Water used for irrigation.....	289 789	96.60
2	Water used for recharge.....	Nil	Nil
3	Total water utilized.....	289 789	96.60

TABLE VII-18
AYIA MARINA DAM
CROPS IRRIGATED

Ser No.	Crop	Area Donums
1	Citrus.....	65
2	Bananas.....	95
3	Vines.....	15
4	Deciduous.....	70
5	Vegetables.....	70
6	Potatoes.....	-
7	Cereals.....	-
8	Others.....	10
	Total.....	325

Water Sale, Income, Operation and Maintenance Costs

From the sale of 289,789 m^3 of water, the gross income to the project, amounted to £5,796. Management and operation expenses being the wages of the water man and that of the dam attendant, amounted to £3,431. Maintenance costs of the dam and the distribution system was £741. Net income to the project is £1,624. Details regarding sale of water income and costs are given on Table VII-19.

Project Operation Data for the last two years

Table VII-20 shows data on the operation of the project for the last two years. The water utilization showed a decrease by 26.77% where the net income showed an increase by 204.12%. The total expenditure showed an increase by 6.35%. The area under irrigation was decreased by 32.85%.

TABLE VII-19
AYIA MARINA DAM-INCOME AND EXPENDITURE DATA

Item No.	Description	Qty m^3	Amount £
1	Water sold at nominal rates	289 789	5 796
2	Water sold at reduced rates	Nil	Nil
3	Water given free of charge	Nil	Nil
4	Total quantity utilized and gross income	289 789	5 796
5	Operation cost	-	3 431
6	Maintenance cost	-	741
7	Net income	-	1 624

TABLE VII-20
AYIA MARINA DAM-DATA ON PROJECT FOR THE LAST TWO YEARS

Item No	Data	Unit	1981	1982	% Change on 1981
1	Capacity	1000 m^3	300	300	NIL
2	Water available in storage	"	464	331	-28.66
3	Water utilized for irrigation	"	396	290	-26.77
4	Water sold	"	396	290	-26.77
5	Water given free	"	NIL	NIL	NIL
6	Water used for recharge	"	NIL	NIL	NIL
7	Gross income	£	4 457	5 796	+43.47
8	Operation cost	£	3 197	3 431	+7.32
9	Maintenance cost	£	726	741	+2.07
10	Total expenses	£	3 923	4 172	+6.35
11	Net income	£	534	1 624	+204.12
12	Area irrigated	donums	484	325	-32.85

KALOPANAYIOTIS PROJECT

The Kalopanayiotis irrigation project consists of a dam reservoir of capacity 363,000 m^3 and a distribution system of closed conduits commanding an area of approximately 435 donums. Irrigation in the project area, started early in May 1982 and continued throughout the year until October 1982. During this period, a total quantity of 221,703 m^3 of water was used for the irrigation of an area of approx. 435 donums planted mainly with deciduous. All the water was sold to the farmers at a fixed rate of 20 mils/m^3, and the gross income was £4,434. The operation expenses were £3,678 while the maintenance cost spent on routine works and emergency repairs, was £809. The project accounts presented a loss of £53.

Project Hydrology

The project hydrologic data, as recorded during the year under review, are tabulated in Table VII-21. The dam scouring gate was opened in January 21st 1982 and it was closed in February the 18th 1982. Overflow over the spillway crest occurred two times. The first occurred during the period 1st to 20th January, 1982. The second lasted from March 16th until June 12th 1982. The smallest quantity ever remained in the reservoir during the irrigation season, was 68,000 m^3 and occurred in September, 1982.

TABLE VII-21
KALOPANAYIOTIS DAM HYDROLOGY FOR 1982

Item No.	Description	Qty m^3	% Storage capacity
1	Initial amount in storage	363 000	100.00
2	Inflow-Seepage	750 241	206.68
3	Total release	221 703	61.08
4	Leakages	150 000	41.32
5	Evaporation	36 406	10.03
6	Overflow	713 835	196.65
7	Final amount in storage	188 000	51.79
8	Minimum quantity in storage (Sept.)	68 000	18.73
9	Storage capacity.	363 000	100.00
10	Flow through scouring gate	360 131**	98.24

** The dam scouring gate was open from 21.1 to 18.2.1982

Water Utilization

During the year under review, a total quantity of 221,703 m^3 of water was utilized for the irrigation of 435 donums of deciduous plantations in the project area. The plantations are mainly apple, pear and peach trees. Part of the water utilized was taken from the seepage collected downstream in a collection weir. (See Table VII-22 for water utilization).

Water Sale, Income, Operation and Maintenance Costs

From the sale of water the gross income during the year under review, was £4,434. Operation expenses, including attendant and waterman wages and travelling costs, amounted to £3,678. Maintenance expenses

were £809. Net income to the project was £53 loss. Details on these are shown on Tables VII-24 and VII-25.

TABLE VII-22
KALOPANAYIOTIS DAM - WATER UTILIZATION

Item No.	Description	Qty m^3	% Storage capacity
1	Water used for irrigation.....	221 703	61.08
2	Water used for recharge.....	Nil	Nil
3	Total water utilized.....	221 703	61.08

TABLE VII-23
KALOPANAYIOTIS DAM CROPS IRRIGATED

Ser No.	Crop	Area Donums
1	Citrus.....	-
2	Bananas.....	-
3	Vines.....	-
4	Deciduous.....	435
5	Vegetables.....	-
6	Potatoes.....	-
7	Cereals.....	-
	Total.....	435

TABLE VII-24
KALOPANAYIOTIS DAM INCOME AND EXPENDITURE DATA

Item No.	Description	Qty m^3	Amount £
1	Water sold at nominal rates.....	221 703	4 434
2	Water sold at reduced rates.....	Nil	Nil
3	Water given free....	Nil	Nil
4	Total quantity utilized and gross income.....	221 703	4 434
5	Operation cost.....	-	3 678
6	Maintenance cost....	-	809
7	Net income.....	-	53

Project Operation Data for the last two years

Table VII-25 shows the operation data for the last two years. The amount of water utilized for irrigation, has increased by 7.25% where the area irrigated has remained the same. The increase was mainly due to the fact that the plantations grow in age, resulting to an increase in water demand.

The operational costs were up by 7.17% whereas the maintenance costs by 170.57%. The net income showed a decrease. This is mainly due to the high operational costs in the year under review. The water utilization in the project area seems satisfactory although further increase of the quantity utilized is expected.

TABLE VII-25
KALOPANAYIOTIS DAM-DATA ON PROJECT FOR THE LAST TWO YEARS

Item No	Data	Unit	1981	1982	% Change on 1981
1	Capacity.....	1000 m^3	363	363	NIL
2	Water available in storage.....	"	570	363	-36.32
3	Water utilized for irrigation..	"	207	222	+7.25
4	Water sold.....	"	207	222	+7.25
5	Water given free.....	"	NIL	NIL	NIL
6	Water used for recharge.....	"	NIL	NIL	NIL
7	Gross income....	£	3 722	4 434	+19.13
8	Operation cost..	£	3 432	3 678	+7.17
9	Maintenance cost.....	£	299	809	+170.57
10	Total expenses..	£	3 731	4 487	+20.26
11	Net income.....	£	-9	-53	-688.89
12	Area irrigated..	donums	435	435	NIL

KITI DAM

The Kiti Dam irrigation project consists of a dam reservoir of storage capacity 1,610,000 m^3 and a distribution system, made of open canals commanding an area of approximately 6,200 donums in the Kiti, Perivolia and Tersephanou villages. Inflow occurred on the 14th March 1982 only. A quantity of 100,000 m^3 was collected in the dam reservoir. On the 3rd of April the dam was dry. During 1982 no area of land was irrigated and no money was collected. The maintenance expenses were £400.

LEFKARA DAM

The Lefkara dam project is a dual purpose project, mainly for the supply of Domestic Water to Famagusta town and partly for the irrigation for agricultural land downstream of the dam. The project consists of (a) a dam reservoir whose capacity is 13.85 MCM (b) a distribution system (piped) for the supply of irrigation water to an area of approximately 615 donums, (c) a feeder pipeline, (d) a domestic water treatment plant near Khirokitia and (f) a pipeline to Famagusta town.

As a result of the Turkish invasion and the occupation of the Famagusta town, the reserved water for Famagusta has been utilized to supply water to the Larnaca and

Famagusta towns, other villages and refugee camps en route to Famgusta, whose population has been greatly increased or created accordingly from the refugees who were expelled from their villages and towns by the occupation army.

This part of the report will deal only with the dam reservoir and water utilization for irrigation and water supply in general, where details, regarding domestic water supply will be given in the section dealing with domestic water supply.

From the sale of irrigation water, the income amounts to £642. Maintenance works were carried out at a total cost of £1,183.

Project Hydrology

The project hydrologic data as recorded during the year under review are tabulated in Table VII-26.

The water in the dam reservoir did not reach spillway crest but remained much lower, with maximum quantity in storage around 4,850,000 m³ or 35,02% of the total capacity. The average inflow - seepage to the dam reservoir during the year, was estimated at 1,008,142 m³. The minimum water level reached, occurred in January with minimum quantity in storage estimated at 1,027,000 m³.

TABLE VII-26
LEFKARA DAM-HYDROLOGY FOR 1982

Item No.	Description	Qty m³	% Storage capacity
1	Initial amount in storage.....	4 850 000	35.02
2	Inflow-Seepage..	1 008 142	7.28
3	Total release...	4 500 905	32.50
4	Leakages.....	25 219	0.18
5	Evaporation.....	310 889	2.24
6	Overflow.....	Nil	Nil
7	Final amount in storage.....	1 027 000	7.42
8	Minimum quantity in storage (Dec.).....	1 027 000	7.42
9	Storage capacity.....	13 850 000	100.00

Water Utilization

As stated above the Project was constructed mainly for the supply of domestic water and to a less extent to provide irrigation water for an area of 615 donums downstream the dam structure. The water utilization for the three main categories of use is shown on Table VII-27.

TABLE VII-27
LEFKARA DAM-WATER UTILIZATION

Item No.	Description	Qty m³	% Storage capacity
1	Water used for domestic WS.....	4 436 749	32.03
2	Water used for irrigation.....	64 156	0.46
3	Total water utilized.....	4 500 905	32.50

Crops Irrigated

The distribution system of the Lefkara irrigation project is still under construction. However, there has been a relatively small agricultural activity in the area and during the year under review, a total of 130 donums of land has been irrigated by using 64,156 m³ of water. The area was planted with citrus, vegetables and olive trees as shown on Table VII-28.

TABLE VII-28
LEFKARA DAM-IRRIGATED CROPS

Ser No.	Crop	Area Donums
1	Citrus.....	100
2	Vegetables.....	20
3	Olive trees.....	10
	Total.....	130

Water Sale Income

The water was sold either for irrigation or domestic use at the fixed rates. Details on water sale for domestic purposes are given in the section on Domestic Water Supply. The irrigation water was sold at 10 mils/m³ and the total expected income from the sale of irrigation water amounted to £642.

TABLE VII-29
LEFKARA DAM-PROJECT OPERATION DATA FOR THE LAST TWO YEARS

Item No	Description	Unit	1981	1982	% change on 1981
1	Capacity.....	1000 m³	13 850	13 850	NIL
2	Water available...	"	7 828	5 522	-29.46
3	Water utilized for irrigation.....	"	43	64	+48.84
4	Water utilized for domestic WS.....	"	2 794	4 437	+58.80
5	Total water utilized.....	"	2 838	4 501	+58.60
6	Inflow-Seepage....	"	4 870	1 008	-79.30
7	Area irrigated....	donums	175	130	-25.71

Project Operation Data for the Last Two Years

From the table it is shown that the quantity

of water used for irrigation was increased by 48.84% and the domestic water supply by 58.80%.

MAVROKOLYMBOS PROJECT

The Mayrokolymbos dam irrigation project consists of a dam reservoir of capacity 2.180 MCM at spillway crest and a distribution system of canal and pipes commanding an area of around 3,555 donums. Irrigation in the project area commenced early in January 1982 and continued throughout the year and was terminated late in December.

During the period a total quantity of 1,744,025 m³ of water was utilized for the irrigation of 2,440 donums of bananas, vines and vegetables under cover and in the open. Of the 1,744,025 m³ utilized 1,644,025 m³ was sold at nominal rates. The rest 100,000 m³ was given free of charge to the Potima Chiflik farmers as water rights. Of the 1,744,025 m³ a quantity of 628,359m³ were released from the dam and the rest 1,115,666 m³ were bought from Paphos Project.

The total gross income from the sale of water amounted to £10,567 where the operation cost amounted to £14,143. The maintenance expenses were £1,840. A deficit of £5,416 was observed for the year under review.

Project Hydrology

The project hydrologic data as recorded during the year under review are tabulated on Table VII-30.

TABLE VII-30
MAVROKOLYMBOS DAM HYDROLOGY FOR 1982

Item No.	Description	Qty m³	% Storage capacity
1	Initial amount in storage.....	325 000	14.91
2	Inflow-Seepage....	376 714	31.04
3	Total release.....	628 359	28.82
4	Leakages.....	Nil	Nil
5	Evaporation.....	58 816	2.70
6	Overflow.....	Nil	Nil
7	Final amount in storage.....	190 000	8.72
8	Minimum quantity in storage (July).	120 000	5.50
9	Storage capacity..2	180 000	100.00

Water Utilization and Crops Irrigated

During the irrigation season a total of 1,744,025 m³ of water was utilized for the irrigation of 2,440 donums of various crops as shown on Table VII-32.

TABLE VII-31
MAVROKOLYMBOS DAM-WATER UTILIZATION

Item No.	Description	Qty m³	% Storage Capacity
1	Water used for irrigation from dam.....	628 359	28.82
2	Water used for irrigation bought from Paphos Project..	1 115 666	51.18
3	Water used for recharge.....	Nil	Nil
4	Total water utilized.....	1 744 025	80.00

TABLE VII-32
MAVROKOLYMBOS DAM - CROPS IRRIGATED

Ser No.	Crop	Area Donums
1	Citrus.....	120
2	Bananas.....	1 000
3	Vines.....	40
4	Deciduous.....	50
5	Vegetables.....	600
6	Potatoes.....	300
7	Cereals.....	Nil
8	Others.....	330
	Total.....	2 440

Water Sale, Income, Operation and Maintenance Costs

From the sale of water the gross income was £10,567. The water sold from the dam reservoir was at nominal rates of 20 mils/m³. The operation expenses amounted to £14,143 where the maintenance works costs were £1,840. Net income to the project was a loss of £5,416. Details regarding the income expenditure and operation costs are shown on Table VII-33.

Project Performance For The Last Two Years

Table VII-34 shows data on the operation of the project for the last two years. The

operation expenses were up by 42.63% while maintenance expenses were down by 31.73%. The net income to the project is a loss of £5,416 while last year there was a profit of £8,921.

TABLE VII-33
MAVROKOLYMBOS DAM-INCOME AND EXPENDITURE DATA

Item No.	Description	Qty m³	Amount £
1	Water sold at nominal rates.....	528 359	32 880
2	Water sold at increased rates....	Nil	Nil
3	Water given free of charge.....	100 000	Nil
4	Total quantity utilized and gross income.....	628 359	10 567
5	Operation cost.....	-	14 143
6	Maintenance cost...	-	1 840
7	Net income.....	-	-5 416

TABLE VII-34
MAVROKOLYMBOS DAM-DATA ON PROJECT FOR THE LAST TWO YEARS

Item No	Data	Unit	1981	1982	% change on 1981
1	Capacity.....	1000 m³	2 180	2 180	NIL
2	Water available in storage.....	"	2 041	943	-53.80
3	Water utilized for irrigation...	"	1 731	628	-63.72
4	Water sold.....	"	1 531	528	-65.51
5	Water given free.	"	200	100	-50.00
6	Water used for recharge.....	"	NIL	NIL	NIL
7	Gross income.....	£	21 532	10 567	-50.92
8	Operation cost...	£	9 916	14 143	+42.63
9	Maintenance cost.	£	2 695	1 840	-31.73
10	Total expenses...	£	12 611	15 983	+26.74
11	Net income.....	£	8 921	-5 416	-160.71
12	Area irrigated...	donums	2 650	2 440	- 7.92

POMOS PROJECT

The Pomos irrigation project consists of a dam reservoir of maximum capacity at spillway crest of 860,000 m³ of water and a distribution system made of a main canal and a closed type distribution system commanding an area of 2,850 donums.

Irrigation in the project area started early in January 1982 and continued throughout the year until mid December 1982.

An area of 990 donums of land planted with citrus, bananas and vegetables was irrigated by utilizing 913,968 m³ of water. From the total water utilized 872,251 m³ were taken directly from the dam reservoir whereas the remaining 41,717 m³ were taken from the overflow.

The total gross income from the sale of water amounted to £17,862. The expenditure for the maintenance was £1,116 whereas the operation and management costs were £12,046. Net income to the project for the year under review was £4,700.

Project Hydrology

The project hydrologic data as recorded during the year are tabulated in table VII-35.

The reservoir was filled to spillway crest on March the 15th and overflow occurred during the period March the 15th to April 16th 1982. Minimum water level in the reservoir occurred in December with water in storage around 25,000 m³.

TABLE VII-35
POMOS DAM-HYDROLOGY FOR 1982

Item No	Description	Qty m³	% Storage capacity
1	Initial amount in storage.....	183 500	21.34
2	Inflow-Seepage....	982 629	114.26
3	Total release.....	872 251	101.42
4	Leakages.....	109 702	12.76
5	Evaporation.....	63 366	7.39
6	Overflow.....	not measured	-
7	Final amount in storage.....	79 545	9.25
8	Minimum quantity in storage (Dec.).....	25 000	2.91
9	Storage capacity..	860 000	100.00

Water Utilization and Crops Irrigated

The 913,968 m³ of water were utilized for the irrigation of 990 donums within the project area. Details about the water utilized and the crops irrigated are shown on Tables VII-36 and VII-37.

TABLE VII-36
POMOS DAM-WATER UTILIZATION

Item No.	Description	Qty m³	% Storage capacity
1	Water used for irrigation.....	913 968	101.42
2	Water used for recharge.....	Nil	Nil
3	Total water utilized.....	913 968	101.42

TABLE VII-37
POMOS DAM - CROPS IRRIGATED

Item No.	Crop	Area donums
1	Citrus.....	650
2	Bananas.....	250
3	Vines.....	Nil
4	Deciduous.....	15
5	Vegetables.....	20
6	Potatoes.....	Nil
7	Cereals.....	30
8	Others.....	25
	Total.....	990

TABLE VII-38
POMOS DAM-INCOME AND EXPENDITURE DATA

Item No.	Description	Qty m^3	Amount £
1	Water sold at nominal rates.....	872 251	17 445
2	Water sold at reduced rates.....	41 717*	417
3	Water given free of charge.....	Nil	Nil
4	Total quantity utilized and gross income.....	913 968	17 862
5	Operation cost.....	-	12 046
6	Maintenance cost.....	-	1 116
7	Net Income.....	-	4 700

* This quantity was taken from the overflow.

Water Sale, Income, Operation and Maintenance Costs

From the sale of water (see details on Table VII-38) the total gross income amounted to £ 17,862 whereas the operation and management costs were £12,046. Maintenance works on the dam and distribution system were £1,116. Net income to the project for the year under review amounted to £4,700.

Project Performance Data for the Last Two Years

Table VII-39 shows data regarding hydrology, water utilization, water sales, gross income, operation, maintenance costs, net income and areas irrigated for the last two years.

The last column of the table shows the change in percentages of the quantities of 1982 over the previous year.

The quantity of water utilized for irrigation was decreased by 4.59% while the gross income was increased 92.79%. The area irrigated was increased by 11.36%.

The operational costs were increased by 46.99% while the maintenance costs were decreased by 10.72%. Total expenses were up by 39.35%. However in this year a profit of £4,700 was presented by the project whilst last year there was a loss of £180.

TABLE VII-39
POMOS DAM-DATA ON PROJECT FOR THE LAST TWO YEARS

Item No	Data	Unit	1981	1982	% change on 1981
1	Capacity.....	1000 m^3	860	860	NIL
2	Water available in storage.....	"	1 096	1 035	-5.57
3	Water utilized for irrigation.	"	958	914	-4.59
4	Water sold.....	"	958	914	-4.59
5	Water given free.....	"	NIL	NIL	NIL
6	Water used for recharge.....	"	NIL	NIL	NIL
7	Gross income...	£	9 265	17 862	+92.79
8	Operation cost.	£	8 195	12 046	+46.99
9	Maintenance cost.....	£	1 250	1 116	-10.72
10	Total expenses.	£	9 445	13 162	+39.35
11	Net income.....	£	-180	4 700	+2711.36
12	Area irrigated.	donums	889	990	+11.36

YERMASOYIA-POLEMIDHIA PROJECT

The Yermasoyia-Polemidhia Irrigation Project consists of the Yermasoyia dam, the reservoir of which has a capacity of 13.5 MCM and the Polemidhia dam with reservoir capacity in the order of 3.43 MCM. The distribution system of the project consists of closed conduits now commanding an area of about 15,440 donums.

The water in the dam reservoir did not reach spillway crest but it remained much lower with maximum quantity in storage for Yermasoyia dam 11,144,000 m^3 and for Polemidhia dam 2,045,000 m^3.

Irrigation in the project area started early in January 1982 and continued throughout the year until late in December 1982. A total quantity of 9,553,767 m^3 of water was released from both dams (7,595,065 m^3 from Yermasoyia dam and 958,702 m^3 from Polemidhia dam). A quantity of 7,010,212 was used for the irrigation of 15,440 donums (partial or full) in the Zakaki, Phasouri, Akrounda-Phinikaria areas and Yermasoyia and Polemidhia Irrigation Divisions. Of the 7,010,212 m^3 of water, 431,840 m^3 were given free of charge as water rights to the Yermasoyia and Polemidhia Irrigation Divisions

(350,000 m³ for Yermasoyia and 81,840 for Kato Polemidhia) and the rest 6,578,372 m³ were sold at the nominal rates (25 mils/m³). A quantity of 1,983,430 m³ was used for recharge of the Yermasoyia and Garyllis aquifers downstream the dam structures. These aquifers are pumped for the supply of water for domestic use for the Limassol town, the Moutayiaka Regional water supply scheme and for irrigation in the Zakaki area. A quantity of 560,000 m³ was lost in the pipe system.

The total gross income from the sale of water amounted to £170,054. The operating costs including power expenses amounted to £83,262. The maintenance works carried out by the WDD were of the order of £11,716. Net income to the project was £75,076.

Project Hydrology

The project hydrologic data as recorded during the year under review are tabulated in the following tables. The data for each dam reservoir are given separately.

POLEMIDHIA DAM

The inflow-seepage to the Polemidhia dam during the year under review totalled 894,170 m³ representing 26.07% of the reservoir capacity. The reservoir did not fill to spillway crest but it remained much lower with maximum quantity in storage around 2,054,000 m³ on the 12th April 1982. Leakages occurred through the dam and part of these were intercepted downstream for irrigation purposes. Releases from the dam reservoir were 958,702m³.

TABLE VII-40
POLEMIDHIA DAM-HYDROLOGY FOR 1982

Item No.	Description	Qty m³	% Storage capacity
1	Initial amount in storage.....	1 512 000	44.08
2	Inflow-Seepage...	894 170	26.07
3	Total release....	958 702	27.95
4	Leakages.....	629 795	18.36
5	Evaporation.....	213 672	6.23
6	Overflow.....	Nil	Nil
7	Final amount in storage.....	602 000	17.55
8	Minimum quantity in storage (Dec.).....	598 000	17.43
9	Storage capacity.	3 430 000	100.00

YERMASOYIA DAM

The inflow-seepage to the dam during the year under review was estimated at 4.887 MCM mostly occurring in the months of January to April and in November and December. The dam reservoir was not filled up the spillway crest but it remained much lower with maximum quantity in storage around 11.152 MCM on the 21st April 1982.

TABLE VII-41
YERMASOYIA DAM-HYDROLOGY FOR 1982

Item No.	Description	Qty m³	% Storage capacity
1	Initial amount in storage.....	7 550 000	55.92
2	Inflow-Seepage..	4 886 853	36.20
3	Total release...	7 595 065	56.26
4	Leakages.....	9 195	0.07
5	Evaporation.....	938 614	6.95
6	Overflow.....	Nil	Nil
7	Final amount in storage.....	2 884 000	21.36
8	Minimum quantity in storage (Dec.).....	2 812 000	20.83
9	Storage capacity	13 500 000	100.00

Water Utilization from both Dams

Details regarding water utilization from both dams separately and in combine are shown on Tables VII-42, VII-43 and VII-45. In summary during the year under review a total quantity of 8,993,642 m³ of water was utilized for irrigation and recharge purposes. Out of this quantity 7,010,212 m³ was utilized for the irrigation (fully or in part) of 15,440 donums as indicated in Table VII-44. The rest 1,983,430 m³ was utilized to recharge the Garyllis and Yermasoyia aquifers.

TABLE VII-42
POLEMIDHIA DAM
WATER UTILIZATION

Item No.	Description	Qty m³	% Storage capacity
1	Water used for irrigation.....	958 702	27.95
2	Water used for recharge.....	Nil	Nil
3	Total water utilized.....	958 702	27.95

TABLE VII-43
YERMASOYIA DAM
WATER UTILIZATION

Item No.	Description	Qty m^3	% Storage capacity
1	Water used for irrigation.....	6 611 635	42.98
2	Water used for recharge.....	1 983 430	14.69
3	Total water utilized.....	8 595 065	63.67

TABLE VII-44
YERMASOYIA-POLEMIDHIA PROJECT-IRRIGATED CROPS

Ser No	Crop	Area Donums
1	Citrus.....	7 256
2	Vines.....	3 856
3	Deciduous.....	130
4	Vegetables.....	4 178
5	Olive trees.....	20
	Total.....	15 440

TABLE VII-45
YERMASOYIA-POLEMIDHIA PROJECT
WATER UTILIZATION

Ser No	Description	Qty m^3	% Storage capacity
1	Water used for irrigation (Y&P).	7 010 212	41.41
2	Water used for recharge.....	1 983 430	11.71
3	Total water utilized.....	8 993 642	53.12
4	Water lost in pipe system.....	560 000	3.31

Water Sale, Income, Operation and Maintenance Costs

Details about the quantity sold at the nominal rates, water given free of charge as water rights and the water given at reduced rates are given in Table VII-46.

From the sale of water the total gross income was £170,054. The operation cost including power cost totalled £94,978 where the maintenance costs spent on routine works was £11,716. Details regarding income and expenditure are shown on Table VII-46.

TABLE VII-46
YERMASOYIA-POLEMIDHIA PROJECT
INCOME & EXPENDITURE DATA

Ser No	Description	Qty m^3	Amount £
1	Water sold at nominal rates...	6 578 372	170 054
2	Water sold at reduced rates...	Nil	Nil
3	Water given free of charge as water rights to: -Yermasoyia Irrig. Division.	350 000	Nil
	-Polemidhia Irrig. Division.	81 840	Nil
4	Total quantity/ income.....	7 010 212	170 054
5	Operation cost..	-	55 200
6	Power cost.....	-	28 062
7	Maintenance cost (Yermasoyia & Polemidhia).....	-	11 716
8	Total cost.....	-	94 978
9	Net income.....	-	75 076

Project Operation Data for the last two Years

Table VII-47 gives details regarding the operation for the last two years. The last column shows the fluctuations of the various data of the Project Operation. The net return is increased due to the fact that the rate of sale of water was increased.

TABLE VII-47
YERMASOYIA-POLEMIDHIA PROJECT - DATA ON PROJECT FOR THE LAST TWO YEARS

Item No	Description	Unit	1981	1982	% Change on 1981
1	Capacity.....	1000 m^3	16 930	16 930	NIL
2	Water available..	"	24 854	13 052	-47.49
3	Water utilized for irrigation...	"	8 565	7 010	-18.16
4	Water sold.....	"	7 670	6 578	-14.24
5	Water given free.....	"	895	432	-51.73
6	Water used for recharge.....	"	9 026	1 983	-78.03
7	Total quantity used.....	"	17 591	8 993	-48.88
8	Gross income.....	£	97 452	170 054	+74.39
9	Operation cost...	£	46 674	55 200	+18.27
10	Power cost.....	£	26 528	28 062	+5.78
11	Maintenance cost.	£	13 593	11 716	-0.14
12	Total expenditure	£	86 725	94 978	+9.52
13	Net income.....	£	10 657	75 076	+604.48
14	Area Irrigated...	donums	15 440	15 440	NIL

PAPHOS IRRIGATION PROJECT

The Paphos Irrigation Project is the largest and most important project of its kind ever undertaken in Cyprus.

Construction of the civil works commenced in 1976 and it is expected to be completed by the end of 1983.

The Project consists of the Asprokremmos dam of maximum capacity at spillway crest of 51.00 MCM and a wellfield (24 nos boreholes) both sources of total annual safe yield of 32.00 MCM with a reliability of supply well above 92%. The Project area is a coastal strip some 38 km long by 3 to 4 km wide with the town of Paphos at its centre. The total area commanded by the project is 35,000 donums. The distribution system is made of canals and pipes and it is the first project on the island to operate on the "on demand" mode. The dam was completed by the end of February 1982 and the first flow into the dam was recorded on the 1st of March 1982. The water quantity for irrigation was that from the dam, the boreholes and the diversion from the Dhiarizos river.

Irrigation in the project area started in March 1982 and was completed late in December 1982. During this period a quantity of 9.401 MCM of water was utilized for the irrigation of 13,536 donums of land, planted with various crops. Also another 0.665 MCM was used for recharge and 0.356 MCM was given for industrial purposes. In brief the water was utilized as shown on Table VII-50. The crops irrigated were citrus, vegetables etc. as shown on Table VII-51.

The operation and maintenance of the project is the responsibility of the WDD. From the sale of water with prices fixed at 20 mils/m³ for irrigation, the income for 1982 is around £198,707. The operation and maintenance expenses amounted to £74,026 and the power cost to £179,641. Total annual cost amounted to £253,667.

Project Hydrology & Water Resources

A quantity of water of the order of 11,698,800 m³ was taken from the Asprokremmos dam, the boreholes and the river diversion as shown on Table VII-48.

Water Utilization and Crops Irrigated

From the water developed, about 1,276,650 m³ were lost in the canal system, 665,000 m³ were released for recharge and the remainder was used for the irrigation of 13,536 donums planted with various crops and for industrial use as shown on Table VII-51 (See Table VII-50 for water utilization).

TABLE VII-48
PAPHOS PROJECT-WATER RESOURCES

Item No	Sources	Quantity m³
1	Asprokremmos Dam.....	4 600 000
2	Boreholes in Dhiarizos river.....	5 203 800
3	Surface flow diversion from Dhiarizos river.....	1 895 000
	Total.....	11 698 800

TABLE VII-49
ASPROKREMMOS DAM-HYDROLOGY FOR 1982

Item No.	Description	Qty m³	% Storage capacity
1	Initial amount in storage.....	-	-
2	Inflow-Seepage..	7 621 144	14.9
3	Total release...	4 600 000	9.0
4	Leakages.....	not available	-
5	Evaporation.....	921 144	1.80
6	Overflow.....	Nil	Nil
7	Final amount in storage.....	2 100 000	4.12
8	Minimum quantity in storage (Mar.).....	304 000	0.59
9	Storage capacity.....	51 000 000	100.00

TABLE VII-50
PAPHOS IRRIGATION PROJECT-WATER UTILIZATION

Item No	Description	Qty m³
1	Water used for irrigation.	9 400 707
2	Water used by industries..	356 447
3	Water used for recharge...	665 000
4	Total water utilized.....	10 422 150
5	Total water lost.....	1 276 650
6	Total water delivered from headworks.....	11 698 800

Water Sale, Income, Operation and Maintenance Costs

The project yield was around 11.699 MCM out of which 9.401 MCM was used for irrigation, 0.665 MCM was used for recharge and 0.356 MCM were used for industrial purposes. The irrigation water was sold at 20 mils/m³ whereas the industrial water was sold at mils/m³.

From the sale of water the total income amounted to £198,707, whereas the operation and maintenance costs were £253,667. Details are shown on Table VII-52.

Project Operation Data for the Last two Years

Table VII-53 gives details regarding the operation and maintenance for the last two years. The last columns show the percentage variation of this data with respect to 1981 figures.

TABLE VII-51
PAPHOS IRRIGATION PROJECT - CROPS IRRIGATED

Ser No	Crop	Area donums
1	Citrus.....	2 415
2	Bananas.....	379
3	Vines.....	1 025
4	Deciduous.....	-
5	Vegetables.....	1 575
6	Potatoes.....	2 184
7	Cereals.....	-
8	Avocados.....	-
9	Alfa-alfa.....	-
10	Ground-nuts.....	3 113
11	Beans.....	2 845
	Total.....	13 536

TABLE VII-52

PAPHOS IRRIGATION PROJECT-INCOME AND EXPENDITURE DATA

Item No	Description	Qty m^3	Amount £
1	Water delivered from Headworks...	11 698 800	-
2	Water pumped from pumping station.....	10 955 550	-
3	Water sold for irrigation.....	9 400 707	188 707
4	Water sold for industrial use...	356 447	10 693
5	Operation cost...	-	18 959
6	Maintenance cost.	-	55 067
7	Pumping cost.....	-	179 641
8	Total annual cost.....	-	253 667
9	Net Income.....	-	54 960

In addition to the above areas a further 2,000 donums of land commanded by Mavrokolymbos dam have been irrigated with supplies from the project western main conveyor.

From the above table it is seen that the income from the sale of water did not compensate for the annual cost of operation and maintenance of the project.

TABLE VII-53
PAPHOS PROJECT-DATA ON OPERATION FOR THE LAST TWO YEARS

Item No	Description	Unit	1981	1982	% change on 1981
1	Yield.....	1000 m^3	10 000	32 000	+220.0
2	Water available..	"	10 000	11 699	+17.0
3	Water utilized...	"	6 914	10 422	+50.7
4	Water sold for irrigation.....	"	5 080	9 401	+85.1
5	Water sold for industrial use...	"	561	356	-36.5
6	Total water sold.	"	5 641	9 757	+73.0
7	Gross income.....	£	93 028	198 707	+113.6
8	Operation cost...	£	11 000	18 959	+72.4
9	Maintenance.....	£	27 775	55 067	+98.3
10	Power cost.....	£	86 928	179 641	+106.6
11	Total cost.....	£	125 703	253 667	+101.8
12	Net income.....	£	-32 675	-54 960	-68.2
13	Area Irrigated...	donums	9 750	13 536	+38.8

ATHALASSA PROJECT

The Athalassa Project consists of a storage dam built, to prevent flooding of the Athalassa Government Farm and for supplying water for the needs of the Government farm in the area. The dam at spillway crest has a capacity of 0.79 MCM and the distribution system commands an area of 310 donums belonging to the A R I and the Department of Agriculture Farm. The distribution system is made of pipelines. The Project is operated by the Department of Agriculture Farm in the area. During the year under review the dam was dry, so no irrigation took place. Maintenance cost £80.

KHAPOTAMI PROJECT

The Khapotami irrigation project consists of a diversion weir and a diversion pipeline capable of diverting a flow of 500 cubic meters/hour when the Khapotami river is flowing in the months January-June. The project is supplying water in bulk during the winter, spring and early summer months, to the Pissouri and Alektora Irrigation Divisions. The area commanded by both irrigation divisions is around 4,235 donums, 3,000 donums in the Pissouri Irrigation Division and 1,235 donums in the Alektora Irrigation Division. In both cases the area to be irrigated is planted totally with vines.

Based on the existing water resources for each of the two irrigation divisions and having in mind the area served by each irrigation division, water is allocated as follows:

- If the works divert only 225 m^3/hr the water will be given in total to the Pissouri Irrigation Division
- If the works divert more than 225 m^3/hr but less than 325 m^3/hr the 225 m^3/hr will be diverted to the Pissouri Irrigation Division and the remaining to the Alektora Irrigation Division.
- If the works divert a flow of more than 325 m^3/hr then the water will be allocated as follows:-

a. 225 m^3/hr to Pissouri Irrigation Division.
b. 100 m^3/hr to Alektora Irrigation Division.
c. The remaining flow will be divided between the two irrigation divisions at a ratio of 3:1 (3 parts to the Pissouri Irrigation Division and 1 part to the Alektora Irrigation Division).

During the year under review the diversion of water started early in January 1982 and was completed in June 1982 when the river flow diminished. In this period a total of 1,006,000 m^3 of water was utilized for the supplementary irrigation of 4,235 donums of land planted with vines.

KHRYSOKHOU VALLEY PROJECT

The Khrysokhou valley project consists of five boreholes equipped with electrosubmersible pumps, from balancing reservoirs and a distribution system made of pipes commanding an area of 1770 donums. The Project is situated in the Paphos District Polis region in the Khrysokhou river valley and was completed in June 1981.

Irrigation in the project area started in June and continued through the year until November 1982. During this period a total quantity of 274,376 m^3 of water was utilized by the farmers and the income, at 25 mils/m^3, amounted to £6,859. The operation and maintenance expenses including pumping cost amounted to £13,647. This shows that the running costs of the project are not recovered by the income from the sale of water and an annual deficit of £6,788 was observed.

Out of the 1,770 donums commanded by the distribution system only an area of 469 donums was irrigated as shown on Table VII-54.

TABLE VII-54
KHRYSOKHOU VALLEY PROJECT - CROPS AND AREA IRRIGATED

Ser No	Crop	Area Donums
1	Citrus.....	144
2	Bananas.....	-
3	Vines.....	8
4	Deciduous.....	-
5	Potatoes.....	-
6	Cereals.....	-
7	Avocatos.....	13
8	Vegetables.....	65
9	Olives.....	71
10	Tobacco.....	120
11	Others.....	48
	Total.....	469

AYIOS THEODHOROS SCHEME (LARNACA)

The Ayios Theodhoros Scheme consists of one borehole equipped with a mechanically driven pump, a regulating concrete dam and a distribution system made of pipes commanding an area of approximately 460 donums. The scheme is situated in the Larnaca District on the Pendaskinos River and was completed in 1980. This scheme was turned over to the irrigators for the operation and maintenance. This was done because of the small size of the scheme and the limited quantities of water pumped.

In the year reviewed the scheme was in operation from August to October during which period a total quantity of 30,990 m^3 was pumped and used for irrigation. All the expenses for the operation and maintenance of the scheme were undertaken by the irrigators. The area irrigated was around 233 donums planted mainly with citrus.

MAINTENANCE DETAILS

During the year under review the maintenance works carried out on each individual Project are summarized below. All costs were charged to Head 20 - Subhead 244 "Maintenance of Dams and Distribution Systems".

Government Projects
Irrigation Works

ARGAKA DAM

Cleaning of embankment from wild vegetation, painting of all metal structures, repairing of bridge. Replacing of 24 No. 2" Ø sluice

valves, painting of all manhole covers, repairing of 2 No. breakages of irrigation main, repairing of 5 No. irrigation meters and maintaining of all sluice valves.
Total expenditure: £880

AYIA MARINA DAM

Cleaning of embankment from wild vegetation repairing and painting of guard house. Painting of all metal structures, replacing of 8 No., 3" Ø sluice valves.
Total expenditure: £741.

ATHALASSA DAM

Cleaning of spillway from rubble piles.
Total expenditures: £80.

KALOPANAYIOTIS DAM

Cleaning of collector weir, painting of guard house inside out including woodwork. Treating of woodwork of bridge with solignum. Painting of store room.

Repairing of 3 No. break pressure valves, painting of manhole covers and other metal structures, repairing of breakages of irrigation main. Treating with Evode 505 of all valves.
Total expenditure £809.

KITI DAM

Treating of metal structures with Evode 505 (gate turret, pipings of hydraulic system, sluice valves in control room etc). Painting of manhole covers, constructing and replacing of 25 No. irrigation gates.
Total expenditure £536.

LEFKARA DAM

Total flooring of guard house with mosaic tiles. Painting of metal structures in inclined gallery, repairing of breakages on irrigation main, removal and replacing via other route 73m of the water supply main. Cleaning of crest near left abutment from avalanched soil and rocks repairing of electric circuity in gallery and shaft.
Total expenditure £1183 (20A/16/244)

MAVROKOLYMBOS DAM

Removal of wild vegetation from embankment and drains. Fencing of guard house. Repairing of joints of canals, cleaning of canals. Slabbing of 20m of canal. Repairing of 8 No. breakages of irrigation main, replacing of 3 No., 4" Ø S.V., maintaining of S Vs, and irrigation meters, painting of manhole covers.
Total expenditure £1840.

POMOS DAM

Cleaning of embankment from wild vegetation, painting of bridge and guard house, repairing of plumbing of guard house, cleaning of canals and repairing of joints, replacing of 15 No. 3"Ø S.V. and repairing and maintaining of the remaining sluice valves.
Total expenditure £1116.

YERMASOYIA AND POLEMIDHIA DAMS

POLEMIDHIA DAM: Constructing of housing of engine of gate, treating with solignum of woodwork of bridge, maintaining of diesel engine of gate, painting of metal structures, painting of woodwork of guard-house, cleaning of spillway and filling of joints with flintkote. Cleaning of embankment and guard house yard from wild vegetation.

YERMASOYIA: Repairing and painting of woodwork of guard house and engine room. Cleaning of gallery and spillway and filling of joints with flintkote. Maintaining of diesel engine of gate winch. Repairing of gate lift indicator, treating of lining of gallery and spillway gates with Evode 505. Replacing of steel wire of gates and cleaning of embankment.

DISTRIBUTION SYSTEM : Repairing of 151 No. irrigation meters, 565 No. sluice valves, 31 No. breakages of irrigation mains, 13 No. air valves and one main float valve. Painting of all manhole covers and pipe accessories.
Total expenditure £11716.

Recharge Works

FAMAGUSTA RECHARGE

Repairing of embankments of two recharge dams at Phrenaros (Livadoudia Dam) and Dherinia (Vathys Loukkos Dam).
Total expenditure £957.

Contributory Irrigation Projects (Advances)

LEFKA-KAFIZES (Special Case)

Repairing of irrigation main.
Total expenditure £124.

PALEKHORI DAM

Laying of 61m x 3" Ø G.I. secondary line at Katemitika locality and crossing of river. Repairing of breakage of 8" Ø Maroullena main pipeline.
Total expenditure £375
Village Share £125
Govt. Share £250

VIII RURAL PROJECTS PLANNING DIVISION

by
C Andreou
Senior Water Engineer
Head of Division

Introduction

The Rural Projects Planning Division is dealing especially with rural domestic water supply and the planning and design of contributory irrigation schemes. Other activities of the Division is the rehabilitation of water supply and irrigation schemes, within the Pitsilia Integrated Rural Development Project, water supply schemes of touristic and livestock areas, encroachment in rivers and streams, quarrying in river beds, design of sewerage systems for Refugee Housing Estates, the administration of capital aid from the Federal Republic of Germany, and the examination of applications for building permits and permits for the division of building plots.

By the end of 1982 the staff of the Division was consisting of the following:

1 Senior Water Engineer - Head of the Division
1 Executive Engineer I
1 Senior Technical Superintendent
2 Senior Technicians
7 Technicians I
1 Hourly paid Technician
1 Secretary - Typist

VILLAGE WATER SUPPLY SCHEMES

The general village water supply situation during 1982 is described in Tables VIII-1 and VIII-2. There are no villages in Cyprus without piped water.

During 1982 only 58 out of a total number of 619 villages remained with public fountains i.e. 1.94% of the total village population.

Out of 561 villages with house to house supply systems 526 enjoyed a per capita daily rate of over 90 litres (20 gallons).

Water Supply Schemes Prepared During 1982

A total number of 68 schemes were prepared and submitted to the District Officers during 1982, at a total estimated cost of £1,477,924 as shown on Table VIII-3.
Another 54 schemes were in the course of preparation by the end of the year as per Table VIII-4.

Besides the above mentioned schemes a total number of 22 water supply schemes were prepared for the housing of desplaced persons (Refugee self-housing and housing estates), at a total estimated cost of £184,750 as per Table VIII-3A, which were submitted to the Department of Town Planning and Housing.

Domestic water supply schemes for livestock areas, and touristic ones are also included in the schemes already mentioned.
In cases where there are no established

TABLE VIII-1
VILLAGE WATER SUPPLIES

Year	Villages with House-to-House distribution system: Schemes completed	Total No. of villages	Villages %	Population %	Village with Public Fountains: Total No. of villages	Villages %	Population %	Total No. of villages	Village without a piped supply: Villages %	Population %	Total No. of villages
1960	-	90	14.33	-	441	70.23	-	97	15.44	-	628
1961	41	131	20.86	-	428	68.19	-	69	10.95	-	628
1962	59	190	30.25	-	380	60.55	-	58	9.20	-	628
1963	67	257	40.90	-	324	51.60	-	47	7.50	-	628
1964	39	296	47.13	66.71	323	51.43	32.29	9	7.44	1.00	628
1965	5	301	47.93	68.86	321	51.11	30.44	6	0.96	0.70	628
1966	7	308	49.05	69.81	316	50.31	29.95	4	0.64	0.24	628
1967	11	319	50.80	71.40	307	48.88	28.46	2	0.32	0.14	628
1968	27	346	55.10	75.72	282	44.90	24.28	-	-	-	619
1969	14	360	57.32	78.60	268	42.68	21.40	-	-	-	619
1970	32	392	62.42	83.23	236	37.58	16.77	-	-	-	619
1971	16	408	64.95	85.42	220	35.05	14.58	-	-	-	619
1972	29	437	69.60	88.70	191	30.40	11.30	-	-	-	619
1973	67	504	81.40	95.10	115	18.60	4.90	-	-	-	619
1974	22	526	85.00	97.20	93	15.00	2.80	-	-	-	619
1975	6	532	85.94	97.55	87	14.06	2.45	-	-	-	619
1976	11	543	87.72	97.60	76	12.28	2.40	-	-	-	619
1977	8	551	89.02	98.04	68	10.98	1.96	-	-	-	619
1978	6	557	89.98	98.20	62	10.02	1.80	-	-	-	619
1979	2	559	90.30	98.27	60	9.70	1.73	-	-	-	619
1980	1	560	90.47	98.04	59	9.53	1.96	-	-	-	619
1981	1	561	90.63	98.06	58	9.37	1.94	-	-	-	619
1982	-	561	90.63	98.06	58	9.37	1.94	-	-	-	619

Water Boards the Division is dealing also with the design of town water supply schemes.

Brief Description of Important Water Supply Schemes Prepared During 1982

Kokkini Trimithia: Supplementary supply from BH 31/81. Total estimated cost £29,000

Klirou: Supplementary supply from BH Hydr. No 1 and extension of the distribution network. Total estimated cost £46,600.

Kapedhes: Supplementary supply from BH 42/81. Total estimated cost £21,000.

Pyla: Supplementary supply from Khirokitia-Famagusta pipeline at a total estimated cost of £12,500.

Ormidhia - Xylophaghou: Supplementary supply from Khirokitia-Famagusta pipeline at a total estimated cost of £230,000.

Akhna Forest: New elevated storage tank and new distribution system for this Refugee self-housing estate at a total estimated cost of £44,000.

IRRIGATION SCHEMES

The planning and design of irrigation schemes aims at increasing the irrigated area near the sources for self employed farming organizations such as Village Irrigation Associations or Divisions.

Paramytha-Palodhia-Spitali: Supplementary supply from BH 8/82 at an estimated cost of £72,910.

Trimiklini: Supplementary supply from Arkolakhania spring at an estimated cost of £39,400.

Paphos Water Supply: Scheme for the increase of the flow from Anarita balancing tank to the town and the improvement of the distribution system of Kato Paphos quarter, at an estimated cost of £290,400.

Polis-Prodhromi: Extension of the distribution system to convey sufficient quantity of water to Lachi area for touristic development, at an estimated cost of £66,300.

The main target is to increase permanent irrigation annually which can be implemented with the financial participation by the farmers.

As the main principles of this special programme is the quick and effective use of water at or near the source combined with intensive agriculture methods, design considerations are usually based on land and water use data furnished by the District Agricultural Officers. Project evaluation is undertaken by a Joint Interdepartmental Committee.

The advantages of the rural projects programme, the beginning of which dates back to the creation of the Department is "speed of reaction" in all phases of project development, "wide participation" of farming communities, "greater flexibility" in budgetary procedure and "greater exploitation" of the existing agriculture and agroeconomic background of the island.

The planning and design of these schemes can be undertaken at a greater advantage by technical staff, whose skill has been acquired by long experience in construction methods and long friction with local problems and practices.

The main types of schemes planned and designed, postulated water conservation either by the improvement of the old obsolete intake and distribution system, the construction of small reservoirs for night or seasonal storage, the exploitation of new boreholes and the artificial recharge of depleted aquifers.

A certain number of schemes have been designed and are now under construction with government contribution.

During 1982 a total number of 27 irrigation schemes was prepared and submitted to District Officers at a total estimated cost of £1,618,600 as per Table VIII-5.

Another 39 schemes were in the course of preparation or under investigation by the end of 1982 as per Table VIII-7.

Brief Description of Some Important Irrigation Schemes prepared During 1982

Lemithou: Pumping scheme from BH 49/77 for the irrigation of 102 donums of new land, at an estimated cost of £48,000.

Apsiou: Improvements to the existing irrigation distribution system, at a total estimated cost of £28,200.

TABLE VIII-2
WATER SUPPLY SITUATION AT THE END OF 1982

District	Satisfactory piped supply: Supply rate 90 litres/head/day & over								Unsatisfactory piped supply: Supply rate below 90 litres/head/day								Total	Total
	Village with house-to house			Villages with fountains			Village with house-to house			Village with public fountains			No. of village	Population 1969				
	No.	%	Pop.	%	No.	%	Pop.	%	No.	%	Pop.	%	No.	%	Pop.	%		
Nicosia.....	143	84.62	115 346	92.80	9	5.33	1 169	0.94	11	6.50	7 021	5.65	6	3.55	760	0.61	169	124 296
Kyrenia.....	39	82.98	30 786	93.50	2	4.26	59	0.18	1	2.13	540	1.64	5	10.63	1 542	4.68	47	32 927
Famagusta...	82	83.68	82 644	92.12	3	3.06	444	0.50	6	6.12	5 695	6.34	7	7.14	934	1.04	98	89 717
Limassol....	104	91.23	72 527	97.87	3	2.63	40	0.15	4	3.51	1 417	1.91	3	2.63	124	0.17	114	74 108
Paphos.....	103	78.03	46 606	90.16	13	9.85	2 202	4.26	12	9.09	2 442	4.72	4	3.03	445	0.86	132	51 695
Larnaca.....	55	93.22	39 813	98.22	2	3.40	156	0.38	1	1.69	425	1.05	1	1.69	140	0.35	59	40 534
Total.....	526	84.98	387 722	93.82	32	5.17	4 070	0.99	35	5.65	17 540	4.24	26	4.20	3 945	0.95	619	413 277

TABLE VIII-3

VILLAGE WATER SUPPLY SCHEMES PREPARED IN 1982 AND SUBMITTED TO DISTRICT OFFICES

Ser. No	Village	Nature of Scheme	Est. Cost £
NICOSIA DISTRICT			
1	*Kokkini Trimithia*	Additional supply from BH 31/81	29 000
2	*Stavrovouni*		8 000
3	*Yeri*	Additional supply from BH 35/79	3 200
4	*Dhali*	Extensions	16 000
5	*Malounda*	Extensions	4 200
6	*Kato Koutraphas*	Replacement of pipelines	3 800
7	*Klirou*	Improvements - Additional supply	46 600
8	*Paleometokho*	Additional supply from BH 17/81	4 800
9	*Kapedhes*	Additonal supply from BH 42/81	21 000
10	*Mammari*	Extensions	7 500
11	*Troodos*	Improvements	1 200
12	*Laxia*	Improvements	12 600
	Laxia	Improvements	7 450
13	*Kokkini Trimithia*	Division of plots	2 000
14	*Meniko*	Temporary supply from BH 83/81	2 500
15	*ARI*	Removing of pipeline	1 300
16	*Lymbia*	Temporary supply	400
17	*Alambra*		950
18	*Moutoullas*	Improvements	3 500
19	*Laxia*	Improvements	4 700
20	*Lakatamia*	Improvements	3 000
21	*Piyenia*	Improvements	18 500
		Total	£202 200
LIMASSOL DISTRICT			
1	*Ayios Tykhonas*	New storage tank	21 000
2	*Sotira*	New main conveyor	10 000
3	*Kellaki*	Extensions	16 000
4	*Ayios Athanasios*	W S to new Limassol cemetery	8 000
5	*Troodhitissa Monastery*	Additional supply from BH	12 500
6	*Prastio*	Additional supply from BH 57/81	26 200
7	*Trimiklini*	Additional supply	39 400
8	*Moniatis*	Additional supply	48 500
9	*Trakhoni*	WS to local communities building sites.	36 000
10	*Kato Polemidhia*	Improvements	42 000
11	*Paramytha-Palodhia-Spitali*	Additional supply from BH 8/82	72 910
12	*Pyrgos*	Improvements	27 000
13	*Arakapas*	Improvements	4 700
14	*Pano Kividhes*	W S to local communities building sites	1 900
15	*Klonari*	Connection to Kellaki water supply system	7 900
16	*Polemidhia*	W S to PASYDY & OELMEK building sites..	6 500
		Total	£380 510

TABLE VIII-3 VILLAGE WATER SUPPLY SCHEMES PREPARED IN 1982 AND SUBMITTED TO DISTRICT OFFICES (Cont.)

Ser. No	Village	Nature of Scheme	Est. Cost £
PAPHOS DISTRICT			
1	*Pano Arkhimandrita*	Replacement of conveyor pipeline	9 400
2	*Polis-Prodhromi*	Extension of distribution system	66 300
3	*Tala*	Additional supply from BH 247/54	21 000
4	*Khoulou*	Additional supply from BH 19/81	13 400
5	*Stavrokono*	Improvements	3 500
6	*Konia*	Extensions of distribution system	7 500
7	*Anavargos*	Extensions of distribution system	8 500
8	*Kissonerga*	Improvements	41 800
9	*Paphos Town*	Improvements	290 400
10	*Mesa Khorio*	Extensions	3 600
11	*Pomos*	W S to the proposed camp	2 400
12	*Yiolou*	Improvements	2 300
		Total	£470 100
FAMAGUSTA DISTRICT			
1	*Ayia Napa*	Extensions	32 500
2	*Sotira*	Livestock farming area	31 500
3	*Paralimni*	Developments	16 000
		Total	£80 000
LARNACA DISTRICT			
1	*Zyyi*	New pipeline from Khirokitia Reservoir.	52 100
2	*Xylotymbou*	Supplementary supply	3 000
3	*Kornos*	Government building sites	3 200
4	*Pyla*	Connection to Famagusta pipeline	12 500
5	*Zyyi*	Replacement of existing pipeline	1 200
6	*Dhromolaxia*	Extensions to livestock area	264
7	*Vavatsinia*	Installation of water meters	1 350
8	*Klavdhia*	Livestock farming areas	9 500
9	*Anaphotia*	Government building sites	18 000
10	*Ormidhia-Xylophaghou*	Connection to Famagusta pipeline	230 000
11	*Mazotos*	New storage tank	5 000
12	*Ayios Minas Monastery*	New storage tank and distribution network	9 000
		Total	£345 114

SUMMARY OF TABLE VIII-3

District	No of Schemes	Est. Cost £
Nicosia	21	202 200
Limassol	16	380 510
Paphos	12	470 100
Famagusta	3	80 000
Larnaca	12	345 114
Total		£1 477 924

TABLE VIII-3A

WATER SUPPLY SCHEMES FOR REFUGEE-HOUSING AND SELF-HOUSING ESTATES PREPARED AND SUBMITTED IN 1982

Ser. No	Village	Nature of Scheme	Est. Cost £
	NICOSIA DISTRICT		
1	*Kato Lakatamia*	Yerani housing estate. House to house scheme	4 800
2	*Yeri*	Self-housing estate. Installation of water meters	500
3	*Ayios Pavlos II*	Temporary supply	800
4	*Strovolos*	Aspres self-housing estate. House to house scheme	43 000
5	*Xeri*	Self-housing estate, phase F. House to house scheme	1 900
6	*Orounda*	Self-housing estate. House to house scheme	2 000
7	*Xeri*	Self-housing estate	2 500
8	*Ayios Pavlos*	New housing estate scheme	12 500
9	*Pallouriotissa*	Ayios Yeoryios house to house scheme	500
10	*Pano Lakatamia*	Anthoupolis housing estate	3 500
11	*Strovolos III*	Housing estate	1 700
		Total	£73 700
	LIMASSOL DISTRICT		
1	*Kolossi*	Self-housing estate D New scheme	18 200
2	*Kolossi*	Self-housing estate E New scheme	1 300
3	*Moutayiaka*	Self-housing estate C New scheme	5 150
4	*Kandou*	Self-housing estate A New scheme	1 150
5	*Limassol*	Chiftlikoudhia self-housing estate. Extensions	850
6	*Limassol*	Omonia self-housing estate	16 000
		Total	£42 650
	LARNACA DISTRICT		
1	*Dhekelia*	Self-housing estate B-2nd Phase	9 500
2	*Xylophaghou*	Self-housing estate-Extensions	1 900
3	*Livadhia*	Self-housing estate	8 500
4	*Larnaca*	Zenon-Kamares housing estate Sewerage system	4 500
		Total	£24 400
	FAMAGUSTA DISTRICT		
1	*Akhna Forest*	Self-housing estate	£44 000

SUMMARY OF TABLE VIII-3A

District	No of Schemes	Est. Cost £
Nicosia	11	73 700
Limassol	6	42 650
Larnaca	4	24 400
Famagusta	1	44 000
Total		£184 750

TABLE VIII-4

VILLAGE WATER SUPPLY SCHEMES PENDING DURING 1982

Ser No	Village	Nature of scheme
	NICOSIA DISTRICT	
1	*Mitsero*	House to house scheme
2	*Episkopio*	Additional supply from BH 59/63
3	*Phikardhou*	Additional supply from BH 3/82
4	*Akaki*	Additional supply from BH 65/82
5	*Ayios Theodhoros (Solea)*	Additional supply from BH 150/80
6	*Platanistasa*	Construction of storage tank in the yard of Ayiasmati Church
7	*Xeri*	Revised estimate of BH 41/54 scheme
8	*Mathiati*	Water supply to camp
9	*Dhali*	Additional supply from BH 3/83 New storage tank and improvements
10	*Kalopanayiotis*	Replacement of main conveyor
11	*Paleometokho*	Extensions
	LIMASSOL DISTRICT	
1	*Apsiou*	Additional supply
2	*Moutayiaka*	Regional scheme. Additional supply
3	*Yermasoyia*	New storage tank and additional supply
4	*Sotira*	Improvements
5	*Plataniskia*	Improvements
6	*Souni-Zanaja*	Additional supply
7	*Dhierona*	New storage tank
8	*Palodhia*	Extensions
9	*Governos Beach*	W S from new borehole
10	*Ayia Phyla*	Improvements
11	*Pano Kividhes*	Improvements
12	*Episkopi*	W S to new building sites
	PAPHOS DISTRICT	
1	*Akoursos*	Additional supply
2	*Khrysokhou*	Additional supply
3	*Goudhi*	Additional supply
4	*Panayia*	Improvement of spring
5	*Akamas-Loutra*	Improvement Board. Distribution system from storage tank
6	*Lara-Coral Bay*	Improvement Board. Distribution system from storage tank
7	*Mandria*	New water supply scheme
8	*Inia*	Additional supply
9	*Dhrousha*	Additional supply
10	*Yeroskipos*	Extensions
11	*Khlorakas*	New storage tank and improvements
12	*Pomos*	Extensions
13	*Nikoklia*	New BH to be drilled for replacement of existing BH
14	*Appidhes Regional Scheme*	Additional supply from BH 64/79
15	*Ayia Regional Scheme*	Additional supply from BH 78/77
16	*Ayia Regional Scheme*	New infiltration system
17	*Ayia Marina (Khrysokhou)*	Improvements
18	*Lemba*	New storage tank and Distribution system
19	*Peyia*	Additional supply from BH 49/82

TABLE VIII-4 VILLAGE WATER SUPPLY SCHEMES PENDING DURING 1982 (Cont.)

LARNACA DISTRICT

1	*Aradhippou*	New Distribution system
2	*Athienou*	Supplementary supply from new BH
3	*Kophinou*	New slaughter house connection to Famagusta pipeline
4	*Voroklini*	New distribution system
5	*Zyyi-Mari*	New pumping scheme from Kalavasos new BH
6	*Kophinou*	New distribution system
7	*Mazotos*	Connection to Famagusta pipeline
8	*Alethriko*	Connection to Famagusta pipeline
9	*Kivisili*	Connection to Famagusta pipeline

FAMAGUSTA DISTRICT

1	*Dherinia*	Development to existing distribution system
2	*Paralimni*	Development to existing distribution system
3	*Ayia Napa-Paralimni*	Combined new pumping scheme from Famagusta pipeline

Nata: Pumping scheme from BH 21/72 at a total cost of £90,000.
Khoulou-Lemona: Pumping scheme from Ammati spring to irrigate switable area at a higher point from the spring. The estimate cost of the scheme is £75,000.

Pitsilia Integrated Rural Development Project

The Division is dealing with the rural domestic water supply and rehabilitation of irrigation schemes within the PIRDP.

During 1982 two schemes were prepared (as per Table VIII-8) at a total estimated cost of £30,140.

Ten rehabilitation schemes were prepared at a total estimated cost of £66,240 (as per Table VIII-9) and were submitted to the co-ordinator of the Pitsilia Project. These schemes are calculated with the internal rate of return method.

Interdepartmental Committee for Small Irrigation Projects

The Committee is functioning in conformity with directions of the Director General of the Ministry of Agriculture and Natural Resources, for the purpose of assessing project viability for budgeting purposes and co-ordinates the activities of the District Agriculture Services, for the supply of agroeconomic data in the preparatory stages of the projects. During 1982, 17 schemes have been considered by the Committee as per Tables VIII-6 & VIII-6A.

Capital Aid from the Federal Republic of Germany

During 1982 a total sum of £42,116 was reimbursed from the loan of 18 million DM for irrigation projects either completed or under construction as detailed below:

Major Projects

Total number of projects	2
Investment cost of projects	£1 159 041
Amount which can be claimed from loan	£1 148 541
Amount reimbursed in 1982	£ 25 244

Minor Projects (Over £15,000)

Total number of projects	1
Investment cost of projects	£ 24 000
Amount which can be claimed from loan	£ 24 000
Amount reimbursed in 1982	£ 7 282

Minor Projects (Up to £15,000)

Total number of projects	1
Investment cost of projects	£11 800
Amount which can be claimed from loan	£11 800
Amount reimbursed in 1982	£ 9 590

Total amount reimbursed from loan up to end of 1982 £42,116.

Encroachment in River & Streams

Some 63 cases for land encroachment in rivers and streams were examined in 1982 and the Director of Lands and Surveys was advised accordingly.

TABLE VIII-5
IRRIGATION SCHEMES PREPARED IN 1982 AND SUBMITTED TO DISTRICT OFFICERS

Ser No	Village	Division or Association	Locality	Nature of proposed works	Est. cost £	Village contr. %	Donums Perm.	Donums Seas.
	NICOSIA DISTRICT							
1	Astromeritis.....	Division	Pissoyia	Pumping scheme and distribution pipes..	27 000	-	-	-
2	Peristerona.....	Division	Petallomeni	Pumping scheme and distribution pipes.	52 000	-	-	-
3	Katokopia.....	Division	Rodamia	Pumping scheme and distribution pipes.	23 000	-	-	-
4	Kochati.....	Division	Ayia Varvara-Kochati	Pumping scheme and distribution pipes.	19 500	-	-	-
5	Kalokhorio (Klirou)	Division	-	Lining of canals.....	21 000	-	-	-
6	Meniko.....	Division	Dhisia Palazi		14 000	-	-	-
				Total.....	£156 000			
	LIMASSOL DISTRICT							
1	Apsiou.....	Division	-	Distribution pipelines.....	28 200	-	-	-
2	Lemithou.....	Division	-	Pumping scheme from BH 49/77.....	48 000	-	-	-
3	Trimiklini.....	Division	-	Conveyance of water from Moniatis River.....	5 400	-	-	-
4	Prodhromos.....	Division	Hardji - Mazourka	Distribution pipelines.....	4 900	-	-	-
5	Paleomylos.....	Division	Hardji-Ayios Yeoryios	Distribution pipelines.....	10 500	-	-	-
6	Kandou.....	Division	Limni-Fraktis	Distribution pipelines.....	21 000	-	-	-
7	Kouka.....	Division	Arnades	Improvements.....	1 200	-	-	-
				Total.....	£119 200			
	PAPHOS DISTRICT							
1	Nata.....	Division	-	Replacement of pumping system and extensions.....	90 000	1/3	-	-
2	Steni.....	Division	-	Pumping scheme from BH 113/78.....	47 000	1/3	120	30
3	Kelokedhara.....	Division	Psathaes	Pumping scheme from BH 68/79.....	44 600	1/3	-	-
4	Kelokedhara.....	Division	Ziripillis	Replacement of pumping system and extensions.....	52 300	1/3	-	-
5	Trakhypedhoula.....	Division	-	Pumping scheme from BH 173/61.....	64 400	1/3	300	-
6	Miliou-Akourdhalia..	Division	Liskiari - Milarka	Conveyor pipeline and distribution system.....	88 700	1/3	60	85

TABLE VIII-5 IRRIGATION SCHEMES PREPARED IN 1982 AND SUBMITTED TO DISTRICT OFFICERS

Ser No	Village	Division or Association	Locality	Nature of proposed works	Est. cost £	Village contr. %	Donums Perm.	Donums seas.
7	Khoulou-Lemona.....	Division	Ammati	Pumping scheme from Ammati spring...	75 000	1/3	-	-
8	Axylou.....	Division	Turkish Village	Pumping scheme from BH Hydr. No 1...	31 600	-	-	-
9	Kholi.....	Division	Grousos	Storage tank and improvements.....	4 200	1/3	-	-
10	Nea Dhimmata.....	Division	Synvoulos	Replacement of distribution pipes...	12 900	1/3	-	-
11	Paramali-Evdhimou...	Division	-	Diversion, distribution pipes.....	730 000	-	-	-
				Total.....	£1240 700			
	LARNACA DISTRICT							
1	Ayii Vavatsinias....	-	-	New storage tank.....	3 500	-	-	-
2	ARI-Zyyi.....	-	-	Pumping scheme.....	8 700	-	-	-
3	Mari.....	-	-	Pumping scheme.....	90 000	-	-	-
				Total.....	£102 200			

Sewerage Schemes

During the year under review 5 sewerage schemes for Refugee housing estates were designed and studied at an estimated cost of £115,700 as per Table VIII-10.

Building and Division of Building Plots Permits

During 1982 a total of 1252 cases were investigated and sent to the District Officers for further action. The applications for building permits were 520 and those for division of building plots were 732.

TABLE VIII-6
SMALL IRRIGATION SCHEMES APPROVED BY THE INTERDEPARTMENTAL COMMITTEE

Ser. No.	Village and Scheme
1	*Trakhypedhoula* - BH 173/61
2	*Ayios Yeoryios (Paphos)* - BH 2865
3	*Pano Platres* - Pano Platres
4	*Paleomylos* - ID Hardji-Ayios Yeoryios
5	*Kato Akourdhalia-Miliou* - Liskiari-Milarka
6	*Nea Dhimmata* - Symvoulos
7	*Axylou*
8	*Kouklia*
9	*Kholi* - Grousos
10	*Khoulou* - Ammati
11	*Nata* - BH 21/72
12	*Steni* - BH 113/78
13	*Lemithou*-ID-Platanoudhia-Sikoudhin
14	*Polemi*-BH 26/60

SCHEMES NOT APPROVED

1	*Arsos (L'ssol)* ID
2	*Pano Akourdhalia* - BH 93/76
3	*Ayios Theodhoros (Tylliria)*

TABLE VIII-8
WATER SUPPLY SCHEMES WITHIN PITSILIA PROJECT PREPARED AND SUBMITTED IN 1982

Ser No	Village	Nature of scheme	Est. Cost
1	*Pelendria*-Additional supply from BH 69/81		27 500
2	*Pelendria*-WS to livestock area		2 640

TABLE VIII-7

IRRIGATION SCHEMES IN THE COURSE OF PREPARATION UNDER INVESTIGATION OR PENDING DURING 1982

Ser No	Village and Nature of Proposed Work
	NICOSIA DISTRICT
1	*Moutoullas* - Pumping scheme BH 104/80
2	*Phlasou-Korakou-Linou* - Selloshes, Lining of canals
3	*Pano Koutraphas* - Pumping scheme from BH 77/80
4	*Kakopetria* - Apotheri, distribution pipelines
5	*Kambos* - Khatoupas, pumping scheme from BH 78/78
6	*Peristerona* - Connection of pipe distribution systems
7	*Kato Pyrgos* - Pumping scheme from BHs 50/81 and 51/81
8	*Kato Pyrgos* - River training
9	*Mosphili* - Improvements
	LIMASSOL DISTRICT
1	*Ayios Dhimitrios* - Use of BH 58/77
2	*Arsos* - Distribution pipelines
3	*Kato Mylos* - Improvements
4	*Prodhromos* - Development of springs
5	*Ayios Therapon* - New Borehole
6	*Tris Elies* - New borehole
7	*Anoyira* - New borehole
8	*Kaminaria* - Use of BH 117/78
9	*Dhora* - New irrigation scheme
10	*Athrakos* - Extensions
11	*Parekklisha* - Improvements
12	*Ayios Yeoryios (Silikou)* - New storage tank
13	*Yerasa* - New storage tank
14	*Lemithou* - Use of BH 134/78
15	*Perapedhi* - Use of BH 109/77
	PAPHOS DISTRICT
1	*Kedhares* - Plistra, Construction of pond
2	*Kallepia* - Mylos, Improvements
3	*Pano Akourdhalia* - Pumping scheme from BH 93/76
4	*Khoulou* - Pumping scheme from BH 74/81
5	*Theletra* - New scheme
6	*Polemi* - Pumping scheme from BH 7/79
7	*Polemi* - Pumping scheme from BH 26/60
8	*Kato Arodhes* - Distribution pipelines
9	*Salamiou* - Pumping scheme from BH 97/79
10	*Kilinia* - Grouti, Improvements
11	*Kritou Terra* - Kefalovrysos, Improvements
12	*Souskiou* - Pumping scheme from BH 96/62
13	*Kholetria* - Pumping scheme from BH 18/69
14	*Inia* - Distribution system
15	*Peyia-Inia-Avakas river* - Construction of pond

TABLE VIII-9
IRRIGATION SCHEME WITHIN PITSILIA PROJECT PREPARED IN 1982

Ser No	Village	Division or Association	Locality	Nature of Proposed works	Est. Cost £	village contr. %	Donums Perm.	Donums Seas.
	NICOSIA DISTRICT							
1	Palekhori.....	Association	Maroullena	Distribution pipelines.....	15 000	44	25	-
2	Spilia.....	Division	Verouti	Distribution pipelines.....	2 500	33	8.5	-
	LIMASSOL DISTRICT							
1	Pelendria.....	Division	Fylagra	Distribution pipelines.....	3 200	33	115	-
2	Pelendria.....	Division	Kato Livadhia	Distribution pipelines.....	4 950	33	4.5	-
3	Pelendria.....	Division	Kolokasi	Distribution pipelines.....	15 800	33	22	-
4	Agridhia.....	Division	Kato Enetikon	Distribution pipelines.....	2 900	33	5	-
5	Agridhia.....	Association	Konizero	Distribution pipelines.....	2 660	40	4	-
6	Kyperounda.....	Association	Kardama-Paraga	Distribution pipelines.....	1 380	40	2	-
7	Kato Mylos.....	Association	Koutsoullas	Distribution pipelines.....	2 150	48	7	-
8	Ayios Pavlos.....	Division	Dhimma Khoriou and Dhomes	Distribution pipelines.....	15 700	33	49	-
				Total.....	£66 240			

TABLE VIII-10
SEWERAGE SCHEMES FOR REFUGEE HOUSING ESTATES SUBMITTED IN 1982

Ser No.	Housing Estate	Est. Cost £
	NICOSIA DISTRICT	
1	Ayios Pavlos (Phase II)....	25 700
2	Ayios Pavlos.....	12 500
3	Apostolos Loucas (Laxia)...	18 500
4	Kakopetria.....	45 000
	LARNACA DISTRICT	
1	Kophinou.....	14 000

IX LARNACA - FAMAGUSTA REGIONAL OFFICE

by
T N Hamatsos
Executive Engineer I
Regional Engineer

General

By the end of the year the staff of the Regional Office was composed of the following officers:

1 Executive Engineer Class I
1 Senior Technician
3 Technicians I
2 Technicians II
7 Regular Employees
1 Secretary-Typist

HYDROLOGY AND WATER RESOURCES

Stream Gauging

During the year 3 permanent gauging observation (one monthly at Liopetri Dam and two weekly at Paralimni Lake) stations equipped with automatic water level recorders were in operation and weekly or monthly visits were paid for observation and maintenance.

Ground Water Hydrology

The ground water conditions of the two Districts Famagusta and Larnaca were observed by means of 490 wells/boreholes.

The water level (i.e. the distance from established bench marks on the top of the observation wells/boreholes to the ground water level) of 365 of them were taken twice this year i.e. in March before the irrigation period and in November after the irrigation period.

The water level of 64 of these observation boreholes was taken every month and another 10 of them was taken every two months.

The water level of 51 boreholes used for village water supplies were also taken once during the whole year.

Chemical Analyses

A total number of 1015 samples were taken from Government and Communal or private boreholes/wells or springs and were sent to the Government or Departmental Laboratories for chemical analysis.

Also a number of 135 samples taken from wells and boreholes were analysed in the Regional Office for chloride content.

Boreholes Test Pumping

During the year the test pumping of 7 boreholes for private use were carried out.

Plotting of Boreholes

During the year the plotting of wells/boreholes in Famagusta – Larnaca Hydrological Area continued and the total number of wells/boreholes plotted were 514.

Questioning

The annual questionnaire was carried out in the areas where the plotting was completed. A total number of 4455 cases were carried out.

Village Water Supplies

During the year the water supply of each village in the two Districts was checked (i.e. the flow of springs and boreholes used by each village were measured and a sample was sent to the Government Laboratory for chemical analysis).

Quarries

A total number of 18 applications for quarries which were sent to the District Office by the Department of Mines were examined on the spot and returned to the above Department with the comments of this Office.

Southern Conveyor

During the year the two Officers dealing partly in different studies concerning the Southern Conveyor continued.

The ground water level of 101 wells/boreholes was taken in the South-Eastern Mesaoria and another 49 in the Area of Kiti.

In addition the water levels were measured by 4 automatic recorders situated at Kiti, Xylophaghou, Liopetri and Phrenaros, and were visited once a month.

Wells Sinking Permits

A total number of 684 applications for sinking, covering permits and the change of the conditions of permits of wells/boreholes were examined in the two Districts, Famagusta and Larnaca, and were presented to the General Advisory Committee for wells/boreholes of the Ministry of Agriculture and Natural Resources.

Some 631 applications are of cases lying in the conservation areas and another 53 in the non-conservation areas.

Apart from the above applications 532 cases dealing with wells/boreholes also examined direct from the District Office of WDD Larnaca-Famagusta and were submitted to the District Officers of Larnaca and Famagusta. The above applications concerned cases for the renewal of leased agreements of wells/boreholes drilled on Government or Forest Land, or cases of cleaning or deepening of existing wells/boreholes.

From the above, 314 cases were approved and 33 were not and 185 were returned to the District Officers for further examination.

INVESTIGATIONS AND DESIGN

Investigations

During 1982 the following investigations were carried out:-

LARNACA DISTRICT

Xylophaghou-Ormidhia: Improvement of the villages water supply from Famagusta pipeline.
Xylophaghou: Investigation for water supply to new refugee self housing plots.
Ormidhia: For the solution of water supply problems of the village.
Aradhippou: Investigation for anti-flood and recharge works. Improvement of the village water supply network.
Anaphotia-Menoyia-Aplanda: Investigation for improvement of the villages water supply from Famagusta pipeline and solution of water supply problems.
Anaphotia: Water Supply for division of plots. Recharge works in Xeropouzos river.
Mari: Investigation for improvement of the Government BH 92/75 for irrigation division and for the solution of water supply problems.
Zyyi-Mari: For improvement of the villages water supply from Khirokitia Treatment Plant or from Government BH 62/82.
Zyyi: For the solution of water supply problems.
Livadhia: For improvement of the river bed through the village. Investigation for water supply to new refugee self-housing plots.
Skarinou-Ayios Theodhoros-Alaminos: Investigation for the distribution system of the village water supply.
Alaminos: Water supply for new division of plots.
Skarinou: For expansion of the village irrigation division.
Ayios Theodhoros: For the solution of the village Irrigation Division problems from BH 64/73.
Alethriko-Kivisil - Mazotos: Investigation for the connection of the village water supply to Khirokitia-Famagusta pipeline.
Mazotos: Investigation for construction of a new storage tank for the village water supply.
Ormidhia: Investigation for water supply to the new slaughter house of the area.
Kiti: Relocation of RCC channel to facilitate division of plots for expansion of the village water supply zone.
Perivolia: Water Supply for new division of plots.
Dhromolaxia: Investigations for expansion of part of the stock farming area A water supply network.

Tersephanou: For the solution of the village water supply problems.
Troulli: For improvement of a Government borehole for the village water supply.
Vavatsinia: Investigation for improvement of the village water supply from a new spring. Improvement of the village water supply network (installing water meters).
Melini: Investigation for the solution of the village irrigation division problems from the pond. For the solution of the village water supply problems.
Ayii Vavatsinias: Improvement of Dhiploma Irrigation Division Investigation for the solution of the village Irrigation Division problems.
Anglisidhes: Investigation for the solution of the village water supply problem. For expansion of Irrigation Division Anglisidhes No.2.
Klavdhia: Water supply of the village stock farming areas. Investigation for improvement of the village water supply from Government boreholes.
Voroklini: Investigation for the construction of a new storage tank for the village water supply. Investigation for the water supply of the proposed stock farming area.
Aplanda: Investigation for improvement of a Government borehole for irrigation division.
Kellia: Investigation for improvement of a Government borehole for irrigation division.
Odhou: For the solution of the village irrigation division problems.
Zenon-Kamares II Government Housing Estate: Effluent pipeline from biological station to the proposed dam at Aradhippou village.
Kophinou: Investigation for improvement of the spring for the village water supply. Solution of water supply problems of the village stock farming area.
Vavla: Improvement of the water supply of Ayios Minas monastery and for irrigation purposes from a new borehole.
Maroni: For the solution of the village water supply problems and Lakki-Xalona irrigation division problems.
Psevdhas: For the solution of the village water supply problems.
Ora: Investigation for the use of private springs.
Pano Lefkara: Relocation of conveyance pipeline of the village water supply .
Athienou: Investigation for the water supply of the village stock farms. Investigation for improvement of the village water supply from a new borehole.

FAMAGUSTA DISTRICT

Dherinia: Investigation for improvement of part of the village water supply network and for the solution of water supply problems.
Vrysoulles: For the solution of the village water supply problems.
Sotira: Investigation for the solution of the refugee camp water supply problems.
Ayia Napa: Investigation for the solution of the village water supply problems. For expansion of the village water supply network.
Paralimni: Investigation of the village water supply problems.
Akhna Forest: Improvement of the Refugee Camp water supply.

CONSTRUCTION

During 1982 the Larnaca-Famagusta Regional Office undertook the construction of numerous works for routine water supply schemes for villages, minor irrigation schemes and water supply to Refugee housing estates. For all construction works details see tables under CONSTRUCTION DIVISION.

TABLE IX-1
DESIGNS SUBMITTED TO THE DIRECTOR FOR APPROVAL

Ser No.	Village and Scheme	Est. Cost £
	A VILLAGE WATER SUPPLY	
	LARNACA DISTRICT	
1	*Anaphotia.* Water supply of village division plots.....	19 000
2	*Vavatsinia.* Installation of water meters in houses..	1 350
3	*Dhekelia.* EAC Refugee Camp house to house scheme Phase B.....	9 500
4	*Aradhippou.* Improvement of existing house to house scheme water supply..	165 000
5	*Xylophaghou.* Refugee self housing estate house to house scheme Phase E.....	1 900
6	*Mazotos.* Construction of a new tank for the village water supply.....	5 000
7	*Livadhia.* Refugee self housing estate house to house scheme Phase G.....	8 500
8	*Xylophaghou-Ormidhia.* Improvement of the village water supply.....	230 000

9 *Alethriko-Kivisil Mazotos.* Improvement of the village water supply..... 12 500

10 *Klavdhia.* Improvement of the village water supply... 7 000

11 *Mari-Zyyi.* Improvement of the village water supply... 85 000

12 *Voroklini.* Construction of new storage tank for the village water supply... 12 000

FAMAGUSTA DISTRICT

1 *Akhna Forest.* Refugee self housing house to house scheme Phase A..... 44 000

2 *Akhna Forest.* Refugee self housing house to house scheme Phase B..... 16 000

B STOCK FARMING AREAS WATER SUPPLY

LARNACA DISTRICT

1 *Klavdhia.* Water supply for stock farming area A..... 7 000

2 *Klavdhia.* Water supply for stock farming area B..... 2 500

C BIOLOGICAL STATIONS

LARNACA DISTRICT

1 *Zenon-Kamares* II Housing Estate. Effluent pipeline from biological station to the proposed dam at Aradhippou village..... 37 000

D IRRIGATION WORKS

LARNACA DISTRICT

1 *Ayyi Vavatsinias.* Improvement of irrigation division Diploma..... 3 500

2 *Mari.* Irrigation division from Government BH 92/75... 90 000

3 *Vavla Ayios Minas Monastery.* Improvement of BH 93/80 for irrigation purposes..... 9 000

E VARIOUS MINOR SCHEMES

LARNACA DISTRICT

1 *Livadhia.* Improvement of river bed through the village..... 2 000

2 *Aradhippou.* Anti-flood Works..... 2 000

3 *Voroklini.* Relocation of pipelines of the village water supply..... 2 000

4 *Kiti.* Relocation of RCC channels to facilitate division of plots..... 6 500

5 *Alaminos.* Water supply for new division of plots..... 2 000

6 *Dhromolaxia.* Expansion of part of the stock farming area A network water supply..... 265

7 *Pano Lefkara.* Relocation of conveyance pipeline of the VWS..... 1 500

8 *Anaphotia-Menoyia.* Placing central water meters..... 250

9 *Ayios Theodhoros.* Replacement of destroyed pipeline irrigation network from BH 64/73..... 450

FAMAGUSTA DISTRICT

1 *Vrysoulles.* Conveyance of water to the village cemetery..... 1 500

2 *Ayia Napa.* Expansion of the village water supply network..... 3 000

X LIMASSOL REGIONAL OFFICE

by
N E Neocleous
Executive Engineer II
Regional Engineer

General

Limassol Regional Office is responsible for the activities of the Department within the District of Limassol. The office is divided into four main sections as follows:

Water Resources
Investigation and Design
Construction
Operation and Maintenance

The Regional Office was composed of 32 staff who serve in the various sections as follows:

1 Executive Engineer II - Head
14 Technicians I & II
1 Chief Foreman
2 Assistant Chief Foremen
12 Technicians (Hourly)
2 Clerical

For the execution of the construction works 20 foremen and about 150 skilled and unskilled workers were engaged.

WATER RESOURCES

Hydrological measurements were carried out in the prescribed areas which are under the Special Measures or Conservation Law as listed under WATER RESOURCES DIVISION.

Surface Water Hydrology

Rivers

The flow of the rivers is gauged by means of automatic water level recorders and the results are calibrated by means of current meter measurements.

Eight gauging stations equipped with automatic water level recorders are established on main rivers of Limassol District.

The total discharges calculated for each river are given in the Hydrological Year Book of the Department.

Kouris river, at Khalassa gauging station had a continuous flow throughout the year.

Current meter measurements were taken at weekly intervals except at times of flood, when additional measurements were taken and at the same time 30 water samples were taken for suspended sediment analysis. Another 68 water samples were taken periodically from all rivers for chemical analysis.

Springs and Streams

The discharge of 53 springs and streams were measured at monthly intervals for the benefit of village water supplies, Limassol water supply, the design of minor irrigation and water supply schemes and for hydrological observations.

A total of 655 spring discharges were taken either volumetrically or by means of a current meter.

Water samples from the above springs and streams were taken once during the year, for chemical analysis.

In addition the discharge of 34 springs and streams and the water level of 14 wells/boreholes were measured, within the framework of Pitsilia Project. A total of 296 spring and stream measurements and 150 water level measurements were taken.

Groundwater Hydrology

Hydrological investigations and measurements were carried out in the Special Measures Law area of Akrotiri and the water conservation areas of Yermasoyia, Moni-Pyrgos, Paramali-Evdhimou, Pissouri - Evdhimou, Parekklisha and the rest of Limassol District.

Special Measures Law-Akrotiri Aquifer

Hydrological observation and control is exercised by means of 195 wells/boreholes strategically situated in the area.

Water level measurements are taken twice a year from the above wells/boreholes except from 138 wells/boreholes where water levels are observed monthly, so that the behaviour of the water table in the aquifer, is observed more closely. A contour map showing the water situation in the aquifer, is drawn monthly.

Sea water intrusion in the aquifer is observed and studied by means of 67 wells/boreholes at Zakaki-Asomatos area and 23 wells/boreholes at Akrotiri area, water samples from which are taken 3-4 times a year.

Water pumped from the aquifer for irrigation, domestic and industrial purposes is noted monthly for each individual licenced well, by means of water meters, (total 392) attached to each pumping unit in order to ensure that the quantity pumped does not exceed the quantity allocated.

It is thus ensured that pumping is kept at the necessary to preserve the existing plantations in good and productive condition and at the same time ensuring that the aquifer is not extensively damaged.

Water for irrigation was also supplied in this area from Yermasoyia and Polemidhia Dams, through the distribution system, of the Dam. Also from Kouris river, through the irrigation intakes, up to May 1982.

Water extracted from Akrotiri Aquifer

Purpose	MCM
Irrigation	10.26
Domestic	3.57
Industrial	0.88
Total	14.71
Water supplied from Dams	4.55
Total supplied for irrigation from the aquifer and from Dams	14.81

Water Conservation Areas

The water situation within the Water Conservation Areas is also observed by means of a number of wells/boreholes, the water level of which is measured twice a year and the total of water extracted is estimated by the method of questioning.

Especially the Yermasoyia Aquifer is observed more closely, by means of 20 wells/boreholes, the water level of which is measured once every month.

Salinity is also observed taking water samples for analysis, twice a year, from a number of wells/boreholes.

The number of observation wells/boreholes in the Hydrological Areas, which are under control, is 272.

Well Sinking Permits

Applications for well sinking permits and applications to transfer water to other plots, engine installations or adjustment of pumping permits were investigated: some 380 cases were investigated and permits were finally granted by the D O for 338 of them.

Limassol Water Supply

Water supply to Limassol, for domestic purpose from the springs and boreholes is gauged and monthly samples are taken both at the water source and at the two reservoirs, for chemical and bacteriological analysis. A total quantity of 7.7 MCM was supplied, 1.6 MCM from springs and 6.1 MCM from boreholes.

Village Water Supply

The water supply of 106 villages was measured during the period September - November, when springs and boreholes are at their minimum output or maximum draw down, respectively.

Water samples were taken from each of the above sources, for chemical analysis.

Meteorological Observations

Daily records were kept for rainfall (Max. 27.7 mm on 11.2.1982), water evaporation (Max. 12.4 mm on 25.6.1982) temperature (Max. 39.1° C on 11.8.1982), wind velocity and sun reflection, at Yermasoyia Dam.

Records were also kept for rainfall (Max. 29.0 mm on 6.11.1982) and water evaporation (Max average 10.4 mm for 7 days period, 24.6.1982 - 30.6.1982) at Polemidhia Dam.

Quarry and Gravel Pits Permits

Fourteen applications for quarries and gravel pits licences, were examined and submitted to the Senior Mines Officer.

Dams and Reservoirs

In the District of Limassol there are fifteen Dams and Reservoirs. Maximum water stored during 1982 and other data are recorded under OPERATION AND MAINTENANCE DIVISION.

INVESTIGATION AND DESIGN

The solution of the irrigation and water supply problems of all the populated areas of Limassol District was the major task of this section.

Irrigation Branch

For the development of irrigation systems of Limassol District, 32 cases were examined, and the relevant designs were prepared for the total cost of £385,512 as follows:

Water Supply Branch

For the development of water supply systems of Limassol District, 96 cases were examined and the relevant designs were prepared for the total cost of £823,227 as follows.

CONSTRUCTION

Routine Irrigation and Domestic Water Supply Schemes

Several schemes were constructed by the Limassol Regional Office for minor irrigation schemes, village water supplies and water supply schemes for refugee housing estates. These are listed under CONSTRUCTION DIVISION.

Materials and Machinery

By the end of the year 1982 the following materials and machinery for irrigation and water supply projects have been used.

OPERATION AND MAINTENANCE

The Limassol Regional Office was responsible for the operation and maintenance of all projects in the District of Limassol.

For repair and maintenance of water meters and valves, and general maintenance and painting of metal structures, timber etc. A sum of £7,515 was spent on Yermasoyia - Polemidhia distribution network, £916 on Polemidhia dam, £2,086 on Yermasoyia Dam, £590 on Pissouri irrigation schemes, £7,487 on Amathus W S scheme and £8,631 on several village water supply schemes.

MEETINGS

During the year under review, the regional Engineer attended several meetings as the representative of the Director of the Department.

TABLE X-1
IRRIGATION SCHEMES PREPARED IN 1982

Ser. No.	Village and Description	Est. Cost £
1	*Kyperounda.* Improvement of distribution system and construction of new storage tank for Kyperounda Irrigation Division.....	58 300
2	*Pelendria.* Improvement of Kato Livadhia proposed Irrigation Division.....	4 950
3	*Kato Mylos.* Improvement of distribution system of Koutsoullas Irrigation Association.....	1 650
4	*Lemithou.* Utilization of B H 49/77 for the improvement of new area at Platanoudhia and Sykoudhi localities....	46 765
5	*Kato Polemidhia.* Extension of distribution system to new area of 40 donums of Kato Polemidhia Irrigation Division.....	33 800
6	*Kouka.* Improvement of Arniadhes Irrigation Division.....	1 200
7	*Asomatos.* Removing of a sluice valve at plot 56/1 Sh/Pl 58/23 of Yermasoyia-Polemidhia distribution system.....	120

8	*Agridhia.* Improvement of Konisero Irrigation Association.....	2 660
9	*Kolossi.* Extension to Merras of Kolossi Irrigation Division from Yermasoyia-Polemidhia distribution system	
	1st solution.....	45 500
	2nd solution.....	23 000
10	*Ypsonas.* Removing of a sluice valve at plot 228 Sh/Pl 58/7 of Yermasoyia-Polemidhia distribution system.....	120
11	*Zakaki.* Removing of a sluice valve at plot 53 Sh/Pl 59/1 of Yermasoyia-Polemidhia distribution system.....	540
12	*Agridhia.* Improvement of Kato Enetikos Irrigation Division.....	2 900
13	*Ayios Pavlos.* Improvement of Dhomes and Dhymma tou Khoriou Irrigation Division by constructing common storage tank.....	15 700
14	*Kato Polemidhia.* Installation of new sluice valve at plot 45/2 Sh/Pl 58/16 of Yermasoyia-Polemidhia distribution system.....	620
15	*Lemithou.* Utilization of BH 134/78 for the Improvement of Lemithou Irrigation Division.....	35 500
16	*Zakaki.* Removing of a sluice valve at plot 22, Sh/Pl 59/9 of Yermasoyia-Polemidhia distribution system.....	300
17	*Trimiklini.* Removing of Trimiklini Dam pipelines from plots 302/1/2, 303/1/1/2 300/1, Sh/Pl 47/29.....	1 250
18	*Trakhoni Extension of Yermasoyia-Polemidhia Project.* Re-evaluation of improvement and extension of distribution system (2nd phase).....	27 100
19	*Ypsonas.* Installation of new sluice valve at plot 354 Sh/Pl 58/7 of Yermasoyia-Polemidhia distribution system.....	50
20	*Akrounda.* Removing of pipeline from plot 127 Sh/Pl 54/12.W.2.....	150
21	*Kyperounda.* Improvement of Frakhti-Postani Irrigation Association.....	660
22	*Kyperounda.* Improvement of Appis-Avlaki tous Palazidhes Irrigation Division.....	85
23	*Kyperounda.* Improvement of Livadhi tis Mesis Irrigation Association.....	11 050
24	*Kyperounda.* Improvement of Halospitiaes-Arcappis Irrigation Association.....	2 200
25	*Kyperounda.* Improvement of Halospitiaes Irrigation Association.....	5 650
26	*Trimiklini.* Substitution of Dam pipeline near Karidaki restaurant.....	3.000
27	*Kato Platres.* Extension to plot 142 Sh/Pl 47/11 from distribution system of Kato Platres Irrigation Division.	192
28	*Kyperounda.* Improvement of Panayia Irrigation Association.....	8 800
29	*Episkopi.* Cleaning and testing of boreholes hydrological Nos 1532 and 1381.....	1 500
30	*Limassol by pass.* Removing of pipelines on the new road between Limassol-Ypsonas-Erimi.....	33 000
31	*Trakhoni.* Installation of new sluice valve at plots 128/2, 128/3, 129, Sh/Pl 58/15 of Yermasoyia-Polemidhia, distribution system.....	200
32	*Saittas-Karvounas.* Removing of pipelines on the new road between Saittas-Karvounas locality.....	14 000
	Total.....	£385 512

In addition to the above 85 cases (applications) were examined and the relevant technical advice was given to those concerned.

TABLE X-2

DOMESTIC WATER SUPPLY SCHEMES PREPARED IN 1982

Ser. No.	Village and Description	Est. Cost £
1	*Sotira.* Improvement of water supply scheme by taking the overflow of Ypsima-Sykaria spring.....	10 000
2	*Plataniskia.* Design to substitute parts of the pipeline from the spring of water supply to the village.....	1 450
3	*Yermasoyia.* Removing of pipeline (4" dia) from plot 181, Sh/Pl 54/36.....	4 700
4	*Akrotiri.* Improvement of water supply scheme and construction of new storage tank.....	33 000
5	*Kolossi.* Refugee self-housing scheme, phase D....	18 200
6	*Agros.* Substitution of Agros water supply pipeline from Karvounas locality to Kyperounda hospital.....	2 074
7	*Amathus water supply.* Supplementary supply to LEMONIA BAY hotel.....	355
8	*Akrounda.* Supplementary supply for land division (file D382/81).....	730
9	*Ayios Athanasios.* Re-evaluation for land division (file D 940/71)...	3 300
10	*Ayios Athanasios.* Re-evaluation for land division at plots 327, 328/2 Sh/Pl 54/42 (File D47/74).....	750
11	*Pyrgos.* Re-evaluation for land division at plot 674/4 Sh/Pl 54/39 (File B103/77).	770
12	*Ayios Athanasios.* Re-evaluation for land division at plots 358, 359, Sh/Pl 54/42 (File D433/73).....	1 080
13	*Kato Polemidhia.* Re-evaluation for land division (File 144/74).....	440
14	*Prastio-Evdhimou.* Design to utilize BH 57/81 for the improvement of village water supply.....	26 200
15	*Kato Polemidhia.* Design to substitute the distribution system of the village.....	45 300
16	*Amathus.* Supplementary supply to plot 97/4/1/5 Sh/Pl 54/45.....	740
17	*Amathus.* Supplementary supply to coffee shop near AVENITA hotel.....	230
18	*Phini.* Supplementary supply to Troodhitissa Monastery.....	12 500
19	*Ypsonas.* Re-evaluation land division at plot 154 Sh/Pl 53/55 (File D79/79)..	340
20	*Monagroulli.* Re-evaluation for land division at plot 876/1 Sh/Pl 54/32 (File B729/77).....	390
21	*Yermasoyia.* Re-evaluation for land division at plot 349 Sh/Pl 54/43 (File D 205/79).....	280
22	*Yermasoyia.* Supplementary supply to plot 89/2/1 Sh/Pl 54/52.....	380
23	*Yermasoyia.* Extension of pipeline of the distribution system to Androkidou street.....	950
24	*Trimiklini.* Re-evaluation for removing part of the pipeline of Lania water supply.....	1 160
25	*Pano Kividhes.* Design to substitute the pipeline between the old spring to the village.....	42 300
26	*Moutayiaka.* Design to substitute part of the central pipeline near Parekklisha village and installation of ball valves at the storage tanks of the villages of this scheme.....	1 500
27	*Trakhoni.* Supplementary supply for land division for the permanent inhabitants of the village.....	37 750
28	*Moniatis.* Design to improve the village water supply scheme.....	53 500
29	*Trimiklini.* Design to improve the village water supply scheme.....	44 600
30	*Pissouri.* Supplementary supply for CYTA building at plot 112/1/2 Sh/Pl 57/13.....	7 400

31 *Erimi.* Substitution of central pipeline of Erimi-Kolossi water supply at Erimi village..... 10 200

32 *Ayios Athanasios.* Re-evaluation for land division at plot 442 Sh/Pl 54/42 (File D167/66).. 2 550

33 *Potamos-Yermasoyias.* Supplementary supply to plot 127 Sh/Pl 54/52..... 1 200

34 *Kolossi.* Refugee self-housing scheme phase E..... 1 300

35 *Yermasoyia.* Re-evaluation for land division (File D 263/72)..... 460

36 *Amathus.* Supplementary supply for RITA COURT at plot 168/2 Sh/Pl 54/45..... 800

37 *Kellaki.* Extension of distribution system and construction of new storage tank at Panayia tou Glossa locality..... 15 100

38 *Moutayiaka.* Refugee self-housing scheme phase C..... 5 150

39 *Palodhia.* Extension of the distribution system..... 1 000

40 *Akrounda.* Supplementary supply to 7 houses at plot 66 Sh/Pl 54/11.E.2 (File B 146/80)..... 200

41 *Yermasoyia.* Supplementary supply to A & B Semiramis at plot 50 Sh/Pl 54/52..... 670

42 *Yermasoyia.* Installation of water meters at BHs Hydrological Nos 8, 287, 286, 858, 948..... 650

43 *Yermasoyia.* Supplementary supply for land division at plots 245/2, 245/3, 245/4, 244/1, Sh/Pl 54/51 & 54/59 (File Nos D 694/71 and D 1022/68)..... 2 310

44 *Kandou.* Re-evaluation of self housing scheme at Kandou village..... 1 150

45 *Kato Amiandos.* Re-evaluation for land division, (File D 109/81)..... 250

46 *Ayia Phyla.* Emergency scheme to improve Ayia Phyla water supply from Mesayitonia storage tanks of Limassol Water Board..... 9 800

47 *Amathus.* Supplementary supply for land division (File D 107/80 and B 106/80)..... 3 900

48 *Pelendria.* Stock farm water supply..... 2 640

49 *Amathus.* Supplementary supply to plot 255/2/5 Sh/Pl 54/45..... 1 200

50 *Amathus.* Supplementary supply to plot 34/1/1 Sh/Pl 54/47..... 900

51 *Kolossi.* Supplementary supply for land division for the permanent inhabitants of the village..... 15 000

52 *Ayia Phyla.* Substitution of the distribution system of the water supply scheme.... 83 800

53 *Ypsonas.* Supplementary supply for land division (File D 779/78)..... 1 500

54 *Yermasoyia.* Supplementary supply to plot 126 Sh/Pl 54/52..... 530

55 *Asomatos.* Supplementary supply for land division, (File D 757/78)..... 7 250

56 *Souni-Zanaja.* Supplementary supply for land, (File B 327/80)..... 3 400

57 *Pano Platres.* Supplementary supply for land division (File D 226/82)..... 80

58 *Pano Platres.* Supplementary supply for house, (File B 149/81)..... 144

59 *Ayios Athanasios.* Re-evaluation for land division (File D 297/79)... 1 000

60 *Yermasoyia.* Substitution of part of pumping main of BH 25/72..... 750

61 *Ayios Athanasios.* Re-evaluation for land division (File 931/71)..... 2 300

62 *Kouka.* Supplementary supply for land division, (File D 160/82) and removing of Arkolakhania spring pipeline from the land divsion..... 4 100

63 *Pyrgos.* Substitution of water supply distribution system..... 27 000

64 *Paramytha-Palodhia-Spitali.* Design to utilize the BH 8/82 for the improvement of water supply of the three villages..... 57 500

65 *Arakapas.* Extension of the distribution system..... 4 450

66 *Limassol.* Omonia Government Housing Estate, New Scheme.. 16 000

67	*Amathus.* Supplementary supply for G Rousos complex, (File B 297/82).....	5 100
68	*Kandou.* Repairing of pumping system.....	50
69	*Korphi.* Extension of the distribution system.....	1 300
70	*Potamos-Yermasoyias.* Supplementary supply to plots 293/5, 293/4, Sh/Pl 54/51.....	1 670
71	*Palodhia.* Improvement of Palodhia-Polemidhia camps distribution system.....	1 760
72	*Amathus.* Supplementary supply to plots 518, 519, Sh/Pl 54/44.....	660
73	*Evdhimou.* Substitution of water supply distribution system.....	4 300
74	*Amathus.* Supplementary supply to plot 149/7, Sh/Pl 54/45 (File B392/82)..	8 000
75	*Ypsonas.* Re-evaluation for land division (File D 91/79).....	1 030
76	*Limassol.* Removing of pipeline between Limassol and Moutayiaka near the sea shore road.....	11 200
77	*Palodhia.* Re-evaluation for KTIMATIKI land division (File D 388/79).....	2 000
78	*Kato Polemidhia.* Re-evaluation for plot 261/1, Sh/Pl 53/56 (File D592/79)..	1 100
79	*Potamos-Yermasoyias.* Removing and installation of pipeline near Potamos Yermasoyias bridge.....	3 204
80	*Kapilio.* Installation of water meters to all the houses of the village.....	1 000
81	*Perapedhi.* Re-evaluation for land division (File D 433/82).....	4 600
82	*Polemidhia.* Re-evaluation for land division (File D 270/80).....	900
83	*Yermasoyia.* Re-evaluation for land division at plots 48, 49, Sh/Pl 54/43 (File 259/72).....	5 900
84	*Ypsonas.* Re-evaluation for land division, (File D 27/82).....	150
85	*Pano Kividhes.* Supplementary supply for land division for the inhabitants of the village.....	1 900
86	*Kato Polemidhia.* Re-evaluation for supervision of land division (File D 592/79).....	200
87	*Louvaras.* Supplementary supply for buildings at plots 413, 414, Sh/Pl 48/34, (File B 360/82).....	390
88	*Ypsonas.* Removing of pipeline from the land division Sent Sylas (File D 309/79).....	7 400
89	*Amathus.* Supplementary supply to plots 199, 171, 173/2, 175/2, 176/2, 197/2, 174/2, 198/2, 200, 201, Sh/Pl 54/49 of Union National Company.....	4 800
90	*Amathus.* Supplementary supply to plots 87/3, 89/1/1/2, 88/1, 87/2, 88/2, Sh/Pl 54/45.....	5 000
91	*Evdhimou.* Supplementary supply to 4 new plots near self housing scheme.....	240
92	*Trimiklini.* Relocation of proposed storage tank to another position (plot 324, Sh/Pl 47/21).....	3 000
93	*Khalassa.* Supplementary supply to the new village Khalassa from Kephalovrysos spring.....	98 000
94	*Klonari.* Supplementary supply from Kellaki water supply distribution system.....	7 900
95	*Ayios Athanasios.* Re-evaluation for land division at plot 386, Sh/Pl 54/42 (File D 829/71).	970
96	*Ayios Athanasios.* Supplementary supply for land division at plots 411, 412, Sh/Pl 54/42 (File 753/77).....	900
	Total.....	£823 227

In addition to the above 83 cases (applications) were examined and the relevant technical advice was given to those concerned.

TABLE X-4
MATERIALS USED BY LIMASSOL REGIONAL OFFICE

Materials Used	Minor Projects
Asbestos cement pipes.....	16 km
Concrete aggregates.....	975 m^3
Cement.....	208 tons
Steel Reinforcing bars.....	108 tons
Special fittings & Joints...	23 133 No.
Sluice valves.....	2 496 No.
Water meters.....	1 091 No.
Victaulic pipes.....	-
Galvanised iron pipes.....	85 km
Sand for pipe bedding.....	383 m^3
Steel pipes.....	0.9 km
P V C pipes.....	1.5 km

TABLE X-3
MACHINERY USED BY LIMASSOL REGIONAL OFFICE

Machinery Employed	Hours
Dumper trucks.....	726
Compressors.....	3 289
Diggers.....	3 978
Land-rover.....	19 805
Concrete mixers.....	745
Cutting machines.....	100
Centrifugal pump.....	-
Bus.....	8
Welding machine.....	988
Excavators.....	33
Vibrators.....	50

XI PAPHOS REGIONAL OFFICE

by
A Lambrou
Executive Engineer I
Regional Engineer

General

In 1982 the staff of the Paphos Regional Office was composed of the following:

1 Executive Engineer I - Head
4 Technicians I
3 Technicians II
5 Technicians (Daily)
1 Assistant Chief Foreman
1 Secretary

The above staff are engaged in carrying out all activities of the Water Development Department in Paphos District. For this purpose the work is divided into four main sections as follows:

- Water Resources Section
- Construction Section
- Design and Investigation Section
- Operation and Maintenance Section

The main activities of each section are outlined herebelow as follows:

WATER RESOURCES

The staff of the water resources section was engaged on the collection of Hydrological data as follows:

Surface Hydrology

During the year 13 permanent stream gauging stations equipped with automatic water level recorders were in operation and weekly visits were made for observation, maintenance and calibration purposes by the use of current meter.

A total number of 682 current meter measurements were taken during the year for calibration purposes. Also samples for suspended sediment load and boron analysis were taken regularly.

Springs

During the year 38 springs were under observation and a total number of 536 spring discharges were gauged by current meter or volumetrically.

Village Water Supply

The water supply of 132 villages was gauged during the months of September and October and samples for Ionic & Nitrates were taken. Also the reading of 46 water meters of Paphos Lower villages, ten of Arminou and one of Timi water supply were taken every month.

Rainfall Observing Stations

Five rainfall observing stations equipped with automatic raingauge recorders were in operation during the year, under weekly and monthly visits for observation.

Ground Water Hydrology

Ground water conditions in South Western Paphos were observed with the help of 126 wells/BHs.

The distance from established benchmarks on top of every observation well/BH to the ground water level was measured twice a year at the end of the wet season (March) when it is expected to be at highest level and at the end of the dry season (November-December) when it is expected to be at the lowest level.

In addition monthly or weekly measurements of the ground water level were taken from 120 wells/BHs during the year for special studies.

A total number of 445 samples for analysis were taken from wells/BHs, springs and streams, 160 of which for Ionic, Boron & Nitrates, 20 for suspended sediment and 265 were analysed in the Paphos district office for chloride content.

Questioning

The annual questioning was carried out in South Western Paphos Hydrological area on 2500 owners of wells during Summer for determining the ground water extracted, area irrigated and kind of crops planted.

Well Sinking Permits

A total number of 148 applications for sinking and covering permits of wells/BHs were examined and submitted to the District Officer Paphos.

These applications were finally examined by the Advisory Committee of the Ministry of Agriculture and Natural Resources and 79 were approved.

Encroachment in Rivers and Streams

Twelve cases for land encroachments in rivers and streams were examined and the Director of Lands and Surveys Department was adviced accordingly.

Quarries and Gravel Pits Permits

Twenty six applications for quarries and gravel pit permits were examined.

The Hydrological section undertook to supervise implementation of the special conditions laid by the Department to the Contractors exploiting the gravel and sand of the river beds.

Pumping Schemes on T/C boreholes

Five applications regarding improvement of Turkish boreholes were received by this office and relevant investigations were carried out. When necessary pumping schemes were prepared and reports were submitted to the General Committee for approval.

Plotting

During 1982, 81 new wells/BHs were plotted on LRO plans for Tremithousa village covering a total area of 5.4 km^2.

Pumping Tests

During the year nine pumping tests were carried out and relevant reports were submitted to the Director of the Department.

CONSTRUCTION

The Construction Programme of the Paphos Regional Office for 1982 included 17 water supply and irrigation schemes of a total cost of £354,410.

Analytically the various works executed in Paphos District are listed under CONSTRUCTION DIVISION.

INVESTIGATION AND DESIGN

The main task of this section is to solve all water supply and irrigation problems in Paphos District. Additionally to investigate the several applications and complaints forwarded to us by the District Officer.

Irrigation Schemes

The planning and design of irrigation schemes were in progress during 1982 and a total number of 12 new projects were prepared. These schemes were submitted to the Director for approval and submission to the Interdepartmental Committee for evaluation. The table below shows separately the extent of land and the cost of each irrigation scheme.

Village Water Supply Schemes

The design of new water supply schemes for Paphos District continued during 1982 and a total number of 6 schemes were prepared and submitted to the Director for approval.

OPERATION AND MAINTENANCE

During 1982 the Paphos Regional Office dealt with the operation and maintenance of the several water works in Paphos i.e. Paphos Dams, Khrysokhou Valley irrigation scheme and the various Government water supply schemes.

Regarding the Government water supply schemes a detail report covering both the expenditure and the revenue generated has been submitted to the Director.

COMMITTEE MEETINGS

During the year under review the District Engineer attended several meetings as the representative of the Director or as member of several local committies.

TABLE XI-2

DOMESTIC WATER SUPPLY SCHEMES PREPARED IN 1982

Ser. No.	Village and Description	Est. Cost £
1	*Tala* pumping scheme BH 247/54	21 000
2	*Khoulou* pumping scheme BH 19/81	13 400
3	*Nikoklia* pumping scheme BH 599 & 67/74	1 640
4	*Lemba* new house to house scheme	1 940
5	*Peyia* pumping scheme BH 49/82	68 600
6	*Yiolou* improvements to distribution system	2 300
	Total	£108 880

TABLE XI-1

IRRIGATION SCHEMES PREPARED IN 1982

Ser. No.	Village and Description	Est. Cost £
1	*Salamiou* pumping scheme BH 97/79 (210 donums)	74 197
2	*Ayios Yeoryios* pumping scheme BH 107/60 (270 donums)	33 500
3	*Ayios Nikolaos* pumping scheme T/C BH (100 donums)	2 540
4	*Kelokedhara-Ziripillis* pumping scheme BH 65/64 (260 donums)	52 000
5	*Khoulou-Ammati* pumping scheme - spring (442 donums)	75 000
6	*Miliou* gravity scheme potamos Liskiari	61 000
7	*Kato Akourdhalia* gravity scheme Milarka-Potamos	16 500
8	*Trakhypedhoula* pumping scheme BH 173/61 (300 donums)	72 293
9	*Kouklia* pumping scheme BH 632 (256 donums)	56 000
10	*Steni, Ayios Isidoros* gravity scheme (29 donums)	1 310
11	*Nata* river training	1 875
12	*Souskiou* pumping scheme BH 96/26 (212 donums)	43 300
	Total	£489 515