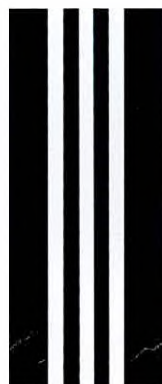


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Republic of Cyprus
Ministry of Agriculture and
Natural Resources

WATER DEVELOPMENT DEPARTMENT
ANNUAL REPORT 1981

Nicosia, November 1982

WATER DEVELOPMENT DEPARTMENT
ANNUAL REPORT 1981

Published by the PIO
for the
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Ministry of Agriculture and Natural Resources.
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Republic of Cyprus

*Ministry of Agriculture and
Natural Resources*

WATER DEVELOPMENT DEPARTMENT

ANNUAL REPORT 1981

C St Lytras, M Sc DIC B Sc – Director

Nicosia, November 1982

Abbreviations

m	metre
mm	millimetre
MCM	Milion 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 1981 the value of the Cyprus £ on average (daily basis) was:-

\$	2.3774
£ st.	1.1767
DM	5.3483
Drachma	131.0417

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I GENERAL

Introduction

Intensive effort in all fields of work continued throughout the year 1981 on planning and construction of projects along with the struggle to maintain adequate domestic water supplies to towns and villages to alleviate suffering from water shortage especially for Nicosia town which, as a result of the Turkish Invasion in 1974 and the flight of refugees to the south, has experienced a population explosion that has rendered water sources, storage and distribution mains capacity inadequate to cope with the demand. Planning of additional emergency measures for the combined water supply of Nicosia, Larnaca and Famagusta as well as several villages was under way by the end of 1981 for construction within 1982 to give a measure of relief together with the new Khir-okitia - Nicosia connection and until more radical solutions are implemented as provided under Vasilikos - Pendaskinos Project and in the long term the Southern Conveyor Project.

During 1981 and for the seventh 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.

Due to above normal rainfall during the year there was some improvement in the aquifers. However this was not the case with regard to the Kokkinokhoria area which remains a grossly overpumped aquifer.

In 1981, the Paphos Irrigation Project entered the last stages of construction with full completion of the project expected in 1982. Similarly construction of several ponds and Xyliatos Dam within the Pitsilia Project was well advanced and construction of Khirokitia - Nicosia pipeline and pertinent works within the Vasilikos - Pendaskinos Project was nearing completion by the end of the year.

Feasibility studies for the development options selected for the Southern Conveyor Project and the Khrysokhou Watershed Irrigation Project continued throughout 1981 and are scheduled to be completed within the first half of 1982.

Although actual construction work expenditure in 1981 (just over £9 million) was slightly lower than that of 1980 there was again an overall all time record expenditure in 1981 amounting to £11,642,262 as against £11, 328, 399 in 1980.

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 to be 36 MCM/year and will be provided by the Xeropotamos River flow (22MCM) regulated at Asprokremmos where an earth dam is being 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 by the end of 1982 and the total cost of the Project is estimated to reach £24 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 m³/s d) 14 pumping stations, e) 41 km long main conveyor pipelines and canaletti and f) 540 km 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 will be constructed by the same authority. In addition 26 km of farm access roads are 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.

Pitsilia integrated Rural Development Project (PIRDP) is a multipurpose project the main component of which is water development but which includes 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 mountainous 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 of 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 19 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 £6 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 kalavosos Dam with a capacity of 17 MCM b) the Dhyopotamos 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) pumping station at Dhypotamos, a treatment plant at Kornos, a balancing reservoir and a conveyor pipeline to Lakatamia Reservoir for Nicosia Water Supply and b) a balancing reservoir and pumping station at Kalavastos and a conveyor pipeline to Khirokitia treatment plant for the augmentation of Larnaca - 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 Kalavastos, Mari, Zygi, Tokhni, Psematismenos and Maroni and b) the Pendaskinos area of 2400 donums belonging to Ayios Theodoros. 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 will be possible as from 1982 to convey to Nicosia treated water from the Khirokitia Water Treatment Works. 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 (30,000m³/day) coupled with the storage facilities of the dam at one end and of the new 40,000 m³ capacity Lakatamia reservoir at the other. Construction of the reservoir was also practically completed by the end of the year. With these facilities it will be 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 Für Wiederaufbau of West Germany who have also financed the construction of Lefkara Dam in the early 1970's.

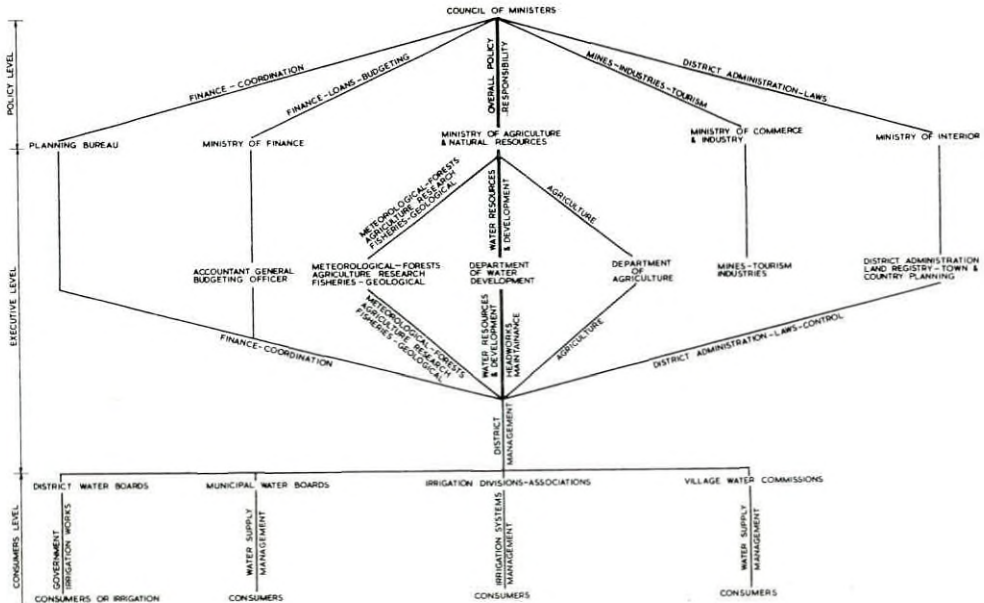
MAJOR PROJECTS UNDER FEASIBILITY STUDY

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 touristic 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

The Khrysoxhou 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 Khrysoxhou 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 Stav-



WATER DEVELOPMENT-ORGANIZATION CHART

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

ros 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 ORGANIZATION

The Water Development Department

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

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

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

The Departmental Organization is shown on page 7 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 multifarious and may involve inter alia, amending laws, handling cases in courts, attending meetings and so on.

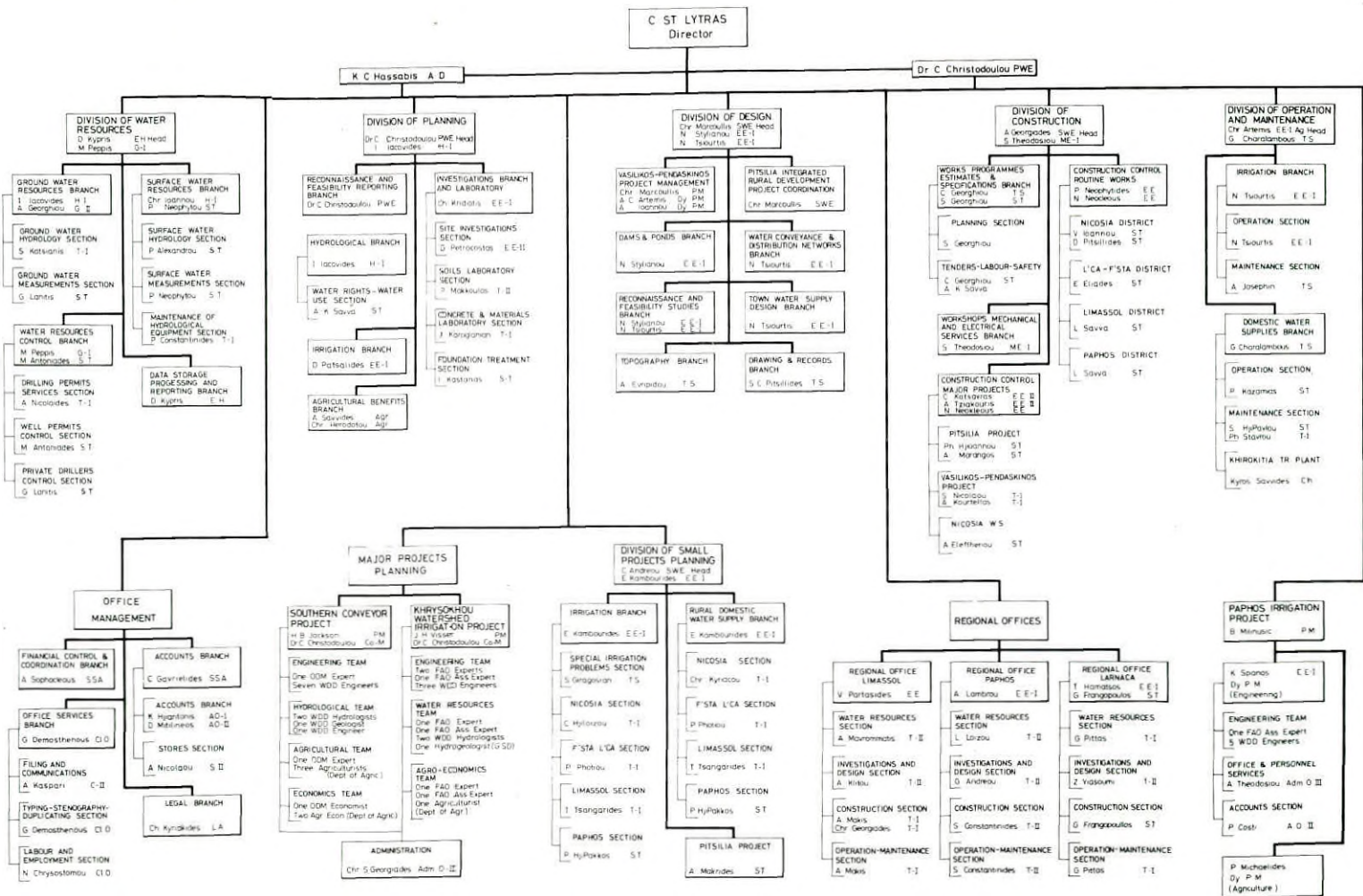
TECHNICAL STAFF OF WDD ON 31.12.81

BM/G/208

MONTHLY DAILY & ON CONTRACT TECHNICAL STAFF		D	AD	PWE	SWE	EH	EE	ME	G	H	CH	QS	TIE	TS	ST	T1	CF	ACF	T2	S	DR	F	PR	TOTAL	REFERENCE		
1	Permanent Ordinary staff	1	1	1	7	1	15	1	2	2				6	12	28	4	8	45		40			174			
2	Permanent Development staff						4			1			1	1	3	13	2	9	13			9		55	D Director		
3	Temporary Development staff						11	1		1	1		3							38		9		64	AD Assistant Director		
4	Daily paid staff and on contract						11						2	1						50	4	2	1	71	PWE Principal Water Engineer		
	TOTAL NUMBERS	1	1	1	7	1	41	2	2	4	1	2	5	6	15	41	6	17	146	4	2	5	1	364	SWE Senior Water Engineer		
DISTRIBUTION OF STAFF																											
5	Divisions	i	Water Resources				1			1					1	2			15		2			22	EH Engineer Hydrologist		
		ii	Planning					2								1			1	5					9	EE Executive Engineer	
		iii	Design				1	7						2	2		1	1		20					34	ME Mechanical Engineer	
		iv	Construction				1	4	1						1	7	2	2	6	4			19		47	G Geologist	
		v	Small Project Planning				1	1							1	2	1			2					8	H Hydrologist	
		vi	Operation & Maintenance					1				1			2	1	1			2			5		13	CH Chemist	
		vii	Paphos Irrig. Project					6	1											22	2	2			33	QS Quantity Surveyor	
		viii	Southern Conveyor Project				1	7	1	2							1				26			1		39	TIE Topographer Irrigation Eng
		ix	Khrysoxhou Project					2			2										3					7	TS Technical Superintendent
		x	Vasilikos Pendaskinos Pr.					5									1				6					12	ST Senior Technician
		xi																									33
6	Administration (Head Office)	1	1																	1				3	CF Chief Foreman		
7	Regional Offices (F'sta, L'ca, Limassol, Paphos)						2								1	3		6	30			23		65	ACF Assistant Chief Foreman		
8	On scholarship						3						1							1				5	T2 Technician 2nd Grade		
9	Vacancies				4	1						2	2	1	3	2	4	9	2		9			67	S Surveyor		
	TOTAL NUMBERS	1	1	1	7	1	41	2	2	4	1	2	5	6	15	41	6	17	146	4	2	5	1	364	DR Draughtsman		

F Foreman

PR Programmer



WATER DEVELOPMENT DEPARTMENT-ORGANIZATION CHART-DEC 1981



The Pedhieos river flood of February 1981 as seen from the Grivas-Dhiyenis Avenue bridge in Nicosia. The peak flow recorded on 24.2.81 at Kambia measuring station was 15m³/hour. WDD Photo C38-1 (24.2.81)

FOREIGN TECHNICAL ASSISTANCE

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

United Nations

Technical assistance received from United Nations during 1981 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.

A A Metekoy, FAO Associate Expert was assigned to Paphos Irrigation Project from November 1979 to December 1981

(ii) Experts - Vasilikos Pendaskinos Project

M A Gutierrez Frias, FAO Expert resigned from his assignment as project Manager, in April 1981.

(iii) Experts - Khrysokhou Watershed Irrigation Project

J H Visser, FAO Water Resources Engineer continued his services as Project Manager of

the Khrysokhou Watershed Irrigation Project throughout the year.

M Bral, FAO Economist finished his services with KWIP on the 14th December, 1981.

J W F Cools, FAO Associate expert Agro-economy continued his services with KWIP throughout the year.

A J Meulenbroek, FAO Associate expert Hydrology finished his assignment to KWIP on the 15th August, 1981.

W van der Linden, FAO Associate expert, Hydraulics Engineer continued his services with KWIP throughout the year.

Consultants - KWIP

The following consultants continued their missions to KWIP throughout 1981 as follows:

R M DOAKE, Dam Engineer worked throughout the year on the studies of two dams (Evretou and Ezousas) and the Uplands and Lowlands Water Conveyors, as part of the KWIP Irrigation development Scheme, and contributed to the preparation of Annexes

4A, 4B and 4C of the Feasibility Report.

M Richardson, Dam Engineer started working with KWIPs from 19th January 1981 and finished his assignment on 23th December, 1981. He assisted in the preparation of Annex 4C of the Feasibility Report and the Tender Documents of the main Uplands Conveyor.

I M Goodwill, Consultant in Water Resources Systems continued his services with 3 missions totalling 14 weeks (January-February, March-April, July-August). He contributed to the preparation of Annexes 2 and 3 of the Feasibility Report and tender documents for the main conveyor.

P Boyd, Consultant in Irrigation Engineering continued his services with 5 missions totalling 14 weeks (February-March, May-June, July, September, November). He assisted in the preparation of the final design report, and the tender documents for the irrigation network and he contributed to the preparation of Annex 5 of the Feasibility Report.

E H Taylor, Consultant in Dam Engineering continued his services with 5 missions totalling 7 weeks (February, March, April, June, October). He assisted the KWIP dam engineers with the feasibility design of the Evretou and Ezousas dams and Lowlands Main and Upland conveyors as well as with the preparation of Annexes 4A, 4B and 4C of the Feasibility Report.

D J C Laming, Consultant in Dam Geology had 3 missions to KWIP totalling 4 weeks (February, April, October). He assisted with the interpretation of the geology at the Evretou and Ezousas damsites and contributed to the preparation of Annexes 4A and 4C of the Feasibility Report.

G P Kruseman, Consultant in Hydrogeology had one mission to KWIP from 25th May to 16th July 1981, totalling 7 weeks to assist with the pumping tests analyses and the preparation of Annexes 2 and 3 of the Feasibility Report.

BRITISH TECHNICAL ASSISTANCE

Southern Conveyor Project

Four experts, from UK Ministry of Overseas Development (ODM) continued throughout 1981 their work together with Cypriot staff on the preparation of a feasibility study for the Southern Conveyor Project.

They are:

H B Jackson

M J Makin

Dr R J Grimble

T J Kingham

Project Manager

Agriculturist

Agr. Economist

Civil Engineer

A detailed description of the work carried out during 1981 is given in chapter III of this report.

Consulting visitors (SCP)

Dr B W Eavis, Irrigation Agronomist of the land Resources Development Centre (UK), visited the project between January 13 and 17 to assist in finalizing the Irrigation Program of the SCP System Model, to advice on mechanisation and to participate in a meeting convened to coordinate island-wide systems for determining crop water requirements.

C A Robertson, Assistant Director of LRDA/ODA visited the project from 13-16 October over the period of the 10th management meeting.

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.

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

Sir M MacDonald and Partners, for the studies of 2 dams and main uplands conveyor of Khrysokhou Watershed Irrigation Project together with the KWIP team.

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 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.

Lemon and Blizard, Southampton, England for the design and supervision of Phase I of the Vasilikos-Pendaskinos Project.

SUMMARY OF ACTIVITIES

Water Resources

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 for the hydrometeorological year 1980-1981 averaged 574 mm which is 108% of normal. Rainfall was above normal over the western areas (Peyia to Akhelia), over all parts of the southern areas and over small parts of the central plain (Meniko to Kokkinotrimithia and Athalassa to Nisou) and ranged between 110% and 125% of normal. Over some areas of Larnaca district rainfall exceeded 140% of normal (Psevdhas to Avdhellero). Over the remaining areas rainfall was around normal or slightly below normal (Yialia - Stavros Psokas - Kykko - Philousa, kapoura - Astromeritis, Nicosia - Klirou - Analiondas - Lefkara, Kokkinokhoria).

The maximum amount of rainfall in a 24-hour period was 198.0 mm recorded by an automatic raingauge, installed at Goshi village by Soil Conservation Section of the Agricultural Department, on the 15th June, 1981.

The first snowfall occurred on Mount Olympus the highest peak of Troodos mountain range, on the 21st November 1980. The last snowfall occurred on the 23rd March 1981.

The air temperature was slightly above normal. The extreme maximum temperature was 40.7°C reported by Nicosia town Climatological Station on the 26th July 1981 and the extreme minimum temperature was -4.2°C reported by Amiandos Mines Climatological Station on the 11th December 1980.

As extracted from the available data the maximum annual evaporation measured from a USWB pan was 2145 mm reported by Larnaca Airport and the minimum annual evapora-

tion was 1767 mm reported by Saittas.

The general conclusion obtained from the study of the records of 62 river flow gauging stations is that river flows were above normal, in general, for this year because of the high precipitation that occurred during January and February.

Of course the high precipitation of January and February resulted in an improvement of the ground water situation in most aquifers as well. However due to severe overpumping, the ground water situation in the Kokkinokhoria area did not improve at all.

Planning and Design of Projects

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

Stage 1 of the feasibility study for the Southern Conveyor Project (SCP) was completed in 1980 and during 1981 the team was involved with stage 2 of the study i.e. the preparation of a detailed feasibility study of the option selected by the government was started. By the end of 1980 a British firm of Consulting Engineers was employed to undertake the engineering component of the feasibility study.

The Southern Conveyor Project study is being carried out with the cooperation of the UK Ministry of Overseas Development which has since the spring of 1978 provided the Project Manager and 3 experts to work with local staff of various expertises, on the various aspects of the study. The main water source of the SCP will be Kouris dam the design of which is carried out by a French firm of Consultants.

The Khrysoxhou Watershed Irrigation Project (KWIP) was initiated in the spring of 1979 with financial assistance from the United Nations Development Programme (UNDP). During 1980 a preliminary report was produced presenting 9 different options which were submitted to the Government. Work on the feasibility study of the option selected commenced in September 1980 and continued throughout 1981. The water source of the KWIP will be Evretou and Ezousas dams and 3 intakes to augment the water of existing dam projects in the northern coastal part of the project.

Early in January a contract was signed between the Government and a joint venture of British Consultants together with a Cypriot technical office for the preparation of the detailed designs, drawings and contract documents of the Vasilikos-Pendaskinos Project works, as well as for the supervision of their construction. The design of the two dams of the project was almost fully completed by the end of the year and tenders for the electromechanical equipment of the treatment plant and of the pumping stations were invited. The studies on other components of the project had also substantially advanced.

As was the case during the last three years, the Design Division of the Department concentrated its efforts mainly on the preparation of feasibility studies, detailed designs and contract documents for pond and borehole irrigation schemes within the Pitsilia Integrated Rural Development Project. Since the commencement of the Project, a number of ten pond and six borehole schemes had been completed or were under construction by the end of 1981.

Construction of Projects

Construction expenditure of the Department during 1981 reached £9,038,378 as against £9,389,027 in 1980.

Construction work for the **Paphos Irrigation Project** continued during the year 1981. Full completion of the 1st phase of the project covering an area of about 3,500 ha in the eastern part was achieved early in 1981 so that it has come under operation during the irrigation season of the same year. Work on Asprokremmos Dam has continued throughout the year 1981 by the end of which it has reached about 90% completion and aiming to start impounding as from the end of February 1982 by closing the tunnel gate so that water would be collected in the dam reservoir before the dry season of the year 1982. Construction works on the last two contracts have started during 1981 which provide for the construction of (a) 26 km of farm access roads in the eastern sectors and (b) the installation of irrigation networks and construction of reservoirs in the western areas of Emba, Kissonerga, Peyia and Ayios Yeoryios of total net irrigable land of 1,320 ha. Progress on both above new contracts up to the end of the year 1981 has been satisfactory.

The total expenditure incurred during the year 1981 reached the sum of £4,032,186

which brought the total expenditure since commencement of the project works to £20,039,646. Full completion of the project is expected within the year 1982 at the total estimated cost of about £24 million.

The water development component of the **Pitsilia Integrated Rural Development Project** (PIRDP) features second in construction expenditure reaching £1,577,069 in 1981 as compared to £881,326 in 1980. PIRDP entered its 3rd full year of construction in 1981. Three earth ponds were completed during the year, namely Ephtagonia Pond No 3, with a capacity of 65,000 m³, Akapnou-Ephtagonia Pond with a capacity of 132,000 m³ and Kato Mylos Pond with 104,000 m³ capacity. By the end of 1981 two other ponds, Arakapas No 1 (Cap. 191,000 m³) and Ephtagonia Pond No 2 (Cap. 127,000 m³) were substantially completed.

Out of a total number of about 20 PVC lined earth ponds included in the PIRDP nine were completed by the end of 1981 including the small Ayii Vavatsinias arch dam with a total capacity of 754,000 m³. Work continued also on Xyliatos Dam the only dam included in the PIRDP with a capacity of 1.3 MCM scheduled for completion late in 1982 at a cost of approx. £1 million. Distribution networks for the areas to be irrigated from ponds were also being constructed as well as the distribution network for Xyliatos Dam, borehole irrigation schemes and rehabilitation works for existing Irrigation Divisions and Associations. During 1981 distribution networks were completed for Ayii Vavatsinias Pond and Ephtagonia Pond No 1. The distribution networks for five other ponds schemes were substantially completed namely for Akapnou-Ephtagonia Pond, Arakapas Pond No 1, Ephtagonia Ponds Nos 2 and 3, Kato Mylos Pond and Khandria Pond.

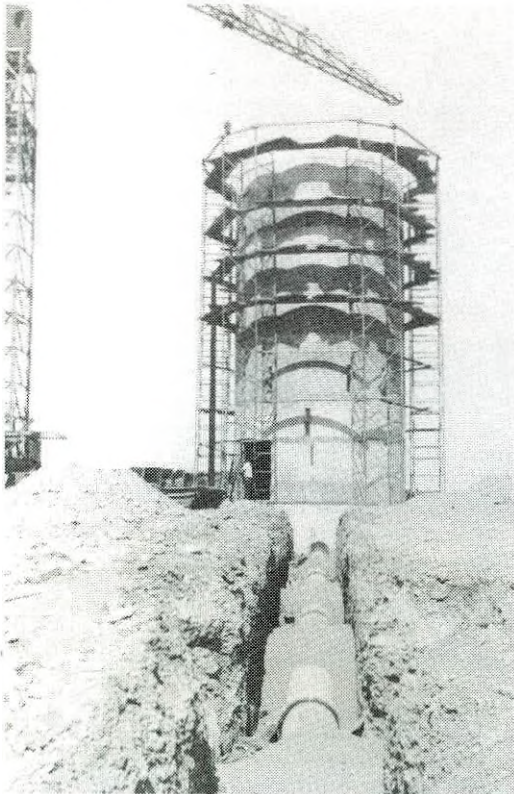
Nicosia Water Supply features 3rd on the construction expenditure for 1981 with £1,259,759 mainly for the continuation of the construction of the New Lakatamia Reservoir and emergency schemes (£237,391) as well as the Phase I of the **Vasilikos-Pendaskinos Project**, Nicosia Water Supply (£1,022,368).

Other significant construction expenditure in 1981 was £1,103,786 for rural domestic water supplies (£616,321) water supply schemes for Refugee housing and self-housing estates (£343,055) and distribution

systems for private land developers (£105,387).

A total number of 36 routine irrigation schemes were constructed in 1981 throughout free Cyprus at a total cost of £366,336 including Khrysokhou Valley B H irrigation scheme (£69,552).

During 1981 the Department undertook the construction of 67 schemes for other Government Departments at a total expenditure of £229,938 mainly for water supply to livestock farm areas and T/C villages.



The break pressure tank being constructed at Nisou on the gravity pipeline from Stavrovouni Balancing Reservoir to Lakatamia storage reservoir. The total length of the Dhypotamos-Nicosia 500 and 600 mm dia pipeline is 40 km made up of 12.5 km steel pipes (mainly from Dhypotamos P S to Stavrovouni) and 27.5 km A C pipes including the connection from Skarinou (on the khirokitia-Famagusta pipeline) to Dhypotamos P S. The conveyance capacity of the pipeline is 30,000 m³/day WDD Photo C 81-8 (30.9.81).

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.

During 1981 a quantity of 8.8 MCM was delivered to Nicosia whilst a further quantity of 0.7 MCM was produced from sources of the Nicosia Water Commission. The Peristerona-Akaki emergency scheme which was put in operation in 1980 faced many problems especially due to the presence of sand in the water which produced rapid pump wear and frequent breakdowns. This resulted in a much lower yield than had originally been anticipated. An average of 3800 m³/day was conveyed to Nicosia from this scheme during the summer months.

Serious difficulties were experienced in meeting the demand especially in the summer months when a 12hr supply every other day was made available. For the first time restrictions were imposed on the supply right through the winter months and into 1982.

The total expenditure for the operation and maintenance of all sources and conveyance systems supplying Nicosia rose to £580,486 and the revenue generated during the year from the sale of water reached £260,674 (including outstanding accounts).

Water continued to be supplied to the Turkish sector 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 Famagusta Water Supply Scheme comprising Lefkara Dam as its main source of water, Vasilikos sub-surface dam, a number of supplementary borehole sources, the Water Treatment Works at Khirokitia and the Lefkara-Khirokitia and Khirokitia-Famagusta

sta pipelines is managed, operated and maintained by the Department of Water Development. In addition to Famagusta town the scheme supplies water to Larnaca town and numerous villages and refugee housing estates in the districts of Famagusta and Larnaca.

A total quantity of 4.5 MCM was produced by the scheme in 1981, of which 3 MCM was drawn from Lefkara Dam (net of losses at the treatment works).

The total expenditure for the operation and maintenance of the scheme during the year was £179,037 and the revenue generated reached £197,164 (including outstanding accounts).

The town of Larnaca received a total of 1.2 MCM of water from the Famagusta Water Supply Scheme and produced from its own (or hired) borehole sources a further quantity of 1.8 MCM. With these quantities at its disposal the Water Board of Larnaca was able to meet the demand of the town successfully.

Limassol Water Board has both the sources and the distribution system of the town under its control. Demand was met comfortably during the year. The total production rose to 7.6 MCM.

Paphos Water Supply comes under the jurisdiction of the Municipality. No water shortage problems were experienced during the year. Total production was 1.2 MCM.

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 54.25 MCM. From this quantity 22.34 MCM were used for the irrigation of 41,084 donums, 3.36 MCM were used for domestic water supplies, 15.06 MCM were used for recharge, 5.42 MCM seeped through or below the dams and 3.05 MCM were lost as evaporation. The remaining 5.01 MCM were retained in the dams as over annual storage.

Water available for utilization from Government Projects reached the figure of 50.66

MCM. Out of this only 37.62 MCM was utilized 19.63 MCM for irrigation, 3.36 MCM for domestic water supply and 14.63 MCM for recharge. Irrigation water was utilized on 37,340 donums of land planted with citrus, bananas, vines, deciduous, vegetables, potatoes, cereals and olives. The gross income from the sale of water amounted to £253,307 whereas the operation expenses reached the amount of £207,738.

The maintenance expenses amounted to £50,539. The net income to Government projects for the year was £4,838.

Water available for utilization from contributory schemes was 3.11 MCM out of which 2.71 MCM was for the irrigation of 3,744 donums.

Recharge works in the Government controlled areas represent only 11.5% of the total recharge capacity available in Cyprus and collected a total quantity of 0.48 MCM out of which 0.43 MCM 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 legal adviser performs all the duties and obligations which are assigned to any counsel of the Republic to carry out, in all the courts of the Republic these be District Court or the Supreme Court that is to say he enters appearances and prepares all necessary pleadings for any actions or recourses which may be assigned to him to handle either because they are against the Director of the Department because the subject matter is the commodity of water, or water rights, differences which derive from breach of contract in which again the Director is a party, trespass to property, compulsory acquisition and requisition of immovable property, nuisance, negligence and so on.

The legal adviser acting under the supervision and auspices of the Attorney General prepares bills amending existing Laws dealing with the commodity of water.

DAMS CONSTRUCTED UP TO 1960

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

Total Storage Capacity 6.174 m³ x 10⁵

MINOR RECHARGE DAMS FROM 1960-70

No	DAM	TYPE	HT	1000m ³	YEAR
47	Sotira	Earth	8	45	1962
48	Panayia (F)	Earth	7	45	1962
49	Paralimni (45)	Earth	5	115	1963
50	Ayia Napa (7)	Earth	8	55	1963
51	Fista Recharge	Earth	5	50	1963
52	Phrenaras (6)	Earth	5	115	1964
53	Dherinya	Earth	6	23	1964
54	Phrenaras (3)	Earth	7	45	1966
55	Avgarou (7)	Earth	3	68	1966
56	Kandea (2)	Earth	5	82	1966
57	Xylophaghou (1)	Earth	7	86	1966
58	Sotira (4)	Earth	5	32	1966
59	Lysi	Earth	7	77	1967
60	Ay Yearayios (9)	Earth	3	68	1967
61	Ay Epikritos (6)	Earth	6	34	1968
62	Akanthou (6)	Earth	6	45	1968
63	Akhna (3)	Earth	4	40	1968
64	Xyloymbou (5)	Earth	5	50	1969

Total Storage Capacity 1075 m³ x 10⁵

MAJOR DAM PROJECTS FROM 1960-70

No	DAM	TYPE	HT	1000m ³	YEAR
17	Prodhromos	Earth	10	122	1962
18	Morphou	Earth	13	1,879	1962
19	Lefka	Gravity	35	368	1962
20	Geunyei	Earth	15	1,045	1962
21	Athalassa	Earth	18	791	1962
22	Kanli Kesuy	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	Kiri	Earth	22	1,614	1964
27	Agros	Earth	26	99	1964
28	Lopetri	Earth	18	340	1964
29	Polemidhia	Earth	45	3,884	1965
30	Ayia Marina	Rockfill	33	311	1965
31	Kalapanayiotis	Earth	40	391	1966
32	Mavrokolymbos	Earth	45	2,180	1966
33	Pamos	Rockfill	38	859	1966
34	Yermasoyia	Earth	49	13,600	1968
35	Syngراس	Earth	7	1,115	1968

Total Storage Capacity 32,041m³ x 10⁵

MAJOR RECHARGE DAMS FROM 1960-70

No	DAM	TYPE	HT	1000m ³	YEAR
36	Ayios Yearayios	Earth	6	90	1962
37	Fista 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	Makrosyfa	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	Protapapas	Earth	6	90	1970

Total Storage Capacity 8,275 m³ x 10⁵

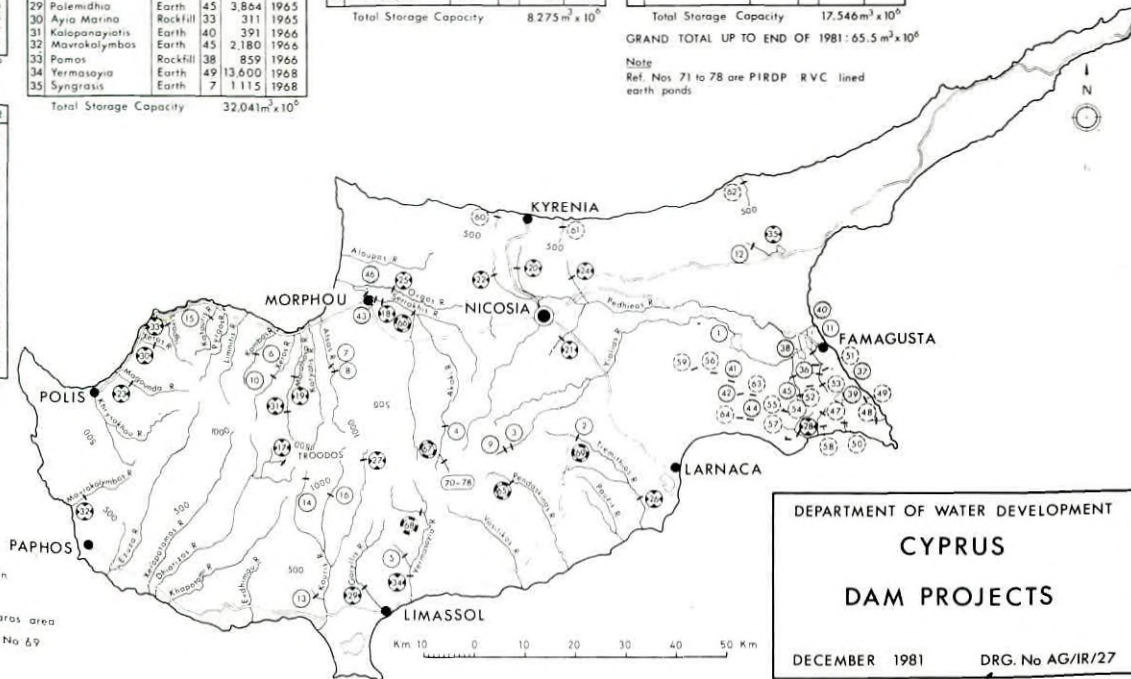
MAJOR DAM PROJECTS FROM 1971-80

No	DAM	TYPE	HT	1000m ³	YEAR
65	Lefkara	Earth	71	13,850	1973
66	Mastara Recharge dam	Gravity	15	2,273	1973
67	Palekhori-Kambi	Earth	33	620	1973
68	Arakapas	Gravity	23	130	1975
69	New Lymbia	Gravity	12	220	1977
70	Ayil Vavatsimias	Arch	14	54	1980
71	Ayil Vavatsimias	Earth	10	55	1980
72	Ephatagonia 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 17,546 m³ x 10⁵

MAJOR DAM PROJECTS FROM 1981-

No	DAM	TYPE	HT	1000m ³	YEAR
76	Ephatagonia No 3	Earth	10	65	1981
77	Akapanou-Ephatagonia	Earth	9	132	1981
78	Kato Mylos	Earth	10	104	1981

Total Storage Capacity 301 m³ x 10⁵GRAND TOTAL UP TO END OF 1981: 65.5 m³ x 10⁵Note
Ref. Nos 71 to 78 are PIRD P RVC lined earth ponds

DEPARTMENT OF WATER DEVELOPMENT

CYPRUS

DAM PROJECTS

DECEMBER 1981

DRG. No AG/IR/27

① Dams constructed up to 1960

② Major dam projects from 1960-70

③ Major dam projects from 1971-80

④ Major recharge dams from 1960-70

⑤ Minor recharge dams from 1960-70

HT refers to height in meters from foundation

YEAR is the year of completion

Phrenaras (6) means six small dams in Phrenaras area

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

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, Hydrologist, 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 Office.

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. The IHP officially started being operational in 1976 with the establishment of National Committees to act as focal points for IHP activities.

Several scientific and educational IHP projects have already been decided upon and questionnaires regarding local practice have been answered. Data from the Cyprus Decade Stations were continued to be provided.

As a contribution of the Cyprus National Committee to the second phase of the IHP terminating in 1983 it has been decided to host and organize a symposium in Cyprus with the subject "hydrological aspects of water supply and waste water disposal in coastal urban areas and tourist sites in the mediterranean area".

All national committees of the mediterranean countries have been invited to attend. Formalities with Unesco have been concluded and the symposium is planned for October 1982.

The secretary of the Committee participated in the International Conference on Hydrology and the Scientific Bases for the Rational Management of Water Resources which was convened in Paris on the 18th to 27th of August 1981 within the auspices of the IHP. Following this he participated in the discus-

sions during the meeting of the Intergovernmental Council of the IHP which was held on the 28th and 29th of August 1981 at the Unesco head-quarters.

P Aristotelous of the Department of Agriculture, appointed member of the working group responsible for the preparation of material illustrating the importance of water resources in socioeconomic development, continued to work on the subject together with the other members of the working group.

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, Hydrologist I.

Members

Dr Christodoulou, Principal Water Engineer

D Kypris, Engineer Hydrologist.

C Andreou, Senior Water Engineer.

Chr Artemis, Executive Engineer I.

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.

Assessment of recharge to aquifers by lysimeter studies

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

REGISTER OF DAMS IN CYPRUS

S E R. No	NAME OF DAM	YEAR OF COMPLE TION	LOCATION			T Y P E	P O S I T I O N A N D N A T U R E O F S E A L I N G E L E M E N T	F O U N D A T I O N	H E I G H T A B O V E L O W E S T F O U N D A T I O N (m)	L E N G T H O F C R E S T (m)	V O L U M E C O N T E N T O F D A M (10 ³ m ³)	G R O S S C A P A C I T Y O F R E S E R V O I R A R E A (10 ³ /m ³) (10 ³ /m ²)	P U R P O S E	M A X I M U M D I S - C H A R G E C A P A C I T Y O F S P I L L - W A Y S (m ³ /s)	T Y P E O F S P I L L - W A Y S	O W N E R	E N G I N E E R I N G B Y	C O N S T R U C T I O N B Y	S E R. No	
			R I V E R	N E A R E S T C I T Y	S T A T E P R O V I N C E O R C O U N T R Y															
1	KAFIZES	1953	Xeros	Nicosia	Nicosia	PG	R	23	27	4	113	I	54	L	Lefka Irr. Div.	W D D	W D D	1		
2	KANDOU	1958	Kouris	Limassol	Limassol	PG	R	15	53	2	34	I	59	L	Kandou Irr. Div.	W D D	W D D	2		
3	PERAPEDI	1956	Kouris	Limassol	Limassol	PG	R	22	62	4	55	I	107	L	Perapedi Irr. Div.	W D D	W D D	3		
4	PYRGOS	1957	Katouris	Nicosia	Nicosia	PG	R	22	66	5	285	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	I	59	L	Trimiklini Irr. Div.	W D D	W D D	5		
6	ATHALASSA	1962	Pedheos	Nicosia	Nicosia	TE	ie	R/S	18	447	103	I	48	L	Government	W D D	W D D	6		
7	GEUNYELI	1962	Pedheos	Nicosia	Nicosia	TE	he	R/S	15	254	50	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	I	246	L	Lefka Irr. Div.	W D D	W D D	8		
9	MORPHOU	1962	Serakhis	Nicosia	Nicosia	TE	ie	S	13	1436	206	I	764	L	Morphou Irr. Div.	W D D	W D D	9		
10	PRODHROMOS	1962	off stream	Limassol	Limassol	TE	ie	R/S	10	756	73	I	-	L	Prodhromos Irr. Div.	W D D	W D D	10		
11	KANLI KEUY	1963	Pedheos	Nicosia	Nicosia	TE	he	R/S	19	311	47	I	116	L	Kanli Keuy Irr. Div.	W D D	W D D	11		
12	AGROS	1964	Kouris	Limassol	Limassol	TE	ie & fe	R	26	180	61	I	6	L	Agros Irr. Div.	W D D	W D D	12		
13	MARGAKA	1964	Magoussa	Paphos	Paphos	ER	ie	R	41	173	138	I	280	L	Government	Howard Humphreys & Sons of U.K.	W D D	W D D	13	
14	KITI	1964	Tremithos	Larnaca	Larnaca	TE	ie	S	22	990	183	I	602	L	Government	Il Nuovo Castoro of Italy	W D D	W D D	14	
15	LIOPETRI	1964	Potamos	Famagusta	Famagusta	TE	he	S	18	579	50	R	150	L	Liopetri Irr. Div.	W D D	W D D	15		
16	MIA MILEA	1964	Pedheos	Nicosia	Nicosia	TE	ie	R/S	22	140	54	I	24	L	Mia Milea Irr. Div.	W D D	W D D	16		
17	OVGOS	1964	Sarrakhis	Nicosia	Nicosia	TE	ie	S	16	745	130	I	786	L	Morphou Irr. Div.	W D D	W D D	17		
18	AYIA MARINA	1965	Xeros	Paphos	Paphos	ER	ie	R	33	142	61	I	161	L	Ayia Marina Irr. Div.	Energoprojekt of Yugoslavia	Med Constr. Greece - G.P. Zachariades Cyprus	W D D	W D D	18
19	POLEMIDHIA	1965	Garyllis	Limassol	Limassol	TE	ie	R/S	45	196	215	I	581	L	Government	Energoprojekt of Yugoslavia	Mowlem & Ridgway of U.K.	W D D	W D D	19
20	KALOPANAYIOTIS	1966	Marathasa	Nicosia	Nicosia	TE	ie	R	40	137	156	I	207	L	Government	Howard Humphreys & Sons of U.K.	W D D	W D D	20	
21	MAVROKOLYMBOS	1966	Mavrokolymbos	Paphos	Paphos	TE	ie	R/S	45	528	267	I	340	L	Government	Energoprojekt of Yugoslavia	CYBARCO of Cyprus	W D D	W D D	21
22	POMOS	1966	Livadi	Paphos	Paphos	ER	ie	R	38	302	153	I	300	L	Pomos Irr. Div.	Energoprojekt of Yugoslavia	Med Constr. Greece - G.P. Zachariades Cyprus	W D D	W D D	22
23	YERMASOYIA	1968	Yermasoyia	Limassol	Limassol	TE	ie	R	49	409	539	I	850	V	Government	Energoprojekt of Yugoslavia	CYBARCO of Cyprus	W D D	W D D	23
24	LEFKARA	1973	Syrkalis	Larnaca	Larnaca	ER	ie	R	74	240	820	S/I	316	L	Famagusta Water Board & Lefkara Irr. Div.	Howard Humphreys & Sons of U.K.	L. Fairclough U.K. & MEDCON Cyprus	W D D	W D D	24
25	MASARI	1973	Sarrakhis	Nicosia	Nicosia	TE	ie	S	15	929	245	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

S E R No	NAME OF DAM	YEAR OF COMPLETION	LOCATION			I Y P E	P O S I T I O N A N D N A T U R E O F S E A L I N G E L E M E N T	F O U N D A T I O N	H E I G H T A B O V E L O W E S T F O U N D A T I O N (m)	L E N G T H O F C R E S T (m)	V O L U M E C O N T E N T O F D A M (10 ³ /m ³)	G R O S S C A P A C I T Y O F R E S E R V O I R A R E A (10 ³ /m ³ , 10 ³ /m ²)	P U R P O S E	M A X I M U M D I S - C H A R G E C A P A C I T Y O F S P I L L - W A Y S (m ³ /s)	T Y P E O F S P I L L W A Y S	D W N E R	E N G I N E E R I N G B Y	C O N S T R U C T I O N B Y	S E R No
			RIVER	NEAREST CITY	STATE PROVINCE OR COUNTRY														
26	PALEKHORI KAMBI	1973	Araki	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 20	I	205	L	Arakapas Irr Div	W D D	W D D	27
28	AYII VAVATSIKIAS No1	1980	off stream	Larnaca	Larnaca	TE	fp	S	17	125	32	55 11	I			Palambelia-Mosphiomouth Irr Div	W D D	Iacovou Bros, Cyprus	28
29	EPHTAGONIA No1	1980	off stream	Limassol	Limassol	TE	fp	S	16	390	46	92 17	I			Kokkinoyia Irr Div	W D D	Iacovou Bros, Cyprus	29
30	KHANDRIA	1980	off stream	Limassol	Limassol	TE	fp	S	35	82	41	70 14	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	59 13	I			Melini Irr Div	W D D	Iacovou Bros, Cyprus	31
32	PELENDRIA	1980	off stream	Limassol	Limassol	TE	fp	S	18	229	59	123 21	I			Ammos Irr Div	W D D	FYSCO, Cyprus	32
33	AKAPNOU - EPHTAGONIA	1981	off stream	Limassol	Limassol	TE	fp	S	18	280	67	132 24	I			Akapnou - Ephantonia Irr Div	W D D	Iacovou Bros, Cyprus	33
34	AYII VAVATSIKIAS	1981	Vasilikos	Larnaca	Larnaca	VA		R	19	58	2	53 12	I			Palambelia - Mosphiomouth Irr Div	W D D	W D D	34
35	KATO MYLOS	1981	off stream	Limassol	Limassol	TE	fp	S	23	240	41	104 20	I			Vatera Irr Div	W D D	Phoenix Constructions, Cyprus	35
36	AGRIDHIA	1982	off stream	Limassol	Limassol	TE	fp	S	18	119	25	59 12	I			Kladhos Irr Div	W D D	Iacovou Bros, Cyprus	36
37	ASPROKREMMOS	1982	Xeropotam	Paphos	Paphos	TE	ie	R/S	56*	700	2097	51000 2590	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	273 36	I			Phterika Irr Div	W D D	Iacovou Bros, Cyprus	38
39	XYLIATOS	1982	Lagoudera	Nicosia	Nicosia	ER	ie	R	42	155	240	1250 98	I	100	L	Government		General Construction Co Cyprus	39
40	LAGOUDHERA	C(1983)	off stream	Nicosia	Nicosia	TE	fp	S	36	123	63	70 14	I			Azousa Irr Div	W D D	Joint Venture Phoenix Constr & KYKON, Cyprus	40
41	AYII VAVATSIKIAS No2	C(1983)	off stream	Larnaca	Larnaca	TE	fp	S	25	130	30	43 9	I			Patela - Palovato Irr Div	W D D		41
42	DHIERONA	C(1983)	off stream	Limassol	Larnaca	TE	fp	S	24	167	59	159 27	I			Dhiastera Irr Div	W D D		42
43	KHIROKITIA	C(1983)	off stream	Larnaca	Larnaca	TE	fp	S	16	460	95	205 31	I			Irr Div to be set up	W D D		43
44	DHPOTAMOS	C(1985)	Pendashino	Larnaca	Larnaca	ER	ie	R	49	390	1090	15000 1000	S/I	1130	L	Government	Rafe, Kennard & Lapworth & W Evans & Partners, U.K		44
45	KALAVASOS	C(1985)	Vasilikos	Larnaca	Larnaca	ER	ie	R	57	482	1700	17000 875	I/S	1268	L	Government	Rafe, Kennard & Lapworth & W Evans & Partners, U.K		45
46																			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

has moved into its 4th year. The project started in 1977 with the objective of finding the effect of rainfall on recharge by means of lysimeters.

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 determining quantitative recharge to aquifers in semi-arid areas. Large lysimeters and geochemical profile techniques have been used in the South-western Mesaoria area and Akrotiri. Initial results from the lysimeters indicate a current annual recharge of 5 mm in Southeastern Mesaoria (1978), whilst a mean annual recharge of 50 mm at Akrotiri has been obtained by the chloride profile method.

Measurements and field investigations are expected to continue until 1983.

International Commission On Large Dams

The International Commission on Large Dams (ICOLD) is a non-profit seeking organization 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 (CYNOLD) was elected to full membership of ICOLD in 1969. During 1981 the National Committee was composed of the following:

Chairman

C St Lytras, Director, WDD

Secretary

C C Artemis, Executive Engineer I, WDD

Members

Dr C A Christodoulou, Principal Water Engineer, Head, Planning Division, WDD

Chr Marcoullis, Senior Water Engineer, Head, Design Division, WDD

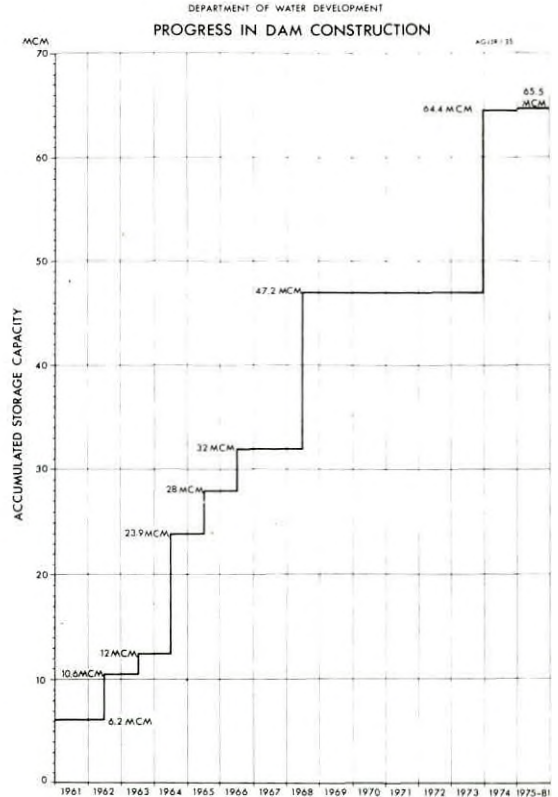
A Papadopoulos, Representative of the Association of Civil Engineers and Architects

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

The 49th Executive meeting of ICOLD was held in Stockholm, Sweden on 28th and 29th

May 1981. Unfortunately the Cyprus National Committee was not represented at this meeting.

The 50th Executive Meeting of ICOLD and the 14th Congress on Large Dams will be held in Rio de Janeiro, Brazil between 28th April and 7th May 1982.



The four topics around which technical papers are to be 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.

During the year under review the only local activity organized by CYNOLD was a visit on 15th May to the Asprokremmos Dam which was under construction as part of the

Paphos Irrigation Project. Participants had a unique opportunity to be ably and knowledgeably guided about this major site by the Resident Engineer, the Contractor's Agent and their respective staffs and to enjoy the excellent hospitality offered by the Joint Venture Contractors.

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.

International Commission on Irrigation and Drainage

The International Commission on Irrigation and Drainage is a non-profit organization whose objectives are to stimulate and promote the development and application of the science and techniques 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 77 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, Executive Engineer I, WDD

Members. Ex-officio

Director, Department of Forests

Director, Department of Agriculture

Director, Argiculture Research Institute

During the year 1981 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 second International Executive Council Meeting was held at Grenoble, France between 31st August - 1st September 1981. The Executive Council meeting has dealt with membership, finance and expenditure, publications, regional conferences, etc.

- The eleventh Congress on Irrigation and Drainage was held in Grenoble. A total of 761 persons from all over the world participated and in all 122 papers were received from 22 countries and 4 International Organizations. The Congress dealt with the following:
Question 36: Improvement and modernization of existing irrigation and drainage systems.

Question 37: Flood control in relation to and use of planning and water management.

Special session 1981: Principles of designing control system for water resources and irrigation using modern techniques.

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 1981 the National Committee was composed of the following:

Chairman

C St Lytras, Director, WDD

G Charalambous, Technical Superintendent, WDD — Secretary

Members, Ex-officio

The Representative of the Ministry of Interior

The Managers, of the 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 1981 the total expenditure by the Department was £11,642,262 from budgeted and non-budgeted votes amounting to £13,576,759.

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 1981

Description	Budget £	Expenditure £
W D D Development Estimates	8 797 459	7 673 703
Village loans		273 398
W D D Ordinary Estimates	1 778 467	1 427 697
Non-budgeted votes for Pitsilia Project, refugee housing estates, works for other government Departments, private developers and village deposits	3 000 833	2 267 464
Total	£13 576 759	£11 642 262

The level of construction works carried out during 1981 was £9,038,378 from WDD and other votes. See table V-1 under Construction Division.

The largest item of expenditure was for the Paphos Irrigation Project for which the sum of £4,032,186 was spent.

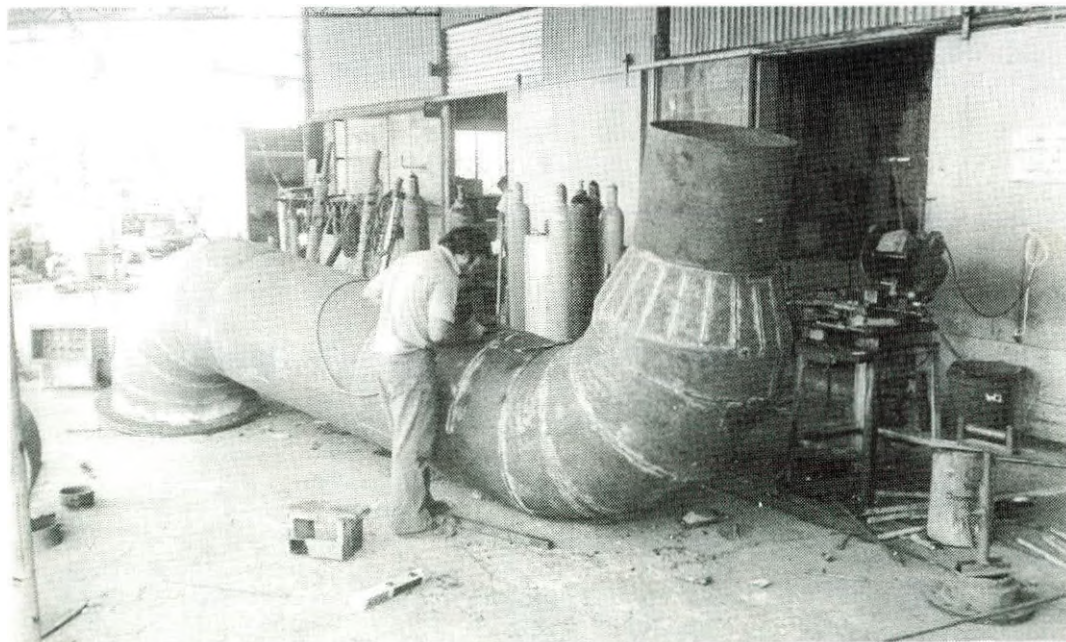
Loan Proceeds

(a) Three loans from the Federal Republic of Germany for the sum of DM 18 million were approved for the construction of irrigation schemes in rural areas. A fourth loan for the sum of DM 10 million was approved for the Nicosia Water Supply-First Phase (VPP). During 1981 the sum of £580,140 was withdrawn from the loan, for irrigation schemes and £1,672,083 for Nicosia Water Supply.

(b) Loan from the International Bank of Reconstruction and Development for the Paphos Irrigation Project (\$14 million). During 1981 the sum of £167,696 was withdrawn from the loan.

Revenue

The sum of £324,509 was collected during the year (1980 was £463,509) as revenue mainly from the sale of water for the Greater Nicosia and Famagusta Water Supply Schemes.



Manufacture, at the WDD workshop, of a special used at the new Lakatamia Reservoir connecting the Stavrovouni incoming pipeline chamber with the Reservoir. WDD Photo C83-1 (9.10.81)

TABLE I-2
EXPENDITURE FOR THE YEAR 1981

Ser No	Details	Expenditure			Total £
		Government Ordinary £	Development £	Village (Loans) £	
A W D D Votes					
1	Administration	591 001	695 401	—	1 286 402
2	Greater Nicosia WS scheme running expenses	579 143	—	—	579 143
3	F'sta water supply running expenses	168 518	—	—	168 518
4	Regional village WS schemes running expenses	42 922	—	—	42 922
5	Irrigation, drainage and dams	22 084	5 941 441	102 274	6 065 799
6	Town water supplies (Nicosia WS)	—	242 007	—	242 007
7	Village water supplies	—	416 725	171 124	587 849
8	Drilling & prospecting	10 903	—	—	10 903
9	Hydrology	—	110 890	—	110 890
10	Surveys & investigations	—	233 430	—	233 430
11	Purchase of machinery and equipment	—	30 097	—	30 097
12	Stores	13 126	—	—	13 126
13	Others	—	3 712	—	3 712
	Total	£1 427 697	£7 673 703	£273 398	£9 374 798
B Non-budgeted votes					
					£
1	Pitsilia Project				1 575 030
2	Refugee housing estates				329 825
3	Works for other Government Department				210 963
4	Private developers				105 386
5	Village deposits				46 260
	Total				£2 267 464
	Grand total				£11 642 262

(i) Breakdown of Administration

	Ordinary £	Development £	Total £
1 Personal emoluments	351 633	260 437	612 070
2 Casual technical assistance	—	129 644	129 644
3 13th salary	44 968	49 475	94 443
4 Fees and allowances	166 871	183 249	350 120
5 M'ce & operation of motor transport	7 590	—	7 590
6 Leave pay to regular employees	—	2 612	2 612
7 Government water supply	7 931	—	7 931
8 Travelling	4 565	59 102	63 667
9 Office expenses	7 444	10 882	18 326
Total	£591 002	£695 401	£1 286 403

TABLE I-2 EXPENDITURE FOR THE YEAR 1981 (Cont.)

(II) Breakdown of Irrigation, Drainage & Dams

	Government £	Village £	Total £
1 Minor irrigation works	210 447	61 332	271 779
2 River training.....	16 060	—	16 060
3 Consultants' fees	228 294	—	228 294
4 Paphos irrigation project.....	4 032 186	34 500	4 066 686
5 Vasilikos-Pendaskinos Project.....	1 282 060	—	1 282 060
6 Other major water works	172 394	6 442	178 836
7 M'ce of dams & distribution systems.....	22 084	—	22 084
Total.....	£5 963 525	£102 274	£6 065 799

**WATER DEVELOPMENT DEPARTMENT
VOTES**

(For each item on table I-2)

1 Administration - Ordinary

Votes	Budget £	Expenditure £
2 OA 00 102	516 401	
	+25 629*	351 632
2 OA 00 107	62 398	
	+3 096	44 967
2 OA 00 121	216 888	
	+10 764*	151 753
2 OA 00 122	1 500	2 543
2 OA 00 125	1 000	133
2 OA 00 199		12 443
2 OA 00 201	4 000	3 422
2 OA 00 202	800	906
2 OA 00 203	200	142
2 OA 00 204	50	95
2 OA 00 211	500	636
2 OA 00 213	1 000	
	+1 200*	1 837
2 OA 00 214	2 700	
	+150*	2 786
2 OA 00 217	500	
	+230*	734
2 OA 00 218	100	96
2 OA 00 219	100	36
2 OA 00 220	500	387
2 OA 00 221	690	932
2 OA 00 243	8 000	7 589
2 OA 01 244	775	648
2 OA 01 262	1 000	
	+1 200*	1 994
2 OA 01 334	4 225	
	+825*	4 615
2 OA 01 349	1 500	675
Total	£867 921	£591 001

* Special warrant.

**2 Greater Nicosia Scheme
Running Expenses - Ordinary**

	Budget	Expenditure
2 OA 02 244	2 000	327
2 OA 02 262	140 000	
	+106 553	223 685
2 OA 02 714	10 000	4 071
2 OA 03 244	1 500	1 453
2 OA 03 262	40 000	39 742
2 OA 03 283	750	494
2 OA 03 334	9 925	
	+2 717*	11 342
2 OA 03 379	1 075	969
2 OA 04 244	1 500	
	+700*	2 106
2 OA 04 262	40 000	
	+20 525*	58 930
2 OA 04 283	1 000	584
2 OA 04 334	7 100	6 411
2 OA 04 379	1 000	651
2 OA 05 243	5 500	5 236
2 OA 05 244	2 000	
	+1 000*	2 848
2 OA 05 262	35 000	
	+31 609*	59 461
2 OA 05 283	500	427
2 OA 05 292	1 800	1 148
2 OA 05 334	46 000	
	+6 200*	51 079
2 OA 05 379	3 000	2 947
2 OA 07 370	80 000	
	+33 210*	105 232
Total	£632 164	£579 143

3 Famagusta Water Supply - Ordinary

2 OA 10 262	4 320	3 889
2 OA 10 334	22 360	
	+7 000*	27 998

2 OA 10 379	11 000	
	+1 000*	11 239
2 OA 10 723	3 000	2 134
2 OA 11 244	8 000	6 623
2 OA 11 262	60 000	
	+28 500*	83 343
2 OA 11 292	2 500	2 399
2 OA 11 334	21 500	
	+10 000*	30 893
Total	£179 180	£168 518

Administration - Development

2D 01 102	266 370	—
	8 820CR	260 437
2D 01 105	97 249	—
	+16 783*	129 644
2D 01 107	32 339	—
	+15 485*	—
	913CR	48 462
2D 01 108	12 019	1 013
2D 01 121	153 716	—
	+13 808*	—
	3 172*CR	167 777
	500	190
2D 01 199	+12 534*	12 540
2D 01 152	2 000	2 742
2D 01 201	35 000	—
	+11 500*	36 438
2D 01 202	10 000	—
	+3 500*	22 385
2D 01 203	100	—
2D 01 204	900	279
2D 01 214	3 500	3 464
2D 01 215	7 500	7 418
2D 01 334	5 000	2 612
Total	£686 898	£695 401

4 Regional Villages Running Expenses - Ordinary

2 OA 15 244	900	884
2 OA 15 262	10 000	—
	+2 000*	10 522
2 OA 17 244	200	—
2 OA 17 262	300	—
	+133*	320
2 OA 18 244	1 200	—
	+1 672*	2 608
2 OA 18 262	2 000	—
	+868*	2 846
2 OA 19 244	1 500	—
	+4 000*	4 218
2 OA 19 262	10 000	—
	+15 179*	21 494
Total	£49 952	£42 922

5 Irrigation, Drainage and Dams - Ordinary

2 OA 244	18 000	—
	+6 000*	22 084
Total	£24 000	£22 084

Irrigation Drainage and Dams - Development

2D 02 602	200 000	—
	+94 266*	210 446
2D 02 603	8 000	—
	+12 240*	160 062
2D 02 631	300 000	228 295
2D 02 841	3 600 000	—
	+600 000*	4 032 187
2D 02 845	1 000 000	—
	+553 000*	1 282 055
2D 02 849	325 000	—
	+42 174*	172 396
Total	£6 734 680	£5 941 441

6 Town Water Supplies - Development

2D 04 605	200 000	—
	+81 870*	237 391
2D 04 714	5 000	—
	+3 500*	3 673
2D 04 801	3 000*	943
Total	£293 370	£242 007

7 Village Water Supplies - Development

2D 07 607	500 000	—
	+141 278	416 725
Total	£641 278	£416 725

8 Drilling & Prospecting - Ordinary

2 OA 240	11 000	10 903
Total	£11 000	£10 903

9 Hydrology - Development

2D 09 634	76 000	—
	+25 000*	86 214
2D 09 842	25 000	24 676
Total	£126 000	£110 890

10 Surveys & Investigations - Development

2D 10 635	130 000	—
	+110 963*	233 430
Total	£240 963	£233 430

11 Purchase of machinery - Development

2D 01 361	2 500	2 439
2D 12 714	12 000	—
	+7 977*	4 016

2D 12 717	10 000	—
	+7 214*	8 254
2D 12 723	7 500	—
	+1 931*	5 230
2D 12 732	4 000	—
	+9 898*	10 158

Total £63 020 £30 097

12 Stores - Ordinary

2 OA 242	1 150	872
2 OA 343	7 000	—
	+800*	7 488
2 OA 714	5 000	4 766

Total £13 950 £13 126

13 Others - Ordinary

2 OA 777	300	—
----------	-----	---

Total £300 —

Others - Development

2D 11 843	5 000	3 712
2D 03 240	200	—
2D 03 283	50	—

TABLE I-3

W D D ORDINARY BUDGET STATEMENT OF MONTHLY EXPENDITURE FOR THE YEAR 1981

Head 2OA Water Development

	£
1981 Approved	1 455 707
Add Special Warrants	322 760
Total	£1 778 467

Month	Monthly Cumulative expenditure		%
	£	£	
January	57 213	57 213	3.22
February ...	105 201	162 414	9.13
March	115 481	277 895	15.63
April	84 323	362 218	20.37
May	88 433	450 651	25.34
June	149 421	600 072	33.74
July	103 165	703 237	39.54
August	108 550	811 787	45.65
September .	82 939	894 726	50.30
October	120 930	1 015 656	57.11
November ..	86 555	1 102 211	61.98
December ..	325 449	1 427 697	80.27

Summary

	£	%
Amount approved	1 778 467	100.00
Less actual expenditure ...	1 427 697	80.27
Balance	350 770	19.73

2D 08 306	5 000	—
2D 10 659	1 000	—
Total	£11 250	£3 712

Grand Total

	£
Ordinary votes	{ Budget 1 778 467 Expend. 1 427 697
Development votes	{ Budget 8 797 459 Expend. 7 673 703

TABLE I-5

STATEMENT OF REVENUE COLLECTED DURING THE YEAR 1981

Description	£
Drilling charges	20
Greater Nicosia scheme	128 526
Paphos Irrigation Project	10 700
Famagusta WS Scheme	103 864
Village water supplies	23 401
Khrysohou Valley Irrigation	1 981
Other fees	56 017
Total	£324 509

TABLE I-4

W D D DEVELOPMENT BUDGET STATEMENT OF MONTHLY EXPENDITURE FOR THE YEAR 1981

Head 2D Water Development

	£
1981 Approved	7 045 443
Add Special Warrants	1 752 016
Total	£8 797 459

Month	Monthly Cumulative expenditure		%
	£	£	
January	211 509	211 509	2.4
February ...	496 461	707 970	8.05
March	436 372	1 144 342	13.01
April	342 003	1 486 345	16.90
May	471 337	1 957 682	22.25
June	792 228	2 749 910	31.26
July	771 788	3 521 698	40.03
August	297 139	3 818 837	43.41
September .	990 507	4 809 344	54.67
October	1 064 411	5 873 755	66.77
November ..	293 922	6 167 677	70.11
December ..	1 506 064	7 673 703	87.23

Summary

	£	%
Amount approved	8 797 459	100
Less actual expenditure ...	7 673 703	87.23
Balance	1 123 756	12.77

TABLE I-6 PAPHOS IRRIGATION PROJECT—EXPENDITURE 1981

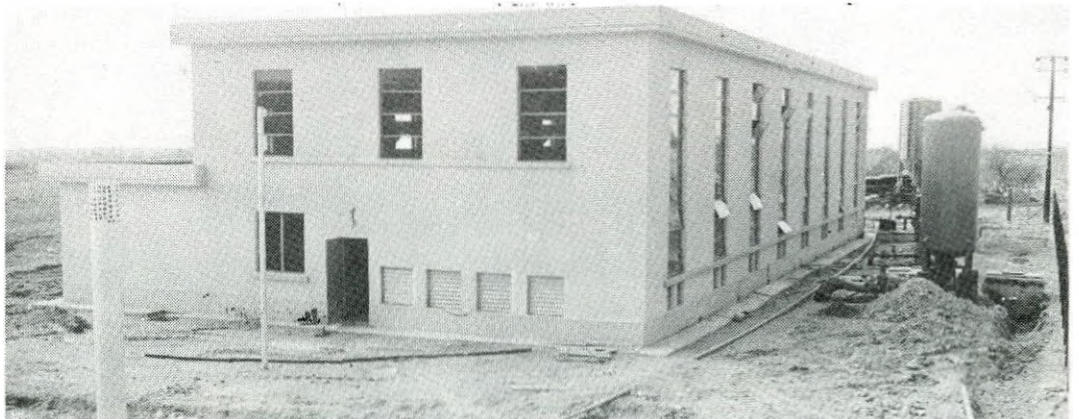
Ser No	Description	1981 Expenditure £	Total Expenditure upto 31.12.81 £
1	Wellfield Conveyance System		
	Drilling and testing of boreholes.....	—	81 914
	Supply and installation of well pumps	—	143 813
	Supply of pipes and valves	—	212 535
	Supply of canaletti.....	14 434	71 013
	Installation of wellfield conveyance system (WCS) by ASPEM	—	25 157
	Installation of WCS by WDD	—	239 027
	Topographical control works	—	1 784
	Redevelopment of boreholes and lowering well pumps	295	3 015
	Diversion of river water into the canaletti	9 250	10 413
2	Construction of Main Canal		
	Main canal construction (GCC)	6 544	914 784
	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	503	4 655
	Repairs and additional works.....	394	13 009
3	Irrigation Network Eastern Area		
	Installation of irrigation network (SOCEA)	22 592	1 912 311
	Supply of AC pipes (CPI)	3 180	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.....	2 090	4 115
	Inspection of CPI factory	—	1 570
	Reinstallation of AC pipes at Akhelia	656	3 610
	Supply and installation of strainers	—	—
	Inspection of hydraulic equipment installed by SOCEA	433	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)	199 699	3 391 376
	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	735	4 359
	Asphalting roads	2 841	10 152
	Overhead line for connection of Ayia Varvara PS.....	205	205

TABLE I-6 PAPHOS IRRIGATION PROJECT—EXPENDITURE 1981 (cont.)

Ser No	Description	1981 Expenditure £	Total Expenditure upto 31.12.81 £
5	Asprokremmos Dam		
	Construction of Asprokremmos Dam (Joint Venture)		
	J & P and MEDCON	2 414 005	8 571 366
	Model testing	—	18 834
	Investigations	—	21 610
	Diversion of services	—	1 509
	Laboratory triaxial tests	—	—
	Design of spillway	—	530
	Supply of progress photographs	244	1 155
	Topographical control works	3 455	9 771
	Pentonitic clay dispersion tests	—	—
	Alkali activity reaction tests abroad	—	1 500
	Compensations: Water supply to Mandria	25 884	27 301
6	Erection of Buildings and Offices	—	72 232
7	Electricity Supply		
	Electricity supply	3 103	225 298
	Metering units	—	—
8	Other works by WDD		
	Purchase of equipment	—	74 744
	Agriculture research activities	—	36 191
	Agriculture development	—	7 645
	Land acquisition	—	10 612
	Installation of six automatic recorders	—	4 118
	Soil and concrete laboratory	31 099	42 058
	Operator drawing/printing machine	1 863	2 962
	New agriculture research station at Akhelia	16 119	27 138
	Green house Akhelia	4 790	14 749
9	Management		
	Furniture and fittings	—	4 625
	Office requirements	7 491	31 615
	Wages of drivers	42 678	125 575
	Operation of motor transport	10 528	35 298
	Maintenance of project vehicles	4 961	15 435
	Trading programme	—	5 417
	Travelling	9 341	45 813
	Purchase of tools	—	—
	Advertisements	399	2 558
	Overtime fees	24 374	84 291
	Poster "Paphos Irrigation Project"	—	355
	Computer charges	—	291
10	Consultants Fees		
	SOGREAH	56 084	458 622
	Sir M MacDonald and Partners	121 721	388 618
	PAC	—	2 626
	G Post	309	4 256
	Extension services (J Hanan-Dr Providenti)	—	14 651
	F Sabarly	—	1 748

TABLE I—6 PAPHOS IRRIGATION PROJECT—EXPENDITURE 1981 (cont.)

Ser No	Description	1981 Expenditure £	Total Expenditure upto 31.12.81 £
11	Maintenance & Operation of the Project		
	Wellpumps & Conveyance system		
	(a) Operation and Maintenance	9 307	9 307
	(b) Electricity	32 028	35 582
	Main Canal		
	(a) Cleaning	125	2 360
	(b) Maintenance & Operation	8 660	13 297
	Purchase of equipment	3 083	6 508
	Operation of vehicles	586	586
	Electrotechnician & Mechanic	6 350	9 389
	Pumping Station & Western Conveyor		
	(a) Operation and maintenance	3 080	3 080
	(b) Electricity	54 900	54 900
	Maintenance of irrigation network	7 584	7 584
12	Irrigation Network & Reservoirs Western Area		
	Installation of irrigation network	335 419	335 419
	Supply of pipes	246 121	436 791
	Handling of pipes	17 039	28 405
	Supply of valves	54 023	54 023
	Supply of hydrants	76 460	76 460
	Topographic control works	1 945	1 945
	Compensations	—	—
13	Road Network		
	Construction of roads	131 791	131 791
	Topographic control works	1 386	1 386
	Total	£4 032 186	£20 039 646



Main Pumping Station of Yeroskipos. Main building and electromechanical installations are completed. Outside finishing works in progress. Its pumps have a total of 2,300 KVA requirement and can supply 1278 m³/hr to the Yeroskipos Sector, 852 m³/hr to the Paphos Sector and 3150 m³/hr to the Western Sectors. WDD Photo C34-11 (12.2.81)

TABLE I—7 MAJOR WATER WORKS—EXPENDITURE 1981

Ser No	Scheme	Contributions			Expenses			Balance		Total £
		Govt. £	Village £	Total £	Govt. £	Village £	Total £	Govt. £	Village £	
1	Ayia Marina Dam-Distribution system .	25 000	—	25 000	23 979	—	23 979	1 021	—	1 021
2	Ayios Theodoros (L'ca) irrigation	3 000	—	3 000	—	—	—	3 000	—	3 000
3	Erimi-Kolossi irrigation	11 334	5 666	17 000	10 477	5 238	15 715	857	428	1 285
4	Khrysokhou valley irrigation	78 150	—	78 150	69 502	—	69 502	8 648	—	8 648
5	Larnaca-Orini project									
	(i) Khirokitia irrigation scheme	1 550	—	1 550	1 205	—	1 205	345	—	345
6	Lefkara dam-distribution system	3 000	—	3 000	2 937	—	2 937	63	—	63
7	Lymbia dam									
	(i) Maintenance	3 800	—	3 800	3 537	—	3 537	263	—	263
	(ii) Acquisition	3 038	1 519	4 557	2 407	1 204	3 611	631	315	946
8	Mavrokolymbos dam acquisition	6 030	—	6 030	5 114	—	5 114	916	—	916
9	New Nicosia-Limassol road									
	Relocation of pipelines	34 655	—	34 655	34 655	—	34 655	—	—	—
10	Pakhyammos reservoir	600	—	600	—	—	—	600	—	600
11	Pissouri irrigation scheme	1 000	—	1 000	537	—	537	463	—	463
12	Yermasoyia-Polemihia project									
	(i) Trakhoni extension	25 916	—	25 916	11 805	—	11 805	14 111	—	14 111
	(ii) Land acquisition for Trakhoni	6 239	—	6 239	6 239	—	6 239	—	—	—
	Total	£203 312	£7 185	£210 497	£172 394	£6 442	£178 836	£30 918	£743	£31 661

TABLE I-8 MINOR IRRIGATION WORKS-EXPENDITURE 1981

Ser No	Scheme	Contributions			Expenses			Balance		Total £
		Govt. £	Village £	Total £	Govt. £	Village £	Total £	Govt. £	Village £	
1	Ayios Epiphaniou	15 333	12 667	28 000	—	—	—	15 333	12 667	28 000
2	Ayios Ioannis "Pitsilis"	10 300	7 460	17 760	5 562	4 028	9 590	4 738	3 432	8 170
3	Akaki "Riatikon"	4 000	4 000	8 000	3 889	3 889	7 778	111	111	222
4	Chakistra	53 677	18 671	72 348	44 149	9 690	53 839	9 528	8 981	18 509
5	Evrykhou "Atsas"	11 334	5 666	17 000	10 769	5 384	16 153	565	282	847
6	Evrykhou "Makronides"	267	178	445	262	175	437	5	3	8
7	Kalokhorio (Klirou)	1 200	600	1 800	1 132	566	1 698	68	34	102
8	Kambos "Kalogiros"	42 225	12 745	54 970	41 337	8 342	49 679	888	4 403	5 291
9	Khoulou "Fillarotos"	4 933	2 467	7 400	4 225	2 113	6 338	708	354	1 062
10	Mamonia	1 200	600	1 800	1 108	554	1 662	92	46	138
11	Meniko "Kyra tou Diakou"	8 666	4 334	13 000	8 064	4 032	12 096	602	302	904
12	Meniko "Riatiko"	866	434	1 300	857	429	1 286	9	5	14
13	Nisou "Frangos"	779	—	779	759	—	759	20	—	20
14	Paleomylos	1 033	652	1 685	—	—	—	1 033	652	1 685
15	Pedhieos River Recharge	9 300	—	9 300	58	—	58	9 242	—	9 242
16	Pera "Fassera"	9 608	4 804	14 412	7 296	3 648	10 944	2 312	1 156	3 468
17	Perapedhi	707	353	1 060	675	338	1 013	32	15	47
18	Peristerona (N) Recharge	14 240	—	14 240	12 044	—	12 044	2 196	—	2 196
19	Potami "Sykamies"	14 333	7 167	21 500	8 138	4 069	12 207	6 195	3 098	9 293
20	Prodhromos "Kyparissi"	814	—	814	—	—	—	814	—	814
21	Skoulli	1 333	—	1 333	—	—	—	1 333	—	1 333
22	Tembria-Sina Oros	1 066	534	1 600	1 010	505	1 515	56	29	85
23	Vasa (Kilani)	3 000	—	3 000	2 949	—	2 949	51	—	51
24	Yerakies - Xeros	65 387	22 673	88 060	56 164	13 570	69 734	9 223	9 103	18 326
	Total	<u>£275 601</u>	<u>£106 005</u>	<u>£381 606</u>	<u>£210 447</u>	<u>£61 332</u>	<u>271 779</u>	<u>£65 154</u>	<u>£44 673</u>	<u>£109 827</u>

TABLE I-9 VILLAGE WATER SUPPLIES-EXPENDITURE 1981

Ser No	Scheme	Contribution			Expenses			Balance		
		Govt. £	Village £	Total £	Govt. £	Village £	Total £	Govt. £	Village £	Total £
1	Akaki	5 075	—	5 075	—	—	—	5 075	—	5 075
2	Alambra	4 850	4 850	9 700	4 167	4 167	8 334	683	683	1 366
3	Amathus	105 000	—	105 000	88 313	—	88 313	16 687	—	16 687
4	Anayia	1 500	750	2 250	558	279	837	942	471	1 413
5	Anglisidhes	2 500	—	2 500	—	—	—	2 500	—	2 500
6	Aradhippou	7 500	7 500	15 000	7 397	7 397	14 794	103	103	206
7	Astromeritis	7 000	—	7 000	3 746	—	3 746	3 254	—	3 254
8	Ayia Napa	20 000	20 000	40 000	9 535	9 534	19 069	10 465	10 466	20 931
9	Ayia Napa Tourist Area	36 000	—	36 000	32 355	—	32 355	3 645	—	3 645
10	Ayios Epiphanios	3 259	1 630	4 889	2 798	905	3 703	461	725	1 186
11	Ayios Ioannis-Aredhiou	2 500	1 250	3 750	1 640	820	2 460	860	430	1 290
12	Ayios Theodoros-Alaminos	24 750	8 250	33 000	20 722	6 907	27 629	4 028	1 343	5 371
13	Connections to FWS pipeline									
	(i) Klavdhia	43 000	—	43 000	10 298	—	10 298	32 702	—	32 702
	(ii) Voroklini	1 800	—	1 800	—	—	—	1 800	—	1 800
	(iii) Livadhia	1 200	—	1 200	1 200	—	1 200	—	—	—
	(iv) Borehole 45/61	7 000	—	7 000	—	—	—	7 000	—	7 000
14	Erimi-Kolossi	256	256	512	252	253	505	4	3	7
15	Kalavastos	15 500	15 500	31 000	14 535	14 535	29 070	965	965	1 930
16	Kivisil (1)	—	9 500	9 500	—	10	10	—	9 490	9 490
17	Kokkini Trimithia	21 500	21 500	43 000	13 851	13 851	27 702	7 649	7 649	15 298
18	Kritou Terra	1 050	1 275	2 325	1 050	1 389	2 439	—	114CR	114CR
19	Layia	1 756	—	1 756	1 075	—	1 075	681	—	681
20	Liopetri	5 000	5 000	10 000	610	609	1 219	4 390	4 391	8 781
21	Lyso-Philousa-Peristerona	4 000	—	4 000	—	—	—	4 000	—	4 000
22	Mammari-Dhenia	27 000	—	27 000	19 370	—	19 370	7 630	—	7 630
23	Mathiati (1)	5 000	5 000	10 000	1 956	1 956	3 912	3 044	3 044	6 088
24	Mazotos	11 250	11 250	22 500	9 326	9 326	18 652	1 924	1 924	3 848
25	Meniko	19 500	—	19 500	—	—	—	19 500	—	19 500
26	Miliou	4 750	5 470	10 220	4 629	5 221	9 850	121	249	370
27	Pano & Kato Dheftera	12 667	—	12 667	—	—	—	12 667	—	12 667
28	Pano & Kato Lakatamia	22 298	22 298	44 596	18 342	18 343	36 685	3 956	3 955	7 911
29	Paphos Lower Villages	1 323	—	1 323	1 087	—	1 087	236	—	236

TABLE I-9 VILLAGE WATER SUPPLIES - EXPENDITURE 1981 (Cont.)

Ser No	Scheme	Contribution			Expenses			Balance		
		Govt. £	Village £	Total £	Govt. £	Village £	Total £	Govt. £	Village £	Total £
30	Pendakomo (1)	8 891	11 633	20 524	1 237	1 618	2 855	7 654	10 015	17 669
31	Perakhorio (Nisou)	29 800	—	29 800	24 721	—	24 721	5 079	—	5 079
32	Peristerona	1 330	1 330	2 660	354	353	707	976	977	1 953
33	Peyia	21 800	21 800	43 600	18 366	18 367	36 733	3 434	3 433	6 867
34	Phlasou	1 000	1 000	2 000	934	933	1 867	66	67	133
35	Phrenaros	1 457	1 458	2 915	137	137	274	1 320	1 321	2 641
36	Pissouri	10 000	10 000	20 000	9 833	9 833	19 666	167	167	334
37	Piyenia	2 500	—	2 500	2 199	—	2 199	301	—	301
38	Polis	16 500	16 500	33 000	—	—	—	16 500	16 500	33 000
39	Pyrga (Larnaca)	800	800	1 600	25	25	50	775	775	1 550
40	Sphalangiottissa Mon.	1 000	—	1 000	735	—	735	265	—	265
41	Trakhoni	7 000	—	7 000	—	—	—	7 000	—	7 000
42	Trimiklini-Moniatis	20 000	20 000	40 000	14 005	14 005	28 010	5 995	5 995	11 990
43	Tseri	—	—	—	23CR	—	23CR	23	—	23
44	Xylophaghou	19 500	19 500	39 000	14 598	14 599	29 197	4 902	4 901	9 803
45	Yerasa	326	—	326	—	—	—	326	—	326
46	Yeroskipos public plaz (2)	7 300	—	7 300	5 429	—	5 429	1 871	—	1 871
47	Ypsonas-Polemichia (1)	57 167	16 265	73 432	55 363	15 752	71 115	1 804	513	2 317
	Total	£632 155	£261 565	£893 720	£416 725	£171 124	£587 849	£215 430	£90 441	£305 871

Notes (1) ETA (Relief Fund) Contributed to four Schemes at a total amount of £13,682

(2) CTO contributed to one project for a total amount of £5,950

TABLE I-10 VASILIKOS-PENDASKINOS-PROJECT-EXPENDITURE 1981

Ser No	Scheme	1981 Expenditure £	Total expenditure upto 31.12.81 £
A	<i>Nicosia Water Supply-First Phase</i>		
1	Electricity & telephone	16 677	70 641
2	Land acquisition	—	—
3	Materials handling & storage supervision, investigations, miscellaneous and contingencies	40 697	103 053
4	Civil engineering works Contract No. 39/78/38-J & P	636 274	850 968
5	Mechanical & electrical works Contrac No 39/78/39-Mather & Platt.....	258 265	303 923
6	Steel pipes Contract No. 39/78/40-P Epiphaniou	—	482 196
7	A C Pipes Contract No. 39/78/41-C P I	—	610 811
8	Valves Contract No. 39/78/42-Pont-a-Mousson	80	45 943
9	Valves Contract No. 39/78/42-S Blakeborough	—	37 431
10	Dhypotamos pumping station Irish Bridge	40 848	104 231
11	Consultant fees	24 693	57 770
12	Construction of additional pipes & fittings	4 577	4 577
13	Wages for the operation and maintenance of the pumping station Dhypotamos	257	257
	Total	<u>£1 022 368</u>	<u>£2 671 801</u>
B	<i>Agricultural Development</i>		
1	Groundwater development	—	—
2	Erection of building	—	—
3	Agricultural Research	4 857	5 774
4	Purchase of vehicles & machinery	31 547	34 047
5	Consultant fees	146 707	146 707
6	Hydraulic model testing	37 771	37 771
7	W D D works	38 358	38 358
8	Administration expenses	76	76
9	Project manager allowance	376	376
	Total	<u>£259 692</u>	<u>£263 109</u>
	Grand Total	<u>£1 282 060</u>	<u>£2 934 910</u>

STAFF MATTERS

APPOINTMENTS

On a Monthly (Unestablished or Temporary Basis)

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

Andreas Papanicolaou, Meteorological Assistant 3rd Grade, with effect from 1.6.81.

Kyros Savvides Chemist Class II, with effect from 10.7.81.

Charalambos Kyriakides Council of the Republic, in the Law Office with effect from 10.7.81.

Vassos Socratous, Executive Engineer, Class II, with effect from 2.10.81.

Ermioni Kouzouli, Executive Engineer, Class II, with effect from 2.10.81.

Eleni Shiakalli, Executive Engineer, Class II, with effect from 2.10.81.

Spyros Stephanou, Executive Engineer, Class II, with effect from 2.10.81.

Vlassis Partassides, Executive Engineer, Class II, with effect from 2.10.81.

George Petrocostas, Executive Engineer, Class II, with effect from 2.10.81.

Stavros Aletras, Executive Engineer, Class II, with effect from 2.10.81.

Frosso Germanou, Executive Engineer, Class II, with effect from 2.10.81.

Demosthenis Antoniou, Executive Engineer, Class II, with effect from 2.10.81.

Soteris Paschalides, Executive Engineer, Class II, with effect from 2.10.81.

Michalakis Ioannou, Executive Engineer, Class II, with effect from 2.10.81.

On a Permanent Basis

Constantinos Katsavras, Executive Engineer, Class II, with effect from 2.10.81.

Panayiotis Scordis Executive Engineer, Class II, with effect from 2.10.81.

The following Officers were promoted or seconded to the posts appearing opposite their names.

Promotions

Andreas Artemis, from the post of Executive Engineer, Class II, to the permanent (Development) post of Executive Engineer, Class I, with effect from 1.4.81.

Georgios Socratous, from the post of Executive Engineer, Class II, to the permanent (Development) post of Executive Engineer, Class I, with effect from 1.4.81.

Nicos Kaisis, from the temporary post of Chief Foreman (on secondment) to the permanent (Ordinary) post of Chief Foreman, with effect from 1.4.81.

Andreas Ioannides, from the permanent post of Assistant Chief Foreman to the permanent (Development) post of Chief Foreman, with effect from 1.4.81.

Costas Georghiou, from the permanent post of Senior Technician, to the permanent (Ordinary) post of Technical Superintendent with effect from 15.9.81.

Andreas Evripidou, from the permanent post of Senior Technician, to the permanent (Ordinary) post of Technical Superintendent with effect from 15.9.81.

Stavros Pitsillides, from the permanent post of Senior Technician, to the permanent (Ordinary) post of Technical Superintendent with effect 15.9.81.

Christodoulos Christodoulou, from the permanent post of Senior Water Engineer, to the permanent (Ordinary) post of Principal Water Engineer with effect from 15.11.81.

Vrahimis Ioannou, from the temporary (Development) post of Senior Technician (on secondment) to the permanent (Ordinary) post of Senior Technician, with effect from 15.11.81.

Symeon Georghiou, from the temporary (Development) post of Senior Technician (on secondment) to the permanent (Ordinary) post of Senior Technician, with effect from 15.11.81.

Michael Antoniadis, from the temporary (Development) post of Senior Technician (on secondment) to the permanent (Ordinary) post of Senior Technician, with effect from 15.11.81.

Panayiotis Hji Pakkos, from the post of Technician 1st Grade, to the permanent (Ordinary) post of Senior Technician with effect from 15.11.81.

Georgios Frangopoulos, from the post of Technician 1st Grade, to the permanent (Ordinary) post of Senior Technician with effect from 15.11.81.

Iacovos Kastanas, from the post of Technician 1st Grade, to the permanent (Ordinary) post of Senior Technician, with effect from 15.11.81.

Phivos Hji Ioannou, from the post of Technician 1st Grade, to the permanent (Ordinary) post of Senior Technician, with effect from 15.11.81.

Liasis Savva, from the post of Technician 1st Grade, to the permanent (Ordinary) post of Senior Technician, with effect from 15.11.81.

Doloros Pitsillides, from the post of Technician 1st Grade, to the permanent (Ordinary) post of Senior Technician, with effect from 15.11.81.

Elias Eliades, from the post of Technician 1st Grade, to the permanent (Ordinary) post of Senior Technician, with effect from 15.11.81.

Andreas Savva, from the post of Technician 1st Grade, to the permanent (Ordinary) post of Senior Technician, with effect from 15.11.81.

George Lanitis, from the post of Technician 1st Grade, to the permanent (Ordinary) post of Senior Technician, with effect from 15.11.81.

Andreas Eletheriou, from the post of Technician 1st Grade, to the permanent (Development) post of Senior Technician, with effect from 15.11.81.

Andreas Marangos, from the post of Technician 1st Grade, to the permanent (Development) post of Senior Technician, with effect from 15.11.81.

Pantelis Alexandrou, from the post of Technician 1st Grade, to the permanent (Development) post of Senior Technician, with effect from 15.11.81.

Nicos Chrysostomou, from the post of Clerk 1st Grade, to the permanent (Ordinary) post of Clerical Officer, with effect from 1.11.81.

Gavriel Demosthenous, from the post of Clerk 1st Grade, to the permanent (Ordinary) post of Clerical Officer, with effect from 1.11.81.

Socrates Kountouris from the post of Agricultural Superintendent, to the temporary (Development) post of Executive Engineer, Class II, with effect from 2.10.81

Andreas Tziakouris, from the post of Technician 2nd Grade, to the temporary (Development) post of Executive Engineer, Class II, with effect from 2.10.81.

TRANSFERS, RETIREMENTS, DEATHS

Transfers

Eleni Nicolaou Clerk 2nd Grade, G.C.S., was transferred from this Department to the Department of Medical Services, with effect from 23.2.81.

Ino Chiomeridou, Clerk 2nd Grade, G.C.S., was transferred from this Department to the Department of Antiquities with effect from 6.4.81.

Ermis Vogazianos, Clerk 2nd Grade, G.C.S., was transferred from this Department to the Department of Medical Services, with effect from 5.10.81.

Themis Mavromoustakis, Senior Supervisor of Accounts, was transferred from this Department to the Ministry Defence, with effect from 15.8.81.

Savvas Gounaris, Storekeeper 2nd Grade, was transferred from this Department to the Department of Central Stores, with effect from 9.9.81.

Charalambos Geroudes, Accounting Officer 2nd Grade, was transferred from this Department to the Press and Information Office with effect from 28.9.81.

Kyriaki Chrysostomou, Clerk 2nd Grade, G.C.S., was transferred to this Department from the Department of Merchant Shipping, with effect from 2.3.81.

Kyriakos Hji Antonis, Accounting Officer 2nd Grade, was transferred to this Department from the Ministry of Agriculture and Natural Resources, with effect from 11.5.81.

Achilleas Nicolaou, Storekeeper 2nd Grade, was transferred to this Department from the Department of Central Stores, with effect from 1.9.81.

Demos Mytilineos, Accounting Officer 2nd Grade, was transferred to this Department, from the Department of Town Planning and Housing, with effect from 17.9.81.

Andreas Aristides, Clerk 2nd Grade, G.C.S., was transferred to this Department from the Department of Medical Services with effect from 5.10.81.

Maria Ermolaou, Clerk 2nd Grade, G.C.S., was transferred to this Department from the Public Service Commission, with effect from 1.10.81.

Costas Gavrilides Senior Supervisor of Accounts, was transferred to this Department from the District Office Limassol, with effect from 16.11.81.

Gavriel Panayi, Messenger, was transferred to this Department from the Department of Public Works, with effect from 1.10.81.

Retirements

Andreas Michaelides, Principal Clerk, G.C.S., retired from the Government Service, with effect from 1.2.81.

Ioannis Athinodorou, Foreman retired from the Government Service with effect from 1.3.81.

Alecos Charalambous, Chief Foreman, retired from the Government Service, with effect from 1.10.81

Deaths

With deep sorrow we record here the death of our highly esteemed colleague

Demetris Frangou, Foreman who died on 1.12.81, one month before his retirement after a long illness.

SCHOLARSHIPS, STUDY LEAVE AND DUTY ABROAD

Scholarships

Chrysostomos Kambanellas, Technician 1st Grade, was awarded a 2 years scholarship by J & P Ltd., through the Government of Cyprus at the Catholic University of America to obtain the B.Sc. degree in Civil Engineering. He left Cyprus on the 17th August, 1981.

Kyros Savvides, Chemist Class II, who has been granted one year scholarship by Netherlands Government in Sanitary Engineering, held at the International Institute of Hydraulic and Environmental Engineering in Delft, completed his studies and was awarded the post-graduate Diploma in Sanitary Engineering. He resumed his duties on the 14th September, 1981.

Tassos Hamatsos, Executive Engineer, Class I, who has been granted a scholarship by the U.K. Technical Co-operation Training Programme in Construction Management at the University of Loughborough, returned and resumed his duties on the 19th October, 1981.

Conferences and Duty Abroad

Elias Kambourides, Executive Engineer Class I and *Andreas Tsiakouris* Technician 2nd Grade, participated in the International Course in Water Resources Engineering, held in Belgrade, Yugoslavia, between 15.6.81-15.9.81

Iakovos Iacovides, Hydrologist Class I, participated a) in the International Conference on Hydrology and the Scientific Bases for the Rational Management of Water Resources, Paris 18-27.8.81 and b) in the Intergovernmental Council of the International Hydrologic Programme, fourth session, Paris 28-29.8.81.

Christos Ioannou, Hydrologist Class I, attended a course in the use and interpretation of isotopic data in the Isotope Hydrology Section of I.A.E.A., held in Vienna, between 1.2.81-17.4.81

Christos Marcoullis, Senior Water Engineer and *Andreas Artemis*, Executive Engineer Class I, visited U.K. between 29th July-18th August 1981, in connection with the preparation of the contract documents for the Vasilikos-Pentaskinos Project.

II DIVISION OF WATER RESOURCES

by
D C Kypris
Engineer Hydrologist
Head of Division

General

During 1981 again no hydrological data could be collected by this Department in the Northern part of Cyprus, because this area amounting to 40% of the Cyprus land is for seven years under the occupation of the Turkish troops. So the behaviour of both surface runoff and groundwater bodies could not be followed or recorded there during the year under examination.

The new areas brought under hydrological observation during the year have an extent of about 31 square kilometers. A number of 332 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 725 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 hydrogeo-

logical 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 38.

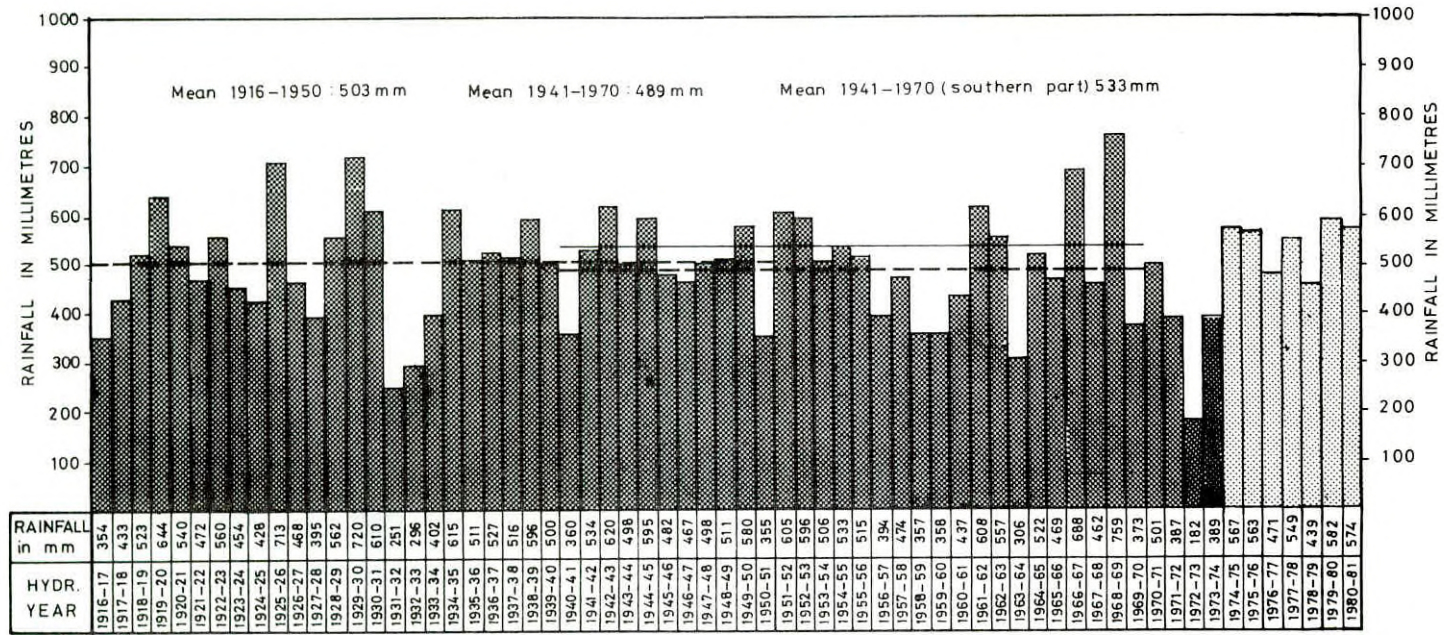
During 1981, D C Kypris, Engineer Hydrologist, was the Head of Division, and M Peppis, Geologist, Class I, was the Assistant Head. He was also Head of the Drilling Permits and Water Control Branch. M Peppis acted also as the chairman of the specially formed advisory committee for the issue of well permits.

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 three existing boreholes.
- Drilling of ten boreholes, one for domestic water supply two for earthing purposes and seven for engineering geology purposes and the determination of hydrological parameters of the aquifer where the Kouris dam will be constructed. Total penetrated depth, 219 m.
- Removing pumps stuck or broken in boreholes.

ANNUAL AVERAGE RAINFALL OF CYPRUS
FROM 1916-1981



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

TEST PUMPINGS

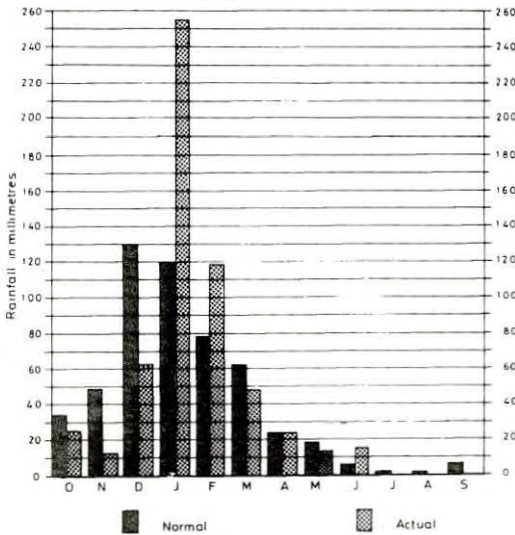
In order that the Department will be in a position to express views on the water supply sources proposed to be used for the division of land into building plots or the erection of hotels, industries or other establishments, it undertakes to carry out pumping tests the results of which are communicated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

Pumping tests are also carried out for Government works.

During 1981, 26 test pumpings were carried out as follows:

■ Six for division of land with total hours pumped	244
■ Eight for building permits with total hours pumped	77
■ Four for irrigation divisions with total hours pumped	86
■ Six for town and village water supplies with total hours pumped .	86

GRAPHICAL PRESENTATION OF INCIDENCE OF RAINFALL



METEOROLOGICAL SUMMARY

Note: As it is not possible for the Meteorological Service of the Republic of Cyprus to obtain measurements of various meteorological elements in the northern part of the Island because of its being occupied by Turkish troops, the data given below relate to the weather experienced in the southern part of the Island during the hydrometeorological year 1980-1981.

Precipitation

The yearly total precipitation averaged over the southern part of the Island during the hydrometeorological year October 1980 to September 1981 was 574 mm which is 108% of normal (see diagram)

(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 were above normal over the western areas of the Island, over all parts of the southern coastal areas and over small parts of the central plain and ranged mainly between 110% and 125% of normal. Over some areas of Larnaca district they exceeded 140% of normal. Over the remaining areas it was around normal or slightly below normal (see isohyetal map).

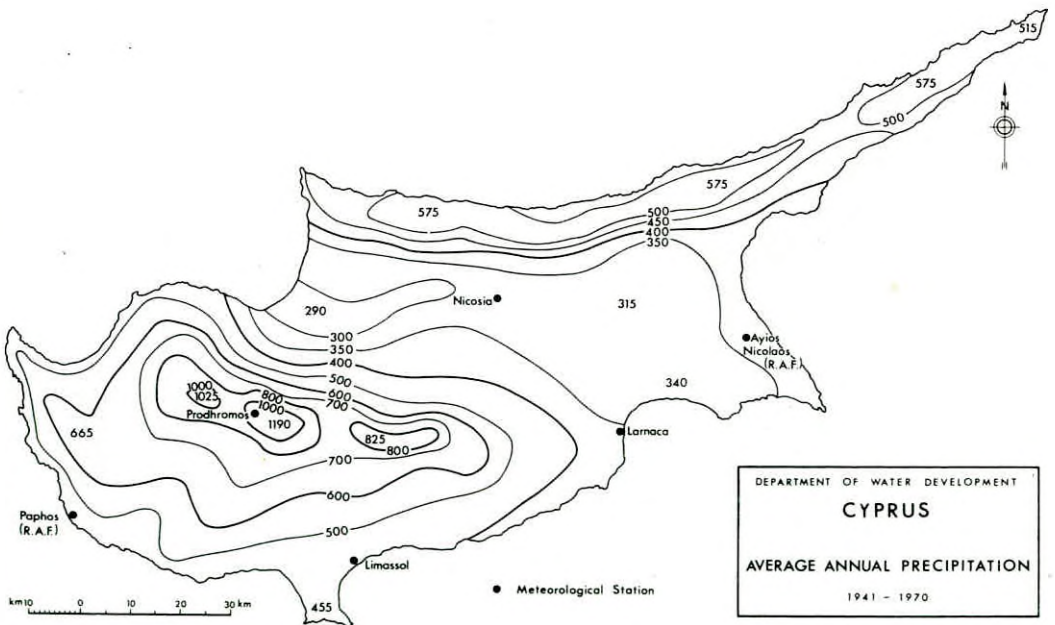
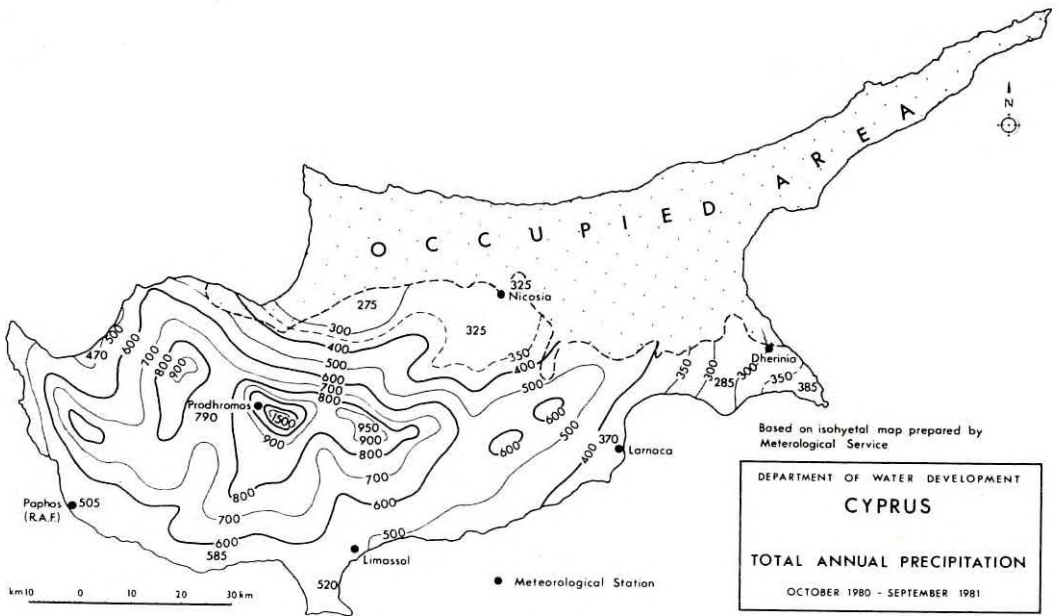
As regards the monthly distribution of precipitation, it was above normal in the months of January, February and June, around normal in April and below normal in the remaining months (see diagram of incidence of rainfall).

Table II-1 giving the incidence of rainfall during the hydrometeorological year 1980-1981, illustrates the situation.

TABLE II-1
INCIDENCE OF RAINFALL DURING THE HYDROMETEOROLOGICAL YEAR 1980-1981

Months	Rainfall (in mm)	Rainfall (in inches)	Percentage of yearly total	Percentage of monthly normal
October	25.4	1.00	4.4	74
November	12.0	0.47	2.1	25
December	62.7	2.47	10.9	48
January.....	255.0	10.04	44.4	212
February.....	118.6	4.67	20.7	151
March	46.6	1.83	8.1	74
April	23.8	0.94	4.2	101
May	14.4	0.57	2.5	77
June.....	14.6	0.57	2.5	247
July	0.4	0.02	0.1	23
August	—	—	—	0
September	0.5	0.02	0.1	7
Totals	574.0	22.60	100.0	—

Note: Yearly total as percentage of yearly normal: 108%



The maximum amount of rainfall reported in a 24-hour period during the hydrometeorological year was 159.4 mm reported by Avdhellero village rainfall station on 15th June, 1981. The next highest was 145 mm reported by Psevthas Elementary School rainfall station on 15th June, 1981.

The first snowfall on the higher tops of Troodos range occurred on 21st November, 1980 and the last on 23rd March, 1981.

Hail occurred in every month from November, 1980 to June 1981 and in September, 1981.

Temperature

During the hydrometeorological year 1980-1981 the air temperature as a whole was

slightly above normal. In particular, monthly mean temperatures were above normal in October, November, March, April, June, July and September, they were around normal in December, February and August and below normal in January and May.

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 1980-1981 at selected stations is given below:

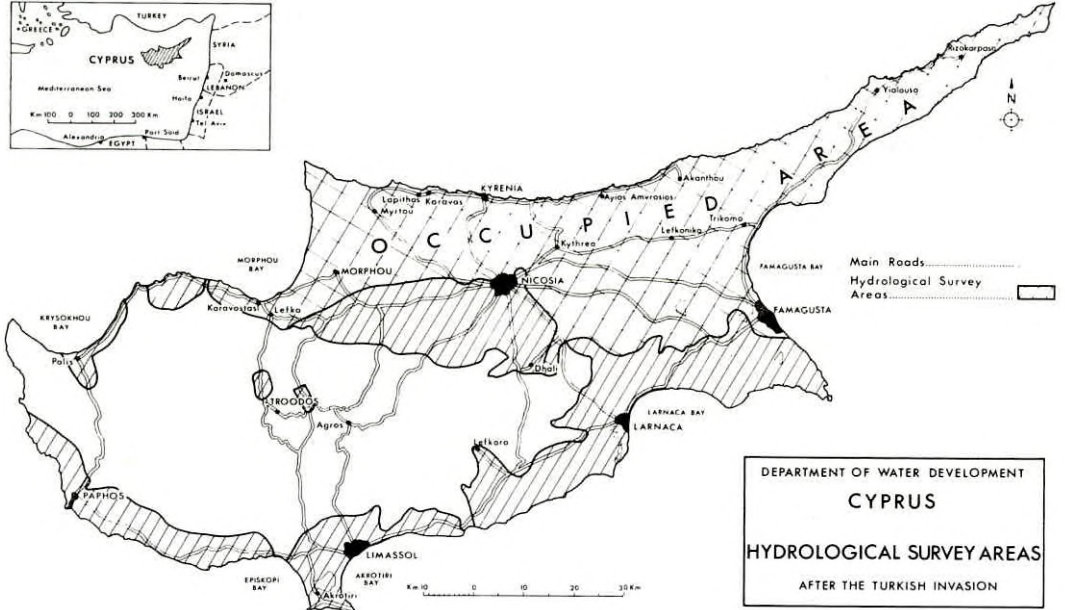
TABLE II-2
INCIDENCE OF MAXIMUM AND MINIMUM TEMPERATURES 1980-1981

Station	Extreme maximum temperature and date °C	Extreme minimum temperature and date °C
Nicosia	40.7 on 26.7.81	1.6 on 18.12.80
Limassol	37.2 on 26.8.81	5.2 on 18.12.80 & 9 & 21.2.81
Larnaca Airport	37.5 on 1.7.81	2.3 on 18.12.80
Paphos R.A.F. station.....	35.6 on 28.6.81	6.0 on 31.1.81
Panayia Bridge.....	39.2 on 26.7.81	- 1.4 on 18.12.80
Saittas	37.2 on 26.7.81 on 26.8.81	0.0 on 18.12.80, 1 & 31.1.81
Amiandos.....	31.5 on 26.7.81	- 4.2 on 11.12.81
Prodhromos	31.7 on 8.9.81	- 3.5 on 11.12.80 17.2.81 2.3.81
Stavros Psokas.....	38.5 on 25.7.81	0.2 on 11.12.80
Kornos	38.2 on 27.6.81	1.5 on 21.2.81 1.3.81
Platania.....	34.7 on 24.7.81	-2.0 on 31.1.81
Phassouri.....	36.5 on 30.6.81	0.5 on 17.12.80 & 18.12.80

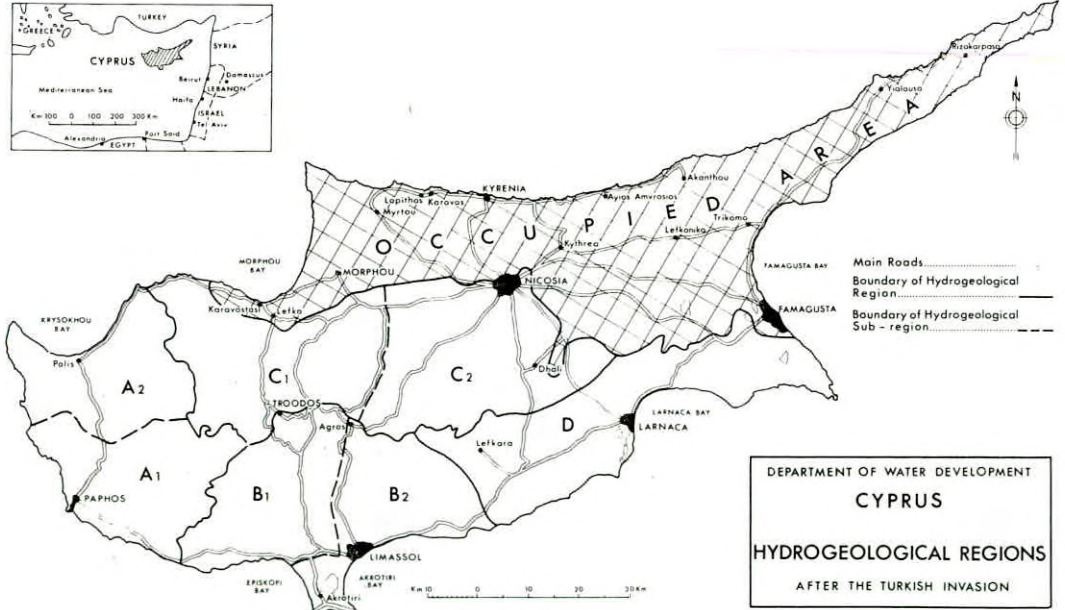
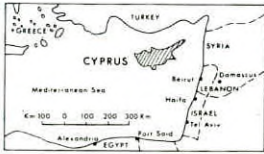
TABLE II-3
TOTAL MONTHLY EVAPORATION

Stations	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	April	May	June	July	Aug.	Sept.
Nicosia	166	105	74	35	48	92	149	203	291	304	284	207
Athalassa	154	84	54	41	55	90	143	202	297	312	301	230
Saittas	125	81	54	40	56	94	133	181	269	271	263	200
Akhelia	155	110	87	79	79	111	139	182	236	224	217	173
Yermasoyia	143	84	58	51	63	99	133	197	267	268	264	202
Polemihia	132	97	68	87	71	106	132	169	228	243	246	194
Prodhromos	111	51	20	*	*	69	123	143	231	249	221	173
Larnaca Airport.....	166	123	91	80	77	117	173	237	280	291	275	235

* No records



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



DEPARTMENT OF WATER DEVELOPMENT
CYPRUS
 HYDROGEOLOGICAL REGIONS
 AFTER THE TURKISH INVASION

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 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.

Stream gauging stations on 62 streams and 3 on intakes were regularly inspected. 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 troops, still occupying almost 40% of Cyprus for the seventh 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 above normal because of the high precipitation of January and February.

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

New Flow Gauging Stations

During the year under review, one new flow

gauging station was constructed.

Ezousas river near Moronero. Construction of a "V" shaped structure 16 m wide, slope 1:10, and installation of a foot bridge for high flow measurements.

Repairs and Improvements to Existing Flow Gauging Stations

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

Tremithos River near Ayia Anna: Construction of new apron of the station which was washed away during the high flood of June 1981.

Minor repairs and improvements, however, were carried out on several other flow gauging stations for better operation.

Flood Discharges

As the rainfall during the hydrological year was above normal some remarkable floods were recorded. The most noteworthy floods were recorded on the following flow gauging stations:

- Tremithos River near Ayia Anna about 300 m³/s on the 15th June 1981. Its catchment area is 90 km².

- Tremithos River near Klavdhia about 300 m³/s on the 15th June 1981. Its catchment area is 142 km².

- Aradhippou River on Nicosia - Larnaca road bridge about 200 m³/s on the 15th June 1981. Its catchment area is 34 km².

- Aradhippou River near Panayia Yematou-sa church about 100 m³/s on 15th June 1981. Its catchment area is 20.5 km².

- Elea River near Vizakia about 11 m³/s on

TABLE II-4

DISCHARGE OF SELECTED STREAMS AS CALCULATED AT SELECTED FLOW GAUGING STATIONS FOR THE YEAR 1980-81

Ser No	Station No.	Stream	Location	Annual flow 10 ⁶ m ³
1	2-8-3-10	Limnitis	Saw mill	18.1
2	3-3-1-70	Ayios Nicolaos	Kakopetria	11.9
3	3-3-3-95	Karyotis	Evrykhou	16.3
4	3-5-4-40	Elea	Vizakia	10.2
5	3-7-1-50	Peristerona	Panayia Br	19.3
6	3-7-3-90	Akaki	Malounda	16.9
7	6-1-1-80	Ayios Onoufrios	Kambia	2.5
8	6-1-1-85	Pedhieos	Kambia	5.2
9	6-5-3-15	Yialias	Nisou	5.6
10	8-4-5-30	Tremithos	Klavdhia	7.8
11	8-9-7-95	Vasilikos	Coast	15.2

TABLE II-5
VOLUME OF WATER ACCUMULATED AND COMMENCING DATE OF INFLOW FOR VARIOUS DAMS DURING
THE YEAR 1981

No.	Dam	Capacity 10 ⁶ m ³	Inflow commencing date (1981)	Maximum volume recorded 10 ⁶ m ³	Date of maximum record (1981)	Minimum volume recorded 10 ⁶ m ³	Date of minimum record (1981)	Remarks
1	Agros	72	January	69	March	13	January	
2	Akrounda	22	January	22	January	Empty	August	Overflowing since Dec.80
3	Akapnou-Ephtagonia	132	December	63	December	—	—	Closed 8.12.81
4	Arakapas	128	January	128	January	50	September	Overflowed 21.12.80
5	Argaka	990	January	990	January	6	November	Overflowed 24.1.81
6	Athalassa	790	January	38	April	Empty	July	
7	Ayia Marina	298	January	298	February	44	November	Overflowed 10.2.81
8	Ayii Vavatsinias Dam.....	53	March	53	March	Empty	December	Closed 18.3.81 Overflowed 23.3.81
9	Ayii Vavatsinias No.1.....	55	December	20	December	—	—	Closed 8.12.81
10	Ephtagonia I	92	January	92	February	Empty	December	Overflowed 4.2.81
11	Kalo Khorio	32	January	32	January	Empty	November	Gate closed 26.1.81 Overflowed 26.1.81
12	Kalopanayiotis	363	January	363	January	50	September	Overflowed 9.12.80
13	Kandou	38	January	38	January	17	September	Overflowed 10.1.81
14	Kato Mylos	104	December	30	December	—	—	Closed 1.12.81
15	Khandria	70	January	70	February	10	December	Overflowed 6.2.81
16	Kiti	1625	January	1625	March	Empty	October	Overflowed 1.3.81
17	Kyperounda	50	January	49	June	10	October	Closed 23.3.81
18	Lefka (Marathasa)	368	January	368	January	146	October	Overflowing since Dec.80
19	Lefka (Kafizes)	113	January	113	January	70	October	Overflowing since Dec.80
20	Lefkara	13850	January	7625	April	3413	January	
21	Liopetri	325	November	325	November	Empty	January	Overflowed 28.11.81
22	Lymbia	220	January	220	January	71	November	Overflowed 28.1.81
23	Lythrodonda Upper	32	January	32	January	Empty	August	Gate closed 30.1.81 Overflowed 31.1.81

24 Lythrodonda Lower	32	January	3	November	Overflowed 22.1.81
25 Melini	59	January	Empty	December	Overflowed 16.2.81
26 Mavrokolymbos	2180	January	116	November	
27 Ormidhia (Vathys)	100	November	Empty	December	
28 Pakhyamos	43	January	Empty	July	Overflowed 8.2.81
29 Palekchori (Kambi)	620	January	Empty	November	Overflowed 26.1.81
30 Paralimni Lake	1365	January	Empty	April	
31 Pelendria	123	January	63	October	Overflowed 20.2.81
32 Perapedhi	55	January	5	October	Overflowing since Dec.80
33 Petra Upper	10	January	Empty	September	Overflowed 17.1.81
34 Petra Lower	25	January	Empty	August	Gate opened 26.9.81
35 Pomos	860	January	Empty	November	Overflowed 17.1.81
36 Polemidhia	3400	January	1160	January	Overflowed 29.1.81
37 Prodhromos	110	January	12	January	Overflowed 7.2.81
38 Pyrgos	283	January	12	October	Overflowed 20.3.81
39 Trimiklini	340	January	125	October	Overflowed 23.1.81
40 Yermasoyia	13600	January	5762	November	Gate closed 30.5.81
		February		January	Overflowed 6.6.81
		February		January	Overflowed 1.2.81

24th February 1981. Its catchment area is 82 km².

- Vathys River near Athalassa about 11 m³/s on 24th February 1981. Its catchment area is 30 km².

- Akaki River near Malounda about 38 m³/s on 24th February 1981. Its catchment area is 92 km².

- Peristerona River near Panayia bridge about 28 m³/s on 24th February 1981. Its catchment area is 78 km².

Inflow of Water in Dams

During 1981 out of 57 most important dams and ponds in Cyprus which were under regular observations in the past only 40 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 dams under regular observations was considered satisfactory; the maximum volume accumulated was 34 MCM or 79% of the total capacity of these dams which is 43 MCM. Out of these dams, 30 overflowed, most of them in January and February. 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 Division of the Department.

During the hydrological year 1980-81 2600 spring and minor stream discharges were taken on 273 springs and minor streams; 1020 discharges were taken on 85 springs which are under regular monthly observations and 1580 discharges were taken on 193 springs and minor streams for a certain period at various intervals.

As the rainfall during the hydrological year under review was above normal, which followed the above normal previous year, most of the springs maintained a higher than normal flow during winter, spring and summer time.

GROUND WATER

Ground Water Hydrological Work

Hydrological surveys of the ground water bearing systems were carried out on a small scale by this Department before 1960. Since then, they were rapidly amounting in scale until the most important known aquifer sys-

tems 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 2732 km² (see map on page 40) The springs, wells/boreholes which were on register at the end of 1981 were 23103.

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

Through these observation boreholes/wells, the water level is being measured twice a year, at the end of the dry season (November), when it is expected to be at lowest and at the end of the Wet season (March), when it is expected to be at highest level. In areas where more detailed information is necessary, a network has been established of observation boreholes where monthly or bi-monthly measurements are taken. The number of observation borehole monitored twice during 1981 is 1469 and, every month or fort-

night 537.

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, cross-checked wherever possible from water meter readings, or electricity meter readings and pump output. It has been established through questioning that during 1981 10086 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 1981 the number of groundwater samples from observation boreholes analysed for chlorides was 1327.

As regards the groundwater situation, due to this year's high rainfall there was some improvement in most aquifers. However due to the continuous overpumping there was no improvement of the situation at Kokkinokhoria area. Details may be seen in the table of selected observation boreholes.

TABLE II-6
SELECTED OBSERVATION BOREHOLES

Serial No.	Hydr. No.	Village	Water level increase (+) or decrease (-)					
			March 1980	November 1980	March 1981	November 1981	March 1980-81	November 1980-81
56/56	192	Liopetri	+0.13	+0.12	+0.24	+0.45	+0.11	+0.33
20/63	1516	Paralimni	+19.69	+19.27	+19.37	+18.31	-0.32	-0.96
22/63	1518	Paralimni	+5.92	+5.73	+5.93	+5.67	+0.01	-0.06
51/51	774	Phrenaros	+3.34	+2.46	+2.52	+1.68	-0.82	-0.78
79/56	975	Phrenaros	+8.63	+8.22	+8.33	+8.32	-0.30	+0.10
88/54	24	Kolossi	+2.70	+0.20	+3.70	+1.40	+1.00	+1.20
51/63	813	Limassol	+1.53	+1.18	+2.18	+1.63	+0.65	+0.45
45/63	811	Zakaki	+1.20	+0.83	+1.58	+1.18	+0.38	+0.35
107/61	17	Yermasoyia	+15.16	+1.13	+18.08	+1.20	+2.92	+0.07
108/59	8	Yermasoyia	+35.44	—	+35.90	+16.85	+0.46	—
7/60	22	Yermasoyia	+6.63	-0.12	+9.00	+0.70	+2.37	+0.82
134/59	27	Yermasoyia	+11.01	+0.46	+14.86	+0.66	+3.85	+0.20
161/50	180	K Trimithia	+187.45	+187.23	+187.53	+187.35	+0.08	+0.12
160/50	222	K Trimithia	+194.97	+193.82	+194.97	+193.62	0.00	-0.20
125/60	15	Episkopi	+26.46	+19.31	+30.96	+20.41	+4.50	+1.10
EB94/70	1236	Akrotiri	+1.56	-0.04	+2.56	+0.51	+1.00	+0.55
P.B.12	2671	Kouklia	+2.26	+0.75	+2.20	+0.20	-0.06	-0.55
P.B.17	2673	Akhelia	+7.67	+5.75	+7.29	+5.72	-0.38	-0.03

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 Agricultural Departments are members of this committee, whose task is to advise the Director of Water Development Department on matters related to well sinking permits. At the meetings, the Legal Advisor of this Department, Ch Kyriakides and the District Engineer of the district where applications were to be examined, participated.

The committee performed during 1981, 29 meetings and examined 1905 applications sent to the Director, WDD by the District Officers, as follows:-

Water Supply (Special Measures)	
Law areas	29
Water Conservation areas	1585
Non Water Conservation areas	291

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 48 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 48 and particulars given in the table below.

For the above areas

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

Water meters

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

According to the provisions of the above referred law, water meters should be installed in the Water Supply (Special Measures) law areas. Information about the installation and operation of water meters is not available for Western Mesaoria area, since this area is still under Turkish occupation. For Paphos area the Law has not yet been enforced. In Limassol-Akrotiri area 393 water meters have been installed of which 346 are in continuous operation. The total volume of water recorded is 11.9 MCM. During the year 225 illegal pumpings have been reported to the District Officer, out of which 130 were presented to court.

Private Drillers (Wells Law, Section 36)

According to the above law, no one is allowed to operate a drilling rig without a Driller's licence. Such a licence is issued by the Director of the Water Development Department, after the interested person to become a Driller applies for it and when the Director of the Department is satisfied that the appli-

TABLE II-7
WATER CONSERVATION AREAS

Ser No	Water Conservation Area	Order No	Date	Cazette 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	Tersephaou - Klavdhia	376	18. 8.52	3639	27. 8.52
4	Laxia	374	18. 8.52	3639	27. 8.52
5	F'sta, Phrenaros, Paralimni, Ormithia, 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, Pendencya	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, Perivolia, 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 Erini	280	19. 5.66	499	2. 6.66
24	Paramali, Evdhimou	SBA		SBA	
		68	29. 7.67	212	29. 7.67
25	Lysi, Kondea	776	7. 9.67	599	22. 9.67
26	Akanthou	777	7. 9.67	599	22. 9.67
27	Pergamos (Extension)	889	19.10.67	606	3.11.67
28	Ayios Amvrosios	890	19.10.67	606	3.11.67
29	Kyrenia Range limestone mass	817	7.11.68	693	22.11.68
30	Vasilikos, Xeropotamos	862	28.11.68	697	13.12.68
31	Yeroskipos, Konia, Ktima, Peyia	741	4. 9.69	748	19. 9.69
32	Karavostasi, Peristeronari	50	29.12.69	771	16. 1.70
33	Yeri	75	8. 1.70	773	23. 1.70
34	Neokhorio, Androlikou	845	14.10.71	904	29.10.71
35	Yiolou, Loukrounou, Skoulli	845	14.10.71	904	29.10.71
36	Pissouri, Evdhimou	576	10. 8.72	958	25. 8.72
37	Kormakitis, Myrtou, Dhiorios	851	7.12.72	979	15.12.72
38	Akanthou (Extension)	288	15.11.73	1054	30.11.73
39	Ayios Ioannis (Malounda)	307	25.11.74	1158	25.11.74
40	Kambos Chakistra	—	—	1180	4. 4.75
41	Parekklissha	206	23.10.75	1233	7.11.75
42	L'ssol-Paphos-L'ca Extension	215	30. 9.77	1429	3. 3.78

cant 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 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 1981 this Department issued 2 Drillers licences and renewed 37 others. The number of private drilling rigs which drilled for water during 1981, was 71 and this Department has been notified about the drilling or cleaning of 114 boreholes. Information from private drillers have been received by this Department for 62 boreholes.

During 1981, 52 private drillers were reported to the District Officers for illegal drilling.

WATER QUALITY

Chemical Analyses

During the year, 1529 samples of water were sent to the Government Analyst and 217 to the WDD Laboratory for chemical analyses. Out of these, 343 samples were taken from springs, wells or boreholes, which are used or proposed as water supply sources. The remaining 986 samples were taken from rivers, springs, observation boreholes and other

miscellaneous sources. During the second half of the year the Health Inspector undertook the sampling from 106 sources and water reservoirs, parts of the town water supply systems of the various towns, both for bacteriological and chemical analysis, to avoid duplication of work by Government Departments.

In addition to the above, 800 samples of water taken from observation boreholes in the hydrological survey areas, were analysed by the Water Resources Division for chloride content.

Bacteriological Analyses

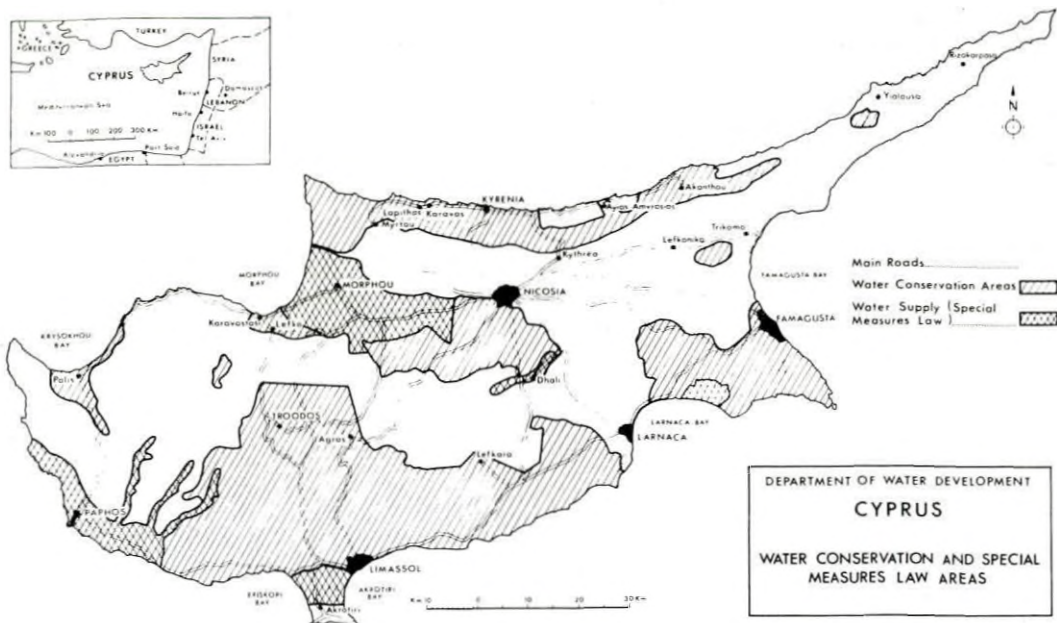
During the year 153 samples were sent to the Pathological Laboratory for bacteriological analysis. These were mainly sent during the first half of the year. During the second half, the bulk of this sampling has been agreed to be carried out by the Health Inspectors. The results are as follows:-

Water Supply	No of samples	No of unsatisfactory samples
Nicosia	42	27
Limassol	71	58
Larnaca	40	34
TOTAL.....	153	119

TABLE II-8

WATER SUPPLY (SPECIAL MEASURES) LAW AREAS

Ser No	Area	Order No	Date	Cazette 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'ista-Paralimni-Ormidhia-Akhna), later withdrawn	—	—	331	9. 7.64
4	Potami	89	12. 2.66	479	24. 2.66
5	Dhiarizos River	196	2. 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



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

Suspended Sediment Analyses

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

During the year, 189 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 lo-

ans 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 properties, or their representatives.

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



Calibration of Akapnou river gauging weir station at Melini by means of current meter measurements. WDD Photo 82 EN-25 (13.2.81)

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

the fields to be irrigated and the loan to be granted.

The decisions of the Committee are then notified to the Loan Commissioner who releases the proper amount so that it may be distributed by the local cooperative banks to the interested farmers. In case of groups of farmers the loan remains in the hands of the local cooperative banks which undertake to purchase, install and run the pumping plant and to deliver water for irrigation 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 to Turkish Cypriot ownership exists on the borehole/well, a loan may be granted for the purchase of what is missing and the value of the existing equipment with its anticipated life is calculated. Taking into account these parameters and after subtracting the residual value which the pumping plant is expected

to have after a maximum of 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 54 meetings during which it approved 427 applications from 1230 displaced farmers for the irrigation of

12047 donums of land. The amount of loans granted by the end of this year was £361,814.-and the pumping plant of Turkish Cypriot ownership to £42,190.

During the year under examination, the Committee had one meeting during which it approved six applications from eight farmers for the irrigation of 73 donums of land. The amount of loans granted is £4,495.

Details are given in the following table II-9

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)	1	—	1	4	6
Wells/boreholes allocated (No)	1	—	1	4	6
Farmers benefited (No)	1	—	1	6	8
Area to be irrigated (donums)	7	—	15	51	73
Loans granted (No)	1	—	—	4	5
Loans granted (£)	550	—	—	3945	4495
Loans issued (£)	550	—	—	3945	4495
T/C pumping plant allowed to be used (No) .	—	—	—	—	—
Estimated value of T/C pumping plants (£) ..	—	—	—	—	—
Amortization rate (£/Year)	—	—	—	—	—



Flow gauging station on Syrkatis stream at the inflow of Dhypotamos Dam. This dam will be built on the confluence of Syrkatis and Mylous tributaries of Pendaskinos River. WDD Photo 97EN-19.

III DIVISION OF PLANNING

by
Dr C A Christodoulou
Principal Water Engineer
Head of Division

Introduction

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

- *Reconnaissance and feasibility Reporting*
- *Investigations and 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 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 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. At the end of 1980 (11 December) Consulting Engineers were employed (Sir William Halcrow and Partners) to work with the team on the Engineering component of the feasibility study.

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

- A closed conduit of approximate length of 110 km
- A diversion tunnel from Dhiarizos to 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 1981 was devoted to the evaluation of surface water resources at the following points with the use of the rainfall-runoff mathematical model for the period 1916-1978

- Evdhimou river
- Paramali river
- Yermasoyia river: at Zonias and at the Yermasoyia dam
- Pyrgos river: at the proposed damsite
- Tremithos river: at Lymbia dam and Ayia Anna

The team also provided assistance in the flood studies work carried out in the office of Sir William Halcrow and Partners in London; relevant information for peak flows and rainfall were collated for Dhiarizos, Yermasoyia, Pyrgos and Akhna reservoir.

A report describing all the work regarding the revision of the hydrology of Vasilikos, Maroni and Pendaskinos rivers has also been issued.

Hydrogeology

During 1981 the hydrogeology section was continued with the collection and processing of data for the aquifers in the framework of the Southern Conveyor Project. By the end of the year all aquifers within the SCP area were studied and their water balances were determined. These aquifers are the following:

- Evdhimou-Paramali
- Akrotiri
- Parekklisha
- Alaminos
- Mazotos
- Kiti-Perivolvia
- Kokkinokhoria

The form of mathematical models applied in the areas of Akrotiri, Kiti-Perivolvia and Kokkinokhoria has been finalized. These models were used for the forecasting of future hydrogeological conditions and for several alternative solutions for the needs of the Southern Conveyor Project.

The specific problem of the seepage of the Akhna reservoir was also studied and a relevant report was issued. Finally a hydrogeological report was issued for the Evdhimou-Paramali aquifer.

ENGINEERING

During 1981 the engineering team of the SCP completes the designs, drawings and cost estimates for all the engineering works of the Project, except Kouris dam which is being designed by "SOGREAH" Ingenieurs Conseils.

The engineering works comprise the following:

- The Dhiarizos Diversion
- The Southern Conveyor Pipeline
- The Tersephanou-Nicosia pipeline
- Irrigation systems including conveyor branches and night storage reservoirs in the areas of Akrotiri, Parekklisha, Mazotos, Kiti and Kokkinokhoria.
- Limassol sewage tertiary treatment works including pumping station and pumping mains
- Water treatment works at Limassol and Tersephanou for Nicosia and Larnaca including the required pumping stations
- Pyrgos and Akhna dams plus the raising of Yermasoyia dam

All the above works were designed at feasibility level except the Mazotos irrigation system and two sections of the Southern Conveyor pipeline which were designed in detail.

Agriculture

During 1981 there was a shift in the activities of the team from agronomy and field survey to map production. The team was occupied with the following tasks:

Final delineation of the Project Irrigation Areas was concluded for all areas namely Akrotiri, Parekklisha, Mazotos, Kiti and Kokkinokhoria. The irrigation work within these areas will cover about 9,460 ha. About 50% of the work for final agricultural map production (land use and land suitability for irrigation) was completed by the end of the year. Data regarding cropping pattern and crop water requirements were provided for use in the computer model.

The cropping pattern by irrigation area was also concluded.

Two field surveys were carried out. First the Xylophagou ownership and second the mapping of the autumn potato crop within the delineated Kokkinokhoria irrigation area.

Finally the team involved itself with the preparation of Volume 4 of the study and completed a large proportion in draft form.

* AGRICULTURAL ECONOMICS

The main activities of the Agricultural Economics Section of the SCP during 1981 were the following:

Crop Cash Flows

Following the revision of crop technical inputs and outputs by the Agricultural Section, the crop cash flows were revised using 1981 prices. The 1981 crop prices were obtained by revising the data used in the regression analysis.

The computer programme which was developed early in 1981 was used to determine crop profitability at various water costs.

Domestic Water Demand

The final estimates of domestic water demand for the feasibility study were developed. The quantities that will be available in future from non-SCP sources were also determined.

For the evaluation of domestic water a questionnaire was prepared and a survey covering 50 water consumers in Nicosia was carried out through the Nicosia Water Board.

Farm Models - Farm Financial Analysis

Ten farm models were developed for farm financial analysis and information on various agricultural credit schemes was collected.

Seminars

The Agricultural Economics Section participated in the Seminar of Agricultural Investment Project which was organized by the Ministry of Agriculture and Natural Resources in cooperation with Reading University. A lecture was delivered by the section to the Seminar on SCP formulation, preparation and evaluation.

Miscellaneous

The section also prepared village level data, agricultural imports-exports statistics, agricultural production, etc.

Systems analysis

During 1981 the team occupied itself with the execution of a large number of computer runs with the following aims:

- Selection of an appropriate hydrological series for use in subsequent analysis.
- Determination of the maximum possible number of hectares that could be profitably irrigated by the SCP
- Determination of Kouris dam size
- Determination of Pyrgos dam size

- Evaluation of the raising of the existing Yermasoyia dam
- Determination of the size of the main SCP structures to satisfy domestic demand only

- Determination of the economic indicators of IRR and NPV for the Project

- Testing of cropping pattern

KHRYSOKHOU WATERSHED IRRIGATION PROJECT

General

The study of KWIP began in March 1979 and it is being carried out in co-operation with the FAO with financial assistance from the United Nations Development Programme (UNDP).

The area of study covers about 900 square kilometres and includes Khrysokhou Bay, Akamas, Tylliria, Marathasa and the Uplands in the Upper Khrysokhou basin.

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

The team which includes both local and FAO personnel includes, Engineers, Hydrologist, Agriculturists and Economists. The study is to be carried out in two stages: stage 1 will identify the various development options and stage 2 will carry out the detailed feasibility study.

It is estimated that the Project will irrigate 4,000 ha of land. This would involve the construction of two dams one at Evretou and one at Ezousas. The conveyance of water will be done by both closed and open conduits. Finally it would involve the construction of new irrigation network system and land development.

Water resources

The Water Resources team was engaged in the preparations for the final runs of the stochastic model. The model produces a series of stochastically generated rainfall - temperature - streamflow data. Twenty 50-year series were produced and ranked according to the presence of consecutive dry years. Two of these series were selected which are believed to represent best the situation in the area under study. The selected series were used as input to the water resources model. The results obtained are presented in Annex 3 of the KWIP Feasibility Report.

Further to the above the collection and ana-

lysis of surface and ground water data continued. The collected hydrogeological data were assessed and the potentials of the various rivers and aquifers in the KWIP region were evaluated. The results obtained are presented in the relevant KWIP reports.

Engineering

Irrigation Engineering

Main activities:

- Completion of feasibility studies and designs for the irrigation network in the Lowlands (3,100 ha) and the Uplands (1,200 ha) (ANNEX 5).
- Detailed design of irrigation distribution system from pond or tank to metered plot inlet in the western sector of the Polis-Khrysokhou Valley (800 ha), including preparation of tender documents and drawings (completion due in March 1982).

Dam Engineering

Main activities:

- Completion of feasibility studies and design of the Evretou dam on the Stavros tis Psokas River (ANNEX 4A)
- Feasibility studies and design of the Ezousas dam on the Ezousas river near Ayia (ANNEX 4B)
- Feasibility studies and design of (1) the Lowlands Main Conveyor, which is the main distribution pipeline from Evretou with branches to river intakes, night storage ponds or break pressure tanks, and of (2) the Uplands Conveyor, which is the main pipeline connecting Ezousas with the night storage ponds in the Uplands (ANNEX 4B)
- Detailed design of first 9 km of the Lowlands Main Conveyor, with branches to three night storage ponds and one break pressure tank in the Polis-Khrysokhou Valley, including preparation of tender documents and drawings.
- Start of detailed design of the Evretou dam by Sir William Halcrow & Partners, including preparation of tender documents (completion due in August 1982).

Agriculture - Agroecology

Main activities:

- Finalization of the cropping pattern
 - Analysis of the technical and economical aspects of the proposed crops
 - Preparation of the relevant KWIP feasibility reports (ANNEXES 2,6,8,9,10)
- The area to be developed is about 4,300 ha (or 32,250 donums) of which 3,100 ha (or 23,250 donums) in the Lowlands of the Pro-

ject area and 1,200 ha (or 9,000 donums) in the Uplands.

The proposed overall cropping pattern includes: Citrus (lemons, valencia, mandarines) or 25% of the total area to be irrigated, avocados (6%), bananas (3%), table grapes (6%), table olives (7%), deciduous (8%), almonds, pistachios and pecans (18%), vegetables (21%), seed potatoes (3%) and fodder (3%).

INVESTIGATION AND LABORATORY BRANCH

General

In 1981 the work of the Site Investigation, Laboratories and Grouting Section of the Division of Planning, related to a number of major and more minor projects undertaken by the Department. Furthermore, at the request of other Government Departments and private organizations, a number of projects were undertaken and completed during the year.

The amount of work undertaken and completed during 1981 by the section was unprecedented and was mainly involved with subsurface geological and construction material investigations at the feasibility and design study stages.

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

- Southern Conveyor Project: Akhna Reservoir, Main Conveyor, Arminou Diversion, Pyrgos Dam.
- Kouris Dam: Site and fill material investigations.
- Vasilikos-Pendaskinos Project: Kalavasos Dam (Site and fill material investigations), Dhypotamos Dam (Site and fill material investigations), Maroni Diversion.
- Khrysokhou Watershed Irrigation Project: Evretou Dam (Site and fill material investigations), Ezousas Dam (Site and fill material investigations).
- Ayii Vavatsinias Arch Dam, grouting.
- Solea Valley Project: Phlassou Pond, site and fill material investigations.
- Siphilos Dam: Site investigations. *Site Investigation or drilling work undertaken for private organizations included.*
- Vasilikos Cement Factory: Grouting of artesian well
- Universal Life Insurance Head Offices, Ni-

cosia: Site investigation.

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

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

In addition to the above considerable work was done by the Concrete laboratory in relation to concrete aggregates and at the request of the Cyprus Standards Organization of the Ministry of Commerce and Industry.

Site/Material Investigations, Grouting Works

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

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

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

Personnel

On the 31st of December, 1981 the total number of personnel employed with the section was the number of, title or speciality and function of personnel employed are as shown below:

Machinery and Equipment

During 1981 the laboratory acquired one electronic balance and various accessories for existing equipment.



*Large dia. Triaxial test being carried out at the WDD Soil Mechanics Laboratory for determining shear strength of materials up to 20 mm max particles size.
WDD Photo 75 EN-O (2.10.81).*

TABLE III-1
SITE/MATERIAL INVESTIGATIONS AND GROUTING

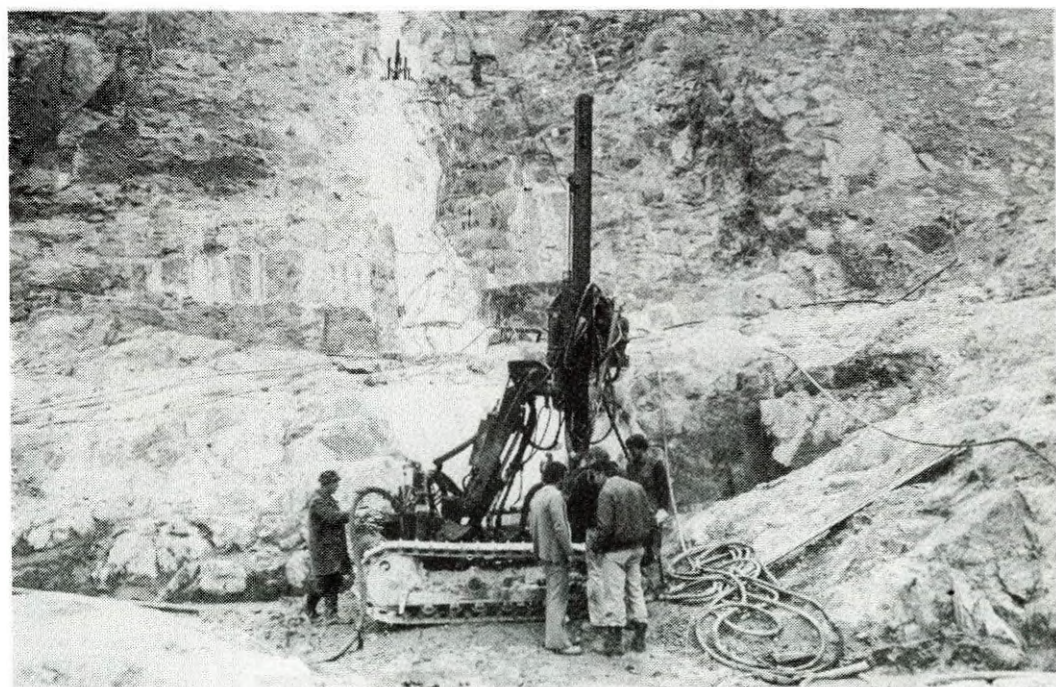
Ser No.	Project	Aim of investigation	Fieldwork as carried out	Machinery used	Expenditure £
A. DEPARTMENTAL PROJECTS					
1	Khrysokhou Watershed irrigation Project <i>Evretou Dam</i> (continued from 1980 to 25.3.81) <i>Ezousas Dam</i> (9.2.81 to 18.10.81)	Subsurface geological and material investigations. To establish foundation conditions and permeability	Drilling of 6 No. boreholes with associated pressure water testing	- Core drills - Flush pumps - Traxcavator - Digger	5 100
		Subsurface geological and material investigations. To establish foundation conditions and permeability	Drilling of 4 No. boreholes with associated pressure water testing	- Core drills - Flush pumps - Traxcavator - Digger	60
2	Southern Conveyor Project <i>Akhna Reservoir</i> (18.5.81 to 9.6.81)	Subsurface geological and material investigations. To establish foundation conditions and permeability	Drilling of 2 No. boreholes	- Auger drill	1 550
	<i>Pyrgos Dam</i> (continued from 1980 to 15.8.81)	Subsurface geological and material investigations. To establish foundation conditions and permeability	Drilling of 21 No. boreholes with associated pressure water testing	-Core drills - Flush pumps - Auger drill - Traxcavator	8 200
	<i>Kouris Dam</i> (9.6.81-31.12.81)	Subsurface geological and material investigations. To establish foundation conditions and permeability	Drilling of 101 No. boreholes with associated pressure water testing	- Core drills - Overburden drills - Auger drills - Flush pumps - Traxcavator	44 200
	<i>Arminou Diversion</i> (29.10.81-7.11.81)	Subsurface site investigation	Drilling of 3 No. boreholes	- Diggers - Overburden drills - Digger - Traxcavator	450
	<i>Main Conveyor</i> (10.6.81 to 18.6.81)	Site investigation to establish foundation/excavation conditions	Excavation of pits	- Diggers - Diggers	700
3	Vasillkos-Pendaskinos Project <i>Kalavasos Dam</i> (from 25.3.81 to 31.12.81)	Subsurface geological and material investigations. To establish foundation conditions and permeability	Drilling of 15 No. boreholes with associated pressure water testing	- Coredrills - Overburden drills - Traxcavator - Flush pumps - Diggers	35 400

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

Ser No.	Project	Aim of investigation	Fieldwork as carried out	Machinery used	Expenditure £
	<i>Dhyptomamos Dam</i> (8.4.81 to 31.12.81)	Subsurface geological and material investigations. To establish foundation conditions and permeability	Drilling of 15 No. boreholes with associated pressure water testing	- Coredrills - Overburden drills - Traxcavators - Flush pumps - Diggers	
4	Pitsilia Project <i>Ayii Vavatsinias Arch Dam</i> (19.1.81 to 14.2.81)	Grouting of construction joints cement-grout mixture	Grouting of construction joints	- Wagon drill - Grout pump - Compressor - Mixer - Pumps	250
5	Solea Valley Project <i>Phlasou Pond</i> (12.1.81 to 14.1.81) <i>Siphilos Dam</i> (31.10.81 to 31.12.81)	Site and fill material investigations	Excavation of test pits	- Digger	60
		Subsurface geological and material investigations. To establish foundation conditions and permeability	Drilling of 2 No. boreholes with associated water pressure testing	- Coredrills - Flush pumps - Traxcavator	2 900
B. PRIVATE PROJECTS					
1	<i>Vasilikos Cement Factor</i> (24.10.81 to 31.10.81)	Grouting of Artesian well		- Grout pump - Compressor - Mixer - Pumps	250
2	<i>Universal Life Insurance Nicosia HeadQuarters</i> (9.12.81 to 18.12.81)	Subsurface site investigation	Drilling of 3 No. boreholes with insitu testing and sampling	- Auger drill	700

TABLE III - 3
CONCRETE AND FIELD LABORATORY TESTS DURING 1981

Tests	Aspro- Kremmos Dam	Xyliatos Dam	Stavrovouni Reservoir	Tenders for concrete aggregate	Miscel- laneous	Total
Mix design	25	—	—	—	—	25
Sieve analysis	139	—	—	13	—	152
Wet Analysis	—	4	10	—	—	14
Silt content	50	5	20	6	—	81
Organic impurities	50	—	—	—	—	50
Colour	—	5	20	7	—	32
Specific gravity	10	—	—	—	—	10
Water absorption	10	—	—	—	—	10
Moisture content	46	—	—	—	—	46
Cube crushing	1 422	331	483	—	671	2 907
Slump	386	245	220	—	—	851
Suspended sediment	10	—	—	—	—	10



Drilling and grouting work for Xyliatos Dam which started in December 1980 was completed by the end of July 1981. WDD Photo C50-6 (7.5.81)

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.

Further, in addition to the Branches particular to the above mentioned kind of works,

this Division incorporates 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 1981 the following qualified personnel were working with the Design Division

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

By the end of 1981 five Executive Engineers were appointed on contract, for both the Vasilikos-Pendaskinos and Pitsilia Projects.

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

MAIN ACTIVITIES

The main activities of the Design Division continued during 1981 being focussed on the implementation of the Pitsilia Integrated Rural Development Project. Furthermore the

Division continued its involvement with the implementation of the Vasilikos-Pendaskinos Project, since the Head of the Division was temporarily acting as the Project Manager of the Project, since April 1981, when the foreign Project Manager resigned from his post. Only one major scheme of local importance outside Pitsilia Project was under detailed design in 1981.

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 Project 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 interested farmers, the preparation of a feasibility study, an appraisal and 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 during 1981 on pond and borehole schemes is given in a tabulary form in Table IV-1. More on the progress of the project until 1981 can be found in the 1980 annu-

al report, whereas details on the progress of the construction of Xyliatos Dam as well as of ponds which were under construction are given in the respective section of the report.

PITSILIA INTEGRATED RURAL DEVELOPMENT PROJECT

Pond schemes

Detailed Studies

The detailed designs of three ponds were completed in 1981. These ponds, details of which were given in the 1980 annual report are:

- Kyperounda Pond (Storage capacity: γ : 270,000 m³)
- Agridhia Pond (Storage capacity: 59,000 m³)
- Lagoudhera Pond (Storage capacity: 70,000 m³)

Tenders for the construction of the first two were invited in October 1981, whereas for the last one in December of the same year. Tenders for the construction of Pharmakas two ponds were also invited in January 1981 but due to administrative problems the tender was not awarded in 1981.

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

- Eptagonia Ponds Nos. 2&3 (Gross area: 265 donums. Est. cost: £72,000)
- Akapnou-Eptagonia Pond (Gross area: 185 donums. Est. cost: £40,000)
- Arakapas Pond (Gross area: 270 donums. Est. cost: £57,000).

Feasibility Studies

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

- Kyperounda Pond
- Agridhia Pond
- Lagoudhera Pond
- Odhou Ponds
- Ora Pond
- Spilia Ponds

The feasibility studies for the first three ponds, which began in 1980, were completed early in 1981. However, certain revisions were brought about later and related addendums were issued.

The feasibility studies of the next two pond schemes were completed late in 1981 and

TABLE IV-1
PITSILIA INTEGRATED RURAL DEVELOPMENT PROJECT
 Major Irrigation Works— Progress during 1981

Scheme	Preliminary Design—Pumping	Preliminary Approval by Farmers Feasibility Studies	Final Designs Contract Docum	Approval by P.B. and W.B	Tendering	Construction
Pelendria Pond and borehole, D.S						XC
Ephtagonia Pond No1, Distribution System						XC
Khandria Pond D.S						X
Akaphou-Ephtagonia Pond						XC
" D.S				X		X
Ephtagonia Pond No 2				X		XC
" D.S						X
Ephtagonia Pond No 3				X		XC
" D.S						X
Kato Mylos Pond						XC
" borehole and D.S						X
Arakapas Pond No 1				X		X
" D.S						X
Pharmakas Ponds					X	P
Kyperaunda Pond		X	X	X	X	
Agridhia Pond		X	X	X	X	
Lagoudhera Pond		X	X	X	X	
Odhou Ponds	X	X	X			
Ora Pond	X	X	X			
Spilia Ponds	X	X				
Dhierona Pond	X					
Arakapas Pond No 2	X					
Ayii Vavatsinias P.No 2	X					
Kalokhorio boreholes						XC
Potamitissa boreholes						XC
Arakapas boreholes (Nos 106 & 107/76)						XC
Ayios Theodoros B/H (No 105/76)						XC
Ayios Ioannis borehole			X			P
Agros borehole (No 63/76)			X	X		
Polystipos B/H			X	X		
Arakapas borehole (No 124/76)	X	X	X			
Ayios Theodoros B/H (No 64/76)	X	X	X			
Ayios Konstantinos B/Hs (Nos 123/76 & 8/81)	X					
Louvaras boreholes (Nos 32/77 & 16/81)	X					
Kyperaunda B/H	X					
Alona borehole	X					
Lagoudhera B/H	X					
Askas borehole	X					
Lazania borehole	X					
Ora B/H (No 10/79)	X					

X: Works under progress in 1981
 XC: Construction of works completed in 1981
 P: Construction of works pending due to administrative problems
 WB: World Bank

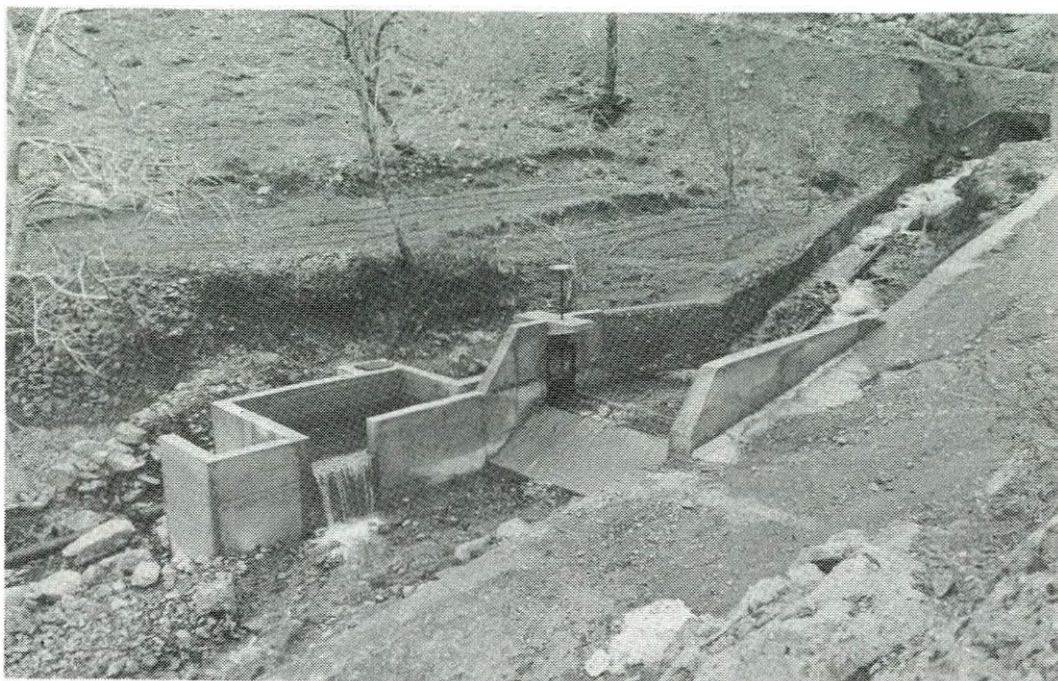
P.B: Planning Bureau
 D.S: Distribution System
 P: Pond
 B/H: Borehole



Aerial photograph of Pelendria Pond, Pitsilia Integrated Rural Development Project, showing extensive terracing of the area to be irrigated. WDD Photo A51EN - 3



Drip irrigation for vegetables in levelled terraced land in the Pitsilia Integrated Rural Development Project area. WDD Photo D 80-9.



Most of the off-stream PVC lined earth ponds of the Pitsilia Integrated Rural Development Project are fed from streams through a diversion weir and pipeline. In the photograph one of the smallest diversion weir arrangements for Khandria pond can be seen consisting of a weir with a grilled intake channel, a settling tank and an outlet chamber. The steel surface laid diversion pipe can be seen on the left. The ponds are filled during the winter and spring months before the streams dry up. WDD Photo C30-11 (6.2.81)

the respective detailed designs were in progress by the end of the year.

Finally no feasibility report was prepared for the last scheme, as this scheme proved not to be economically viable.

Details of Odhou and Ora pond schemes are given below:

Odhou Ponds

This scheme involves the construction of two off-stream ponds, with storage capacities of 47,500 m³ and 57,500 m³ respectively, located southeast of Odhou village.

The two ponds will be impounded with water from a nearby stream, which is a tributary of Vasilikos river, through a common 2200 m long and 150 mm dia A C diversion pipeline. Geologically the sites are situated in a valley of weathered diabase. The total volume of earthworks is estimated at about 106,000 m³

and 66,000 m³ and the total area of membrane lining to be used for watertightness about 11,300 m² and 12,750 m² for the first and second pond respectively.

The ponds will be used for the irrigation of a gross area of 180 donums (150 donums net) of citrus and of some table olives. Out of this area, 50 donums are presently under irrigation but suffering severe water shortage.

Both geological and topographical conditions are not very favourable. This is reflected on the obtained internal rate of return of the scheme, which is only 8.74%. Furthermore the construction of the second pond will require the destruction of a small young mandarine plantation.

The feasibility study was completed and submitted for further consideration in December 1981.

Ora Pond

This is an off-stream pond located northwest of Ora village, with a storage capacity of 60,000 m³.

The pond will be impounded with water diverted from a nearby stream which is a tributary of Vasilikos river. A 600 m long, 200 mm dia A C pipeline will deliver the water from the diversion weir to the pond. Geologically the site is situated in a valley of diabase and dolerite. The total volume of earthworks is estimated at 69,000 m³ and the total area of membrane lining to be used for watertightness is about 14,000 m².

The pond will be used for the irrigation of a gross area of 85 donums (70 donums net) of mainly citrus. The whole of this area is located within the existing Ora Irrigation Division. The topographical conditions are not very

favourable. This affects the cost of the works and consequently the internal rate of return which was estimated at 9.4%.

By the end of the year the approval by IBRD to proceed with the scheme was received.

Borehole schemes

Detailed Studies

The detailed designs for the following two borehole schemes started in 1981.

Agros B/H ***(No. 63/76)***

The scheme provides for the exploitation of the Agros borehole, which has a yield of 50 m³/hr. About 10 m³/hr out of this yield will be used to reinforce the domestic water needs of the village whereas the remainder 40 m³/hr will be utilized within this scheme which provides for the following:

(a) The installation of a pressurized distribu-



The first filling of Kato Mylos Pond was during December 81 to January 82. Water is diverted to the pond from a stream through a 150 mm dia, 2 km long gravity pipeline. Water from the borehole is used to irrigate the higher lying areas of the Vatera Irrigation Division with the possibility of feeding also the pond which commands the low lying areas of the Division.
WDD Photo D20-8 (23.4.82)

tion network for the Karkopoulia Irrigation Division which at present obtains water from the Agros dam but cannot be fully satisfied.

(b) The rehabilitation of several small Irrigation Divisions which rely for their water on small streams and springs. The actual land area of these Irrigation Divisions which is irrigated at present is limited to 40 donums.

With the utilization of the borehole water along with the existing present sources a gross area of about 350 donums of mainly deciduous fruit trees will be fully irrigated. The total cost of the scheme is estimated at about £100,000.

Polystipos B/H
(No. 21/77)

The main use of Polystipos borehole which has a yield of 12 m³/hr is to cover the water shortage of several small Irrigation Divisions in the proximity of the borehole. In fact the existing irrigation works depend for their irrigation on several small springs. However, due to the lack of proper distribution works and the variation in the yield of the springs, they usually experience severe water shortage problems, which will be ameliorated by the new scheme.

The area to be served by the scheme extends to 63 donums gross (54 donums net) and is now cultivated with deciduous trees mainly apples, walnuts and hazelnuts.

The total cost of works is estimated at £46,000.

Feasibility Studies

Further to the feasibility studies for the two above mentioned schemes of Agros and Polystipos boreholes two other borehole schemes for Ayios Ioannis (Agros) and Ayios Theodoros (Agros) were also completed in 1981.

The first scheme which involves the utilization of the Ayios Ioannis borehole (No. 65/76), with a yield of 94 m³/hr, which is the highest ever met in the Pitsilia regions, was rejected by the farmers due to administrative problems.

The second scheme provides for the utilization of the second borehole drilled for Ayios Theodoros (No. 64/76). The feasibility study was completed in August 1981. In spite of the relatively high internal rate of return, which is 11.5%, the high pumping cost involved, makes the farmers sceptical to accept the scheme.

Pumping Tests

Due to the rather complex conditions of occurrence 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 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 1981 such tests were performed on eight boreholes. The results-pending verification by water level recovery in Spring 1982 - versus those of the short duration tests which are carried out during the drilling of the boreholes are as follows:

TABLE IV-2
BOREHOLES PUMPING TESTS

Village	B/H No.	Prolonged	Short
		Average Yield (m ³ /hr)	Test Duration Test Yield (m ³ /hr)
Kyperounda	62/76	40	54
Alona.....	46/80	32	41
Lagoudhera.....	53/80	16	20
Askas	98/80	38	41
Ora.....	10/79	14	30
Ayios Konstantinos....	8/81	75	81
Lazania.....	4/81	6	45
Louvaras	16/81	54	100

The difference observed in the yield of almost all the tested boreholes between the long and the short duration tests indicate the importance of the prolonged pumping tests in determining the yield on which such schemes are to be designed. Based on these results, the yield of Ora and Lazania boreholes could not justify the planning or irrigation schemes.

VASILIKOS-PENDASKINOS PROJECT

Due to the continuous involvement of this Division in the implementation of the project the progress achieved during 1981 is reported herebelow.

The Consulting Engineers, who were appointed to prepare the detailed designs, drawings and contract documents and to supervise the construction of the project works, started working early in January 1981. Their first assignment was to review the feasibility studies of the project. As a result of this review the following were recommended:

(a) Several changes in the type of the works, most of which were aiming to increase the security of the works and achieve their better functioning.

(b) Testing of the behaviour of the spillways of the two dams of the project through physical modelling.

(c) Additional field investigations and topographical surveys, which were carried out all through the reported year.

The review of the feasibility studies was followed by the preparation of the design memorandums for all the works envisaged by the project, after which the main design work started with priority given to the design of the dams.

The design for the two dams was reviewed in August by a four-member panel of experts appointed by the Government for this purpose.

By the end of 1981 the work undertaken by the Consulting Engineers had reached the following stages:

(a) The designs, construction drawings and contract documents for the two dams i.e. Dhypotamos and Kalavassos dams, were almost completed. Tenders for their construction will be invited early in 1982 after the contract documents undergo a final check by WDD. Prequalification of contractors had reached the stage where only the final decision of the Ministerial Committee on Tenders was needed.

(b) The contract documents for the electromechanical equipment of the Kornos Treatment Plant and of the three pumping stations envisaged by the project had been prepared as well as the prequalification of contractors which will undertake this job. Tenders were invited in November 1981.

(c) Due to the major changes brought about on the two main conveyors of the project, that is the Maroni diversion and the Kalavassos dam to Khirokitia Treatment Works, most of the time was devoted in fixing the

route of the pipelines and carrying out the topographical surveys and field investigations involved. Applications for prequalification of contractors for these contracts were invited and received in December 1981.

(d) The design work on the distribution networks of the two main areas of the project i.e. Pendaskinos and Vasilikos irrigation schemes had not advanced further than a preliminary layout of the systems.

In addition to the work directly related to the various designs by the Consulting Engineers, other activities on the project undertaken during 1981, included:

- Award of tender for the construction of the Project headquarters building at Khirokitia, which eventually will be used to accommodate personnel for the operation and maintenance of the project.

- Final fixing of the boundaries of all the areas which will be irrigated by the project.

- The boundaries of the three areas, where land consolidation will be applied, were fixed and meetings with farmers were held. Voting was carried out in one of them with positive results, whereas in the other two the preparation of the list of owners was almost completed.

- The land for the Agricultural Research Station was finally acquired and fenced.

- Procurement of vehicles and equipment.

It should be mentioned finally that the foreign Project Manager resigned and left the project in April 1981.

Other projects

As earlier stated due to the heavy commitments of the Division with Pitsilia and Vasilikos-Pendaskinos Project, its activities in other projects were very limited. In fact the only scheme where detailed designs were initiated was that of Khirokitia Pond and Borehole scheme within the Larnaca-Orini Project. The detailed designs although quite advanced had not been completed by the end of 1981.

TOPOGRAPHY BRANCH

The Topography Branch, which operates within the Design Division of the Department, is headed by a Technical Superintendent and staffed with: 7 Technicians (monthly paid), 15 Technicians (on Contract) 14 Chainmen and 20 Labourers. The staff is interdepartmentally trained on the surveying

methods, the use of the instruments, recording of field data, computing and preparation of plans. Modern surveying instruments and equipment are available and these are replenished regularly by purchasing new ones to cope with the needs of survey work required by the Department.

The surveys conducted by the Topography Branch are of the Engineering type such as:- Contour surveys, profile levelling, cross sectioning, setting out of project outlines, instrumental observation for movement detection etc.

The main areas of surveying activities this year were the Southern Conveyor Project, the Vasilikos-Pendaskinos Project, the Khrysokhou Watershed irrigation Project and the Pitsilia Integrated Rural Development Project. See table IV-3.

TABLE IV-3

SURVEYING WORK CONDUCTED DURING 1981

Southern Conveyor Project

Kouris Dam

- Extension downstream. Contour Survey
- Tunnel route and profile levelling
- Tunnel portals (New sites) Contour survey
- Dam axis. Profile levelling
- Test pits at borrow areas. Setting out and levelling
- Access roads and exploratory B/Hs. Contour survey and levelling

Main Conveyor

- Tersephanou Water Treatment Works to Akhna terminal storage. Route and profile levelling
- Alternatives from Kouris Dam to Kato Polemidhia area. Route and profile levelling
- Mari area to Ayios Theodoros (L) area. Route and profile levelling
- Ormidhia to terminal storage. Setting out and levelling
- 5 No. River crossings. Contour survey.

Tersephanou Water Treatment Plant. Contour surveys for 2 No. sites

Tersephanou Storage Tank. Contour surveys for 2 No. sites

Irrigation Tanks. Site survey for Episkopi, Kandou, Ypsonas, Parekklishia, Monagroulli
Tersephanou-Nicosia Pipeline. Route and profile levelling

Tersephanou-Nicosia Pipeline. River crossings contour survey

Mazotos Irrigation Scheme. Night storage tanks (2 No) contour survey and pipelines route and profile levelling

Dhiarizos Diversion Khapotami weir and shaft contour survey and tunnel outlet at Kryos River contour survey

Vasilikos-Pendaskinos Project

Dhyptomamos Dam

- Damsite contour survey
- Axis profile levelling
- Exploratory B/Hs levelling
- Access road strip survey

Dhyptomamos Dam. Relocation of Lefkara pipeline. Profile levelling

Kalavastos Dam

- Damsite extension axis contour survey and profile levelling
- Exploratory B/Hs levelling
- Borrow area contour survey

Kalavastos-Khirokitia Pipeline. Cross sections and profile levelling

Maroni Diversion Pipeline profile levelling and weir contour survey

Khirokitia Treatment Works. Balancing reservoir (2 No. sites) Contour Survey.

Pendaskinos Irrigation Scheme. Main pipeline route and profile levelling

Kornos Treatment works. Lagoons contour survey

Khrysokhou Watershed Irrigation Project

Evretou Dam Damsite extension contour survey and exploratory B/Hs levelling

Ezousas Dam Damsite extension contour survey and exploratory B/Hs levelling

Evretou Main Conveyor Pipeline and tertiaries route and profile levelling, river crossings contour survey and storage tanks contour survey

West Conveyor Route and profile levelling and river crossings contour survey

Yialia Distribution Network Extension Route and profile levelling

Pomos Sample Area Main conveyor route and profile levelling

Pitsilia Integrated Rural Development Project

Kyperounda Pond Setting out plan for pond and contour survey-profile levelling for diversion weir and pipeline

Pharmakas Ponds (2 No) Setting out plan
Agridhia Pond Setting out plan for pond and
 contour survey profile levelling for diversion
 weir and pipeline

Lagoudhera Pond setting out plan

Gourri Dam (Ayios Mamas) Contour survey
Dhieronon Pond. Contour survey

Xyliatos dam Distribution system and stor-
 age tanks. Profile levelling and contour sur-
 veys.

Other Routine Works

- Syphilos Dam: Extension of dams site
 survey

- Measurements on settlement markers for
 Kalopanayiotis, Lefkara and Yermasoyia
 dams and for Khirokitia Treatment Works

- Establishment of triangulation system and
 movement observations at Asprokremmos
 Dam

- Observations for possible sliding of
 dumped material at Amiandos Asbestos
 Mines

DRAWING AND RECORDS BRANCH

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

- *The Drawing and Cartography section*
- *The Plan Registry and Plan Reproduction
 section*
- *The Photographic section and Photo Pro-
 cess laboratory, and*
- *The Technical Library and Technical In-
 formation section*

At the end of the year under review the staff
 of the Drawing and Records Branch num-
 bered 19 ie 17 Technicians II and two hourly
 paid assistants of the plan reproduction
 section.

Six of the Technicians were working throu-
 ghout the year with the Planning Division,
 two on KWIP and four on SCP.

1981 was an extremely hard year for all the
 members of the Drawing and Records
 Branch with all the major projects running
 together. Special mention must be made
 here of the 2 staff working with the KWIP who
 have carried out all the work load of the pre-
 paration of the drawings of the project with
 little if any assistance.

During the Summer months several Higher
 Technical Institute (HTI) students were em-
 ployed to carry out drawing work within their
 training programme.

The work carried out by the Drawing and Re-
 cords Branch is listed as follows:

TABLE IV-4

WORK CARRIED OUT BY THE DRAWING AND RECORDS BRANCH DURING 1981

Ref	Description	Time spent in hours	Man months	% of total
a	Existing dams (completion plans, sedimentation maps, control monuments etc)	353	2.3	1.0
b	Irrigation distribution systems for dams	122	0.8	0.4
c	Routine irrigation schemes	958	6.2	2.7
d	Routine domestic water supply schemes	1298	8.4	3.7
e	Paphos Irrigation Project	648	4.2	1.9
f	Pitsilia Integrated Rural Development Project	3818	24.8	10.8
g	Vasilikos-Pendaskinos Project	1989	12.9	5.7
h	Southern Conveyor Project	9429	61.2	26.6
i	Khrysokhou Watershed Irrigation Project	3478	22.6	9.8
j	Solea Valley Project	219	1.4	0.6
k	Larnaca-Orini Project	433	2.8	1.3
l	Yermasoyia-Vasilikos scheme	360	2.3	0.1
m	Antiflood and River Training works	38	0.3	0.2
n	Sewage disposal for Refugee estates	355	2.3	1.1
o	Watershed surveys	56	0.4	0.2
p	Hydrological	126	0.8	0.4
q	Programmes and organisation	193	1.2	0.6
r	Agricultural show	—	—	—
s	Productivity centre course	157	1.0	0.5
t	Training of staff and HTI students	322	2.1	0.9
u	Completion plans and reports	423	2.7	1.2
v	Reports	423	2.7	1.2
w	General	680	4.4	1.9
x	Odd jobs	215	1.4	0.6
y	Auxiliary services			
	(i) Library	939	6.1	2.7
	(ii) Plan registry	384	2.5	1.1
	(iii) Plan reproduction	2003	13.0	5.7
	(iv) Drawing materials store	330	2.1	0.9
	(v) Photographic section			
	and photo process lab	1848	12.0	5.2
	Total for auxiliary services	5504	36.7	15.6
z	Leave etc.			
	(i) Leave paid	2255	14.6	6.4
	(ii) Leave without pay	6	0.1	0.1
	(iii) Sick leave	613	4.0	1.7
	(iv) Maternity leave	672	4.4	1.9
	(v) D.C. (including site visits)	301	2.0	0.9
	Total for leave etc	3847	25.1	11.0
	Grand total	35442	230	100

Drawing and Cartography Section

More than 50% of the time, as can be seen
 from the above table, was taken by the five
 major projects - Paphos, Pitsilia, Vasilikos -
 Pendaskinos, Southern Conveyor and Khry-
 sokhou. The volume of work for the SCP was
 such that some of it had to be diverted to
 drawing sections of the Departments Re-
 gional Offices in Limassol and Paphos. Ex-
 tensive use was also made of the Co-op
 electronic plotter to plot longitudinal sec-

tions of conveyors, both for SCP and the VPP. In addition some overtime work was approved to carry out urgent work on VPP in August to supply the consultants with information needed for the design of the project.

Plan Reproduction and Plan Registry Section

An increase in demand was also observed on the print room. Some 4000 orders were executed for 40000 prints of all sizes and types.

The plan registry work is being shared by all the drawing office staff.

The Photographic Section and Photo Process Laboratory

Photographic coverage of all construction works of the Department continued during 1981. Black and white and colour still photography was applied as well as colour cinematography. Monthly visits continued to Paphos Project and specifically Asprokremmos Dam. Albums of B & W and colour photos are kept with the Technical Library at WDD HQs.

A great demand for photolithographic work was also made on the photo process laboratory by the SCP and the KWIP mainly for the production of base maps and reduction of drawings to be included in feasibility reports.

The work load for this one man section, had exceeded, during 1981, all previous years demand therefore the photographer had to be offered assistance from other members of the staff of the Drawing and Records Branch in non-lab work not needing special photographic skills.

Technical Library and Technical Information Section

In 1981 £795 was spent on the purchase of technical books and subscription to 9 periodicals.

In addition to the 57 books presented by BRITAIN in 1980 through the British Council/ODM Books Presentation Programme of total value of Stg £853.38 four other books were presented in 1981 valued at Stg £51.90.

The Library continued to issue monthly notes on material received and of articles of special interest in periodicals. Table IV-5 lists books purchased, books presented by BRITAIN and of WDD reports.

LIBRARY MATERIAL 1981

Books purchased (66 No)

E A PEARSON - E D FRANGIPANE - (EDITORS). Marine pollution and marine waste disposal. Proceeding of the 2nd international congress, San Remo, 17-21st, December 1973. Great Britain, 1975. Book No. 9072 \$97.00

ICID. The application of systems analysis to problems of irrigation drainage and flood control. A manual for water and agricultural engineers. Great Britain, 1980. Book No. 9073 \$15.00

BAGUELINE - JEZEQUEL - SHIELDS. The pressuremeter and foundation engineering Germany, 1978. Book No. 9099 sFr130.00

THHANNA. Foundation instrumentation. Series on rock and soil mechanics. Germany 1973. Book No. 9100 sFr78.00

G B NOLTE. Optimum pipe size selection. Germany 1978. Book No. 9101 sFr90.00

ASCE. Transactions of the American society of civil engineers Volume 145 USA 1980. Book No. 9102 \$18.00

J G RICHARDSON. Practical formwork and mould construction. London 1976. Book No. 9122 stg £23.40

J M PAXTON. Manual of civil engineering plant and equipment. Volume I. London, 1971. Book No. 9123 stg £59.40

F HARRIS - R Mc CAFFER. Modern construction management Great Britain 1977. Book No. 9177 stg £11.25

W ARMSTRONG. Contractual claims under the ICE conditions of contract. Great Britain 1979. Book No. 9178 stg £4.25

P L GOULD - SHABU-SITTA. Dynamic response of structures to wind and earthquake loading. London 1980. Book No. 9179 stg £17.50

ANCHOR - HILL - HUGHES. Handbook on BS 5337:1976. The structural use of concrete for retaining aqueous liquids. London 1979. Book No. 9180 stg £7.50

N SIMONS - B K MENZIES. A short course in foundation engineering UK, 1977. Book No. 9181 stg £8.75

R L ARMSTRONG. How to pass the professional examination. London, 1980. Book No. 9186 stg £2.00

INTERNATIONAL ASSOCIATION FOR HYDRAULICS RESEARCH (IAHR). International conference on water resources engineering 10-13 January, 1978. Volume I. Fluvial and coastal hydraulics - Volume II. Water resources development and management. Thailand 1978. Book Nos. 9182, 9183 stg £40.00

W R LOMAX - A J SAUL. Laboratory work in hydraulics. Great Britain, 1979. Book No. 9184 stg £6.50

ICE. Corrosion in civil engineering. London 1979. Book No. 9185 stg £13.00

AMERICAN SOCIETY FOR TESTING AND MATERIALS

STP 623. Dispersive clays related piping and ero-

sion in geotechnical projects. Philadelphia, 1977. Book No. 9217 \$40.75

STP 599. Soil specimen preparation for laboratory testing. Philadelphia, 1976. Book No. 9218 \$35.00

STP 523. Evaluation of relative density and its roll in geotechnical projects involving cohesionless soils. Philadelphia 1973. Book No. 9219 \$30.75

STP 361. Laboratory shear testing of soils. Philadelphia, 1965. Book No. 9220 \$24.50

NATURAL ENVIRONMENT RESEARCH COUNCIL

Flood studies report. London, 1975. Five volumes stg £50.20

I Hydrological studies. Book No. 9222

II Meteorological studies. Book No. 9223

III Flood routing studies. Book No. 9224

IV Hydrological data. Book No. 9225

V Maps. Book No. 9226

HSAI - YANG FANG. Analysis and design of building foundation. USA, 1976. Book No. 9221 \$31.40

P EDWARDS. Flowcharting and fortran IV, USA, 1973. Book No. 9291 \$11.50

P XANTHAKOS. Slurry walls. USA, 1979. Book No. 9292 \$46.95

WATER RESEARCH CENTRE. TR 128. The fate of pathogenic micro-organisms during waste-water treatment and disposal, England, March 1980. Book No. 9329. Stg £10.00

WATER RESEARCH CENTRE. TR 130. Chlorination of sewage and effects of marine disposal of chlorinated sewage. A review of the literature. England, March, 1980. Book No. 9330. Stg £5.00

WATER RESEARCH CENTRE. TR 136. Removal of trace organics from water-1. Absorption of halofoms and chlorinated pesticides by granular activated carbon. England, May, 1980, Book No. 9331 Stg £5.00

WATER RESEARCH CENTRE. TR 138. Water reuse and health in the London area. England, 1980. Book No. 9332. Stg £5.00

INTERNATIONAL IRRIGATION INFORMATION CENTRE SHAINBERG-OSTER. IIC Publication No.2 Quality of irrigation water. Israel, 1978. Book No. 9333. \$15.00

H K COMPTON. Storehouse and stockyard management, 2nd edition, London, 1981. Book No. 9336. Stg £18.75

AMERICAN PUBLIC HEALTH ASSOCIATION. Standard methods for the examination of water and wastewater, 14th edition. USA, 1975. Book No. 9368. US\$35.00

KREIDER-KREITH. Solar energy handbook. USA, 1981. Book No. 9369. US\$57.50

ASSOCIATION OF OFFICIAL ANALYTICAL CHEMISTS. Official methods of analysis. USA, 1980. Book No. 9411. US\$78.00

AMERICAN SOCIETY OF CIVIL ENGINEERS. Management of engineering of control systems for water pipelines USA, 1978. Book No. 9412, US\$16.25

AMERICAN SOCIETY OF CIVIL ENGINEERS. Guide for collection analysis and use of urban

stormwater data. USA 1977. Book No. 9413. US\$5.15

AMERICAN SOCIETY OF CIVIL ENGINEERS. Effective project management techniques. USA 1973. Book No. 9414, US\$5.00

AMERICAN SOCIETY OF CIVIL ENGINEERS. Manuals and reports on engineering practice. No 54. Sedimentation engineering. USA, 1977. Book No. 9415 US\$32.50

AMERICAN SOCIETY OF CIVIL ENGINEERS. Manuals and reports on engineering practice. No 56. Subsurface investigation for design and construction of foundation of buildings. USA, 1976. Book No. 9416. US\$6.00

G J REYNOLDS. Measurement of civil engineering work. Great Britain, 1980. Book No. 9456 stg £15.00

M SNOWDON. Management of engineering projects. England, 1977. Book No. 9457 stg £10.50

ASCE. Construction cost control. USA, 1979. Book No. 9458 stg £7.50

A RYDER. The engineers' computer handbook. London 1980. Book No. 9459 stg £14.00

E D MILLS. Building maintenance and preservation. A guide to design and management. London, 1980. Book No. 9460 stg £18.75

F N EAGLESTONE. Insurance for the construction industry. London, 1979. Book No. 9461 stg £17.50

J K GREEN-PH H PERKINS. Concrete liquid retaining structures. Design specification and construction. England, 1980. Book No. 9462 stg £26.50

R D ANCHOR. Design of liquid retaining concrete structures. London, 1981. Book No. 9463 stg £17.50

ASCE - ACI. Shotcrete for ground support. USA, 1977. Book No. 9464 stg £17.50

C S CONTENT. A geologist sketch book. USA. Book No. 9465 stg £4.00

ASCE - W SAUKIN Ed. 1980 national conference on environmental engineering. USA, 1980. Book No. 9466 stg £26.25

ASCE - S WILSON - R MARSAL. Current trends in design and construction of embankment dams. USA, 1979 stg £8.00

ASCE. Inspection, maintenance and rehabilitation of old dams. USA, 1974. Book No. 9468 stg £12.25

TELLING - MENZIES - SIMONS - COULTHARD. Cut-offs for dams: an analysis and design. England, 1978. Book No. 9469 stg £12.75

C D SHANN. The pipeline glossary and directory. England, 1978. Book No. 9470 stg £13.50

ASCE - HERR - SONNEN - THOMPSON. Proceedings of the conference on water conservation needs and implementing strategies. New York, 1979. Book No. 9471 stg £12.75

WHO - IRC. Evaluation for village water supply planning Great Britain, 1981. Book No. 9472 stg £9.25

ASCE. Manuals and reports on engineering practice - No 57 Operation and maintenance of irrigation and drainage systems. USA, 1980. Book No. 9473 stg £15.24

ASCE. Proceedings of the 1980 specialty confer-

ence. Irrigation and drainage today's challenges. USA, 1980. Book No. 9474 stg £20.00

LLOYD - O' DONNEL - WILKINSON. The mathematics of hydrology and water resources. London, 1979. Book No. 9475 stg £12.75

N T KOTTEGODA. Stochastic water resources technology. Hong Kong 1980. Book No. 9476. Stg £30.00

P L RUSHBROOKE. Working with FIDIC. A practical approach to its use in the middle east. England, 1979. Book No. 9477 stg £5.25

BOOKS PRESENTED BY BRITAIN through the BRITISH COUNCIL/ODM BOOKS PRESENTATION PROGRAMME.

R B POJASEK. Drinking water quality enhancement through source protection USA, 1977. Book No. 9373 stg £21.70

N McCLELLAND Ed. Individual onsite wastewater systems. Proceedings of the sixth national conference 1979. USA, 1980. Book No. 9374 stg £17.30

MOSLEY-BUNGEY. Reinforced concrete design. Hong-Kong, 1981. Book No. 9375 stg £6.95

P EDWARDS. Flowcharting and fortran IV. USA, 1973. Book No 9376 stg £5.95

WDD REPORTS

N TSIOURTIS - AFRODISIS. Pitsilia integrated rural development project. Agros irrigation scheme. Mini feasibility study. Nicosia, January, 1981. Report No. D/84. Book Nos 9076, 9077

P MARATHEFTOU. Pitsilia integrated rural development project. Agridhia irrigation scheme. Mini feasibility study. Nicosia, January 1981. Report No. D/83. Book Nos 9074, 9075

N TSIOURTIS-S AFRODISIS. Pitsilia integrated rural development project. Pumping test results - 1980 Preliminary results. Nicosia January, 1981. Report No. D/87. Book Nos 9082, 9083

B M MILINUSIC. Memorandum on emergency measures to secure irrigation water from Mavrokolymbos dam. Nicosia, January, 1981. Report No. D/86. Book Nos 9078, 9079

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M A GUTIERREZ FRIAS. Vasilikos-Pendaskinos project. Progress report No.4. Covering period from 1.10.80 to 31.12.80 Nicosia, January, 1981. Report No. D/204. Book Nos 9084, 9085

C C ARTEMIS - SABBEN CLARE. Vasilikos-Pendaskinos project. Nicosia Water Supply - First phase. Progress report No. 2 covering period from 1.10.80 to 31.12.80. Nicosia, January, 1981. Report No. D/89 Nos 9097, 9098

N TSIOURTIS - S KOUNTOURIS. Pitsilia integrated rural development project. Polystipos borehole. Irrigation scheme, Mini feasibility study. Nicosia, January 1981. Report No. D/85. Book Nos 9124, 9125.

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H B JACKSON. Southern conveyer project. Seventh progress report. September-December 31, 1980. Nicosia January 1981. Report No. P/20. Book No. 9128.

P MARATHEFTOU. Pitsilia integrated rural development project. Lagoudhera pond. Irrigation scheme. Mini feasibility study Nicosia, February, 1981. Report No. D/91. Book Nos 9190, 9191.

M ZACHARIOU - MICHAELIDOU. Pitsilia integrated rural development project. Kyperounda pond. Irrigation scheme. Mini feasibility study. Nicosia, February, 1981. Report No. D/92. Book Nos 9192, 9193.

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G SOCRATOUS. The use of computers in water resources planning. A case study from Cyprus. Nicosia, March 1981. Nicosia, April, 1981. Report No. L/24. Book No. 9196.

B M MILINUSIC. Paphos irrigation project. Progress report No 21. Covering period from 1.1.81 to 1.4.81. Nicosia, April, 1981. Report No. D/95. Book Nos. 9205, 9206.

G FRIAS. Vasilikos-Pendaskinos project. Progress report. No. 5. Covering period from 1.1.81 to 31.3.81. Nicosia, April, 1981. Report No. D/205. Book Nos 9207, 9208.

C C ARTEMIS-SABBEN CLARE. Vasilikos-Pendaskinos project. Nicosia water supply. First phase. Progress report No. 3. Covering period from 1.1.81 to 31.3.81. Nicosia, April 1981. Report No. D/94. Book Nos 9208, 9209.

CHR. POLYCARPOU. Proposals for future extension programs for the Southern conveyer project area. Nicosia April 1981. Report No. P/21. Book Nos 9210, 9211.

H B JACKSON. Southern conveyer project. Eighth progress report. Nicosia May, 1981. Report No. P/22. Book No. 9406.

JACOVIDES-SKORDIS. Southern conveyer project. The runoff of the rivers within the Vasilikos-Pendaskinos region. Nicosia February 1981. Report No. H/51. Book Nos 9228, 9229.

CHR. MARCOULLIS. Pitsilia integrated rural development project. Kyperounda pond. Irrigation scheme (Addendum) Mini feasibility study. Nicosia, May, 1981. Report No. D/96. Book Nos 9232, 9233.

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C ST LYTRAS. Water development department, annual report 1979. Nicosia November, 1980. Book Nos 9267, 9268.

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N TSIOURTIS-AFRODISIS. Pitsilia integrated rural development project. Pumping test results - 1980. Final results. Nicosia, June, 1981. Report No. D/98. Book Nos 9250, 9251.

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C C ARTEMIS & T E H SABBEN-CLARE. Vasilikos-Pendaskinos project. Nicosia water supply. First phase. Progress report No.4. Covering period 1.4.81 to 30.6.81. Nicosia, July, 1981. Report No. D/100. Book Nos 9254, 9255.

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G SOCRATOUS. Southern conveyor project. Computer model, Theoretical basis of the model. Volume I. Nicosia, August, 1981. Report No. P/24. Book No. 9327.

G SOCRATOUS. Southern conveyor project. Computer model Programm listings and user's guide. Volume II. Nicosia, June, 1981. Report No. P/25. Book Nos 9264, 9265.

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C KRIDIOTIS. Astarti development Co. Ltd. Site investigation. Nicosia, May 1981. Report No. F/76. Book Nos 9260, 9261.

N TSIOURTIS. Irrigation in Cyprus. Nicosia, March, 1981. Report No. I/31. Book Nos 9262, 9263.

G FRANGOPOULOS-G PITTAS. Phrenaros water supply. House-to-house scheme. Completion report. January 1977. Report No. C/135. Book Nos 9258, 9259.

H B JACKSON. Southern conveyor project. Ninth progress report. Nicosia, September 1981. Report No. P/27. Book No. 9407.

JACOVIDES-GEORGHIOU-CHRISTODOULIDES-SKORDIS. Southern conveyor project. The water resources of the Pitsilia-dhimou-Paramali area. Nicosia, October, 1981. Report No. H/53. Book Nos 9377, 9378.

B M MILINUSIC. Memorandum on the construction of Paphos Irrigation Project. Nicosia, November, 1981. Report No. D/108. Book No. 9379.

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P MARATHEFTOU. Pitsilia integrated rural development project. Ora pond. Irrigation scheme. Mini feasibility study. Nicosia, October, 1981. Report No. D/105. Book Nos 9382, 9383.

N NEOKLEOUS. Pitsilia integrated rural development project. Khadria pond. Completion report. Nicosia, September, 1981. Report No. C/140. Book Nos 9384, 9385.

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J S JACOVIDES-A GEORGIU-A CHRISTODOULIDES. Southern conveyor project. Akhna reservoir-seepage assessment. Nicosia, August, 1981. Report No. H/52. Book Nos 9340, 9341.

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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 1981 the Division consisted of the following staff:

- 1 Senior Water Engineer - Head
- 1 Mechanical Engineer, Class I
- 5 Executive Engineers, Class II
- 1 Technical Superintendent
- 8 Senior Technicians
- 4 Technicians I
- 3 Chief Foremen
- 4 Assistant Chief Foremen
- 5 Technicians II
- 45 Monthly paid Foremen
- 35 Weekly paid Foremen
- 112 Total staff

In addition to the above technical staff, the Division engaged 540 regular employees of various trades, and an average daily number of 172 casual employees, mostly unskilled,

for the execution of the various schemes all over the Island.

During the year the Division continued the collection of data regarding actual rates, standards of materials and equipment and the results were appraised and utilized for the preparation of a unit cost manual for use in future planning and cost estimating.

As usual the commencement of the execution of the new schemes started late in the year as a result of the long and some times unnecessary administrative formalities, such as the approval of the schemes by the beneficiaries, the approval of the budget by the House of Representatives, the de-dagging of funds, etc.

CONSTRUCTION PROGRAMME AND PROGRESS

For all the schemes approved for construction during 1981, the Division's planning section prepared a construction programme having in mind all the information available at the time, ie availability of funds, administrative formalities, requisition of land, supply of electricity and any other obstacles that might arise.

The Division in general had to deal with all water projects approved in the Department's 1981 budget, or in the budget of other Ministries or Departments. Such projects included in the budgets of other Ministries or Depart-

ments constituted a great proportion of the Division's activities during 1981, and could be classified as follows:

- New or carry over schemes approved in the Department's 1981 budget.
- Ponds, borehole schemes, irrigation rehabilitation schemes or water supply schemes approved for the PIRDP in the budget of Ministry of Agriculture and Natural Resources
- Water supply schemes for:
 - The housing of refugees approved in the budget of the Department of Planning and Housing
 - Industrial areas for the Ministry of Commerce and Industry
 - Stock farms for the Department of Agriculture
 - T/C villages for the Ministry of Interior
 - Towns or villages from funds deposited direct by the beneficiaries
 - Private developers, etc.,

In total during 1981 the Division of Construction had to deal with 631 projects of an estimated value of £7,077,506. The expenditure

incurred on all these schemes during the year reached the amount of £4,971,692, which is a record figure as compared to previous years (not including specific major projects under contract)

Although the Division engaged additional professional staff during 1981, still the sub-professional technical staff allocated to the Division for the execution of all these projects was very inadequate, especially in the lower ranks of Technicians I & II grades.

As a result all the technical staff had to work hard in order to respond to the urgent demand for the execution of so many projects.

Table V-I below shows in detail the volume of work executed by the Division during 1981. All categories of schemes are shown in tables further on.

PLANNING BRANCH

Although the intention at the time of establishing this branch three years ago, was to enlarge it and staff it properly so as to enable it to function in its true perspective ie plan-

TABLE V-I
SCHEMES UNDERTAKEN FOR CONSTRUCTION DURING 1981

Ser No	Description	No. of schemes	Amount allocated £	Expenditure incurred £
1	Rural domestic water supplies	60	1 150 833	616 321
2	Minor irrigation schemes	35	611 022	296 784
3	Major irrigation schemes	16	410 497	178 886
4	Town water supply schemes	10	466 857	295 931
5	Vasilikos-Pendaskinos Project	1	1 302 765	1 282 060
6	Pitsilia Integrated Rural Development Project	78	2 021 469	1 577 069
7	Refugee housing and self housing schemes	75	507 302	343 055
8	Schemes undertaken for other Government Departments	67	328 748	229 938
9	Rural domestic water supply schemes from village deposits	116	91 763	39 023
10	Minor irrigation schemes from village deposits	18	32 368	7 238
11	Schemes executed for private developers (mainly distribution systems for land development)	155	153 882	105 387
	Total	631	£7 077 506	£4 971 692
	Note: Paphos Irrigation Project expenditure not included in the above figure is			4 066 686
	Grand Total			£9 038 378

TABLE V-2
LABOUR FORCE 1981

Month	Skilled	Semiskilled	Unskilled	Regular	Casual	Total
January.....	611	103	19	538	195	733
February.....	596	99	23	536	182	718
March.....	601	107	22	537	193	730
April.....	588	86	17	538	153	691
May.....	577	76	13	538	128	666
June.....	558	95	15	538	130	668
July.....	575	97	24	538	158	696
August.....	566	99	37	536	166	702
September.....	617	110	20	536	211	747
October.....	602	94	15	535	176	711
November.....	631	101	23	552	203	755
December.....	593	107	21	563	158	721
Daily average No. .	593	98	21	540	172	712
Daily average %...	83	14	3	76	24	100

ning, programming work study and cost control, still during 1981 no progress was made towards this direction. On the contrary during the year this branch was deprived of the services of one Technician II, who was transferred to another Division.

It should be stated here that unless this branch is properly staffed it will not be in a position to achieve the targets for which it was established.

The activities which should be included in the schedule of responsibilities of this branch should be the following:

- The programming and cost control of all schemes under construction.
- 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 distribution of resources, such as labour force, plant and materials to the various schemes under construction all over the free Island.
- The assessment of the Division'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 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 sec-

tor, when such machinery is not available with the EMS.

- The acquisition of immovable property which is affected by the construction of the scheme.
- The supply of services towards the installation of electricity supply and telephone, at the site of various works.

CONTROL BRANCH

The main activity of this branch is to exercise control over the construction of all 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 control of all schemes under execution has also to be followed up and be kept always at the highest possible standard.

Other objectives of this branch are to ensure that the construction of all the schemes is 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 scheme, for the solving of problems arising during the execution. The schemes approved in the budget for construction other than Nicosia District are constructed direct by the three

Regional Offices of the Department, Larnaca-Famagusta, Limassol and Paphos, in close association with a senior technical officer of the Construction Division who acts as the co-ordinator between the Regional Offices and Nicosia HQs.

The Head of the Division and other senior technical officers carry periodic visits to the Regional Offices and to the sites of works under construction. Also 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 Offices for this purpose.

LABOUR FORCE

For the construction of all the projects the Division engages 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 1981 for the construction of all the schemes was 712 persons. Out of this figure 540 persons were regular employees of various trades, mostly builders, pipelayers carpenters, etc and 172 persons were casual skilled or unskilled labourers.

The total expenditure incurred during 1981 on wages alone on schemes constructed by direct labour reached the amount of £1,430,543.

Table V-2 shows in detail the monthly average labour force engaged direct by the Division of Construction during 1981.

PIPES AND PIPE FITTINGS

Most of the pipes and fittings used by the Division during 1981 have been purchased through the Government Central Stores, where a reasonable stock is kept permanently.

Our yearly requirements in pipes and pipe fittings are assessed by the planning section of the Division early, as soon as the budget is approved by the Ministerial Council and an order is put through the GCS.

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 direct by our Department from local or foreign factories.

During 1981, a length of 186,148 meters of

pipes of various types and diameters were laid all over the free Island for all schemes other than the Paphos Irrigation Project, at an expenditure of £495,183. Table V-3 shows in detail all types of pipes laid during 1981.

TABLE V-3
PIPES LAID DURING 1981

I GALVANIZED IRON PIPES-CLASS B

Dia inches	Length m	Value £
1/2	8 274	2 822
3/4	954	369
1	1 536	759
1 1/4	3 258	2 060
1 1/2	4 722	3 845
2	4 914	6 586
2 1/2	7 050	11 125
3	7 572	14 430
4	19 074	55 066
Total	57 354	£97 062

II *STEEL PIPES (PLAIN ENDED OR VICTAULIC)- CLASS B

6 5/8	5 274	23 885
8 5/8	6 592	52 976
10 3/4	1 992	14 654
12 3/8	1 040	20 742
Total	14 898	£112 257

III CAST IRON STANTON PIPES - CLASS B

6	624	205
12	157	103
Total	781	£308

IV STEEL TUBES (FOR CASING)

6 5/8	78	566
8 5/8	468	4 999
10 3/4	6	59
Total	552	£5 624

V BLACK STEEL PIPES

4	385	2 179
Total	385	£2 179

• VI ASBESTOS CEMENT PIPES - CLASS 15

Dia inches	Length m	Value £
3	608	91
4	29 693	43 081
6	9 704	23 572
8	9 008	33 375
10	3 640	18 229
12	2 651	21 459
14	468	4 395
18	1 049	17 833
Total	56 821	£162 035

VII ASBESTOS CEMENT PIPES - CLASS 20

4	6 437	9 456
6	10 234	19 707
8	4 418	21 657
10	824	5 285
12	634	7 164
14	623	8 397
18	1 402	29 263
Total	24 572	£100 929

VIII PVC/POLYTHENE PIPES

1/2	3 850	469
3/4	4 240	814
1	5 351	1 383
1 1/4	781	79
1 1/2	316	50
2	457	151
2 1/2	328	266
3 (9 mm)	10 680	7 794
4 (110 mm)	4 002	2 920
6	780	863
Total	30 785	£14 789

SUMMARY OF ALL TYPES OF PIPES LAID DURING 1981

Ser No	Type	Length m	Value £
I	Galvanized iron pipes	57 354	97 062
II	Steel pipes	14 898	112 257
III	Cast iron pipes	781	308
IV	Steel tubes casing	552	5 624
V	Black steel pipes	385	2 179
VI	Asbestos cement pipes - class 15	56 821	162 035
VII	Asbestos cement pipes - class 20	24 572	100 929
VIII	PVC/Polythene pipes	30 785	14 789
Total		186 148	£495 183

CONSTRUCTION PLANT

For the construction of the schemes approved in the 1981 budget and all other schemes undertaken for construction during 1981, the Division of Construction 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 could not be obtained through the EMS Department, the Division had to hire machinery from the private

**TABLE V-4
MACHINERY HIRED DURING 1981**

Ser No	Description	Quantity	Unit	Value £
1	Diggers	19626	w/hrs	68 984
2	Boreholes with diggers	29	Nos	162
3	Trenches with diggers	42993	m	45 328
4	Trenches with diggers	1397	m ³	7 163
5	Trenches	agreed	—	60
6	Caterpillar	1107	w/hrs	9 918
7	Trenches with caterpillar	320	m	160
8	Bulldozers	536	w/hrs	3 408
9	Cranes	217	w/hrs	1 681
10	Cranes	agreed		573
11	Industrial tractors	1446	w/hrs	3 985
12	Tractors	865	w/hrs	2 267
13	Buses	1219	w/day	10 387
14	Buses	agreed		65
15	Buses	642	seats	71
16	Tipper lorries	1359	w/hrs	3 814
17	Tipper lorries	9	trips	40
18	Tipper lorries	agreed		22 448
19	Traxcavators	851	w/hrs	7 681
20	Compressors	5437	w/hrs	7 859
21	Compressors	34	w/day	295
22	Electrowelding machine	1346	w/hrs	1 269
23	Water pumps	8	w/day	140
24	Water pumps	42	w/hrs	44
25	Drilling machinery	91	w/hrs	137
26	Drilling machinery	2.5	w/days	150
27	Tractor-mixer-elevator	agreed		1 215
28	CASTING OF TERRACE	15	w/days	1 193
29	Mixers	189	w/days	576
30	Mixers	112	w/hrs	56
31	Flush pumps	agreed		105
32	Brakers	18	w/hrs	144
33	Vibrators	agreed		15
34	Lister engine	4	w/days	100
35	Land Rovers	4339	w/days	28 971
36	Saloon cars	3145	m	11 719
37	Computer use	—	—	11 809
Total				£253 992

sector through open tenders. It should be noted here that during 1981 the machinery provided by the EMS worked generally less hours than those of the private sector as more time was spent for repairs in the EMS workshop. This problem of the too many breakages of the EMS machinery has to be dealt with some time at other levels as the repercussions in cost in the construction of the schemes in some cases may be significant.

During 1981 the Division had to hire machinery both from the EMS and the private sector. In total during the year an amount of £253,992 was paid for such purposes.

Table V-4 shows in detail all machinery engaged by the Division of Construction during 1981.

BUILDING AND OTHER MATERIALS

As usual all building materials such as cement, shingle, 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 the two local cement factories. However when cement is required in smaller quantities it has to be purchased through the GCS. During 1981 the Division purchased a quantity of 1412 tons of cement at a cost of £31,519.

During 1981 the Division purchased and used materials of various types at a cost of £109,445.

TABLE V-5
MATERIALS PURCHASED AND WATER METERS INSTALLED

I BUILDING AND OTHER MATERIALS USED DURING 1981

No.	Description	Quantity	Value £
1	Cement	1412 tons	31 519
2	Shingle	3566 m ³	13 212
3	Sand	3996 m ³	14 876
4	Aggregate	1433 m ³	3 457
5	Sand for pipe bedding	7445 m ³	11 286
6	Havara	1684 m ³	1 329
7	Soil	731 m ³	616
8	Mild steel	91 tons	11 866
	Total		£88 161

II WATER METERS INSTALLED DURING 1981

Ser No	Dia inches	Number	Value £
1	1/2	2549	9 944
2	3/4	8	27
3	1	46	328
4	1 1/4	9	67
5	1 1/2	6	75
6	2	13	364
7	2 1/2	30	1 148
8	3	92	3 834
9	4	132	4 139
10	6	15	1 046
11	8	3	312
	Total	2903	£21 284

RURAL DOMESTIC WATER SUPPLY SCHEMES

The construction programme for 1981 included 60 rural domestic water supply schemes of an estimated cost of £1,150,833. The overall expenditure incurred on all the above schemes during the year reached the amount of £616,321. These 59 schemes were split in the five free districts of the Island as follows:

SUMMARY OF RURAL DOMESTIC WATER SUPPLY SCHEMES

District	No. of schem.	Amount allocated for 1981 in £	Amount incurred in 1981 in £
Nicosia	21	322 385	140 810
Limassol	12	313 749	222 907
Famagusta	5	188 915	52 917
Larnaca	12	201 856	131 965
Paphos	10	123 928	67 722
Totals	60	£1 150 833	£616 321

A list showing all 59 schemes that were approved for construction during 1981, is given on Table V-6

MINOR IRRIGATION SCHEMES

The construction programme for 1981 included 35 minor irrigation schemes of an estimated cost of £611,022. The overall expenditure incurred on all the above schemes during 1981 reached the amount of £296,784. These 35 schemes were split in the four districts of the Island as shown below:

Table V-7 shows all 35 schemes that were approved for construction during 1981.

SUMMARY OF MINOR IRRIGATION SCHEMES

District	No. of schemes	Amount allocated during 1981 £	Expenditure incurred during 1981 £
Nicosia.....	21	466 080	271 543
Limassol	5	7 485	3 962
Larnaca	1	13 500	29
Paphos.....	8	123 957	21 250
Totals	35	£611 022	£296 784

TABLE V-6

RURAL DOMESTIC WATER SUPPLY SCHEMES APPROVED FOR CONSTRUCTION IN 1981

Ser No	Scheme	Amount allocated for 1981 £	Expenditure incurred in 1981 £	Remarks
NICOSIA DISTRICT				
(a) Carry Over Schemes				
1	<i>Anayia</i> Improvements to the distribution system ..	2 250	837	Completed
2	<i>Ayios Epiphanius (Orini)</i> Supplementary supply from new BH	4 889	3 703	Completed
3	<i>Astromeritis</i> Improvements to distribution system ..	7 000	3 746	Completed
4	<i>Ayios Ioannis (Malounda) Aredhiou</i> -new pumping unit	3 750	2 460	Completed
5	<i>Dhali</i> -supplementary supply	17 000	—	New scheme will be prepared
6	<i>Lakatamia Pano & Kato</i> -supplementary supply from two new BHs and improvements to distribution system	44 596	36 685	Work in progress. Will be completed in 1982
7	<i>Laxia - Yeri</i> - improvements to existing system ...	15 800	—	Scheme abandoned combined scheme separated
8	<i>Nisou - Perakhorio</i> - supplementary supply and improvements to distribution system.....	29 800	24 721	Work in progress. Will be completed in 1982
9	<i>Pitsilia</i> Regional Scheme - supplementary supply from Troodos	9 000	—	Scheme will be revised
(b) New Schemes				
10	<i>Akaki</i> - improvements to existing scheme	16 000	—	Execution will commence early in 1982
11	<i>Alambra</i> - extensions to the distribution system ..	9 700	8 334	Work in progress. Will be completed early in 1982
12	<i>Deftera Pano & Kato</i> -supplementary supply from new BH 45/81	19 000	—	Source of supply revised, Work will commence early in 1982
13	<i>Dhenia-Mammari</i> -supplementary supply from new BH	27 000	19 370	Work in progress. Will be completed early in 1982
14	<i>Klirou-Mitsero-Kalokhorio-Malounda</i> - supplementary supply from new BH 113/76	18 600	—	Villages requested increased Govt financial contribution
15	<i>Kokkini Trimithia</i> - improvement to existing distribution system	43 000	27 702	Work in progress. Will be completed in 1982
16	<i>Mathiati</i> -supplementary supply from new BH 24/79	15 000	5 868	In progress Will be completed in 1982
17	<i>Meniko</i> -supplementary supply from new BH.....	26 000	—	Objections from Akaki for the use of new BH. New scheme will be prepared
18	<i>Perakhorio</i> - extension to A ' Nicosia Regional Gymnasium	4 500	3 318	Completed

TABLE V-6 RURAL DOMESTIC WATER SUPPLY SCHEMES APPROVED FOR CONSTRUCTION IN 1981 (Cont.)

Ser No	Scheme	Amount Expenditure		Remarks
		allocated for 1981 £	incurred in 1981 £	
19	<i>Phlasou</i> - improvement to existing distribution system	2 000	1 867	Completed
20	<i>Piyenia</i> -improvement of existing system	2 500	2 199	Completed
21	<i>Sina Oros-Tembria-Evrykhou</i> - supplementary supply from a new spring	5 000	—	Work executed by the villages
Total for Nicosia District		£322 385	£140 810	
LIMASSOL DISTRICT				
(a) Carry Over Schemes				
1	<i>Amathus</i> - new scheme and continuation of extensions	105 000	88 313	Completed
2	<i>Erimi-Kolossi</i> -improvements to existing scheme .	512	505	Completed
3	<i>Pakhna</i> -improvements to distribution system	1 200	—	Scheme rejected by village
4	<i>Ypsonas-Pano & Kato Polemidhia</i> -supplementary supply from new BH 51/78 and improvements to existing distribution system	84 885	82 214	Work in progress Will be completed early in 1982
(b) New Schemes				
5	<i>Korphi</i> - improvements to existing system	1 100	—	Scheme rejected by village
6	<i>Pendakomo</i> - supplementary supply from BH89/80 and extensions.....	34 400	3 464	Work in progress
7	<i>Pissouri</i> -supplementary supply from new spring .	20 000	19 666	Work in progress
8	<i>Prodhromos</i> -supplementary supply from BH 64/77	10 000	—	Delay in commencement due to objections from village
9	<i>Sfalangiotissa monastery</i> -construction of storage tank	2 000	735	In progress
10	<i>Trakhoni</i>	14 000	—	Will commence in 1982
11	<i>Trimiklini-Moniatis</i> supplementary supply	40 000	28 010	Work in progress
12	<i>Yerasa</i>	652	—	Will commence in 1982
Total for Limassol District		£313 749	£222 907	
FAMAGUSTA DISTRICT				
(a) Carry Over Scheme				
1	<i>Phrenaros</i> -supplementary water supply	2 915	274	Completed
(b) New Schemes				
2	<i>Ayia Napa</i> - improvements to existing distribution system	40 000	19 069	Work in progress
3	<i>Ayia Napa</i> -development of Ayios Epiphanios-Makronisos tourist area	36 000	32 355	Completed
4	<i>Liopetri</i> - supplementary WS from BH 655	10 000	1 219	Work in progress
5	<i>Paralimni-Protaras</i> tourist area development	100 000	—	Pending final approval of scheme
Total for Famagusta District		£188 915	£52 917	
LARNACA DISTRICT				
(a) Carry Over Scheme				
1	<i>Pyrga</i> -improvements to existing well	1 600	50	Suspended due to village request

TABLE V-6 RURAL DOMESTIC WATER SUPPLY SCHEMES APPROVED FOR CONSTRUCTION IN 1981 (Cont.)

Ser No	Scheme	Amount allocated for 1981 £	Expenditure incurred in 1981 £	Remarks
(b) New Schemes				
2	<i>Maroni</i> additional supply from BH 45/61	7 000	—	Will be executed in 1982
3	<i>Anglisidhes</i> -supplementary WS from spring	5 000	—	Scheme revised from £16,000 to £5,000
4	<i>Ayios Theodoros-Alaminos</i> improvements to existing system	33 000	27 629	Work in progress
5	<i>Klavdhia</i> -supplementary WS from Famagusta scheme	43 000	10 298	Work in progress
6	<i>Layia</i>	1 756	1 075	Completed
7	<i>Livadhia</i> - supplementary WS from Famagusta scheme	1 200	1 200	Completed
8	<i>Mazotos</i> - replacement of main conveyor	22 500	18 652	Completed
9	<i>Voroklini</i> -supplementary WS from Famagusta scheme	1 800	—	Will be executed in 1982
10	<i>Xylophaghou</i> -supplementary WS scheme	39 000	29 197	Work in progress
11	<i>Aradhipou</i> - Phase A extensions to existing distribution system	15 000	14 794	Work in progress
12	<i>Kalavastos</i> -Phase A supplementary WS from BH 101/79	31 000	29 070	Work in progress
	Total for Larnaca District	£201 856	£131 965	
PAPHOS DISTRICT				
(a) Carry Over Schemes				
1	<i>Kritou Terra</i>	2 325	2 439	Completed
2	<i>Miliou</i> -improvements to existing scheme	10 220	9 850	In progress
3	<i>Peristerona</i> - supplementary WS from new BH ...	2 660	707	Pending supply of electricity
(b) New Schemes				
4	<i>Kritou Marottou</i> -house to house scheme	1 200	1 200	Completed
5	<i>Lysos-Philousa-Peristerona</i>	9 900	—	Will commence in 1982
6	<i>Paphos Lower Villages</i>	1 323	1 087	Completed
7	<i>Peyia</i> - replacement of main conveyor	43 600	36 733	In progress
8	<i>Polis</i> -improvements to existing system	33 000	—	Will start January 1982
9	<i>Theletra</i> -new distribution system	4 400	4 327	
10	<i>Yeroskipos</i> - tourist development	15 300	11 379	In progress
	Total for Paphos District	£123 928	£67 722	

*TABLE V-7

MINOR IRRIGATION SCHEMES APPROVED FOR CONSTRUCTION IN 1981

Ser No	Name of scheme	Amount allocated for 1981 £	Expenditure incurred in 1981 £	Remarks
NICOSIA DISTRICT				
(a) Carry Over Schemes				
1	<i>Kambos</i> - Potamos Kaloyirou	54 970	49 679	Work in progress
2	<i>Nisou</i> - Frangos	779	759	Completed
3	<i>Pera</i> - Phassera	14 412	10 944	Work in progress
4	<i>Peristerona</i> - Recharge	14 240	12 044	Completed
5	<i>Chakistra</i> - Yefiri	72 348	53 839	Work in progress
6	<i>Yerakies</i> - Xeros Phase B	88 000	69 734	Work in progress
(b) New Schemes				
7	<i>Akaki</i> - Riatiko lining of channels	8 000	7 778	Completed
8	<i>Ayios Epiphaios</i> (Orini)	28 000	—	Scheme revised
9	<i>Ayios Ioannis</i> - Pitsilli	17 760	9 590	In progress
10	<i>Evrykhou</i> - Kato Atsas	17 000	16 153	Completed
11	<i>Evrykhou</i> - Makronidhes	445	437	Completed
12	<i>Kalokhorio</i> - Klirou	1 800	1 698	Completed
13	<i>Kato & Pano Pyrgos</i> - Piyenia pumping scheme from BHs 50/80 and 65/80	37 500	—	Will commence early in 1982
14	<i>Meniko</i> - Kyra tou Diakou	13 000	12 096	In progress
15	<i>Meniko</i> - Riatikon, Avlaki Mesis	1 300	1 286	Completed
16	<i>Nikitari</i> - Phase A	43 666	—	Scheme will be revised
17	<i>Pedhieos River</i> - recharge near Episkopio	9 300	58	Suspended due to the winter season
18	<i>Potami</i> - Syka-Mosphileri-Kambos	21 500	12 207	In progress
19	<i>Tembria</i> - Sina Oros - Avlakoudhi	1 600	1 515	Completed
20	<i>Yialias River</i> - recharge works	5 000	—	Scheme under investigation
21	<i>Yialias River</i> - recharge works - 2D-603	15 400	11 726	In progress
	Total for Nicosia District	£466 080	£271 543	
LIMASSOL DISTRICT				
(a) Carry Over Schemes				
1	<i>Ayios Theodoros</i> (Agros) Koufes	455	—	Scheme will be revised
2	<i>Prodromos</i> - Kyparissi	1 295	—	Will be revised
3	<i>Vasa</i> (Kilani) drilling test pumping and reinstallation of pumping unit	3 000	2 949	Complete
(b) New Schemes				
4	<i>Paleomylos</i> - Hardji extensions to distribution system	1 685	—	Revised
5	<i>Perapedhi</i> - improvements to existing works	1 050	1 013	Completed
	Total for Limassol District	£7 485	£3 962	
LARNACA DISTRICT				
1	<i>Kivisil</i> - repairs and extensions to existing system	13 500	29	Will be continued in 1982
	Total for Larnaca District	£13 500	£29	

TABLE V-7 MINOR IRRIGATION SCHEMES APPROVED FOR CONSTRUCTION IN 1981 (Cont.)

Ser No	Name of scheme	Amount allocated for 1981 £	Expenditure incurred in 1981 £	Remarks
PAPHOS DISTRICT				
(a) Carry Over Schemes				
1	<i>Akourdhalia</i>	11 340	—	Will be revised
(b) New Schemes				
2	<i>Kato Akourdhalia - Miliou</i> - Phase A diversion and distribution system	46 700	—	Will be revised
3	<i>Kelokedhara - Ziripillis</i> - extension of irrigation works	5 417	5 417	Completed
4	<i>Mamonia</i>	1 800	1 662	Completed
5	<i>Pano Yalia</i> - extension and improvement to distribution system (PVC) pipes	19 300	7 833	Work in progress
6	<i>Khoulou</i> - Phyllarotos ID replacement of main conveyor with AC pipes 150 mm class 25	7 400	6 338	Work in progress
7	<i>Skoulli Ayios Andronikos ID</i> - installation of pumping unit on new BH 39/80	2 000	—	Delay in the issue of village contribution
8	<i>Yiolou</i> - Phase A pumping scheme from BH 55/78	30 000	—	Will be revised
	Total for Paphos District	£123 957	£21 250	

MAJOR IRRIGATION SCHEMES

The construction programme for 1981 included 16 major irrigation schemes of a total estimated cost of £410,497.

The overall expenditure incurred on all schemes during 1981, reached the amount of £178,886.

A list showing in detail all 16 major irrigation schemes included in the 1981 budget is given on Table V-8.

TOWN WATER SUPPLY SCHEMES

During 1981 the Construction Division had to deal with 10 town water supply schemes of an estimated cost of £466,857.

The overall expenditure incurred on all these 10 town water supply schemes during 1981 reached the amount of £295,931.

In addition to the above 10 town water supply schemes it should be noted that the Vasilikos-Pendaskinos Project 1st Phase, has been implemented for the augmenting of the Nicosia town water supply. On this project alone the expenditure during 1981 reached the amount of £1,022,368. Details of this scheme are shown on Table V-10

The largest expenditure incurred on one

single town water supply project is on the Lakatamia reservoir. As already mentioned in previous annual reports of the Department the construction of this reservoir commenced in Autumn 1978 and was completed by the end of 1981.

The town water supply schemes undertaken for construction by our Division during 1981 are shown on Table V-9.

New Lakatamia Reservoir

The new Lakatamia reservoir is the third supplementary reservoir which was proposed in the "Maclaren Report" for the development of Nicosia Water Supply, in order to meet future demands of the town and its suburbs.

This reservoir was designed by WDD and specifically by the Engineers of the Construction Division and its capacity is 41,100 m³. The original estimated cost (at 1978 prices) was £672,000.

It is situated near the Strovolos II Refugee Housing Estate and adjacent to the old Lakatamia reservoir. Basically it is a reinforced concrete structure with cantilevered vertical walls and flat slab with external dimensions 93mX83m X6.5m and internal dimensions

TABLE V-8

MAJOR IRRIGATION SCHEMES APPROVED FOR CONSTRUCTION IN 1981

Ser No	Scheme	Amount allocated for 1981 £	Expenditure incurred in 1981 £	Remarks
1	<i>Ayia Marina Dam</i> - distribution system	25 000	23 979	
2	<i>Ayios Theodoros</i> - BH 64/73	3 000	—	
3	<i>Erimi-Kolossi</i> repairs to turbine pumps, installation of 3 electric motors and supply of electricity	17 000	15 715	
4	<i>Khirokitia</i> - BH 136/78	1 550	1 205	
5	<i>Khirokitia Pond</i> Akrotiri extension of distribution system, Paramali distribution system from Sapani river, Evdhimou distribution system from Paramali river, Nikoklia pumping scheme, Ayii Vavatsinias-Vavatsinia-Ora Pavlias scheme, Alona-Platanistasa Polystipos, Syrfilos scheme	160 000		Amount budgeted for these 7 projects for commencement of work subject to final approval of schemes
6	<i>Khrysokhou valley</i> - irrigation	78 150	69 552	
7	<i>Lefkara Dam</i> - distribution system	3 000	2 937	
8	<i>Lymbia Dam</i>	3 800	3 537	
9	<i>Lymbia Dam</i> - compensations	4 557	3 611	
10	<i>Mavrokolymbos Dam</i> - compensations	6 030	5 114	
11	<i>New Nicosia</i> - Limassol Road	34 655	34 655	
12	<i>Pakhyammos Reservoir</i>	600	—	
13	<i>Pissouri-Khapotami</i>	1 000	537	
14	<i>Phlasou Pond, Solea valley</i> Yermasoyia-Polemidhia project	40 000	—	
15	<i>Trakhoni</i> extensions	25 916	11 805	
16	<i>Trakhoni extensions</i> - compensations.....	6 239	6 239	
	Total	£410 497	£178 886	

TABLE V-9

TOWN WATER SUPPLY SCHEMES APPROVED FOR CONSTRUCTION IN 1981

Ser No	Scheme	Amount allocated during 1981 £	Expenditure incurred in 1981 £	Remarks
A NICOSIA				
1	Christos St. Ioannou Foundation	4 100	3 150	
2	Dhali emergency scheme	2 600	2 212	
3	Kokkini Trimithia emergency scheme	30 000	26 965	
4	Lakatamia reservoir	187 326	179 790	
5	Peristerona BH 70/80	500	460	
6	Peristerona-Orounda BH 31/79	2 337	2 287	
7	Peristerona-Orounda-Akaki	400	301	
8	Peristerona-Orounda-Akaki emergency scheme ..	22 464	21 510	
9	Tseri pipeline.....	1 130	716	
	Total for Nicosia	£250 857	£237 391	
B PAPHOS				
10	Paphos town	216 000	58 540	
	Grand total	£466 857	£295 931	

89.50mX79.50m X 6.14m, with a dividing wall for operation and maintenance purposes.

Its construction started in October 1978 and work continued throughout 1979 and 1980 and eventually it was completed in November 1981.

The main materials used for its construction were 715 tons of mild steel reinforcement, 6,400 m³ of concrete and 15,550 m² of shuttering.

The external and dividing walls have vertical expansion joints every 20 m and contraction joints every 20 m. They also have three horizontal construction joints.

The floor slab is 200 mm thick and has expansion joints every 5 m.

The roof slab is flat slab construction and its thickness is 200 mm. It rests on column heads every 5 m. It has expansion joints every 15 m in one direction and every 20 m in the other.

The columns have been cast in distances of 5 m and they have footings 1.50 m X 1.50 m and heads 1.00 m X 1.00 m.

All expansion, contraction, and construction joints have been compacted with PVC water stop, bituminous cork filler and sealant.

The recently laid pipeline from Dhypotmos pumping station (VPP) has been connected to the reservoir.

There are some minor works, such as connecting the Tseri and Dhali pipelines onto the new reservoir and purchasing and installing the chlorination system, which are expected to be completed early in 1982.

The total actual cost up to the end of 1981 reached the amount of £717,500 which is very close to the original estimate in spite of the 2 1/2 years of construction period.

VASILIKOS PENDASKINOS PROJECT **Nicosia Water Supply - First Phase**

The whole project has been designed by Messrs Lemon and Blizard Consulting Engineers, using as a basis the feasibility study of the Water Development Department. The Consulting Engineers were also responsible for the supervision of the works, assisted by Technical staff from the Construction Division of the Department. The head of the Division had to play also an important role in this project.



The laying of the 40 km long 600 and 500 mm steel and AC pipeline connecting the Khirokitia-Famagusta pipeline to Dhypotamos Pumping Station and from there to Stavrovouni Balancing Tank and on to Nicosia was substantially completed by the end of the year. The photograph shows a length of the 500 mm AC pipe being laid towards the Nicosia end of the pipeline. WDD Photo C43-11 (30.3.81)

Nicosia Water Supply - First Phase consists of the following:

- AC pipeline of 500 mm dia which links the existing Khirokitia - Famagusta pipeline with Dhypotamos pumping station.
- Dhypotamos pumping station which is close to Dhypotamos Dam site and was built directly by the Water Development Department.
- Steel and AC pipeline of 600 m dia from

Dhyptomamos pumping station to Stavrovouni balancing reservoir

- Stavrovouni balancing reservoir which is west of Stavrovouni and close to Nicosia-Limassol main road, with a capacity of 7000 m³.

- Steel and AC pipeline of 500 mm dia from Stavrovouni to new Lakatamia reservoir.

- Break pressure tank near Nisou which limits the pressure in the gravity section downstream of it, enabling AC pipe to be used instead of steel.

- An inlet chamber which is sited near the Lakatamia reservoir and it automatically regulates/shuts down flow in the pipeline to maintain surge pressures within acceptable limits.

The total length of the pipelines is about 40 km.

The construction of this project was undertaken by contractors J & P who started work on 30th April 1980 and by the end of the year

they had completed about 25 % of the works.

Construction works continued throughout 1981 and by the end of the year the whole of the project was nearing completion.

The total expenditure incurred up to 31st December 1981 was £2,935,000.

Dhyptomamos Pumping Station

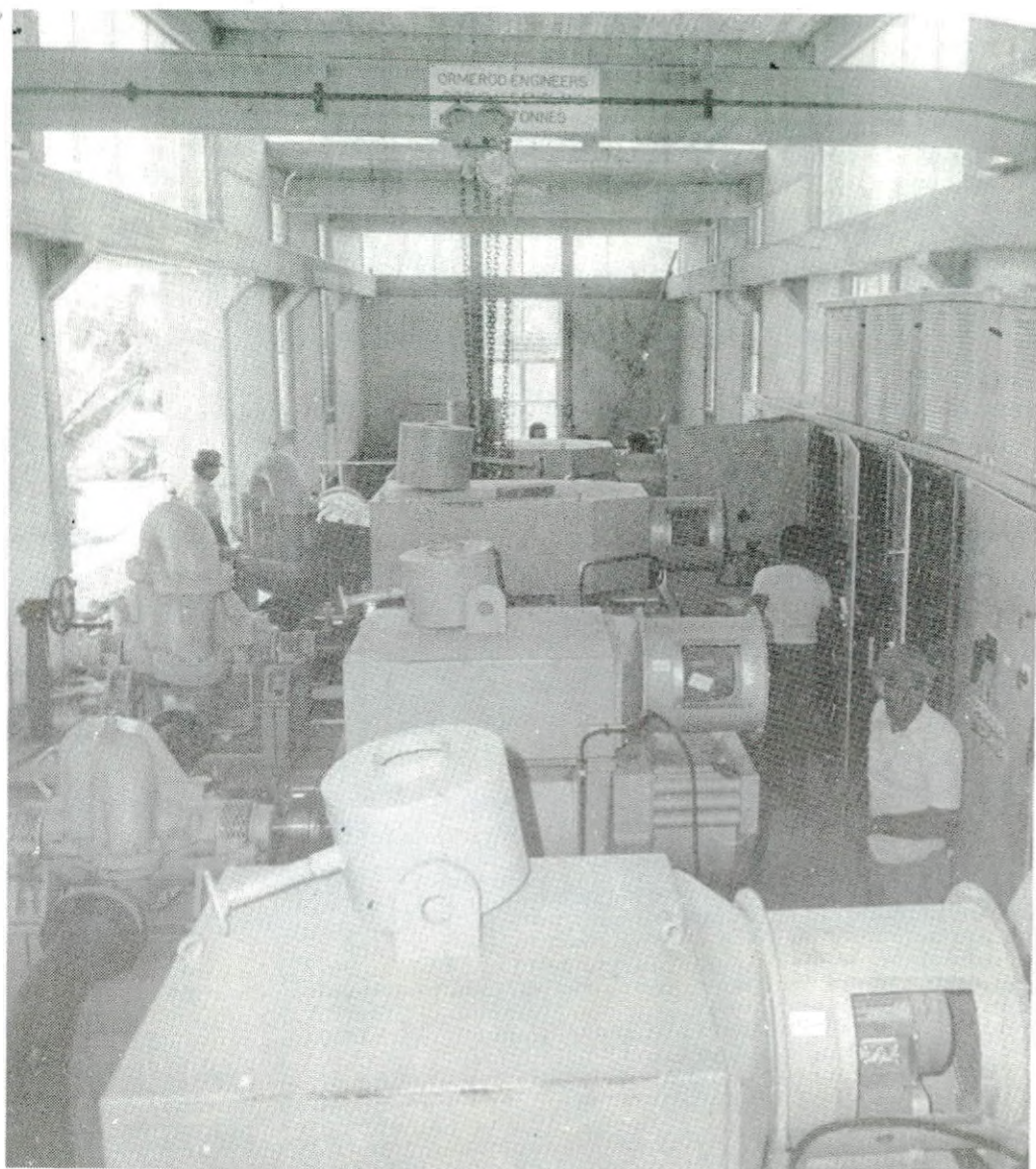
Dhyptomamos pumping station has been constructed near the Pendaskinos river, about three kilometres NW of Skarinou bridge.

The construction of the pumping station was undertaken direct by the WDD Division of Construction. The work was put in hand in January 1980 and was continued throughout 1981. The work is expected to be completed in January 1982.

The cost of this project is expected to reach the amount of £104,300 as compared with £102,176 which was the original estimated



Construction on Stavrovouni Balancing Reservoir continued throughout 1981 and by the end of the year it was structurally completed. The Stavrovouni Reservoir site is the highest point on the Khirokitia-Nicosia pipeline so that water pumped here will gravitate to Nicosia new Lakatamia Reservoir. Stavrovouni Balancing Reservoir with 7,500 m³ capacity is designed to store 6 hrs or so demand thus taking advantage of the water pumping tariff code which limits pump operation to about 18 hours a day. WDD Photo C45-5 (30.3.81)



Towards the end of 1981, the installation of the five high lift pumps at Dhypotamos Pumping Station, by the suppliers Mather and Platt of U.K., was nearing completion. The 2 pumps have a capacity of 600 m³/hour and the three remaining ones are of an output of 300 m³/hour. The pumps will be working in rotation. At any one time one large pump will be working with two of the smaller ones or two small ones are to work together depending on the quantity of water to be pumped. During the first phase of the project treated water will be pumped from the khirokitia Treatment plant connection to Stavrovouni Balancing Reservoir from where it will gravitate to Lakatamia Reservoir. After the completion of Dhypotamos Dam these pumps will be used to boost raw water from the Dam to the new Treatment Plant to be built for Nicosia near Kornos from where treated water will be pumped to Stavrovouni Reservoir. WDD Photo C75-5 (1.9.81)

cost. This small extra cost is due to additional works on the construction of anchor blocks and attendance works on the electromechanical contractor.

During 1981 the total expenditure incurred on Vasilikos-Pendaskinos Project reached the amount of £1,282,060. Table V-10 shows analytically the expenditure on this project

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. In the area of the project a rugged topography prevails and the terrain is dissected by numerous streams and small deep valleys.

TABLE V-10
VASILIKOS-PENDASKINOS PROJECT-BUDGET/EXPENDITURE FIGURES - 1981

Ser No	Description	Amount allocated for 1981 £	Expenditure incurred during 1981 £	Remarks
(i) Nicosia Water Supply First Phase				
1	Electricity and telephone	17 078	16 677	
2	Land acquisition	—	—	
3	Supervision			
4	Materials-handling and storage	43 090	40 697	
5	Investigation			
6	Miscellaneous			
7	Contingencies			
8	Contract No. 39/78/38 (Civil engineering works) ...	636 280	636 274	
9	Contract No. 39/78/39 (Mechanical and electrical works)	261 004	258 265	
10	Contract No. 39/78/40 (Steel pipes-P. Epiphaniou) .	—	—	
11	Contract No. 39/78/41 (AC pipes-CPI)	—	—	
12	Contract No. 39/78/42 (Valves Pont-a-Mousson) ...	1 016	80	
13	Contract No. 39/78/42 (Valves J. Blakeborough) ...	—	—	
14	Dhypotamos Pumping Station (Irish Bridge)	38 076	40 848	
15	Consultants fees	25 673	24 693	
16	Construction of additional pipes and fittings	6 020	4 577	
17	Erection of Irish bridge	—	—	
18	Wages for the operation and maintenance of the pumping station - Dhypotamos	1 560	257	
	Total	£1 029 797	£1 022 368	
(ii) Agricultural Development				
19	Ground water development	—	—	
20	Erection of building	—	—	
21	Agricultural research	8 421	4 857	
22	Purchase of vehicles and machinery	31 547	31 547	
23	Consultant's fees	151 500	146 707	
24	Hydraulic model testing	43 000	37 771	
25	WDD works	36 500	38 358	
26	Administration expenses	2 000	76	
27	Project manager allowances	—	376	
	Total	272 968	259 692	
	Grand total	£1 302 765	£1 282 060	

The project aims at improving the living conditions 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 is scheduled to be implemented in a period of 5 years 1978-1982.

The total investment will amount £9 million (£4 million secured through a World Bank loan and the balance will be covered by the Government of Cyprus) out of which about £6 million will be expended by the Department of Water Development for the development of the region's water resources to irrigate 9,000 donums through the following schemes:

- Construction of a dam at Xyliatos with a capacity of 1.3 MCM to irrigate 2,300 donums.
- Construction of about 20 ponds with a total capacity of 1.7 MCM to irrigate 2,250 donums.
- Development of about 20 boreholes with a combined yield of 1 MCM per year to irrigate about 2,250 donums.
- Rehabilitation of existing minor irrigation

schemes to irrigate 1,150 donums.

In addition to the above schemes the village domestic water supplies will be improved within the project activities.

By the end of 1981 the total expenditure incurred reached the amount of £2,979,344 as follows:

	£
■ 1978 expenditure	49 407
■ 1979 expenditure	471 542
■ 1980 expenditure	881 326
■ 1981 expenditure	1 577 069
Total	£2 979 344

In 1981 the construction programme for the Pitsilia Integrated Rural Development Project included 73 schemes out of which 10 schemes were for the improvement of domestic water supplies, 33 schemes were irrigation rehabilitation schemes and 30 schemes involved the construction of the Xyliatos Dam, ponds and pumping schemes from boreholes.

All the 73 schemes that were approved for execution in 1981 at an estimated cost of £2,021,469 are shown in detail on Table V-11.

TABLE V-11

PITSILIA INTEGRATED RURAL DEVELOPMENT PROJECT

Ser No	Description	Amount Expenditure		Remarks
		allocated for 1981 £	incurred in 1981 £	
<i>A POND AND BOREHOLE SCHEMES</i>				
1	Agros -BH 63/76.....	30 000	—	Work to commence in 1982
2	Akapnou-Ephtagonia distribution system ..	40 000	28 676	Completed 80%
3	Akapnou-Ephtagonia Pond	112 384	104 659	Completed
4	Arakapas-BH scheme	46 840	22 513	Still pending supply of electricity
5	Arakapas distribution system	45 000	36 614	Completed 80%
6	Arakapas -Pond	136 631	114 247	Completed 80%
7	Ayii Vavatsinias - Pond	10 472	8 325	Completed in 1980
8	Ayii Vavatsinias -distribution system	3 025	3 061	Completed (January 81)
9	Ayii Vavatsinias dam	12 880	11 725	Completed in 1980
10	Ayios Theodoros BH scheme	18 498	18 636	Pending installation of pump
11	Ephtagonia Pond 1	2 100	615	Completed in 1980
12	Ephtagonia Pond 2	116 636	108 798	Substantially completed
13	Ephtagonia Pond 3	80 886	74 374	Completed
14	Ephtagonia distribution system for pond 1 ..	26 000	23 468	Completed
15	Ephtagonia distribution system for ponds 2 and 3	69 683	53 473	Completed 95%
16	Kalokhorio BH scheme	13 720	12 666	Pending connection with electricity
17	Kato Mylos Pond	97 568	94 414	Completed
18	Kato Mylos distribution system for pond and BH scheme	60 450	53 534	Completed 90%
19	Khandria distribution system	4 832	5 950	Suspended due to delays in village contribution

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

Ser No	Description	Amount allocated for 1981 £	Expenditure incurred in 1981 £	Remarks
20	<i>Khandria Pond</i>	5 134	325	Completed in 1980
21	<i>Kyperounda Pond</i> 1 repairs.....	17 093	9 428	Completed
22	<i>Kyperounda Pond</i> 2	35 000	—	Work to commence in 1982
23	<i>Melini Pond</i>	6 892	4 661	Completed in 1980
24	<i>Melini</i> distribution system	2 205	946	Completed in 1980. Flow regulators installed in 1981
25	<i>Pelendria</i> distribution system for pond and borehole	49 663	48 982	Completed
26	<i>Pelendria Pond</i>	11 357	7 211	Completed in 1980
27	<i>Polystipos</i> BH scheme	42 654	5 181	Started Dec. 1982
28	<i>Potamitissa</i> BH scheme	46 113	44 497	Still pending connection of one pump with electricity
29	<i>Xyliatos Dam</i>			
	(i) Construction (GCC)	36 184	368 121	Access road, diversion tunnel, cofferdam, drilling and grouting all completed. Embankment 45 % Spillway 50 %
	(ii) Supervision	38 546	35 755	
	(iii) Removal of pipeline	1 788	92	
	(iv) Access road	3 766	3 766	
	(v) Purchase of valves	22 336	21 600	
30	<i>Xyliatos</i> distribution system			
	(i) Purchase of pipes	133 030	86 881	Trenching 35% laying of pipes 9%
	(ii) Purchase of valves	10 661	1 197	
	(iii) Construction	30 000	27 836	
	Total for Ponds and Boreholes	£1 753 027	£1 442 227	

B REHABILITATION SCHEMES

31	<i>Agridhia</i> Pano & Kato Leftina	462	—	Completed
32	<i>Ayii Vavatsinias</i> remedial works	2 700	—	Work on remedial works to start early in 1982
33	<i>Ayios Ioannis</i> Angoulos-Dipotamia	10 906	—	Works discontinued
34	<i>Ayios Ioannis</i> Yerambelos	660	—	Completed
35	<i>Ayios Ioannis</i> Makheras	2 554	1 812	Completed
36	<i>Ayios Ioannis</i> Spilios-Kofouvounou	511	478	Completed
37	<i>Ayios Theodoros</i> Koufes	7 180	—	Work to start in 1982
38	<i>Alona</i> Kardaki	232	—	Rejected by the farmers concerned
39	<i>Alona</i> Kolymbos tis Pernias	5 152	—	Scheme modified
40	<i>Alona</i> Alona ID	2 400	—	Scheme to be modified
41	<i>Athrakos</i> Kalimera	130	8	Completed
42	<i>Dhymes</i> Kambos-Kardhama	5 000	—	Cost estimate to be revised
43	<i>Ephtagonia</i> remedial works	3 550	—	Work on remedial works to start early in 1982
44	<i>Kalokhorio</i> Maramenos	278	8	Completed
45	<i>Kato Amiandos-Pelendria</i> Kardhama-Hji Physouni	565	105	Completed
46	<i>Khandria</i> Panayia	60	—	Completed
47	<i>Khandria</i> remedial works	1 550	—	Work on remedial works to start early in 1982
48	<i>Kyperounda</i> Appis-Avlaki tous Palazidhes..	315	—	Completed
49	<i>Louvaras</i> Paralonia	1 547	1 253	Completed
50	<i>Melini</i> Mallouris	567	360	Completed

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

Ser No	Description	Amount Expenditure		Remarks
		allocated for 1981	incurred in 1981	
		£	£	
51	Melini remedial works.....	3 200	—	Work on remedial works to start early in 1982
52	Odhou Odhou 'B' irrigation	5 700	—	Work will commence in 1982
53	Palekhori Kamini IA	2 200	2 207	Completed
54	Palekhori Pera Avlaki Halkomatas ID	2 076	1 898	Completed
55	Palekhori Yiofiri IA	3 192	—	Delays due to farmers, modifications
56	Pelendria Potamoulia	197	—	Completed
57	Pelendria Poullos	1 600	1 568	Completed
58	Pelendria Korypi-Kolokasi.....	8 999	—	Work to start in 1982
59	Pharmakas Ayios Yeorgios IA	1 800	1 129	Completed
60	Pharmakas Koskinas IA	5 800	4 564	Completed 70%
61	Spilia ID	20 244	20 231	Completed
62	Sykopetra-Agridhia Konomidhes	2 100	436	To be completed in 1982
63	Sykopetra Kounfourka	6 600	6 092	Completed
Total for Rehabilitation Schemes		£110 027	£42 149	

C RURAL DOMESTIC WATER SUPPLY SCHEMES

64	Agros supplementary supply from BH	40 000	22 006	10 % Completed
65	Apliki supplementary supply from Palekhori	6 400	—	Work to start in 1982
66	Gourri extensions and improvements	1 600	1 000	Completed
67	Ora supplementary supply from BH	11 755	9 113	Pending installation of pumping unit
68	Palekhori (M) supplementary supply from BH.....	8 658	6 004	Completed
69	Palekhori (Orini) supplementary supply from BH	23 750	11 230	Pending installation of pumping unit
70	Pelendria	820	8	Completed
71	Pharmakas supplementary supply from BH	17 190	14 106	Completed
72	Phterikoudhi distribution box.....	497	196	Completed
73	Sykopetra extension to Profitis Elias from springs	4 000	3 804	Completed
Total for Domestic Water Supply Schemes .		£114 670	£67 467	

D OTHER WORKS

74	Ayios Ioannis operation expenses for BH ..	3 309	2 587
75	Consultants fees.....	4 478	1 796
76	Purchase of 2 electrosuimmersible pumps ..	573	—
77	Test Pumping (general)	32 834	20 465
78	Purchase of membrane	2 651	378
Total for Other Works.....		£43 754	£25 226

SUMMARY OF ALL PITSILIA INTEGRATED RURAL DEVELOPMENT SCHEMES

	£	£
POND AND BOREHOLE SCHEMES	1 753 027	1 442 227
IRRIGATION REHABILITATION SCHEMES	110 027	42 149
RURAL DOMESTIC WATER SUPPLY SCHEMES	114 670	67 467
OTHER WORKS.....	43 745	25 226
Grand total	£2 021 469	£1 577 069



Ayii Vavatsinias is a small arch dam of 54,000 m³ capacity. With Ayii Vavatsinias Pond also completed in 1981 they will irrigate an area of 180 donums of land to be planted mainly with citrus and vegetables. The first impoundment of both structures belonging to Pitsilia Integrated Rural Development Project was in March 1981. WDD Photo D24-6 (3.6.82)

CONSTRUCTION OF PONDS (PIRDP)

By the end of 1981 a total of ten ponds and one arch dam (total capacity 1.1 MCM) were completed or were nearing completion. During the year there was intense constructional activity for the Ponds of Kato Mylos, Ephtagonia 2, Ephtagonia 3, Akapnou-Ephtagonia and Arakapas.

As it is known the type of design adopted for these ponds is unique in the sense that waterproofness is achieved by the use of PVC impermeable membrane sheets, 0.5 mm thick.

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

The construction of the ponds is being carried out by private contractors after tendering, and the WDD supervises the works. The distribution systems however, are constructed directly by the Construction Division of the

Department.

More details regarding construction dates, expenditure, capacity etc are given in Table V-12.

Stability problems of the membrane lining of the ponds arose in four ponds after the first heavy rains in January, "Bulging" of the covered membrane lining on the excavated slopes was then observed, caused by excessive water pressure under the membrane lining, created by seeping water, due to insufficient drainage and/or poor permeability of the fine material (bedding layer) placed below the lining.

Remedial works were then thought necessary for Khandria, Ephtagonia 1, Melini and Ayii Vavatsinias Ponds.

The expenditure for remedial works following relevant decision of the Council of Ministers (November 81) will be borne entirely by the Government and "repair works" are

TABLE V-12

POND SCHEMES IN THE PITSILIA INTEGRATED RURAL DEVELOPMENT PROJECT UP TO 1981

Ser No	Name of scheme	Capacity m ³	Contractor	Commencement date	Completion date	Estimated cost £	Expenditure by end of 1981 £
1	Pelendria Pond	123 000	FYSKO Contracting Co Ltd	February 79	December 80	119 887	115 741
2	Ephtagonia Pond No 1	92 000	Iacovou Bros Ltd	February 79	July 80	82 238	80 752
3	Khandria Pond	70 000	CYBARCO Ltd	July 79	September 80	106 153	101 775
4	Melini Pond No 1	58 000	Iacovou Bros Ltd	November 79	October 80	66 217	64 173
5	Akapnou-Ephtagonia Pond	132 000	Iacovou Bros Ltd	September 80	September 81	185 653	175 679
6	Ephtagonia Pond No 2*	127 000	Hadjiconstantis-Fysenzides-Charalambous Ltd	September 80	1982	162 271	150 430
7	Ephtagonia Pond No 3	65 000	Iacovou Bros Ltd	September 80	December 81	97 686	88 999
8	Arakapas Pond *	192 000	Iacovou Bros Ltd	September 80	1982	174 005	140 800
9	Kato Mylos Pond	104 000	Phoenix Constructions Ltd	September 80	September 81	133 732	123 978
10	Ayii Vavatsinias Pond No 1	55 000	Iacovou Bros Ltd	April 80	March 81	68 497	65 372
11	Ayii Vavatsinias Arch Dam	53 500	W D D	February 80	February 81	83 055	81 901
Totals						£1279 394	£1189 600

* By end of 1981, 95% of the works were completed.

* * By end of 1981, 90% of the works were completed.



Kato Mylos offstream PVC lined pond under construction. This pond built within the Pitsilia Integrated Rural Development Project has a capacity of 104,000 m³ of water for the irrigation of some 300 donums of land together with a borehole scheme, both belonging to Vatera Irrigation Division of Kato Mylos Village. WDD Photo C30-12 (6.2.81)

planned to start early in 1982.

All the above ponds were successfully completed and impounded although with some delays, mainly due to adverse weather conditions in the mountainous regions they have been constructed.

The contracts were concluded without any major claims by the contractors, except Pelenoria Pond where the contractor has resorted to arbitration on two major claims ie supply of rip-rap and contract prolongation period. The outcome of this arbitration still remains to be seen.

XYLIATOS DAM CONSTRUCTION

Contract No. 39/79/35

Construction works on Xyliatos Dam continued throughout 1981 and the following progress was made:

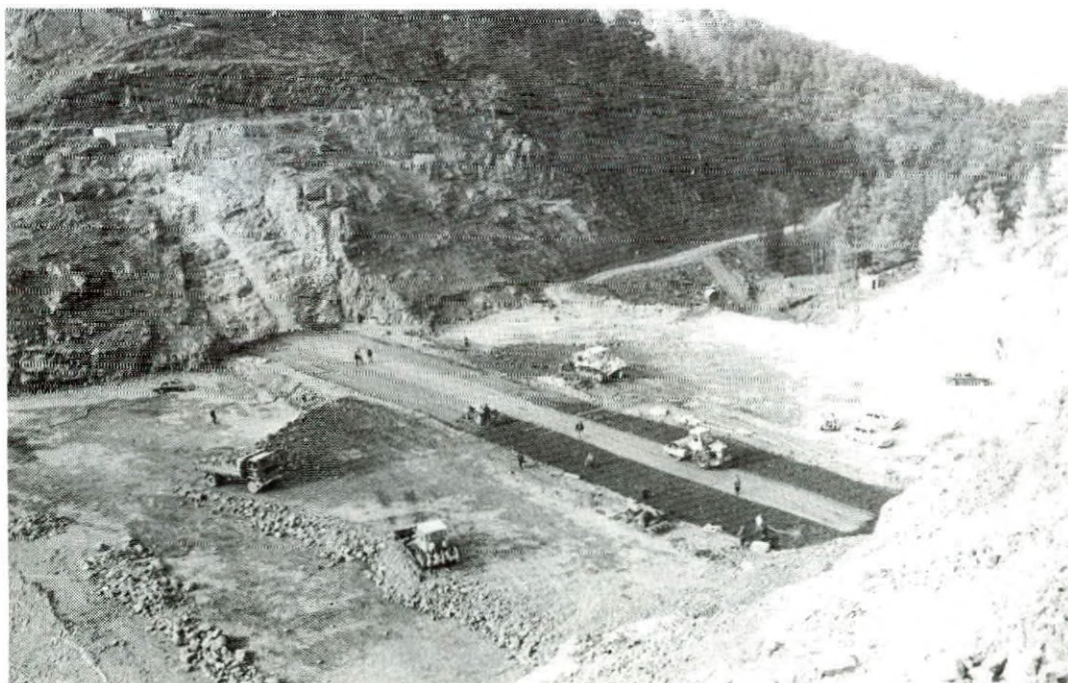
Diversion Tunnel Concreting of the diversion tunnel and culvert were completed in

August and the concrete structure for the control house was cast in October.

The valve chamber foundations were excavated and the floor as well as 3 m in height of valve chamber walls were concreted.

Embankment The cofferdam was completed in February 1981. Following completion of the cut-off excavations and grouting works in the river valley, placing off fill materials for the main embankment started in July 1981. Some drainage trenches, which were later grouted, had to be constructed in the river valley in order to overcome problems in dewatering. At the end of December, the average elevation of the embankment was 515.60 m, the final elevation being at 541.75 m.

Spillway Rock excavations of spillway was completed in July and by the end of December about 63% of concrete work was carried out. Final trimming to excavated surfaces was carried out before placing concrete.



Xyliatos Dam with a capacity of 1.3 MCM is the only dam being constructed within the Pitsilia Integrated Rural Development Project. Estimated to cost approx. £1 million it will be completed in mid 1982. The photograph shows progress on the dam embankment PIO Photo (11.1.82)



Water from Xyliatos Dam will gravitate to the area to be irrigated, some 2,300 donums, belonging to Xyliatos and Ayia Marina Villages. Work on the laying of the main conveyor pipeline commenced during the latter half of 1981. PIO Photo (11.1.82)

Drilling and Grouting Works Drilling and grouting works which began in December 1980, were completed by the end of July 1981. The final amount of work executed was about 8% greater than the amount estimated in the Bill of Quantities.

Interim Measurement The amount of work certified by the Resident Engineer up to the end of December 1981 was £651,780 (including materials on site and variations in costs) with the contractor having received £597,261 and the retention money being £54,519.

It is estimated that the contract will be finally concluded within the contract price, without any major claims on behalf of the contractor.

Xyliatos Dam Distribution System - Stage I

This project covers an area of 2,300 donums of land at Xyliatos and Ayia Marina villages. Its implementation has been split into two stages. Stage I estimated at £265,000 and Stage II estimated at £332,000.

The construction of the work has been un-

dertaken direct by the Division of Construction of our Department.

Work on stage I commenced on 27.9.81 and by the end of the year the expenditure incurred was £115,914. Out of this amount £88,078 were paid for pipes and valves and £27,836 on the construction, ie wages, trenching, laying etc. By the end of 1981, a small proportion of the work was completed (35% of trenching and 10% of laying approximately), and it is expected to complete this stage of the work by July 1982.

Stage II of the distribution system is scheduled to commence in May 1982 and is expected to be completed in Spring 1983, provided that no obstacles occur in the meantime.

WATER SUPPLY SCHEMES TO REFUGEE HOUSING ESTATES

Since the invasion of Cyprus by Turkey in 1974 the Department had to respond to the

urgent demand for the supply of water to the Refugee Housing Estates for the housing of the 200,000 Greek Cypriot Refugees. All such projects were dealt with the utmost urgency, giving them top priority over all other works.

During 1981 the Construction Division had to respond to 27 Government Housing Es-

tates of an estimated cost of £320,566 and 48 Self-Housing Estates of an estimated cost of £186,736. The expenditure incurred on all these 75 schemes during 1981 reached the amount of £343,055.

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

TABLE V-13
WATER SUPPLY SCHEMES FOR REFUGEE HOUSING

Ser No	Description	Amount allocated for 1981 £	Expenditure incurred in 1981 £	Remarks
<i>HOUSING ESTATES</i>				
1	Apostolos Andreas	13 330	12 214	
2	Apostolos Loucas	8 552	5 061	
3	Apostolos Loucas (Sewage)	20 500	22 596	
4	Archangelos Michael	24 500	18 759	
5	Archangelos Michael (Phase II)	9 000	5 813	
6	Athalassa	10 000	10 293	
7	Ayii Anargyri (Larnaca)	5 616	3 487	
8	Ayios Ioannis (Larnaca)	11 000	8 391	
9	Ayios Ioannis (Larnaca) Sewage	22 000	9 045	
10	Ayios Ioannis (Limassol)	12 572	12 395	
11	Ayios Mamas (Nicosia)	5 200	3 262	
12	Ayios Pavlos	4 400	2 439	
13	Ayios Pavlos (Sewage)	13 000	11 270	
14	Kamares (Larnaca)	9 300	7 407	
15	Kapsalos (Limassol)	2 000	1 961	
16	Khrysopiliotissa	15 000	11 662	
17	Kokkines (Nicosia)	7 290	488	
18	Kokkinies	8 500	—	
19	Kophinou	4 000	1943	
20	Kophinou (Sewage)	40 000	31 934	
21	Makarios III (Limassol)	17 100	16 541	
22	Ormidthia	1 800	1 128	
23	Pano Lakatamia (Anthoupolis)	6 000	5 180	
24	Tsakileron (Larnaca)	6 500	212	
25	Tsiflikoudhia	3 250	—	
26	Zenon	15 156	4 008	
27	Zenon (Sewage)	25 000	—	
	Total	<u>£320 566</u>	<u>£207 489</u>	
<i>SELF HOUSING ESTATE</i>				
<i>(i) Nicosia District</i>				
1	Agrokippia A	290	99	
2	Akaki C	400	119	
3	Akaki E	570	250	
4	Anayia	1 289	1 544	
5	Ayii Trimithias C	400	153	
6	Kokkini Trimithia A	784	120	
7	Kokkini Trimithia B	515	139	
8	Meniko A	180	—	
9	Nisou C	1 300	638	
10	Nisou D	450	15	
11	Pera (Orini)	860	697	
12	Peristerona E	1 020	966	
13	Peristerona Z	4 529	4 291	

14	Tseri E	5 770	5 636
15	Yeri C	15 610	8 291
16	Yeri D	7 726	4 166
17	Yeri E	1 591	17
18	Yeri H	17 867	29 499
19	Yeri Z	6 856	3 119
	Total	<u>£68 007</u>	<u>£59 759</u>

(ii) *Famagusta District*

1	Avgorou A	1 500	—
2	Dherinia C	3 200	2 378
3	Phrenaros D	2 500	—
4	Sotira A	5 340	3 506
5	Sotira B	3 675	3 354
6	Vrysoulles A	14 535	8 258
7	Vrysoulles B	2 539	1 000
8	Vrysoulles C	1 138	680
9	Vrysoulles D	1 788	518
	Total	<u>£36 215</u>	<u>£19 694</u>

(iii) *Limassol District*

1	Ayia Phyla	600	438
2	Episkopi C	1 571	1 282
3	Kato Polemidhia A	7 000	623
4	Kolossi D	3 000	—
5	Moutayiaka	2 104	1 776
6	Pano Polemidhia	5 885	5 359
	Total	<u>£20 160</u>	<u>£9 478</u>

(iv) *Larnaca District*

1	Dhekelia	4 084	11 882
2	Dhromolaxia E	7 500	6 949
3	Kalokhorio E	1 486	420
4	Kellia A	2 510	106
5	Klavdhia	3 000	23
6	Meneou	12 783	5 337
7	Livadhia C	501	81
8	Livadhia D	915	145
9	Livadhia E	2 075	2 156
10	Livadhia Z	8 540	6 307
	Total	<u>£43 394</u>	<u>£33 406</u>

(v) *Paphos District*

1	Mandria A	2 700	1 667
2	Mouttalos	3 460	3 246
3	Mouttalos (Sewage)	12 000	8 316
4	Timi	800	—
	Total	<u>£18 960</u>	<u>£13 229</u>

SUMMARY OF ALL DISTRICTS

1	Housing Estates	320 566	207 489
2	Self Housing Estates		
	(i) Nicosia District	68 007	59 759
	(ii) Famagusta District	36 215	19 694
	(iii) Limassol District	20 160	9 478
	(iv) Larnaca District	43 394	33 406
	(v) Paphos District	18 960	13 229
	Grand total	<u>£507 302</u>	<u>£343 055</u>

SCHEMES UNDERTAKEN FOR CONSTRUCTION FOR OTHER GOVERNMENT DEPARTMENTS

As already stated, the Division of Construction had to respond to the request for the construction of water supply, or irrigation schemes that were approved in the budgets of other Government Departments, ie the Refugee Housing Schemes that were included in the budget of the Department of Planning and Housing, and the Pitsilia Integrated Rural Development Project which was included in the budget of the Ministry of Agriculture and Natural Resources.

In addition to the above major groups of schemes the Division of Construction had to respond to 67 more schemes that were approved in the budget of other Government Department. These schemes cover a wide field and include livestock projects, water supply to T/C properties, improvements or extensions to existing water supplies from funds from various Departments, etc. In all for these 67 schemes the expenditure during 1981 reached the amount of £229,938.

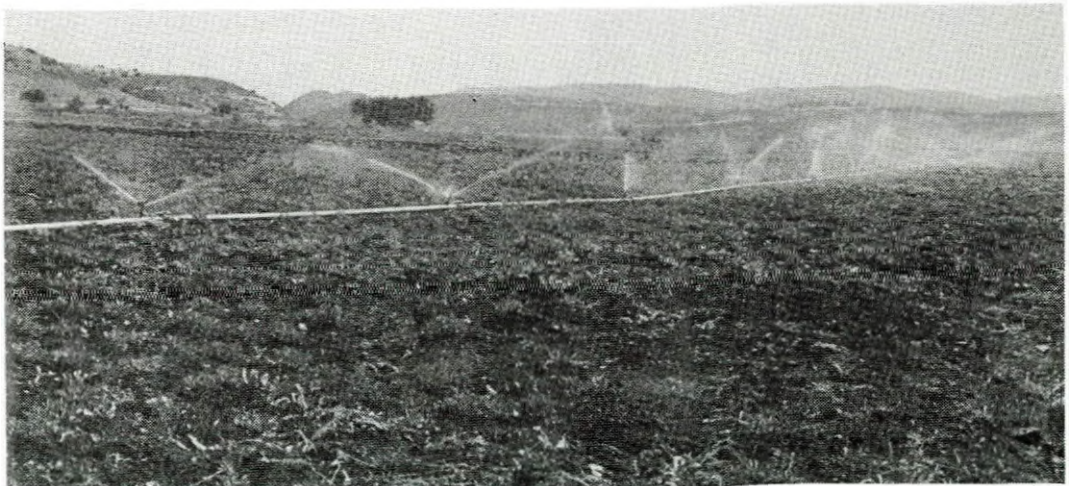
Table V-14 below shows all 67 schemes undertaken for construction on behalf of other Government Departments.

TABLE V-14
SCHEMES UNDERTAKEN FOR CONSTRUCTION FOR OTHER GOVERNMENT DEPARTMENTS DURING 1981

Ser No	Description	Amount allocated for 1981 £	Expenditure incurred in 1981 £	Remarks
1	Philoxenia hotel	3 750	4 308	
2	Yeri livestock	33 300	32 039	
3	Troodos	800	870	
4	Kolossi livestock	200	124	
5	Kophinou	1 200	1 036	
6	Geological Department	1 250	1 224	
7	Pitsilia	300	300	
8	Pano Lakatamia	3 976	4 113	
9	Kalopanayiotis	3 400	3 420	
10	Installation of fire hydrants	2 650	2 620	
11	Plataniskia	555	557	
12	Pano Kividhes	280	278	
13	Services for the protection of T/C properties	2 000	998	
14	Ayios Yeorgyios-Sylikou	106	106	
15	Yermasoyia irrigation	50	50	
16	Kiti	700	696	
17	Polemidhia	3 163	3 151	
18	Armenokhori	120	112	
19	Moutayiaka	140	142	
20	Mosphiloti camp	1 000	922	
21	Pedhieos, river training	30 000	883	
22	Pissouri	8 945	8 945	
23	Paramali	42	42	
24	Amathus WS (Renata)	5 000	4 679	
25	Kolossi	67	67	
26	Ypsonas - Polemidhia	60	60	
27	Amathus WS (Panorama)	870	532	
28	Livadhia - Voroklini	1 620	219	
29	Khandria - Agros - Kyperounda	750	631	
30	Kiti - Meneou - Perivolia	30 000	28 623	
31	Amathus WS (Avenita)	690	690	
32	Peristerona T/C Houses	676	664	
33	Psevdhas	480	241	
34	Kornos reservoir	750	653	
35	Amathus	719	719	
36	Trakhoni	750	743	
37	Amathus (Anemos)	1 500	1 500	
38	Kato Polemidhia	4 550	4 323	

TABLE V-14 SCHEMES UNDERTAKEN FOR CONSTRUCTION FOR OTHER GOVERNMENT DEPARTMENTS DURING 1981 (Cont.)

Ser No	Description	Amount allocated for 1981 £	Expenditure incurred in 1981 £	Remarks
39	Erimi - Kolossi	860	496	
40	Moutayiaka regional scheme	325	114	
41	Tokhni	165	99	
42	Amathus M/nce	4 150	4 209	
43	Kilani	130	130	
44	Sha - Kornos - Pyrga	200	98	
45	Paleometokho bridge	200	200	
46	Pyrga	150	150	
47	Ypsonas - Polemidhia WS	22 000	11 099	
48	Polemidhia Dam	80	80	
49	Yankar Estate	1 850	820	
50	Livadhia	200	174	
51	Agros	35 000	35 000	
52	Yeri	500	500	
53	Lambousa School	845	845	
54	Santa Barbara	115	25	
55	Pendakomo	4 376	609	
56	Mathiati WS	5 000	1 955	
57	Casual assistance	6 100	6 076	
58	New Nicosia - Limassol road	57 740	27 966	
59	Akaki	1 500	1 459	
60	Yeri H.	470	470	
61	Goshi (removal of pipes)	4 000	1 718	
62	Palekhori road	4 500	4 293	
63	Xyliatos - Lagoudhera	453	453	
64	Potamos Yermasoyias	500	460	
65	School for the disabled children	500	167	
66	Stavrokonou WS	550	181	
67	Paphos International Airport WS	29 880	18 812	
	Total	<u>£328 748</u>	<u>£229 938</u>	



Application of sprinklers method of irrigation through the use of the distribution system in the Kouklia West Sector. WDD Photo C59-7 (11.6.81)

V/I PAPHOS IRRIGATION PROJECT

by
K. Spanos
Executive Engineer I
Deputy Project Manager

General

During the year 1981 the 1st phase of the project continued to be in full operation covering an area of about 3,500 ha from the village of Kouklia to Yeroskipos.

The total quantity of water utilized was 6,914,604 m³ which was provided from diversion of surface flow in Dhiarizos river (2,100,000 m³) and pumping from boreholes in the rivers of Dhiarizos, Ezuzas and Xeropotamos (4,814,604 m³).

The water was supplied to the farmers through the pipe distribution systems for the irrigation of 2,250 donums of permanent plantations and 7,450 donums of summer crops.

In the field of construction during the year 1981 the works of two major contracts which were substantially completed in the previous year have been finally tested and commissioned to WDD for operation (a) the 14 Pumping Stations and the Western Main Conveyor and (b) the Irrigation Networks of all the Eastern Project Sectors with their reservoirs.

The construction of Asprokremmos Dam has continued throughout the year 1981 by

the end of which it has reached about 90% completion. Following the approval to proceed with the construction of the dam power station the supply contract for the turbine generator and other equipment was awarded to Elin Union and J M Voith in May 1981.

Two other new contracts have been also awarded in 1981: (a) The Construction of Farm Access Roads in eastern area and (b) the Installation of Irrigation Networks and Construction of Reservoirs in the Western area. The contracts for the supply of A C pipes and fittings, Valves and Hydrants for the networks of the Western area have been completed during 1981.

More details of the progress performed in each of the above contracts during the year 1981 are given under the forthcoming headings and also shown in the progress chart page 102.

The total expenditure incurred during 1981 for continuation of the project works has reached the amount of £4,032,186 which brought the total amount spent for the project since its start to the sum of £20,039,646 which is about 80% of total estimated cost up to full completion of the project which is of the order of £24 million.

For the supervision of the contract works under execution and the operation of the completed ones the following number of staff of the Department were occupied at the end of the reporting year.

Technical Staff

- 1 Executive Engineer I, PM
- 1 Executive Engineer I, DPM
- 2 Executive Engineers I
- 3 Executive Engineers II
- 29 Technicians II (monthly or daily)
- 2 Ass. Chief Foremen
- 5 Foremen
- 43 No. total technical staff

Administrative Staff

- 1 Administrative Officer
- 1 Accounting Officer
- 3 Clerical Assistants
- 2 Secretary - Typists
- 1 Telephonist
- 2 Messengers
- 10 No. total administrative staff

In addition to the above staff the Project engaged from time to time a considerable number of hourly paid staff on regular or temporary basis and of various trades to assist in the various activities of the above staff.

The two Consulting Engineering Firms SO-GREAH and Sir M MacDonald and Partners who are responsible for the supervision of the contract works continued their contribution in Engineering Staff with 2 Resident Engineers assisted by 2 expatriate Civil Engineers.

Finally, mention is made to the beneficial contribution in Engineering Staff from FAO with the appointment to the Project of 2 Associate Experts.

PROGRESS OF WORKS

Contract Works in progress from previous year:

The following two construction contracts and three supply contracts have reached full completion during the year 1981.

1 Construction of Pumping Stations, Western Conveyor and Remote Indication - Main Contract No 6C 39/77/37.

Contractor: Costain Civil Engineering Ltd of UK

This Contract started in 1978 and detailed description of its structures and their purpose were given in the previous annual reports. Although the works of this contract

were completed up to 95% by the end of the year 1980, it took rather long for the Contractor and his Sub-Contractor to complete the remaining uncompleted parts of the work during the year 1981 which mainly included repair and finishing work on the civil and electromechanical works, testing and commissioning of most of the pumping equipment, installation of the remote monitoring system and general testing of the western conveyor.

All above operations were proved to be time consuming due to many unforeseen difficulties. Final completion of each structure was achieved as follows:

PUMPING STATIONS:

Kouklia East and Kouklia West.

Their testing and commissioning was carried out in the previous year. Before however these stations could be put into automatic running it was necessary to install on each pump unit an air eliminator in order to release air which was entrained in the water coming from the canaletti outfall structure. Since the beginning of April 1981 both pumps have been working normally.

The Contractor had also proceeded with the repair of the stations' civil works and the installation of dry run protection equipment which were all completed by the end of the year 1981 except the dust preventing paint which was to be applied to the floor of these two stations in the beginning of 1982.

Akhelia P S

The capacity test of the pumps was successfully completed early in 1981 and the station has been put into automatic operation. The Contractor has then proceeded with the installation of the dry run protection and repair of some civil works during the maintenance period of the contract.

Mandria, Timi, Koloni and Ayia Varvara P S

The capacity test of the pumps of all above stations were carried out early in 1981 and completed by the end of April. At the same time the contractor had repaired or replaced all the electromechanical parts which were found defective during their testing or their maintenance period which would expire in 1982. Some of the repairs on the civil works were left to be completed towards the end of the maintenance period. All the stations however have been on automatic running throughout the irrigation season of 1981 without any serious problem.

PAPHOS IRRIGATION PROJECT
PROGRESS CHART FOR WORKS UNDER CONTRACT



LOT No	DESCRIPTION OF WORKS	CONTRACT SUM	GROSS PAYMENT TO 31.12.81	1977												1978												1979												1980												1981												1982																							
				J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D
S 20 S 21 S 22	Supply of Laboratory Equipment Survey Equipment and Vehicles	£ 66,602	£ 67,083	100%																																																																																			
D1	Drilling, Casing, Testing of 8 Hs	82,000	81,914	100%																																																																																			
1 C 1 S	Main Canal Construction	992,826	908,240	100%																																																																																			
2	Supply and installation of Well Pumps	142,372	134,718	100%												100%																																																																							
SUPPLIES FOR WELLFIELD CONVEYANCE SYSTEM																100%												100%																																																											
3 S1	1 Canals	66,850	59,272	100%																																																																																			
3 S2 3 S3	2 A C Pipes with Fittings and Valves	208,402	216,534	100%												100%																																																																							
4 C1 4 C2	Installation of Wellfield Conveyance System and Eastern Main Pipeline	162,869	241,342	100%												100%																																																																							
6 C	Main Contract—Supply and installation of Pumping Stations Western Conveyer and Remote Indication	2606,603	3,191,677	100%												100%												100%												100%												100%												100%																							
SUPPLIES FOR DISTRIBUTION NETWORK OF EASTERN AREA																100%												100%												100%												100%												100%												100%											
5 S1	1 A C Pipes and Fittings	1267,257	1,261,353	100%												100%												100%												100%												100%												100%																							
5 S2	2 Valves	113,868	108,069	100%												100%												100%												100%												100%												100%																							
5 S3	3 Hydrants	251,052	242,321	100%												100%												100%												100%												100%												100%																							
7 C1 7 C2	Installation of Irrigation Network and Construction of Reservoirs for Eastern Area	1,640,984	1,580,556	100%												100%												100%												100%												100%												100%																							
SUPPLIES FOR DISTRIBUTION NETWORK OF WESTERN AREA																100%												100%												100%												100%												100%												100%											
8 S1	1 A C Pipes and fittings	456,215	436,791	100%												100%												100%												100%												100%												100%																							
8 S2	2 valves	40,824	44,483	100%												100%												100%												100%												100%												100%																							
8 S3	3 Hydrants	80,385	76,450	100%												100%												100%												100%												100%												100%																							
9 C	Installation of Irrigation Network and Construction of Reservoir for Western Area	1,229,930	335,920	100%												100%												100%												100%												100%												100%																							
10	Central Offices Temporary Buildings	40,413 (21,185)	71,598	100%												100%																																																																							
11	Construction of Farm Access Road	183,332	131,790	100%												100%												100%												100%												100%												100%																							
12	ASPROKREMMOS DAM 1 Dam construction	6,743,837	8,541,141	100%												100%												100%												100%												100%												100%																							
Note: Including adjustment of cost due to variation of prices			Months	1977												1978												1979												1980												1981												1982																							

Main Pumping Station

The Contractor has completed all the remaining civil works (drainage ditches, landscaping, fencing) and painting of metal works during the first half of the year.

The electromechanical installations were also completed and fully tested. The pumps of Yeroskipos and Paphos Sectors were put on automatic running as from May 1981.

During the testing of the pumps of the main lift to the western conveyor it was found that the starting current ratio was exceeding the maximum allowable of 3.3. As a temporary measure the autotransformer was readjusted to 80% instead of 65% to allow more current to the motor terminals to overcome its starting torque. The Contractor has undertaken to remedy the situation by installing electrical activators for the automatic closing and opening of the gate valves at the outlet of each pump in connection with the starting of the pump motors.

The pumps of the main lift were operated during 1981 for the purpose of filling the western conveyor in order to carry out its general test.

Kissonerga I and II, Emba South and North, Mandria Extension and Koloni Extension.

The remaining finishing work in the civil and electromechanical parts was completed during the first half of the year 1981. The Contractor has then proceeded with the testing and commissioning of the stations before the end of the year. Some repairs on the civil works were left to be carried out during the maintenance period of the station.

Western Main Conveyor

The sub-contractor for the Civil Works has continued with the finishing work on the on-line structures of the Western Conveyor such as the headbreakers, chambers for air valves and washouts and Yeroskipos balancing reservoir. The general water pressure test of the conveyor was carried out successfully during the period May-June 1981. No failures at all were recorded on the ductile iron pipes of the Conveyor. The repair work on the on line structures continued up to the end of the year and that delayed the issue of completion certificate by the Resident Engineer for the Conveyor up to the end of September 1981.

Remote Monitoring System

During the year 1981 the sub-contractor

"Serk Controls" of UK had installed all the equipment of the remote monitoring system and its first overall testing was carried out in October 1981. Soon after, however, the system could not work properly. The specialists from the suppliers and the Consultants have undertaken to carry out thorough inspection of all the system and locate its defective components. Final acceptance test of the system was programmed for 1982.

All the works under the above Contract were considered as substantially completed by the end of 1981. During this year the Contractor had received £198,314 as total interim payments which brought the total payments since the beginning of the Contract up to now to £3,389,991. Preparation of the final account of the contract was still pending due to the delay in reaching an agreed settlement on the Contractor's claims in connection with his request for extension of time but this is expected to be finalised early in 1982. From the first estimates of the final measurements of the contract works and of the Contractor's claims it is expected that the final contract amount will reach the sum of £3.6 million.

2 Installation of Irrigation Networks and Construction of Reservoirs for Eastern Sectors Contract No C7 39/77/38-39

Contractor: SOCEA of France

The installation of the irrigation networks in the eastern sectors started in 1978 and although they were substantially completed by the end of May 1980 with the installation of 388 km of A C pipelines it took another full year in order to perform a general water pressure test of each different sector (11 No. altogether) and carry out repair and finishing works which mainly included the following:

- Installation of several concrete protection pipes over hydrants, valves and farm risers and filling with gravelly materials.
- Construction of several road crossing structures over the pipelines.
- Repair of defective parts of hydraulic equipment like water meters of hydrants, leaking farm risers, leaking air valves and painting of many such hydraulic equipment.
- Repair of concrete work on reservoirs and concrete protection pipes and other on-line structures.
- Repair of broken pipes and fittings either during general test of the networks or during their normal operation.

The above works were executed during the general testing of the networks as well as during their maintenance period. The general hydraulic test was first completed for the sectors of Kouklia West, and Kouklia East in July 1980 and by the end of the year 1980 their completion certificate was issued. General tests were continued in 1981 for the remaining sectors and the last completion certificates were issued in May 1981 for the sectors of Aya Varvara and Koloni. For the remaining months of the year the Contractor had continued with one crew the maintenance of the networks which mainly included repair of any breakages on the A C pipes or fittings, cleaning blocked water meters and repairing farm risers and air valves. By the end of the year 1981 the following defects or failures were recorded and repaired by the Contractor as part of his maintenance work.

- 480 pipe breakages or leakages out of total 81,780 pipes installed.
- 970 defective or blocked water meters out of total 1274 installed.
- 795 leaking farm risers out of total 5138 installed

During the year 1981 the Resident Engineer has issued maintenance certificates for the sectors of Kouklia East, Kouklia West, Akhelia, Mandria and Timi which were then taken over by the Department.

For the remaining sectors the Contractor had to continue the repairs on pipes, on line structures and hydraulic equipment in 1982 as well.

The preparation of the final measurement and final account of the Contract could not be finalized before the end of 1981 due to the fact that the Contractor submitted several claims exceeding the amount of £1 million altogether and which were still under discussion between the Contractor and the Resident Engineer.

The payments to the Contractor for his works during 1981 amounted to £22,592 bringing the cumulative payments up to date at £1,580,556 excluding payments for the supply of valves and hydrants by the nominated sub-contractors.

3. Supplies for Irrigation Networks of Western Area

Lot 8S1 - Supply of A C pipes and fittings

Contract No 39/77/34

The Supplier for this lot Cyprus Pipes Industry Ltd have continued the supply of A C pipes and special fittings from the previous year and completed all the orders by the end of July 1981 by delivering to the stores of the Project about 110 km of A C pipes and about 120 tons of special fittings, mostly cast iron from Yugoslavia. All supplies were checked and received by the project well ahead of the start on the installation of the networks in the western sectors.

The total amount paid to the C P I up to the end of the year was £436,791.

Lot 8S2-Supply of Valves

Contract No. 39/77/35

The first supplies from the manufactures (INTECO for sluice valves, ZET for air valves and ERHARD for butterfly valves) were delivered by Messrs Caramondani Bros Ltd in January 1981 in the stores of the Project and completed within the first half of the year by delivering some 1,200 valves at the total cost of £44,483. The final contract sum has exceeded the original tender by £3,659 due to additional orders in supplying extra valves required to complete the networks due to variations in their design.

Lot 8S3-Supply of Hydrants

Contract No. 39/77/36

Messrs Neophytos Demetriou commenced supply of hydrants manufactured by Schlumberger of France in cooperation with Nemitsas Industries Ltd of Cyprus early in 1981 and completed the required quantity of 268 No of hydrants by the end of June 1981 at the total cost of £76,460.

4. Asprokremmos Dam - Contract No. C2 39/77/26

Contractor Joint Venture of J&P and MED-CON

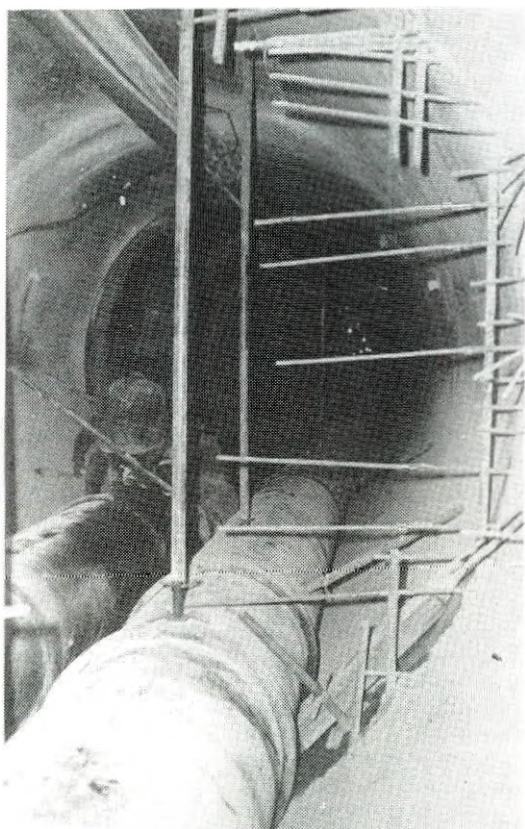
This is the only contract which was continued from the previous years but still it had not reached full completion by the end of the year 1981. According to the original contract program the completion date was the 18th of May 1981.

Due to additional works, however, particularly in alluvial grouting, the Resident Engineer has granted an extension of time to the Contract of 49 weeks bringing the completion date as far on the end of April 1982. During the reporting year the following

progress was achieved on each of the items given below:

Diversion Tunnel-Intake Tower

River flow has been diverted through the diversion tunnel throughout the wet months of 1981. In June when the river flow was reduced to its normal summer flow the contractor has provided temporary diversion in the form of installing a dewatering plastic pipeline in the crown of the tunnel through which river flow was pumped in order to enable the Contractor to proceed with installation of the twin irrigation pipelines (800 mm diameter D I pipes) and carry out the second phase works for the base of the intake tower and second stage concreting in the tunnel.



*Asprokremmos Dam. Installation of twin 800 mm dia D I irrigation pipelines in the diversion tunnel in progress.
WDD Photo C77-7 (10.9.81)*

The pipelaying operation in the tunnel progressed normally except the testing which took rather long due to difficulties in anchoring and propping the pipes and finally were all successfully completed by September 1981. In the meantime second stage concreting to the tunnel has started in order to cover the pipes and was completed just in time together with concreting of the tower base before the start of the river flow which came around the middle of November.

As from April the Contractor has managed to start concrete work on the stem of the intake tower after removal of the crane to this area for this purpose. Due to the late start and the slow progress in the concreting of the intake tower this work became critical for the completion of the tunnel gate installation and its closure which was programmed to take place during the coming wet season and preferably before the end of February 1982 so that some impounding would have been possible.

The tower stem from level 41.0 m up to level 84.0 m was finally completed in November and by the end of December the lower floor slab to the intake tower superstructure was also completed and the remainder of the superstructure was on programme for the installation of the gate operating equipment by the end of February 1982.

As work was concentrated on the intake tower the progress on the footbridge structure was kept very slow with one or two pours of concrete per month on the two supporting piers which were started in August and expected to be completed in January 1982. The footbridge truss was delivered to site in December with minor damages the repair of which were undertaken by the contractor so that it would be ready for installation early in 1982.

Galleries

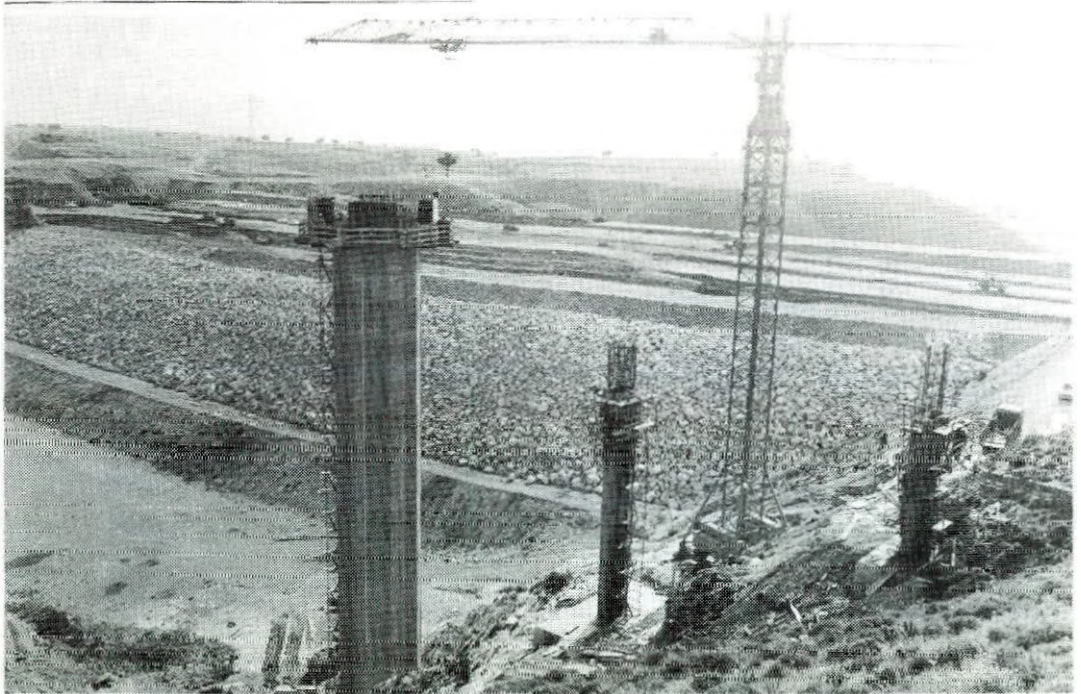
After completion of concreting the left abutment drainage gallery from the previous year the contractor has proceeded with contact grouting and the drilling of the side and bottom drainage holes which were fully completed by February 1981.

Concreting of the irrigation pipe tunnel started also in the beginning of 1981 and its total length of 106 meters was completed in May 1981.

In March the Contractor started also concreting of the right abutment drainage gall-

ery and continued with a fairly steady progress up to July reaching a total concreted length of about 97 meters of soffit section in the spur gallery. No further work was carried out up to the end of the year because all the gangs were concentrated to the concrete works in the tunnel, the intake tower and the footbridge piers. A remaining length of about 270 meters was left to be concreted in the next year.

During the same month all the 15 instruments of foundation piezometers were installed in the upstream side of the embankment. Construction of the instrument house on the downstream side was started in February while placement of the granular fill continued by stepping up towards the abutments in order to avoid stoppage on the placement of fill on the embankment. For higher production on this



Asprokremmos Dam. General view of the works on the construction of the main embankment from upstream and on the construction of intake tower with concreting of its first platform slab and of the two supporting piers of footbridge. WDD Photo C93-8 (10.12.81)

Embankment and Alluvial Grouting

By the end of January 1981 chemical grouting was completed in all the grouting zones. Water test was also completed, with both the sleeve water testing method and the perforated rod method.

From the middle of January the Contractor moved to the downstream side of the embankment in the river valley by starting placement of the blanket drains which was then followed with the granular fill bringing the top level of the embankment by the end of January at 35.0 meters elevation a m s l.

work the Contractor has started working in two eight hour shifts. As from March the Contractor has concentrated his works mainly in the embankment clay and granular fill. Instrumentation at level 37 meters a m s l in the clay was installed in April as well as tubing and read out units in the instrument house which was also completed all under the site supervision of the Engineer of Soil Instruments the nominated sub-contractor for this work. After installation of instruments was completed the Contractor has increased his output for fill placement and during the period from June up to end of

September 81 has achieved an average weekly rate of about 36,000 m³ and a maximum of about 46,000 m³. The general level of the clay core at the end of September was at 61.0 meters a m s l. The granular shoulders were stepped on the upstream side down to the level of 55.0 meters. This was done in order to enable the Contractor to follow with the placing of the rip-rap material which was first delivered from a quarry in the limestones above Yeroskipos village after being opened by the Contractor in May 1981. Due to the low production of rip-rap material from this quarry the Contractor was instructed to start bringing as from mid September rip-rap material from an existing quarry at Ypsonas of Limassol until a new quarry was going to be opened by the Contractor 6 miles away from the dam site near Stavrokonnou village. Material from the Stavrokonnou quarry started coming on site about the middle of December when the rip-rap was at the level of 64.0 metres. Due to the higher densities of the rock stones coming from Stavrokonnou (marble type of 2.7 tons/m³ as compared to 1.8 of Yeroskipos lime stones) the thickness of the rip-rap was reduced from 1.35 m to 0.80 m.

During the month of August installation of the piezometers at level 52.0 m was carried out and was completed in September with the construction of the instrument houses at section A-A and C-C.

Progress on the embankment during the last three months of the year continued with lower rates which were between 25,000 m³ and 15,000 m³ per week.

The general level of the embankment at the end of the year 1981 was on the clay at the 67.5 m and the granular at the 67.3 m. The rip-rap was completed up to the level of 64.0 m. In total about 1,060,000 m³ of fill material was placed on the embankment during the year 1981.

Decision was taken to start impounding as from the end of February 1982 with the aim to collect about 6.0 MCM of water which was estimated to be the minimum amount that would be required to be supplied from the dam in order to meet water requirements during the dry season of 1982. Two major constraints were still faced at the end of December in order to achieve above aim:

a. *Valve tower* - this structure needs to be completed in such a way that control gate

can be installed and closed off to impound.

b. *Embankment* - the absolute minimum level for the embankment should be 72.0 m which would be able to cope with a flood of the order of 1000 years return period using as escape the diversion tunnel. Under such conditions the maximum allowable storage in the reservoir was fixed at 15 MCM.

But when impounding will take place the upstream borrow areas will be inundated and hence unavailable. As a solution it was decided to take granular material from downstream and to stockpile clay, about 30,000 m³ from the existing borrow area.

Spillway

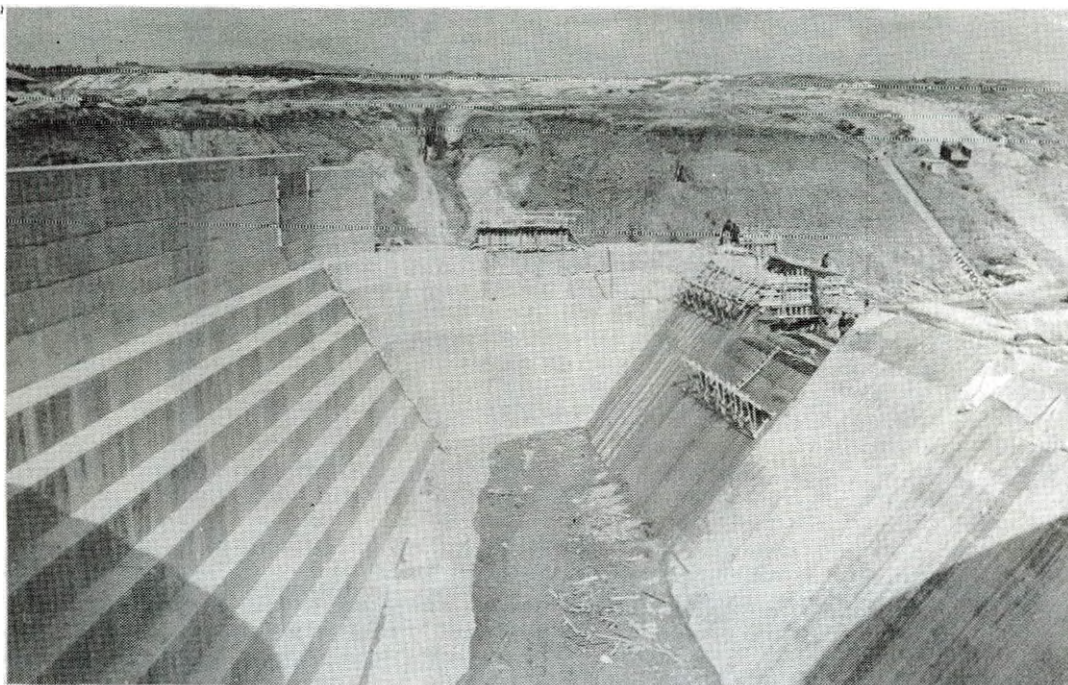
Progress on concreting in all parts of the spillway has been maintained reasonable during the first four months of the year 1981 trying to complete the bulk of the mass concreting before temperature problems arise again during the hot season.

With the movement however of the tower crane to the intake tower site in June the progress in the spillway discharge channel and retaining walls during the period June - September has been very slow as the Contractor has switched his efforts to the intake tower and tunnel. During the last quarter of the year progress was better again mainly on the chute, the flip bucket walls and mass concreting on spillweir which were nearing completion by the end of the year. It is expected that the remaining parts in this work which would need about 70 pours of concrete will be completed by the end of March 1982.

Power Station - Nominated Sub Contract SR 39/77/27

Lot S4.1 for turbine, generator and valves Following the decision of the Ministerial Committee on tenders the Tender Board awarded the above sub-contract for the manufacturing and installation of turbine, generator and valves for the power station to Elin Union A G of Vienna and J M Voith of St. Polten for the sum of £236,521.

Following the approval of the working drawings by the Consultants the suppliers have started manufacturing of the equipment towards the end of the year 1981 and should be delivered to the site for installation towards the end of the year 1982. In the meantime in order to have release of water from the dam into the main canal during the summer of



Asprokremmos Dam. Concreting on the spillweir and mass concrete retaining walls on the upper part of the spillway nearing completion WDD Photo C93-9 (10.12.81)

1982 it was decided to make early in 1982 a direct connection of one of the irrigation pipelines with the canal through a diversion of the power station.

Finance

The total amount of work certified by the Resident Engineer to the end of December was £6,250,000 at contract rates while the gross amount paid to the Contractor including the retentions, adjustment of costs and the advanced payments reached the sum of £8,571,366. The total cost of the dam at full completion was estimated to exceed the £10 million.

NEW CONTRACTS

During the year 1981 two new Contracts have been awarded and for which tenders were invited from the previous year and they were the last ones up to the full completion of the Project works. These are the following:

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

Contractor: G P Zachariades Ltd.

This contract includes the installation of the

distribution systems over the sectors of Emba, Kissonerga, Peyia and Ayios Yeoryios in the western area of the Project of total net irrigable land of about 1,320 ha. It also includes the construction of 5 storage concrete lined open reservoirs of total capacity of 23,500 m³. The received tenders from 9 prequalified contractors were opened on the 2nd February 1981. Following the evaluation of the tenders the contract was awarded to Messrs G P Zachariades Ltd for the sum of £1,229,994 which was the lowest one. The contract agreement was signed on the 19th May 1981 and proceedings with the construction of the works commenced by the middle of the following month. The whole of the works should be completed within 12 months and by the end of the year 1981 the following progress was made:

Distribution System:

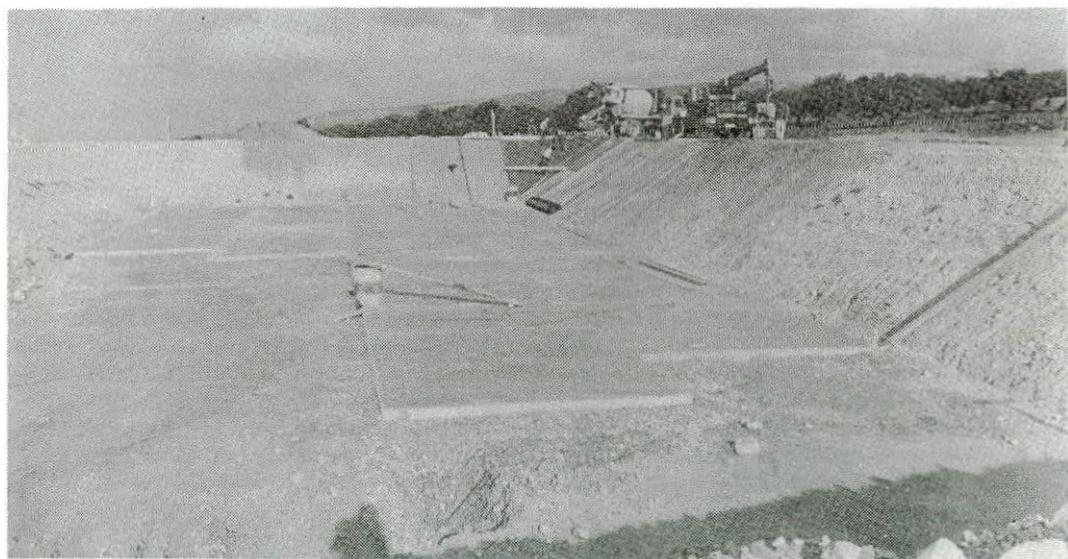
As it was programmed the contractor has first started with trenching for pipelaying in the Sector of Kissonerga and one month later he moved also to the sector of Emba South. The trench excavation was carried out by the use of a Cleveland Trencher, one



Installation of irrigation networks in Western Sectors. Pipelaying for distribution system of Kissonerga Sector in progress. WDD Photo C69-2 (6.8.81)

Hymac excavator and seven ordinary diggers. By the end of December the total length of trenches excavated were about 29,000 meters in Kissonerga and 15,800 meters in Emba South which represent about 80% of the total length of trenches in these two sectors. Altogether the Contractor has managed to lay by the end of the year 28,000 meters of A C pipes in Kissonerga and 12,300 meters in Emba out of which 25,400 meters were also fully tested. At the same time the Contractor has completed in the above two sectors the installation of 75 hydrants out of a total of 112 and of 450 farm riser valves out of a total of 780.

Although the Contractor has been working in a well organized manner his output has been lower than in his program and by the end of the year he has been behind schedule by about 2 1/2 months. The main reasons for the delays were: (a) A large increase in the quantities of hard excavations in the above two Sectors which were nearly three times more than those provided in the bill of quantities. (b) On the 12th to 13th of October 1981 heavy rainfall had occurred in the area causing serious damages to open or partly back-filled trenches of total length of about 15,000 meters which have been flooded. Cleaning of the trenches and repair of damages took



Construction of Kissonerga storage reservoir of 4,000 m³ capacity in progress. Excavation and compaction works are completed while concrete lining of floor still in progress. WDD Photo C96-6 (10.12.81)



Placement of fill material (river gravels) on road embankment for construction of farm access roads in Eastern Sectors of Project. WDD Photo C59-11 (11.6.81)

more than one month. (c) The Contractor was not fully equipped to meet his programme.

Reservoirs

The earthworks in 3 storage reservoirs, Kisonerga, Emba South and Emba North were nearly completed by the end of the year. Concrete lining was also started in the first two reservoirs but its progress has been slowed due to unsatisfactory results on the concrete cubes tested. Efforts to improve the results by trying better gradings for the aggregates were still in progress. The storage capacity of the above reservoirs will be 4,000 m³, 3,500 m³ and 2,500 m³ respectively which will allow night storage of 8 hours pumping.

Finance

The amount of work certified by the Resident Engineer to the end of December 1981 was £339,655 at contract rates which was the gross amount paid to the Contractor including the retentions and advance payment reached the sum of £428,062 out of which £81,062 was actually paid in the first week of January 1982.

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

Contractor: Messrs A. Papaettis

This Contract includes the construction of about 26 km of secondary farm access roads in the eastern sectors of the project where land consolidation will not be applied. These roads will be gravel surfaced of 35 cm thickness over a width of 5.5 m. Following the evaluation of the tenders which were received on the 26th January 1981 the contract was awarded to Messrs A. Papaettis for the sum of £183,332. The Contract Agreement was signed on the 11th April 1981 and the whole of the works should be completed within 10 months.

Progress on the road construction as well as construction of culverts during the year 1981 has been satisfactory and always within programmed schedule. In fact, by the end of December all the works were completed including 54 culvert structures except the top layer of 15 cm thickness over 2 roads of 6 km in Akhelia sector which were used as access roads to the site of the Paphos airport

under construction, and the excavation of about 2,000 meters of drainage ditches. Test carried out on the compaction of the fill materials and on the concrete work have shown that quality of the work was very good.

The total amount paid to the Contractor up to the end of the year 1981 for works carried out was £131,791.

OPERATION AND MAINTENANCE OF THE COMPLETED WORKS IN 1981

During the year 1981 a separate section was formed from the Project staff which has undertaken the operation and maintenance work of the 1st phase of the project which includes the wellfields, the main canal and the pumping stations with their irrigation networks in the eastern sectors of the project covering an area of about 3,000 ha, excluding the extensions of Mandria, and Koloni, and the sectors of Ayia Varvara and Paphos.

Irrigation supplies to the farmers started in March and continued up to December. About 1,300 ha of various crops were irrigated during the above season and which are shown in the table below:

Crop	Area in ha
Citrus	265
Bananas	34
Avocado	6
Beans	400
Ground nuts	340
Potatoes	110
Seasonal vegetables	110
Alfa-alfa	35
Total	<u>1300 ha</u>

To meet the water requirements for the above crops we have made use of 20 Project boreholes in the rivers of Dhiarizos (11), Ezousas (6) and Xeropotamos (3) as well as diversion of surface flow in Dhiarizos river during the period from March up to the 24th June 1981. The quantities of water obtained from the above sources were as follows:

Surface flow diversion:	2 100 000
From boreholes in Dhiarizos:	3 177 895
From boreholes in Ezousas: ..	1 376 281
From boreholes in Xeropotamos	<u>260 428</u>
Total	<u>6 914 604 m³</u>

It is estimated that 5% of the above quantity

of water was lost during its conveyance through the open canaletti of the wellfield conveyance system and an additional 10% was lost through its conveyance in the Main Canal. The following quantities of water were recorded to be supplied through the pumping stations along the main canal into the irrigation networks or through direct use from the conveyors:

■ Through Pumping Stations to the irrigation networks ...	5 472 005
■ Directly for irrigation purposes	8 000
■ Supplies for Industrial use*	<u>560 945</u>
Total	<u>6 040 950 m³</u>

The water which was supplied through the Pumping Stations was utilized for irrigation purposes by the farmers and was delivered through the hydrants of the distribution systems on which the quantities of water consumed by each individual are recorded by their water meters.

The total quantity of water which was recorded during the year 1981 by all the hydrant water metres of the irrigation networks has amounted to 5,076,089 m³ which gives an average difference between pumping station meter reading and consumers meter reading of about 7.2% which represents the losses in the distribution systems due to leakages of joints or breakages of pipes and accuracy in the recordings of the water meters.

The quantity of 8,000 m³ is an estimate of the amount which was supplied directly from the main canal or canaletti to farmers of Anarita and Nikoklia villages for irrigating existing plantations. The quantity of 560,945 m³ was pumped from the main canal by the Co-operative Industries at Anatoliko and recorded by a central water meter.

From the sale of water with prices fixed at 15 mils/m³ for irrigation and 30 mils/m³ for industrial uses the gross income was around £93,028.

The operation and maintenance cost, including power cost amount to £125,703. Details regarding this expenditure is shown herebelow:

	£
Power cost for operating the wells	32 028
Power cost for operating the pumping stations	54 900
Maintenance cost	24 720
Operation cost	11 000

Purchase of equipment	3 055
Total	<u>£125 703</u>

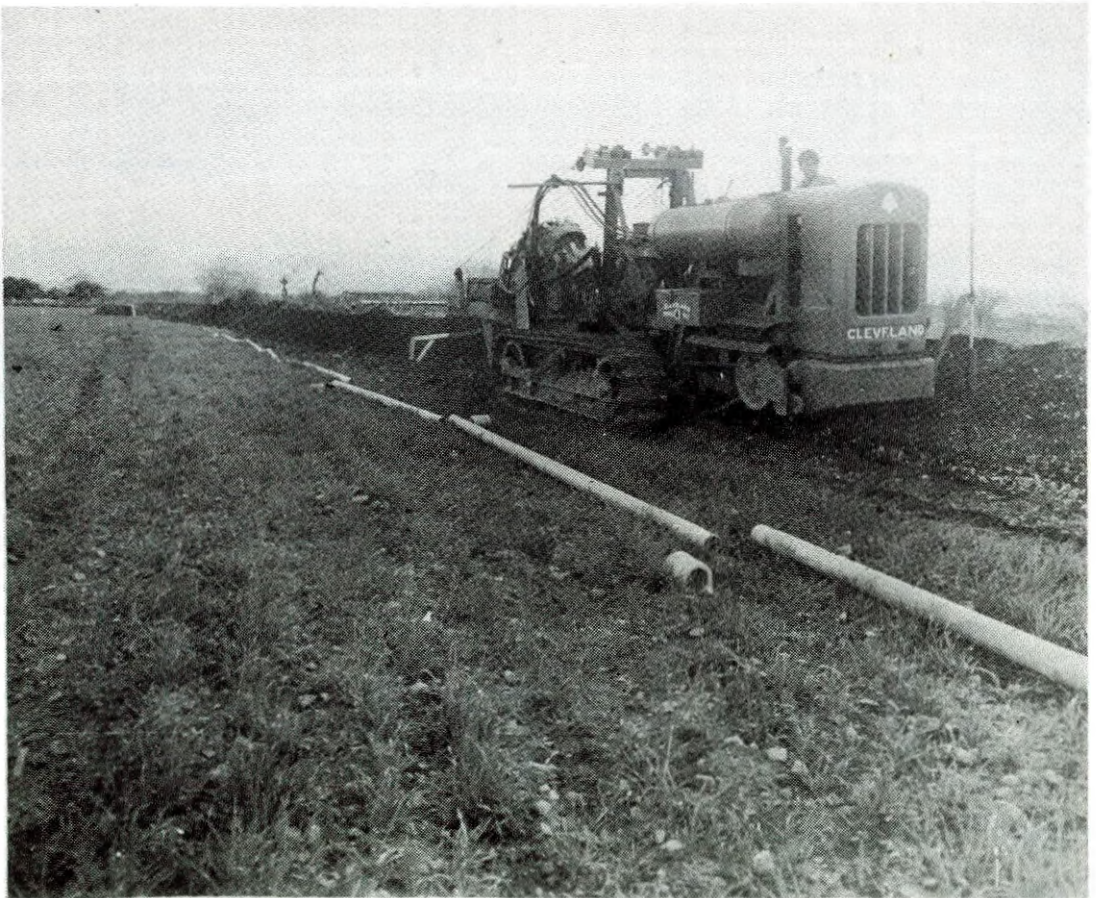
On the basis of the above costs and quantities of water utilized from the Project the unit cost per cubic meter of water supplied at farm level are as follows:

Pumping cost	
£86,928,000 mils =	15.4 mils/m ³
5,645,034	
Operation & Maintenance cost	
£ 35,720,000 mils =	6.3 mils/m ³
5,645,034	
Total unit cost	21.7 mils/m ³

FINANCIAL INFORMATION

A total of £3,600,000 has been allocated as a daggered provision in the 1981 Development Estimates for the Paphos Irrigation Project. However the actual expenditure during the year reached the total £4,032,186 which was covered by the issue of a special warrant at the end of the year. A detailed breakdown of the expenditure incurred during 1981 is shown on the table I-7 of page 28 of this report.

The up to-date expenditure for the Project in December 1981 reached the total of £20,039,646 while the projected total estimated cost at full completion is of the order of £25 million.



Excavation of trench for installation of distribution system in Western area, Paphos Irrigation Project WDD Photo C99-7 (14.1.82)

VI DIVISION OF OPERATION AND MAINTENANCE

by C C Artemis
Executive Engineer I
Ag. Head of Division

General

The Division of Operation and Maintenance consists of two Branches:

- *The Domestic Water Supply Branch dealing with the operation and maintenance of Government water supply projects for towns and rural regional water supply schemes and*
- *The Irrigation Branch dealing with the operation and maintenance of Government irrigation projects.*

DOMESTIC WATER SUPPLY BRANCH

Introduction

The main activity of this branch of the division is the administration, operation and maintenance of:

- All sources of supply and conveyance systems for the water supply of Nicosia town and suburbs.
- The Famagusta Water Supply Project, which is the main source of water supply of the towns of Larnaca and Famagusta and of over 30 communities and refugee housing estates in the two respective districts.
- A number of Government rural regional domestic water supply schemes, and
- The water supply system of Government residences and institutions in Nicosia.

The branch is also involved in the administration of the Nicosia, Limassol, Famagusta and Larnaca Water Boards through participation of its senior staff in the Water Board

meetings as representatives of the Director. Through its membership of the Water Boards the Department acts as their technical adviser and also undertakes at times design and construction work for major developments in their distribution systems.

The Ag. Head of the Division has in addition to his normal duties been deeply involved in the management of the first phase of the Nicosia Water Supply component of the Vasilikos-Pendaskinos Project and of the Yermasoyia-Vasilikos scheme, the design of which was undertaken in the second half of the year following a Council of Ministers decision to go ahead with the project.

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 and offices and other institutions are supplied free of charge with water for irrigation and cleaning purposes by a separate system. The sources of this system are four boreholes situated within the inhabited area of Nicosia. The total quantity of water produced from these sources during 1981 was 111,155 m³ which met satisfactorily the demand. The total expenditure, which is borne by Government, for the operation and maintenance of this system for 1981 was £7,932.

Technical advice to Water Boards

This branch offered technical advice to several Government and Semi-Government Organizations on water supply matters.

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

During the year a detailed study was undertaken and proposals were put forward for increasing the water rates in the towns of Nicosia, Limassol and Larnaca, in order to cover the increasing expenditure of the Water Boards and at the same time to discourage wasteful use of water by the consumers.

Proposals were also put forward for a substantial increase in the rate at which Government sells water in bulk to the Water Boards of Nicosia and Larnaca and other rural communities in order to cover the full cost of producing the water.

The new rates were adopted early in 1982.

NICOSIA WATER SUPPLY

The Water Supply of Nicosia Town and suburbs is faced jointly by three authorities.

- The Water Development Department which after the amalgamation keeps the ownership of all sources and conveyors up to 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 within Nicosia Town and suburbs, and

- The Nicosia Water Commission which has the responsibility for the distribution of water to the area within the Walls of Nicosia Town. Its sources are the boreholes P1 and P2 and the Arab Ahmet chain of wells.

The main water supply sources of Nicosia Town are the boreholes of Morphou-Pendayia, Peristerona-Akaki, Kokkinotri-mithia, Laxia, Dhikomo and Sykhari Adit.

The total quantity of water produced from all sources during 1981 was 9,717,946 m³ as follows:

- Government sources	7 162 895
- Water Commission sources ..	688 460
- Private sources	<u>1 866 591</u>
Total	9 717 946 m ³

The total production of all sources in com-

parison with last year's was by 160,000 m³ less, despite the fact that four new private and two additional Government boreholes were connected to the Water Supply System in the second half of the year, with an additional production of 340,000 m³.

The decrease in water production and the increased water supply demand caused a deterioration of the water supply situation of Nicosia in 1981.

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 for 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 4 persons per consumer connection it is estimated that an average of only 138 litres per capita per day was delivered to the service reservoirs of Nicosia during the year. (The corresponding figure for Limassol which enjoyed unrestricted supply was 191 litres per capita per day).

Due to the water shortage, restrictions on water supply were imposed on the capital from 19th April, 1981 till the end of the year. During the summer water was supplied to the consumers for as little as 12 hours in every 48.

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 April and June 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 establish a 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 contribution of the United Nations personnel to this end is much appreciated.

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.

It is anticipated that the operation of the first phase of the Nicosia Water Supply component of the Vasilikos-Pendaskinos Project in 1982 and of the Yermasoyia-Vasilikos scheme in 1983 will prove invaluable short term contributions to the solution of the water shortage problem 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 becomes 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.

New Schemes

Vasilikos-Pendaskinos Project - Phase I which provides for the laying of a pipeline 500 mm in dia from Stavrovouni balancing reservoir to Lakatamia reservoir outside Nicosia, a pumping station downstream of the proposed Dhypotamos Dam and the laying of the 600 mm dia pumping main to Stavrovouni Balancing Reservoir, was practically completed by the end of 1981. This scheme will convey, in the first instance, treated water from Khirokitia Treatment Plant to Nicosia and is expected to be put into commission early in 1982.

New Lakatamia Service Reservoir

Work for the construction of this reservoir was completed by the end of the year under review and is expected to be put into service early in 1982. The capacity of this reservoir is 40,000 m³.

Yermasoyia - Vasilikos Scheme

By decision of the Council of Ministers, based on a proposal submitted by this Department, design of this scheme commenced in September and was almost completed by the end of the year. Tenders for six contracts for the procurement of materials had also been invited. The scheme 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 equipment for the existing pumping stations at Yermasoyia and Vasilikos which will be utilized for the purpose. The scheme was given top priority and it is planned to be operational before the end of 1982. It will, of course, be a useful addition to the sources of water of the Famagusta Water Supply Project as a whole and will thus be beneficial not only to Nicosia but also to the other demand centres being fed from this project.

Statement showing expenditure for the operation and maintenance of sources and conveyors and revenue from the sale of water for the year 1981 is given in table VI-1a below.

TABLE VI-1a
NICOSIA WATER SUPPLY
Expenditure and Revenue account for 1981
Expenditure

Morphou Bay Scheme:

	£
Maintenance expenses	1 673
Electricity	209 531
Wages	14 153
Miscellaneous expenses	4 071
<i>General pumping and maintenance charges:</i>	
Wages	51 079
Electricity and fuel	59 461
Miscellaneous expenses	12 605
<i>Peristerona - Akaki Scheme:</i>	
Wages	6 410
Electricity	58 930
Miscellaneous expenses	3 341

Tseri Scheme:

Wages	11 342
Electricity and fuel	39 742
Miscellaneous expenses	2 916

Purchase of water from

<i>private sources</i>	<u>105 232</u>
Total	£580 486

Revenue generated

Value of water delivered to Nicosia Water Board	249 436
Value of water delivered to various consumers directly	<u>11 238</u>
Total value of water delivered	260 674
Amount actually collected in 1981 ..	5 780
Amount outstanding for 1981	254 894
Amount outstanding on 31.12.80 ..	218 359
Total amount outstanding on 31.12.1981	<u>£473 253</u>

Note 1: This statement does not include for the amortization of the installations and equipment of the scheme. The amortization cost of the installation is estimated at £107,760 annually. Thus, without taking into account office overheads, the deficit for the year 1981 amounts to £427,572. If outstanding payments are not considered as revenue then the deficit rises to £682,466.

Note 2: During the year an amount of £124,036 was received from the Nicosia Water Board representing collections for supply of water to consumers in the Greater Nicosia Area prior to the amalgamation of the two areas of supply.

FAMAGUSTA WATER SUPPLY SCHEME

This scheme provides water to Famagusta and Larnaca towns as well as to several villages and refugee camps in the two districts. In addition to the above areas served during 1981 a certain quantity of water was conveyed through Dhypotamos pumping station for the testing of the new Khirokitia-Nicosia pipeline constructed under the first phase of the Vasilikos-Pendaskinos Project.

The scheme provides both underground water being pumped from Vasilikos Sub-surface Dam and several boreholes in the areas of Khirokitia, Psematismenos and Alethriko villages and surface water from Lefkara dam, the latter being treated at the Khirokita Water Treatment Works.

During 1981 the Khirokitia Water Treatment Works was in operation continuously because demands in water by the communities served could not at any time be met from the various underground sources alone.

The water held in storage in the Lefkara Dam reservoir on 1st January 1981 was 3,530,000

m³ representing 25% of the reservoir capacity and by the end of the year the total water storage rose to 4,974,000 m³ representing 36% of the reservoir capacity.

The total quantity of water pumped and/or treated from all sources of this scheme during 1981 was 4,539,586 m³ (including losses) and this quantity was distributed as follows.

Famagusta town	1 058 160
Larnaca Water Board	1 182 380
Regional village water supplies ..	1 625 411
Local irrigators	55 486
Refugee camps	178,892
Khirokitia-Nicosia pipeline tests ...	13 845
Losses	<u>425 412</u>
Total	4 539 586

This represents a 23% increase on the corresponding figure for 1980.

Statement showing expenditure and revenue of the Famagusta Water Supply Scheme for the year 1981 is shown on table VI-2a.

TABLE VI- 2a

**FAMAGUSTA WATER SUPPLY
Expenditure and revenue account for 1981
Expenditure**

<i>Pumping and maintenance charges</i>	£
Wages	30 893
Electricity	83 343
Materials and others	<u>9 021</u>
Total	£123 257
<i>Khirokitia and Lefkara Installations Running Expenses</i>	
Wages	27 998
Electricity	3 860
Materials and others	<u>13 372</u>
Total	£45 230
<i>Khirokitia regional water supply scheme Running Expenses</i>	
Wages	—
Electricity	<u>10 550</u>
Total	10 550
Grand total	<u>£179 037</u>

Revenue generated from sale of water in 1981

1 274 941 m ³ of water @ 50 mils/m ³	63 747
117 110 m ³ of water @ 30 mils/m ³	3 513
74 555 m ³ of water @ 20 mils/m ³	1 491
Other collections	<u>807</u>
Total amount collected	69 558
Amount outstanding	<u>127 606*</u>
Total	<u>£197 164*</u>

* Includes an amount of £52,908 representing the

value of 1,058,160 m³ of water @ 50 mils/m³ supplied to Famagusta area occupied by Turks.

Outstanding account upto 31.12.81

	£
Upto 31.12.1980	341 876
For the year 1981	127 606
Total	<u>£469 482**</u>
Less amount collected in 1981 from outstanding account of previous years	37 000
Total outstanding on 31.12.1981	£432 482**

** Includes an amount of £351,846 representing the value of 7,036,929 m³ of water @ 50 mils/m³ supplied to Famagusta area occupied by Turks during the years 1974-1981.

Notes on expenditure and revenue account of Famagusta water supply scheme for 1981

a) The cost of Famagusta Water Supply Scheme amounted to £2, 979,900. Roughly the amortization of this capital investment is £277,010 annually (at 9% for 40 years). Thus, without taking into account office overheads for the management of the Scheme, the deficit for the year 1981 amounts to £258,883. If outstanding payments are not considered as revenue then the deficit rises to £386, 489.

b) Expenditure under the heading "pumping and maintenance charges refers to the following sources:

- 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 sub-surface dam pumping scheme
- The total quantity produced by these sources during 1981 was 1,504,777 m³.

The unit cost of pumping and maintenance was therefore 81.9 mils/m³.

c) Expenditure under the heading "Khirokitia and Lefkara installations - running expenses" refers to the following installations:

- Lefkara dam
- Khirokitia Treatment Works

Total quantity of water treated during the year reached 3,034,809 m³ and the unit running cost was 14.9 mils/m³.

d) Expenditure under the 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 49,440 m³.

FACTS ABOUT EACH OF 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 introduced on 19th April. Because of the increased demand and certain limitations of the distribution system the fair rationing of water to all consumers proved an impossible task. The high parts of the various supply Areas were naturally the worst affected by the intermittent supply and numerous complaints arose. In order to ameliorate the water shortage, the Board, in co-operation with this Department embarked on a water saving campaign. This campaign included advertisements on Television and radio, the distribution to consumers of literature on water saving and of water-filled, sealed nylon bags for introduction as displacers in W.C. cisterns.

Water Supply and other data are given below:-

- Total quantity of water delivered to the Service Reservoirs or directly into the distribution system 9 526 980 m³
- Total quantity of water consumed as registered by area meters 8 676 120 m³
(Including Nicosia Water Commission)
- Total consumption during 1981 as registered by individual consumers meters in the Greek sector only 5 419 309 m³
- Unaccounted for water 23.56%
- Maximum daily summer consumption 38 810 m³

(Based on area meter readings and including Nicosia Water Commission. Registered on 24.8.81 for 17 hours supply in every 48)

- Total number of consumers on 31.12.80 34 181No. and on 31.12.1981 36 087No.
 - Average number of consumers during 1981 35 134No. (Excluding consumers in the area under Turkish control)
 - Average gross supply per connection 553 l/day
 - Extension of distribution system 7 650 m (100 mm and 150 mm dia. A C pipes)
 - Total number of fire hydrants installed during 1981 24 No.
- 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 25.7% of the total supply.

Unaccounted for water between the inlets of the service reservoirs and the consumers has been estimated at 23.56%.

Limassol Water Board

The Water Board sources met satisfactorily the water demand and the town enjoyed a regular supply throughout the year. The Consulting Engineers entrusted with the study of the distribution system submitted their report and recommendations the year. The recommendations include immediate improvements to the distribution system and service reservoirs and phased extensions to cover the needs up to the year 2000. The estimated cost of works proposed for implementation up to 1985 and comprising two new service reservoirs and a number of new mains within the distribution system is £2,340,000.

Water supply data are given below:

- Total quantity of water produced from all sources during 1981 7 661 617 m³
- Total quantity of water consumed during 1981 7 411 301 m³ (as registered by area meters)
- Total consumption during 1981 as registered by individual consumers meters 5 809 807 m³
- Unaccounted for water 24.17%
- Maximum daily summer production (Registered on 7.8.1981) 31 565 m³
- Total number of consumers on 31.12.1980 26 416 No. and on 31.12.1981 28 392 No.
- Average number of consumers during 1981 27 404 No.
- Average gross supply per connection 766 l/day
- Extension of distribution system 12 187 m (100 mm, 150 mm and 200 mm dia. A C pipes)
 - Total length of distribution system as at 31.12.1981 341 081 m
 - Total number of Fire Hydrants installed during 1981 38 No.
 - Total number of Fire Hydrants installed as at 31.12.1981 1 193 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 1981 was 1,058,160 m³.

Larnaca Water Board

The Water Boards sources could not meet the demand and the water supply of the town was supplemented with 1,182,380 m³ from the Famagusta Water Supply Scheme. As a result a regular supply could be maintained throughout the year under review.

Water supply data are given below:

- Total quantity of water supplied during 1981 2 965 820 m³
- Total quantity of water consumed during 1981 (as registered by area meters) 2 931 690 m³
- Maximum daily summer consumption (registered on 5.8.1981) 10 800 m³
- Total number of consumers on 31.12.1980 11 776 No. and on 31.12.1981 13 487 No.
- Average number of consumers during 1981 12 632 No.
- Average gross supply per connection 643 l/day
- Extension of distribution system during 1981 (100 mm, 150 mm and 200 mm dia. A C pipes) 12 010 m
- Fire Hydrants installed in 1981 45 No.
- Total number of Fire Hydrants installed as at 31.12.1981 628 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 supply to the town during summer from the Paphos Lower Villages Regional Scheme by 58,202 m³.

- Total quantity of water produced during 1981 1 239 485 m³
- Total quantity of water consumed during 1981 (as registered by consumer's meters) 884 657 m³
- Unaccounted for water 28.63%
- Maximum average daily summer consumption (for

July, August and September)	4 534 m ³
■ Total number of consumers on 31.12.1980	4 413 No.
and on 31.12.1981	4 921 No.
■ Average number of consumers during 1981	4 667 No.
■ Average gross supply per connection	728 l/day
■ Extension of distribution system	1 885 m
■ Total length of distribution system as at 31.12.1981	130.000 m
■ Number of Fire Hydrants installed during 1981	8 No.
■ Total number of Fire Hydrants installed as at 31.12.1981	31.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 pipe lines and associated pumping installations and are wholly financed by Government. They operate with automatic control equipment. Periodic supervision as well as maintenance work are carried out by the Regional offices of the Department. During the year 1981 the following regional schemes were in operation.

Paphos Lower Villages

This scheme supplies water to 21 communities, to Mesoyi Industrial Estate, Ayios Neophytos Industrial Estate and supplements the Paphos Town Water Supply.

The source of this scheme is BH 57/72 in Xeropotamos river. The total quantity of water distributed during 1981 was 437,301 m³.

The total expenditure for the operation and maintenance of the scheme was £25,710 and the revenue generated was £23,818.

See Table VI-3a.

TABLE VI-3a

PAPHOS LOWER VILLAGES REGIONAL SCHEME

Expenditure and Revenue account for 1981	
Expenditure	£
Electricity cost	21 493
Maintenance expenses	4 217
Total	£25 710

Revenue

Amount collected for 1981	19 825
Outstanding accounts for 1981	3 993
Total	£23 818
Outstanding accounts by 31.12.80 ..	12 455
Less amount collected in 1981	1 008
Total amount outstanding by 31.12.1981	£15 440

Note: This statement does not include for the amortization of the installations and equipment of the scheme. The amortization cost of the installations is estimated at £30,823 per annum. Without taking into account administration overheads, the total deficit for the year 1981 amounts to £32,715.

Arminou Regional Scheme

This scheme supplies water to 8 communities. The source of this scheme BH 56/72 in Dhiarizos river near Arminou village. The total quantity of water distributed to the 8 communities was 18,663 m³.

The total expenditure for the operation and maintenance of this scheme was £5,453. More details on revenue and expenditure are given in table VI-4a.

TABLE VI-4a

ARMINOU REGIONAL SCHEME

Expenditure and Revenue account for 1981

Expenditure	£
Electricity cost	2 846
Maintenance expenses	2 608
Total	£5 354

Revenue

Amount Collected for 1981	178
Outstanding amount for 1981	755
Total	£933
Outstanding amount by 31.12.80	1 489
Total amount outstanding by 31.12.81	£2 244

Note: This statement does not include for the amortization cost of capital expenditure of the scheme amounting to £6,895.

The total deficit for the year under review, without taking into account administration expenses and other overheads, amounts to £11, 316.

Timi Water Supply Scheme

This scheme supplies water to Timi Village only. The source is borehole No. 2821 and the total quantity produced during 1981 was 15,232 m³.

The total expenditure for the operation and maintenance of this scheme was £319 and the revenue generated was £305.

DIVISION OF OPERATION AND MAINTENANCE IRRIGATION BRANCH

By
N. Tsiourtis
Executive Engineer I
Head of Branch

Introduction

This branch encompasses two sections which deal with:

- *The management, operation and maintenance of Government irrigation works.*
- *The maintenance of contributory irrigation works.*

Definitions

Government Waterworks: These are projects constructed under the Government Waterworks Law Cap. 341. These projects are listed in Table VI-1.

Contributory Waterworks. These are irrigation projects constructed under the Irrigation Division Law Cap. 342. A list of these projects is given in Table VI-6.

MANAGEMENT AND OPERATION PROCEDURES

The management and operation of the two main categories of irrigation waterworks are carried out as follows:

1. Government Waterworks

The management and operation of these projects is carried out by Waterworks Committees (with the exception of Paphos Irrigation Project and Khrysokhou Valley Irrigation Scheme where the management and operation is the responsibility of the Director, WDD) established in accordance with the provisions of the relevant Law. The Waterworks Committees are usually composed of the following:

Chairman

District Officer of the district in which the project is situated.

Members

Director of the Water Development Department or his representative. Director of the Land 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 Waterwork Project such as:

- Putting forward recommendations on the development, conservation, management and efficient use of the available water resources of the project.

- Managing and operating 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

- sell the water at the nominal rates approved by the Government and see that the fees and charges are collected (See Table VI-1).

The Committees and the Director of WDD have their own budgets, approved by the Minister of Finance and the Council of Ministers.

The selling rates of water which were approved by the Council of Ministers are shown on Table VI-3

2. Contributory Irrigation Projects

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 role of the Water Development Department in such cases is limited to giving technical advice both to the District Officer and to the Committee. The costs of the operation of these projects is borne in total by the beneficiaries.

3. Government Recharge Waterworks

These are managed directly by the Water Development Department. (See Table VI-7).

MAINTENANCE PROCEDURES

The maintenance of the irrigation waterworks is carried out by the Water Development Department but depending on the type of the Project the expenses are either paid in full by the Government or are shared between the Government and the Irrigation Divisions. The procedures are as follows:

Government Waterworks: The maintenance of these projects is carried out by the Water Development Department being the Government Agency for waterworks and the costs are borne in full by the Government. By the term maintenance we mean routine dam and pipeline maintenance, valves and water me-

TABLE VI-1
GOVERNMENT IRRIGATION PROJECTS-DATA FOR 1981

Ser No	Project	Capacity m ³ X10 ³	Area commanded donoms	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 Donoms	Water utilized index %	Land utilized index %
1	Argaka	990	2 340	1 339	1 184	Nil	Nil	1 184	93	5	1 679	88. 4	72
2	Ayia Marina	300	1 500	464	396	Nil	Nil	396	25	45	484	85. 3	32
3	Kalopanayiotis	363	435	570	207	Nil	Nil	207	45	150	435	36. 3	100
4	Kiti	1 610	6 200	1 610	612	Nil	5 601	6 213	173	3 657	816	385. 9	51
5	Lefkara * *	13 850	615	7 828	43	2 795	Nil	2 838	544	28	175	36. 3	28
6	Mavrokolymbos	2 180	3 355	2 041	1 731	Nil	Nil	1 731	176	Nil	2 650	84. 8	79
7	Pomos	860	2 850	1 096	958	Nil	Nil	958	44	124	889	87. 4	31
8	Polemidthia	3 430											
9	Yermasoyia	13 500	15 440	24 854	8 565	Nil	9 026	17 591	1 516	1 415	15 440	70. 8	100
10	Athalassa	791	310	38	38	Nil	Nil	38	2	Nil	40	100. 0	13
11	Paphos	—	35 000	10 000	5 080	561	Nil	5 641	—	—	9 750	56. 4	—
12	Khapotami	—	4 235	600	600	Nil	Nil	600	—	—	4 235	100. 0	100
13	Khrysokhou valley	—	1 770	211.5	211.5	Nil	Nil	211.5	Nil	Nil	711	100. 0	40
14	Ayios Theodoros (Larnaca) ..	—	460	8	8	Nil	Nil	8	Nil	Nil	36	100. 0	—
	Total		74 510	50 659.5	19 633.5	3 356	14 627	37 616.5	2 618	5 424	37 340	74.25	50

* This is the water that possibly may be utilized: storage + overflow or seepage that may be utilized after deducting evaporation and seepage losses.

* * Water allocated mainly for domestic water supply.

ters repair or replacement painting of metal or woodwork 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 (ID) 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 from both surface and groundwater. The groundwater resources being easier to develop are at present over-pumped. 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 relatively 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 65.5 MCM, 47.8 MCM for irrigation or domestic water supply and the rest 17.7 MCM for recharge purposes where the commanded area has risen to 110,711 donums. Details on the projects and the rate of storage development are given on map "Cyprus Dam Projects" page 14 and "Progress in Dam Construction" graph page 18.

SUMMARY OF MANAGEMENT, OPERATION AND MAINTENANCE DATA

The overall average precipitation during the hydrological year under review was 574 mm or 108% 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 54.25 MCM. From this quantity 22.34 MCM was used for irrigation, 3.36 MCM was used for domestic water supplies, 15.06 MCM was used for recharge, 5.42 MCM seeped through or below the dams and another 3.05 MCM was lost as evaporation. The rest 5.01 MCM remained in the dams for over year storage or was lost as overflow. Projects in the Turkish occupied area are not included here as no records can be collected from these areas.

The total area commanded by the irrigation projects is estimated at 110,711 donums where an estimated area of 41,084 donums has been irrigated, planted with citrus, bananas, deciduous, vegetables, potatoes etc.

Maintenance works totalling £56,995 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 £50,539 were spent where the rest £6,456 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 50.66 MCM. From this total, a quantity of 37.62 MCM or 74.2% was utilized, 19.63 MCM for irrigation, 3.36 MCM for the domestic water supply and 14.63 MCM for recharge purposes. The rest of the water remained in storage or lost in the form of overflow. In the same period 2.62 MCM was lost in the form of evaporation where another 5.42 MCM were lost as seepage or deep percolation (see Table VI-1). The irrigation water was used to irrigate fully or partly 37,340 donums of land planted with citrus, bananas, vines, deciduous, vegetables, potatoes, cereals and olives (see Table VI-2).

The gross income from the sale of water amounted to £253,307 being the income from the sale of water at the rates shown on Table VI-3. The operation expenses amounted to £207,738 being the cost for the pay-

ment of the watermen, energy, the bill collectors etc which amounted to 11.14 mils/m³ of water sold or 5.52 mils/m³ of water utilized. The maintenance expenses on government projects amounted to £50,539 i.e. 2.71 mils/m³ of water sold or 1.34 mils/m³ of water utilized. The total annual operation and maintenance expenses amounted to £258,277 which amounts to 13.85 mils/m³ sold or 6.87 mils/m³ utilized.

Evaporation losses from the reservoirs amounted to 2.62 MCM or 6.9% of the total storage capacity available. The seepage losses were estimated at 5.42 MCM or 14.30% of the total storage, mostly from the Polemidhia and Yermasoyia dams.

The overall water utilization and land utilization indexes are 74.25% and 50.1% respectively. Of the 19.63 MCM used for irrigation 18.64 MCM was sold at the nominal rates, (95.0%) where the rest .99 MCM, (25%) was given free of charge as water right or overflows.

A summary of the above data in detail is given in Tables VI-1, VI-4, and VI-5 where more details are given for each project under separate headings.

Table VI-5 gives data on the operation and maintenance of the government irrigation projects for the last 10 years.

Table VI-8 gives data on the operation and maintenance for the last two years.

Contributory Irrigation Projects

In general there are 33 contributory irrigation projects with total capacity of 7.98 MCM commanding an area of 36,201 donums. Ten projects of total capacity 5.20 MCM or 65.2% of the total capacity of contributory schemes, commanding an area of 26,020 donums are situated in the Turkish occupied area and on which no data is collected. From the rest of the projects the total water collected amounted to 3.11 MCM out of which 2.71 MCM was used for the irrigation of 3,744 donums where the rest was lost in the form of evaporation (see Table VI-6).

Recharge Works

On the Island there are about 33 recharge works of total capacity 17.74 MCM. Out of these projects 20 of the total capacity 15.69 MCM or 88.5% 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 476,000 m³ collected 434,000 m³ were

recharged where 42,000 m³ were lost as evaporation. For information on individual projects see Tables VI-7 and VI-10.

COST OF OPERATION OF SOME IMPORTANT GOVERNMENT PROJECTS

The operation cost of a number of important projects is shown on Table VI-9. This Table shows the running costs (O+M and power) and the unit cost of water.

TABLE VI-2
CROPS AND AREAS IRRIGATED BY GOVERNMENT IRRIGATION PROJECTS

Ser. No.	Crop	Area in donums
1.	Citrus	10 765
2.	Bananas	1 722
3.	Vines	8 211
4.	Deciduous	692
5.	Vegetables	6 650
6.	Potatoes	1 490
7.	Cereals	7 710
8.	Olives	20
	Total	37 340

TABLE VI-3
GOVERNMENT IRRIGATION PROJECTS AND APPROVED WATER CHARGES IN MILS/m³

Ser No.	Project	Overflow	Vegetables	Vines	Deciduous	Citrus	Industrial	Flat Rate
1	Argaka	Free	10	15	15	15	—	—
2	Ayia Marina	5	10	15	15	15	—	—
3	Kalopanayiotis	—	—	—	—	—	—	18
4	Kiti	—	—	—	—	—	—	15
5	Lefkara	—	—	—	—	—	—	10
6	Mavrokolymbos	—	10	15	15	15	—	—
7	Pomos	5	10	10	15	15	—	—
8	Polemihia	3	8,10	15	15	15	—	—
9	Yermasoyia	3	7,10	15	15	15	—	—
10	Athalassa	—	—	—	—	—	—	Free
11	Paphos	—	15	15	15	15	30	15
12	Khapotami	—	—	—	—	—	—	Free
13	Khrysokhou	—	—	—	—	—	—	25

TALBE VI-4 DATA ON MANAGEMENT, OPERATION AND MAINTENANCE OF GOVERNMENT IRRIGATION PROJECTS 1981

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			Income (Net) £
									Oper. £	Maint. £	Total £	
1	Argaka	990	2 340	1 339	1 184	847	1 679	11 685	3 665	917	4 582	7 103
2	Ayia Marina	300	1 500	464	396	324	484	4 457	3 197	726	3 923	534
3	Kalopanayiotis	363	435	570	207	207	435	3 722	3 432	299	3 731	-9
4	Kiti	1 610	6,200	1 610	6 213	612	816	6 121	2 087	1 691	3 778	2 343
5	Lefkara	13 850	615	7 828	2 838	43.35	175	434*	400	1 381	1 781	-1 347
£	Mavrokolymbos	2 180	3 355	2 041	1 731	1 531	2 650	21 532	9 916	2 695	12 611	8 921
7	Pomos	860	2 850	1 096	958	958	889	9 265	8 195	1 250	9 445	-180
8	Polemidthia	3,430										
9	Yermasoyia	13 500	15 440	24 854	17 591	7 670	15 440	97 452	73 202	13 595	86 797	10 657
10	Athalassa	791	310	38	38	—	40	—	—	130	130	
11	Paphos		35 000	10 000	5 641	5 641	9 750	93 028	97 928	27 775	125 703	-32 675
12	Khapotami	—	4 235	600	600	600	4 235					
13	Khrysokhou valley	—	1 770	211.5	211.5	211.5	711	5 288	5 473	—	5 473	-185
14	Ayios Theodoros (Larnaca)	—	460	8	8		36	323	243	80	323	0
	Total	37,874	74 510	50 659.5	37 616.518	644.85	37 340	253 307	207 738	50 539	258 277	-4 838

*For irrigation only

TABLE VI-5
DATA ON WATER USE FOR THE LAST 10 YEARS FOR THE GOVERNMENT PROJECTS

Ser No	Description	Unit	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981
1	Capacity	1000m ³	23 420	2 340	37 890	37 890	37 890	37 890	38 061	37 874	37 874	37 874
2	Water available	"	3 777	1 858	6 367	27 612	28 000	32 003	27 380	28 282	34 408	50 660
3	Water utilized for irrigation	"	NA	NA	NA	7 776	8 388	9 704	9 457	10 847	27 109	19 634
4	Water used for DWS	"	NIL	NIL	NIL	1 000	1 365	2 058	2 856	2 936	2 210	3 356
5	Water used for recharge	"	NA	NA	NA	NA	6 016	3 323	1 982	1 623	6 579	14 627
6	Total water used	"	NA	NA	NA	8 776	15 769	15 085	14 295	15 426	23 609	37 617
7	Evaporation losses	"	NA	NA	NA	2 854	2 570	2 662	2 683	2 409	2 587	2 618
8	Seepage losses	"	NA	NA	NA	NA	428	359	3 367	1 024	5 087	5 424
9	Water sold	"	2 757	971	2 544	5 522	6 624	7 999	8 447	12 642	11 748	18 644
10	Gross income	£	29 891	11 137	26 138	60 600	73 747	93 485	101 367	128 281	169 418	253 307
11	Operation cost	£	7 282	6 450	11 048	12 619	18 627	34 500	33 592	55 197	84 496	207 738
12	Maintenance cost	£	4 849	4 278	4 603	3 174	4 496	8 059	8 165	7 202	18 563	50 539
13	Total expenditure	£	12 131	10 728	15 651	15 793	23 123	42 559	41 757	62 399	103 059	258 277
14	Net income	£	17 260	409	10 487	44 808	50 264	50 926	59 610	65 882	68 159	-4 838
15	Area irrigated	Donums	NA	NA	NA	12 458	17 376	15 459	14 905	20 084	27 109	37 340

TABLE VI-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	Arakapas	128	200	128	110	—	—	110	10	—	171
2	Palekhorio	620	1 000	620	580	—	—	580	40	—	828
3	Prodhromos	110	170	110	105	—	—	105	5	—	120
4*	Morphou	2 000	6 740	—	—	—	—	—	—	—	—
5*	Lefka Marathasa ...	368	1 300	368	338	—	—	338	30	—	482
6*	Geunyeli	1 000	850	—	—	—	—	—	—	—	—
7*	Kanli	1 100	4 000	—	—	—	—	—	—	—	—
8*	Mia Milea	330	1 300	—	—	—	—	—	—	—	—
9*	Ovgos	250	6 370	—	—	—	—	—	—	—	—
10*	Lefka Kafizes	113	770	122	113	—	—	113	9	—	160
11	Pyrgos	283	1 600	283	255	—	—	255	27	—	364
12	Trimiklini	340	650	340	314	—	—	314	26	—	448
13	Lythrodhonda										
	Upper	32	115	32	29	—	—	29	3	—	41
14	Kalokhorio (Klirou) .	32	1 350	32	30	—	—	30	8	—	42
15	Akrounda	22	60	22	20	—	—	20	2	—	29
16*	Galini	22	1 300	—	—	—	—	—	—	—	—
17*	Petra Upper	10	4 690	10	9	—	—	9	1	—	13
18*	Petra Lower	25	—	27	25	—	—	25	2	—	36
19	Lythrodhonda										
	Lower	32	115	32	29	—	—	29	3	—	41
20	Kandou	38	563	38	35	—	—	35	3	—	50
21	Perapedhi	55	195	55	50	—	—	50	5	—	71
22	Agros	72	300	69	64	—	—	64	5	—	91
23	Kyperounda	50	80	49	45	—	—	45	4	—	64
24	Lymbia	220	940	220	103	—	—	103	18	—	50
25	Ayii Vavatsinias (dam)	53	—	57	53	—	—	53	4	—	76
26	Ayii Vavatsinias	55	180	20	18	—	—	18	2	—	26
27	Akapnou- Ephtagonia	132	185	63	58	—	—	58	5	—	83
28	Ephtagonia No.1 ...	92	150	92	85	—	—	85	7	—	121
29	Kato Mylos	104	180	30	27.5	—	—	27.5	2.5	—	40
30	Melini	59	110	59	54.0	—	—	54.0	5.0	—	77
31	Pakhyammos	43	400	43	40.0	—	—	40	3	—	57
32	Pelendria	123	198	123	60	—	—	60	10.0	—	86
33	Khandria	70	140	70	54	—	—	54	6.0	—	77
	Total	7983	36201	3114	2711.5	—	—	2711.5	390.5	—	3744

* Project in Turkish occupied areas

TABLE VI-7
RECHARGE WORKS DATA

Ser No.	Project	Capacity m ³ X10 ³	Water available m ³ X10 ³	Water use for recharge m ³ X10 ³	Water lost in evaporation m ³ X10 ³
1*	Kouklia	4545	—	—	—
2*	Ayios Loucas	455	—	—	—
3	Sotira	45	45	42	3.0
4	Panayia (F)	45	—	—	—
5	Paralimni	115	—	—	—
6	Ayia Napa	55	10	9	1.0
7	Famagusta Antiflood	50	—	—	—
8	Phrenaros	115	100	90	10.0
9	Dherinia	23	23	20	3.0
10	Phrenaros	45	40	36.0	4.0
11	Avgorou	68	5	4.5	0.5
12*	Kondea	82	—	—	—
13	Xylophagou	86	5	4.5	0.5
14	Sotira	32	32	29.0	3.0
15*	Lysi	77	—	—	—
16*	Ayios Yeoryios (k)	68	—	—	—
17*	Ayios Epiktitos	34	—	—	—
18*	Akanthou	45	—	—	—
19	Akhna	40	—	—	—
20	Xylotymbou	50	50	4.5	5.0
21*	Syngراسis	1115	—	—	—
22*	Ayios Yeoryios (F)	90	—	—	—
23*	Famagusta Recharge	165	—	—	—
24*	Ayios Nicolaos (F)	1365	—	—	—
25	Paralimni Lake	1365	86	8.0	6.0
26*	Ayios Loucas Lake	4545	—	—	—
27*	Makrasyka	195	—	—	—
28*	Akhna Mesania	90	—	—	—
29	Vrysoulles	140	—	—	—
30*	Morphou Recharge	130	—	—	—
31*	Morphou (Protopapas)	90	—	—	—
32	Ormidhia	100	80	7.4	6.0
33*	Masari	2273	—	—	—
Total		17738	476	43.4	42.0

* Projects in Turkish occupied area.

TABLE VI-8
DATA ON MANAGEMENT
AND OPERATION OF GOVERNMENT
IRRIGATION PROJECTS FOR
THE LAST TWO YEARS

Item No.	Data	Unit	1980	1981	% change on 1980
1	Capacity	1000 m ³	37 874	37 874	Nil
2	Water available	"	34 408	50 660	+47.2

3	Water utilized for irrigation	"	14 820	19 634	+32.5
4	Water utilized for DWS	"	2 210	3 356	+51.8
5	Water utilized for recharge	"	6 579	14 627	+122.3
6	Total water used		23 609	37 617	+59.3
7	Evaporation losses	"	2 587	2 618	+1.2
8	Seepage losses	"	5 087	10 848	+113.2
9	Water sold	"	11 748	18 644	+58.7
10	Gross income	£	169 418	253 307	+49.5
11	Operation cost	£	84 496	207 738	+145.8
12	Maintenance cost	£	18 563	50 539	+172.2
13	Total expenses	£	103 059	258 277	+150.6
14	Net income	£	68 159	-4 838	—
15	Area irrigated	donums	27 109	37 340	+37.7
16	Area commanded	donums	72 280	74 510	+3.1

TABLE VI-10
CONTRIBUTORY IRRIGATION
WORKS MAINTENANCE COSTS

Ser No	Project	Maintenance cost		Total cost £
		Govt Contrib. £	I D Contrib. £	
1	Arakapas	—	—	—
2	Palekhori	—	—	—
3	Prothromos	—	—	—
4	Pyrgos	596	298	894
5	Trimiklini	—	—	—
6	Lythrohdonda Upper	—	—	—
7	Kalokhorio (Klirou)	—	—	—
8	Akrounda	—	—	—
9	Lythrohdonda Lower	—	—	—
10	Kandou	—	—	—
11	Perapedhi	—	—	—
12	Agros	—	—	—
13	Kyperounda	—	—	—
14	Lymbia (Special case)	4106	—	—
15	Lefka Kafizes	—	—	—
16	Pakhyammos (special case)	273	—	273
17	Kapilio (Special case)	105	—	105
18	Lefka Marathasa (Special case)	1078	—	1078
Total		£6158	£298	£6456

TABLE VI-9
GOVERNMENT IRRIGATION PROJECTS - COST OF WATER

Ser No.	Project	Water Sold m ³	Total water utilized m ³	Operation Maintenance cost £	Power cost £	Total annual cost £	Cost of water	
							mils/m ³ sold water	total utilized
1	Argaka	847 000	1 194 000	4 582	—	4 582	5.40	3.87
2	Ayia Marina	324 000	396 000	3 923	—	3 923	12.12	9.91
3	Kalopanayiotis	207 000	207 000	3 731	—	3 731	18.02	18.02
4	Kiti	612 000	6 213 000	3 778	—	3 778	6.17	50.61
5	Mavrokolymbos	1 531 000	1 731 000	12 611	—	12 611	8.24	7.29
6	Pomos	958 000	958 000	9 445	—	9 445	9.86	9.86
7	Polemihia	—	—	—	—	—	11.32	4.93
8	Yermasoyia	7 670 000	17 591 000	60 267	26 528	86 795	11.32	4.93
9	Paphos	5 641 000	5 641 000	38 775	86 928	125 703	22.28	22.28
10	Khrysoxhou valley	211 500	211 500	1 240	4 233	5 473	26.00	26.00
	Total	18 001 500	34 132 500	£138 352	117 689	£256 041	14.223	7.5

DETAILS ON OPERATION OF GOVERNMENT IRRIGATION PROJECTS

ARGAKA PROJECT

The Argaka Irrigation Project consists of a dam reservoir of maximum capacity at spillway crest 0.99 MCM and a distribution system made of closed conduits commanding an area of 2,340 donums (312 ha). Irrigation in the Project area started late in February and lasted until late in November, 1981. An area of 1,679 donums was irrigated by utilizing about 1.18 MCM of water.

The area irrigated was planted with citrus, bananas, vines, deciduous, vegetables, cereals and potatoes. Out of the 1.33 MCM of water utilized, 847,033 m³ were sold to the farmers at the nominal rate, 336,631 m³ were taken from the overflow, free of charge and the remaining 150,000 m³ were used for recharge. The gross income from the sale of water was £11,685. The expenditure of management was £3,665 where that of maintenance amounted to £917. Net income to the Project was £7,103.

Project Hydrology

The project hydrologic data, as recorded during the year, are tabulated on Table VI-11. The dam reservoir was filled to spillway crest on January 24th and overflow continued until May 23rd 1981. During this period a total quantity of 5,659,285 m³ had overspilled. The minimum level of water in storage ever reached was in November with total quantity in storage around 5,750 m³.

TABLE VI-11
ARGAKA DAM-HYDROLOGY FOR 1981

Item No.	Description	Qty m ³	% Storage capacity
1	Initial amount in storage	276 875	27.97
2	Inflow during the year	6 435 545	650.06
3	Total release	847 033	85.56
4	Leakages	4 931	0.50
5	Evaporation	93 671	9.46
6	Overflow	5 659 285	571.64
7	Final amount in storage	107 500	10.85
8	Minimum quantity in storage (Nov.)	5 750	0.58
9	Storage capacity	990 000	100.00

Water Utilization and Crops Irrigated

The project is built for irrigation purposes and as such, a quantity of 1,183,664 m³ of wa-

ter was utilized for the irrigation of 1,683 donums of land planted with various crops as indicated in Table VI-13. An additional amount of 150,000 m³ was utilized by recharging the aquifer downstream the dam where irrigation water is pumped.

Table VI-12 shows the utilization of the project water and Table VI-13 shows the crops irrigated.

TABLE VI-12
ARGAKA DAM-WATER UTILIZATION

Item No	Description	Qty m ³	% Storage capacity
1	Water used for irrigation	1 183 664	119.56
2	Water used for recharge	150 000	Nil
	Total water utilized	1 333 664	119.56

TABLE VI-13
ARGAKA DAM - CROPS IRRIGATED

Ser No	Crop	Area Donums
1	Citrus	663
2	Bananas	250
3	Vines	38
4	Deciduous	60
5	Vegetables	256
6	Potatoes	—
7	Cereals	300
8	Others	112
	Total	1 679

Water Sale, Income, Operation and Maintenance Costs

The water released for irrigation was 847,033 m³. The total quantity utilized for irrigation, water released from the dam reservoir and overflow, amount to 1,183,664 m³. Out of this 847,033 m³ was sold to the farmers at the nominal rates and the rest 336,631 m³ was given free of charge because of water rights. From the sale of water a total of £11,685 was collected. For the operation of the project an amount of £3,665 was paid to the watermen and bill collectors where for the maintenance of the project another £917 was spent.

Net income for the benefit of the project is £7,103. All the data concerning water sale, operation and management costs are shown on Table VI-14.

Project Performance for the last two years.

Table VI-15 shows the performance of the project for the last two years. As shown there

was an increase in the total volume of water used for irrigation by 2.69% and the area irrigated was increased by 41.33%. The net income to the project was increased by 29.92%.

Generally, the water utilization could be considered as satisfactory.

TABLE VI-14
ARGAKA DAM-INCOME AND EXPENDITURE DATA

Item No	Description	Qty m ³	Amount £
1	Water sold at nominal rates	847 033	11 685
2	Water sold at reduced rates	Nil	Nil
3	Water given free of charge	336 631	Nil
4	Total quantity utilized and gross income	1 183 664	11 685
5	Operation cost	—	3 665
6	Maintenance cost	—	917
7	Net income	—	7 103

TABLE VI-15
ARGAKA DAM-DATA ON PROJECT FOR THE LAST TWO YEARS

Item No	Data	Unit	1980	1981	% Change on 1980
1	Capacity	1000 m ³	990	990	Nil
2	Water available in storage	"	1 405	1 334	-5.050
3	Water utilized for irrigation	"	1 153	1 184	+2.69
4	Water sold	"	697	847	+21.52
5	Water given free	"	456	337	-26.10
6	Water used for recharge	"	Nil	150	—
7	Gross income	£	9 482	11 685	+23.23
8	Operation cost	£	3 417	3 665	+7.26
9	Maintenance cost	£	598	917	+53.34
10	Total expenses	£	4 015	4 582	+14.12
11	Net income	£	5 467	7 103	+29.92
12	Area irrigated	donums	1 188	1 679	+41.37

AYIA MARINA PROJECT

The Ayia Marina Irrigation Project consists of a dam reservoir of capacity at spillway crest of 0.30 MCM and a distribution system commanding an area of 1,500 donums. The distribution system consists of a main canal at the terminal of which tertiary pipes

Project Operation Data for the Last Two Years

Table VI-20 shows data on the operation of the project for the last two years. The water utilization shows an increase by 3.39% where the net income showed an increase by 85.42%. The operation expenditure showed an increase by 15.04%.

The area under irrigation was decreased by 192 dons or by 65.75%.

Generally, the utilization of water in the project area was satisfactory.

TABLE VI-20
AYIA MARINA DAM-DATA ON PROJECT FOR THE LAST TWO YEARS

Item No	Data	Unit	1980	1981	% Change on 1980
1	Capacity	1000 m ³	300	300	Nil
2	Water available in storage	"	731	464	-36.52
3	Water utilized for irrigation	"	383	396	+3.39
4	Water sold	"	383	396	+3.39
5	Water given free	"	Nil	Nil	Nil
6	Water used for recharge	"	Nil	Nil	—
7	Gross income	£	3 468	4 457	+28.52
8	Operation cost	£	2 779	3 197	+15.04
9	Maintenance cost	£	401	726	+81.05
10	Total expenses	£	3 180	3 923	+23.36
11	Net income	£	288	534	+85.42
12	Area irrigated	donums	292	484	+65.75

KALOPANAYIOTIS PROJECT

The Kalopanayiotis irrigation project consists of a dam reservoir of capacity 363,000 m³ and a distribution system of closed conduits commanding an area of approximately 435 donums. Irrigation in the project area, started early in May 1981 and continued throughout the year until October 1981. During this period, a total quantity of 206,781 m³ of water was used for the irrigation of an area of approx. 435 donums planted mainly with deciduous. All the water was sold to the farmers at a fixed rate of 18 mils/m³, and the gross income was £3,722. The operation expenses were £3,432 while the maintenance cost spent on routine works and emergency repairs was £299. The project accounts presented a loss of £9.

Project Hydrology

The project hydrologic data, as recorded during the year under review, are tabulated in Table VI-21. The dam scouring gate was

opened on January 15th 1981 and the reservoir emptied by February 11th 1981. The scouring gate was closed on March 17th 1981 and by March 27th the reservoir was filled to spillway crest. Overflow over the spillway crest occurred two times. The first occurred during the period 9th to 14th January, 1981. The second lasted from March 27th until May 21st 1981. The smallest quantity ever remained in the reservoir during the irrigation season, was 50,000 m³ and occurred in September, 1981.

Water Utilization

During the year under review, a total quantity of 206,781 m³ or water was utilized for the irrigation of 435 donums of deciduous plantations in the project area. The plantations are mainly trees, pear trees and peach trees. Part of the water utilized was taken from the seepage collected downstream in a collection weir. (See Table VI-22 for water utilization).

TABLE VI-21
KALOPANAYIOTIS DAM HYDROLOGY FOR 1981

Item No	Description	Qty m ³	% Storage capacity
1	Initial amount in storage	363 000	100.00
2	Inflow during the year	8 500 000*	2 341.60
3	Total release	206.781	56.96
4	Leakages	150 000*	41.32
5	Evaporation	44 793	12.34
6	Overflow	1 075 751	296.35
7	Final amount in storage	363.000	100.00
8	Minimum quantity in storage (Sept.)	50 000	13.77
9	Storage capacity	363 000	100.00
10	Flow through scouring gate	7 022 675**	1 934.621

* Roughly estimated

** The dam scouring gate was open from 15.1 to 11.2.1981

TABLE VI-22
KALOPANAYIOTIS DAM-WATER UTILIZATION

Item No	Description	Qty m ³	% Storage capacity
1	Water used for irrigation	206 781	56.96
2	Water used for recharge	Nil	Nil
	Total water utilized	206 781	56.96

branch-off to distribute water to each individual plot. Irrigation in the project area started late in March 1981 and continued throughout the year until early in November. An area of 484 donums was irrigated by utilizing about 0.39 MCM. The area irrigated was planted with bananas, vines, deciduous, vegetables and cereals. The water utilized was sold to farmers at the approved rates. Out of the 0.39 MCM utilized, 0.32 MCM were released from the dam and sold to the farmers at nominal rates, whereas the remaining 0.07 MCM were taken from the overflow and were paid at reduced rates. The total gross income from the sale of water amounted to £4,457. The expenditure for the operation was £3,197 and that for maintenance £726. Net income to the project was £534.

Project Hydrology

The project hydrologic data as recorded during the year, are tabulated on Table VI-16.

The dam was overflowing from February 11th 1981 to May 13th 1981. Minimum quantity of water ever stored during the year under review, was 44,090 m³ and this occurred in November 1981.

TABLE VI-16
AYIA MARINA DAM-HYDROLOGY
FOR 1981

Item No	Description	Qty m ³	% Storage capacity
1	Initial amount in storage	70 509	23.50
2	Inflow during the year	572 852	190.95
3	Total release	323.858	107.95
4	Leakages	45 486	15.16
5	Evaporation	25 028	8.34
6	Overflow	180.808	60.27
7	Final amount in storage	68 181	22.73
8	Minimum quantity in storage (Nov.)	44 090	14.70
9	Storage capacity	300 000	100.00

TABLE VI-17
AYIA MARINA DAM-WATER UTILIZATION

Item No	Description	Qty m ³	% storage capacity
1	Water used for irrigation	396 200	132.07
2	Water used for recharge	Nil	Nil
3	Total water utilized	396 200	132.07

Water Utilization and Crops Irrigated

During the year under review, a total quantity of 396, 200 m³ of water was utilized for the irrigation of approximately 484 donums planted with various crops. Details about the water utilization and the crops irrigated and their extent are shown on Tables VI-17 and VI-18.

Water Sale, Income, Operation and Maintenance Costs

From the sale of 396,200 m³ of water, the gross income to the project, amounted to £4,457. Management and operation expenses being the wages of the waterman and that of the dam attendant, amounted to £3,197. Maintenance costs on the dam and the distribution system was £726. Net income to the project is £534. Details regarding sale of water income and costs are given on Table VI-19

TABLE VI-18
AYIA MARINA DAM
CROPS IRRIGATED

Ser No	CROP	Area Donums
1	Citrus	72
2	Bananas	39
3	Vines	12
4	Deciduous	8
5	Vegetables	194
6	Potatoes	—
7	Cereals	15
8	Others	144
	Total	484

TABLE VI-19
AYIA MARINA DAM-INCOME AND
EXPENDITURE DATA

Item No	Description	Qty m ³	Amount £
1	Water sold at nominal rates	323 858	4 095
2	Water sold at reduced rates	72 342*	362
3	Water given free of charge	Nil	Nil
4	Total quantity utilized and gross income	396 200	4 457
5	Operation cost	—	3 197
6	Maintenance cost	—	726
7	Net income	—	534

* It was taken from the overflow

TABLE VI-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

Water Sale, Income, Operation and Maintenance costs

From the sale of water the gross income during the year under review, was £3,722. Operation expenses, including attendant and waterman wages and travelling costs, amounted to £3,432. Maintenance expenses were £299. Net income to the project was £9 loss. Details on these are shown on Tables VI-24 and VI-25.

TABLE VI-24
KALOPANAYIOTIS DAM
INCOME AND EXPENDITURE DATA

Item No.	Description	Qty m ³	Amount
1	Water sold at nominal rates	206 781	3 722
2	Water sold at reduced rates	Nil	Nil
3	Water given free	Nil	Nil
4	Total quantity utilized and gross income ...	206 781	3 722
5	Operation cost	—	3 432
6	Maintenance cost	—	299
7	Net income	—	9

Project Operation Data for the last two years

Table VI-25 shows the operation data for the last two years. The amount of water utilized for irrigation, has increased by 5.08% 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 30.44% whilst the maintenance costs were down by 32.66%. 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 satisfacto-

ry although further increase of the quantity utilized is expected.

TABLE VI-25
KALOPANAYIOTIS DAM-DATA ON
PROJECT FOR THE LAST TWO YEARS

Item No	Data	Unit	1980	1981	% change on 1980
1	Capacity	1000 m ³	363	363	Nil
2	Water available in storage	"	573	570	-0.52
3	Water utilized for irrigation .	"	197	207	+5.08
4	Water sold ...	"	197	207	+5.08
5	Water given free	"	Nil	Nil	Nil
6	Water used for recharge .	"	Nil	Nil	Nil
7	Gross income	£	3 540	3 722	+5.14
8	Operation cost	£	2 631	3 432	+30.44
9	Maintenance cost	£	444	299	-32.66
10	Total expenses	£	3 075	3 731	+21.33
11	Net income ..	£	465	9	-10.2
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 m³ and a distribution system, made of open canals commanding an area of approximately 6,200 donums in the Kiti, Perivolia and Tersephanou villages. Irrigation in the project area started mid March and ended late in September 1981. A total of 612,100 m³ of water were sold at a rate of 10 mils/m³ for the irrigation of approximately 816 donums of citrus, deciduous and seasonal crops mainly potatoes, carrots and ladies fingers. The gross income amounted to £6,121 whereas the operation expenses were £2,087.

The maintenance expenses of the dam and distribution system were of the order of £1,691. The project presents a profit of £2,343. The dam was empty by mid October and was completely dry until December, 1981. A total quantity of 7.209 MCM has been flowing into the reservoir out of which 340,000 m³ were released from scouring gate for recharge purposes and 612,100 m³ were released for irrigation. A quantity of 2.44 MCM has overspilled out of which about 1.60 MCM was used for recharge and about 0.84 MCM flowed to the sea. The rest 3.83 MCM

was lost mostly in deep percolation and to a smaller extent in evaporation.

Project Hydrology

The project hydrologic data as recorded during the year under review are shown in Table VI-26.

Inflow to the reservoir occurred late in January upto July in intermitent periods. The dam reservoir was filled to spillway crest on March 23rd and overflowed until 14th April. Overflow occurred also on June 15th where the flooding water reached the sea.

Water from the reservoir was lost, either in the form of evaporation or seeped through the Meneou and Bekir Pasha chain of wells to recharge the aquifers south and east of the reservoir.

The dam scouring gate was opened on February 16th - 22nd 1981, for the release of water for recharge purposes.

TABLE VI-26
KITI DAM - HYDROLOGY FOR 1981

Item No	Description	Qty m ³	% Storage capacity
1	Initial amount in storage	12 000	0.75
2	Inflow during the year	7 209 505	447.79
3	Total release	612 100	38.19
4	Leakages & Deep Percolation	3 656 535	227.11
5	Evaporation	172 540	10.68
6	Overflow	2 440 330	151.57
7	Final amount in storage	Nil	Nil
8	Minimum quantity in storage (Oct.)	Nil	Nil
9	Storage capacity	1 610 000	100.00
10	Flow through scouring gate	340 000	21.12

Water Utilization and Crops Irrigated

Irrigation in the project area, lasted from March 19th to September 29th 1981 and a total quantity of 612,100 m³ of water was utilized. This quantity irrigated approximately 816 donums of seasonal early crops as shown on Tables VI-27, VI-28. Another quantity of the order of 5.601 MCM was utilized for recharge of the aquifer in the Kiti and Meneou area.

Water Sale, Operation and Maintenance Cost

From the sale of water the gross income amounted to £6,121, where the operation cost was £2,087. The maintenance cost was

£1,691. The project presents a profit of £2,343. Details regarding water sale and cost, are shown on Table VI-29.

Project Operation Data for the Last Two Years

Table VI-30 shows data on the operation of the project for the last two years. There can be no comparison of the data since the water inflow to the reservoir is not steady and dependable. However, comparison of the figures of the last two years, shows that the amount of water in storage was considerably increased because of the great amount of rainfall occurred during the year. Water utilization was done satisfactorily. An area of 816 donums was irrigated while in the last year only 582 donums was irrigated. The operation cost was £2 087 while in the last year was £1 772. The maintenance cost was increased by 57.22%, Still the net income was increased by 29.75 % due to the availability of water.

TABLE VI-27
KITI DAM - WATER UTILIZATION

Item No	Description	Qty m ³	% Storage capacity
1	Water used for irrigation	612 100	24.84
2	Water used for recharge	5 601 535	347.30
	Total water utilized ..	6 213 496	372.14

TABLE VI-28
KITI DAM - CROPS IRRIGATED

Ser No	Crop	Area Donums
1	Citrus	80
2	Bananas	—
3	Vines	—
4	Deciduous	—
5	Vegetables	451
6	Potatoes	265
7	Cereals	—
8	Others	20
	Total	816

TABLE VI-29
KITI DAM - INCOME AND EXPENDITURE DATA

Item No	Description	Qty m ³	Amount £
1	Water sold at nominal rates	612 100	6 121
2	Water sold at reduced rates	Nil	Nil

3	Water given free	5 601 535*	Nil
4	Total quantity utilized and gross income	6 213 496	6 121
5	Operation cost	—	2 087
6	Maintenance cost	—	1 691
7	Net income	—	2 343

* For recharge purposes

TABLE VI-30
KITI DAM - DATA ON PROJECT FOR THE LAST TWO YEARS

Item No	Data	Unit	1980	1981	% change on 1980
1	Capacity	1000 m ³	1 610	1 610	Nil
2	Water available in storage	"	456	1 610	+853
3	Water utilized for irrigation	"	313	612	+95.53
4	Water sold	"	313	612	+95.53
5	Water given free	"	143	340	137.76
6	Water used for recharge	"	143	5 601	—
7	Gross income	£	4 692	6121	+30.46
8	Operation cost	£	1 772	2 087	+17.78
9	Maintenance cost	£	893	1 691	+89.36
10	Total expenses	£	2 665	3 778	+41.76
11	Net income	£	2 027	2 343	+15.58
12	Area irrigated	donums	582	816	+40.21

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 of agricultural land downstream of the dam. The dam consists of (a) a dam reservoir whose capacity is 13.85 MCM (the largest in Cyprus), (b) a distribution system (piped) for the supply of irrigation water to an area of approximately 615 donums, (c) a feeder pipeline, (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 Famagusta, 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 has been given in the section dealing with domestic water supply.

From the sale of irrigation water, the income amounts to £434. Maintenance works were carried out at a total cost of £1,381.

Project Hydrology

The project hydrologic data as recorded during the year under review are tabulated in Table VI-31.

The water in the dam reservoir did not reach spillway crest but remained much lower, with maximum quantity in storage around 7,625,000 m³ or 55.05 % of the total capacity. The average inflow to the dam reservoir during the year, was estimated at 4,869,663 m³. The minimum water level reached, occurred in January with minimum quantity in storage estimated at 3,413,000 m³.

TABLE VI-31
LEFKARA DAM - HYDROLOGY FOR 1981

Item No	Description	Qty m ³	% Storage capacity
1	Initial amount in storage	3 530 000	25.49
2	Inflow during the year	4 869 663	35.16
3	Total release	2 854 351	20.61
4	Leakages	27 618	0.20
5	Evaporation	543 694	3.93
6	Overflow	Nil	Nil
7	Final amount in storage	4 974 000	35.91
8	Minimum quantity in storage (Jan.)	3 413 000	24.64
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 two main categories is shown on Table VI-32.

TABLE VI-32
LEFKARA DAM - WATER UTILIZATION

Item No	Description	Qty m ³	% Storage capacity
1	Water used for domestic WS	2 794 274	20.18
2	Water used for irrigation	43 350	0.31
3	Total water utilized	2 837 624	20.49
4	Water lost in pipeline	16 792	0.12

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 175 donums of land has been irrigated by using 43,350 m³ of water. The area was planted with citrus and vegetables as shown on Table VI-33.

TABLE VI-33
LEFKARA DAM - IRRIGATED CROPS

Ser No	Crop	Area Donums
1	Citrus	100
2	Vegetables.....	75
Total		175

There has been intercropping in the citrus plantation since the trees are very young.

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 £434.

Project Operation Data for the Last Two Years

From the table it is shown that the quantity of water used for irrigation was decreased by 36.76% and domestic water supply was increased by 26.42%.

TABLE VI-34
LEFKARA DAM - PROJECT
OPERATION DATA FOR THE LAST
TWO YEARS

Ser No	Description	Unit	1980	1981	% change on 1980
1	Capacity.....	1000 m ³	13 850	13 850	Nil
2	Water available.....	"	5 816	7 828	+34.59
3	Water utilized for irrigation.	"	68	43	-36.76
4	Water utilized for domestic WS.....	"	2 210	2 794	+26.42
5	Total water utilized	"	2 278	2 838	+24.58
6	Inflow (estimated) ..	"	3 405	4 870	+43.02
7	Area irrigated	donums	135	175	+29.63

MAVROKOLYMBOS PROJECT

The Mavrokolymbos dam irrigation project consists of a dam reservoir of capacity 2.18 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 1981 and continued throughout the year and was terminated late in December.

During the period a total quantity of 1,731,386 m³ of water was utilized for the irrigation of 2,650 donums of bananas, vines and vegetables under cover and in the open. Of the 1,731,386 m³ utilized 1,531,386 m³ was sold at nominal rates. The rest 200,000 m³ was given free of charge to the Potima Chiflik farmers as water rights.

The total gross income from the sale of water amounted to £21,532 where the operation cost amounted to £9,916. The maintenance expenses were £2,695 thus reducing net project income to £8,921.

Project Hydrology

The project hydrologic data as recorded during the year under review are tabulated on

TABLE VI-35
MAVROKOLYMBOS DAM
HYDROLOGY FOR 1981

Item No	Description	Qty m ³	% Storage capacity
1	Initial amount in storage	137 000	6.28
2	Inflow during the year	2 080 702	95.44
3	Total release	1 721 475	78.97
4	Leakages.....	Nil	Nil
5	Evaporation	176 227	8.08
6	Overflow	Nil	Nil
7	Final amount in storage	320 000	14.68
8	Minimum quantity in storage (Nov.)	122 000	5.60
9	Storage capacity	2 180 000	100.00
10	Quantity of water flowing directly in the irrigation channel from stream	9 911	0.45

Water Utilization and Crops Irrigated

During the irrigation season a total of 1,731,386 m³ of water was utilized for the irrigation of 2,650 donums of various crops as shown on Table VI-37.

Water Sale, Income, Operation and Maintenance Costs

From the sale of water the gross income was

£21,532. The water sold from the dam reservoir was at nominal rates 10 and 15 mils/m³. The operation expenses amounted to £9,916 where the maintenance works costs were £2,695. Net income to the project was £8921. Details regarding the income expenditure and operation costs are shown on Table VI-38.

Project performance for the last two years

Table VI-39 shows data on the operation of the project for the last two years. There is an increase in the quantity of water available which resulted to increase the area irrigated by 28.64%. The operation expenses were down as 4.56% while maintenance expenses were up by 6.06%. The net income to the project was increased by £2,010 or 29.08%.

TABLE VI-36
MAVROKOLYMBOS DAM-WATER UTILIZATION

Item No	Description	Qty m ³	% Storage capacity
1	Water used for irrigation	1 731 386	79.42
2	Water used for recharge	Nil	Nil
Total water utilized ..		1 731 386	79.42

TABLE VI-37
MAVROKOLYMBOS DAM - CROPS IRRIGATED

Ser No	Crop	Area Donums
1	Citrus	120
2	Bananas	800
3	Vines	50
4	Deciduous	30
5	Vegetables	600
6	Potatoes	400
7	Cereals	—
8	Others	650
Total		2 650

TABLE VI-38
MAVROKOLYMBOS DAM - INCOME AND EXPENDITURE DATA

Item No	Description	Qty m ³	Amount £
1	Water sold at nominal rates.....	1 531 386	21 532
2	Water sold at increased rates	Nil	Nil
3	Water given free of charge	200 000	Nil
4	Total quantity utilized and gross income ...	1 731 386	21 532

5	Operation cost	—	9 916
6	Maintenance cost....	—	2 695
7	Net income.....	—	8 921

TABLE VI-39
MAVROKOLYMBOS DAM - DATA ON PROJECT FOR THE LAST TWO YEARS

Item No	Data	Unit	1980	1981	% Change on 1980
1	Capacity.....	1000 m ³	2 180	2 180	Nil
2	Water available in storage	"	1 333	2 041	+53.11
3	Water utilized for irrigation .	"	1 307	1 731	+32.44
4	Water sold ...	"	1 207	1 531	+26.84
5	Water given free	"	100	200	100.00
6	Water used for recharge .	"	Nil	Nil	Nil
7	Gross income	£	19 842	21 532	+8.52
8	Operation cost	£	10 390	9 916	-4.56
9	Maintenance cost	£	2 541	2 695	+6.06
10	Total expenses	£	12 931	12 611	-2.47
11	Net income ..	£	6 911	8 921	+29.08
12	Area irrigated	donums	2 060	2 650	+28.64

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 mid March 1981 and continued throughout the year until late in November 1981.

An area of 889 donums of land planted with citrus, bananas and vegetables was irrigated by utilizing 957,525 m³ of water. From the total water utilized 885,384 m³ were taken directly from the dam reservoir whereas the remaining 72,141 m³ were taken from the overflow occurring in the period January the 29th - May the 14th 1981.

The total gross income from the sale of water amounted to £9,265. The expenditure for the maintenance was £1,250 whereas the operation and management costs were £8,195. Net income to the project for the year under review was £180 loss.

Project Hydrology

The project hydrologic data as recorded during the year are tabulated in table VI-40.

The reservoir was filled to spillway crest on January the 29th and overflow occurred during the period January the 29th to May 14th 1981. Minimum water level in the reservoir occurred in November with water in storage around 18,181 m³.

TABLE VI-40
POMOS DAM-HYDROLOGY FOR 1981

Item No	Description	Qty m ³	% Storage capacity
1	Initial amount in storage	106 818	12.42
2	Inflow during the year	5 261 484	611.80
3	Total release	885 584	102.95
4	Leakages	124 289	14.45
5	Evaporation	43 686	5.08
6	Overflow	4 132 898	480.57
7	Final amount in storage	182 045	21.17
8	Minimum quantity in storage (Nov.)	18 181	2.11
9	Storage capacity	860 000	100.00

Water Utilization and Crops Irrigated

The 957,525 m³ of water was utilized for the irrigation of 889 donums within the project area. Details about the water utilized and the crops irrigated are shown on Tables VI-41 and VI-42.

TABLE VI-41
POMOS DAM-WATER UTILIZATION

Item No	Description	Qty m ³	% Storage capacity
1	Water used for irrigation	957 525	111.34
2	Water used for recharge	Nil	Nil
Total water utilized ..		957 525	111.34

TABLE VI-42
POMOS DAM-CROPS IRRIGATED

Item No	Crop	Area Donums
1	Citrus	369
2	Bananas	378
3	Vines	—
4	Deciduous	25
5	Vegetables	58
6	Potatoes	—
7	Cereals	59
Total		889

Water Sale, Income, Operation and Maintenance Costs

From the sale of water (see details on Table

VI-43) the total gross income amounted to £9,265 whereas the operation and management costs were £8,195. Maintenance works on the dam and distribution system were £1,250. Net income to the project for the year under review amounted to £180 loss.

TABLE VI-43
POMOS DAM-INCOME AND EXPENDITURE DATA

Item No	Description	Qty m ³	Amount £
1	Water sold at nominal rates	885 384	8 590
2	Water sold at reduced rates	72 141*	675
3	Water given free of charge	Nil	Nil
4	Total quantity utilized and gross income ...	957 525	9 265
5	Operation cost	—	8 195
6	Maintenance cost	—	1 250
7	Net income	—	-180

* This quantity was taken from the overflow.

Project Performance Data for the Last Two Years

Table VI-44 shows data regarding hydrologic, water utilization, water sales, gross income, operation, maintenance costs, net income and areas irrigated for the last two years.

The last column of the table shows the change in percentages of the quantities of 1981 over the previous year.

The quantity of water utilized for irrigation was increased by 9.96% while the gross income was reduced by 6.24%. The area irrigated was increased by 50.17%.

The operational costs were increased by 52.07% while the maintenance cost by 34.70%. Total expenses were up by 49.52%. However in this year a loss of £180 was presented by the project whilst last year there was a profit of £3,565.

TABLE VI-44
POMOS DAM-DATA ON PROJECT FOR THE LAST TWO YEARS

Item No	Data	Unit	1980	1981	% Change on 1980
1	Capacity	1000 m ³	860	860	Nil
2	Water available in storage ...	"	1 162	1 096	+8.68
3	Water utilized for irrigation .	"	1 064	958	-9.96

4	Water sold . . .	"	912	958	+5.04
5	Water given free	"	153	Nil	—
6	Water used for recharge . . .	"	Nil	Nil	Nil
7	Gross income	£	9 882	9 265	-6.24
8	Operation cost	£	5 389	8 195	+52.07
9	Maintenance cost	£	928	1 250	+34.70
10	Total expenses	£	6 317	9 445	+49.52
11	Net income	£	3 565	-180	—
12	Area irrigated	donums	592	889	+50.17

YERMASOYIA-POLEMIDHIA PROJECT

The Yermasoyia-Polemihdia 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.

Irrigation in the project area started early in January 1981 and continued throughout the year until late in December 1981. A total quantity of 8,565,433 m³ of water was utilized from both dams (7,358,187 m³ from Yermasoyia and 1,207,246 m³ from Polemidhia dam) 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 8,561,427 m³ of water 895,727 m³ was given free of charge as water rights to the Yermasoyia and Polemidhia Irrigation Divisions (386,958 m³ for Kato Polemidhia, 508,769 m³ for the Yermasoyia Irrigation Division) and 1,366,660 m³ was given at reduced rates 7 or 8 mils per cubic meter. The rest 6,303,030 m³ was sold at the nominal rates. Overflow occurred from both dams. Yermasoyia dam overflowed in the period February 1st to May 20th and Polemidhia February 28th to April 17th. The total quantity from the overflow was 24,882,429 m³ (20,908,604 m³ from Yermasoyia and 3,973,825 m³ from Polemidhia). Part of this water found its way to the sea and the remaining recharged 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.

Total gross income from the sale of water

amounted to £97,452 where the operating costs, including power expenses amounted to £73,202. The maintenance works carried out by the WDD were of the order of £13,595.

Project Hydrology

The project hydrologic data as recorded during the year under review are tabulated in the following tables. The data for each dam reservoir are given separately.

POLEMIDHIA DAM

The inflow to the Polemidhia dam during the year under review totalled 6,493,315 m³ representing 189.31% of the reservoir capacity. The reservoir filled to spillway crest and overflow took place for two months from February 28th to April 17th 1981. Leakages occurred through the dam and part of these were intercepted downstream for irrigation purposes. Releases from the dam reservoir were only 446,590 m³ where the total water utilized for irrigation and recharge amounted to 4,207,246 m³. As it is seen, most of the leakage water was intercepted for irrigation.

TABLE VI-45
POLEMIDHIA DAM-HYDROLOGY
FOR 1981

Item No	Description	Qty m ³	% Storage capacity
1	Initial amount in storage	1 162 000	33.88
2	Inflow during the year	6 493 315	189.31
3	Total release	446 590	13.02
4	Leakages	1 401 050	40.85
5	Evaporation	328 850	9.59
6	Overflow	3 973 825	115.85
7	Final amount in storage	1 505 000	43.88
8	Minimum quantity in storage (Jan.)	1 153 000	33.62
9	Storage capacity	3 430 000	100.00

YERMASOYIA DAM

The inflow to the dam during the year under review was estimated at 31.097 MCM mostly occurring in the months of January to August and in November and December. Out of this inflow 20.90 MCM overspilled and part of it recharged the aquifer downstream. Overflow took place over a period of four months, February to May 1981 (See Table VI-46).

Water Utilization from both Dams

Details regarding water utilization from both dams separately and in combine are shown on Table VI-47, VI-48, and VI-50. In summary,

during the year under review a total quantity of 17,591,333 m³ of water was utilized for irrigation and recharge purposes. Out of this quantity 8,565,433 m³ was utilized for the irrigation (fully or in part) of 15,440 donums as indicated in Table VI-49. The rest 9,025,900 m³ was utilized to recharge the Garyllis and Yermasoyia aquifers.

TABLE VI-46
YERMASOYIA DAM - HYDROLOGY FOR 1981

Item No	Description	Qty m ³	% Storage capacity
1	Initial amount in storage	5 762 000	42.68
2	Inflow during the year	31 264 477	231.59
3	Total release	7 384 087	54.70
4	Leakages	11 046	0.08
5	Evaporation	1 187 740	8.80
6	Overflow	20 908 604	154.88
7	Final amount in storage	7 535 000	55.81
8	Minimum quantity in storage (Nov.)	6 450 000	47.78
9	Storage capacity	13 500 000	100.00

TABLE VI-47
POLEMIDHIA DAM WATER UTILIZATION

Item No	Description	Qty m ³	% Storage capacity
1	Water used for irrigation	1 207 246	35.20
2	Water used for recharge	3 000 000	87.46
	Total water utilized	4 207 246	122.66

TABLE VI-48
YERMASOYIA DAM WATER UTILIZATION

Item No	Description	Qty m ³	% Storage capacity
1	Water used for irrigation	7 358 187	54.50
2	Water used for recharge	6 025 900	44.64
	Total water utilized	13 384 087	99.14

Water Sale, Income, Operation and Maintenance Costs

Details about the quantity sold at the nominal rates, water given free of charge as water rights and the water given at reduced rates are given in Table VI-51.

From the sale of water the total gross income was £97,452. The operation cost including power cost totalled £73,202 where the maintenance costs spent on routine works was £13,593. Details regarding income and expenditure are shown on Table VI-51

Project Operation Data for the Last Two Years

Table VI-52 gives details regarding the operation for the last two years. The last column shows the fluctuations of the various data of the Project Operation. Although there is an increase in water utilization and water sales the net return are reduced. This is due to the fact that operational costs have increased considerably.

TABLE VI-49
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 tress	20
	Total	15 440

TABLE VI-50
YERMASOYIA - POLEMIDHIA PROJECT WATER UTILIZATION

Ser No	Description	Qty m ³	% Storage capacity
1	Water used for irrigation (Y. & P.)	8 565 433	50.59
2	Water used for recharge	9 025 900	53.31
	Total water utilized	17 591 333	103.91

TABLE VI-51
YERMASOYIA - POLEMIDHIA PROJECT INCOME & EXPENDITURE DATA

Ser No	Description	Qty m ³	Amount £
1	Water sold at nominal rates	6 303 046	88 267
2	Water sold at reduced rates*	1 366 660	9 185
3	Water given free of charge as water rights to: - Yermasoyia Irrig. Division	508 769	Nil

- Polemidhia Irrig.		
Division	386 958	Nil
4 Total quantity/ income	8 565 433	97 452
5 Operation cost	—	46 674
6 Power cost	—	26 528
7 Maintenance cost (Yermasoyia & Polemidhia)	—	13 593
8 Total cost	—	86 795
9 Net income	—	10 657

* Reduced rates 8 mils/m³ for the supply of water to Polemidhia Irrigation Division (586,988 m³) 7 mils/m³ for the supply of water to the Yermasoyia Irrig. Division (537,462 m³) and 3 mils/m³ for the overflow (242,210 m³).

TABLE VI-52
**YERMASOYIA-POLEMIDHIA PROJECT -
DATA ON PROJECT FOR THE
LAST TWO YEARS**

Ser No	Description	Unit	% Change		
			1980	1981	on 1980
1	Capacity	1000 m ³	16 930	16 930	Nil
2	Water available	"	21 248	24 854	+16.97
3	Water utilized for irrigation	"	8 657	8 565	-1.06
4	Water sold	"	7 831	7 670	-2.06
5	Water given free	"	826	895	+8.47
6	Water used for recharge	"	6 436	9 026	+40.24
7	Total quantity used	"	15 093	17 591	+16.52
8	Gross income	£	102 214	97 452	-4.66
9	Operation cost	£	36 902	46 674	+26.48
10	Power cost	£	14 518	26 528	+82.72
11	Maintenance cost	£	7 720	13 593	+76.08
12	Total expenditure	£	59 140	86 725	+46.76
13	Net income	£	43 074	10 657	-75.26
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 1982.

The Project will consist of the Asprokremos dam of maximum capacity at spillway crest of 51.00 MCM and a wellfield (24 No. 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 38,000 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. Since the dam is not yet completed the water quantity for irrigation is very limited this being the water pumped from the 24 boreholes, and the water diverted from the Dhiarizos river.

Irrigation in the project area started in March 1981 and was completed late in December 1981. During this period a quantity of 5.080 MCM of water was utilized for the irrigation of 9750 donums of land, planted with various crops. Also another .561 MCM was given for industrial purposes. In brief the water was utilized as shown on Table VI-53. The crops irrigated were citrus, vegetables etc as shown on Table VI-54.

The operation and maintenance of the project is the responsibility of the WDD. From the sale of water with prices fixed at 15 mils/m³ for irrigation, and 30 mils/m³ for industrial uses. The income for 1981 is around £93,028. The operation expenses amounted to £11,000 the power cost to £86,928 and the maintenance cost to £27,775. Total annual cost amounted to £125,703.

TABLE VI-53
PAPHOS PROJECT WATER RESOURCES

Item No	Sources	Quantity m ³
1	Surface flow division from Dhiarizos river	2 100 000
2	Boreholes in Dhiarizos river	3 177 895
3	Boreholes in Ezusas river	1 376 281
4	Boreholes in Xeropotamos river	260 428
Total		6 914 604

TABLE VI-54
**PAPHOS IRRIGATION PROJECT -
WATER UTILIZATION**

Item No	Description	Qty m ³
1	Water used for irrigation	5 079 976
2	Water used for recharge	Nil
3	Water used by Anatoliko Industry	560 945
4	Total water utilized	5 640 921
5	Total water lost	1 273 683
Total water pumped		6 914 604

Project Hydrology & Water Resources

Due to the fact that the Asprokremmos dam is not yet completed all the quantity of water of the order of 6,914,604 m³ was taken either from boreholes or river diversion as shown on Table VI-53

Water Utilization and Crops Irrigated

From the water developed 1,273,653 m³ was lost in the canal system where the remainder was used for the irrigation of 9750 donums planted with various crops as shown on Table VI-55 and for industrial use in the Anatoliko industries (see table VI-54 for water utilization).

TABLE VI-55

PAPHOS IRRIGATION PROJECT - CROPS IRRIGATED

Ser No	Crop	Area donums
1	Citrus	1 987
2	Bananas	255
3	Vines	—
4	Deciduous	—
5	Vegetables	825
6	Potatoes	825
7	Cereals	—
8	Avocados	45
9	Alfa-alfa	263
10	Ground-nut	2 550
11	Beans	3 000
Total		9 750

Water Sale, Income, Operation and Maintenance Costs

The project yield was around 6.91 MCM out of which 5.08 MCM was used for irrigation and 0.56 MCM was used for industrial purposes. The irrigation water was sold at 15 mils/m³ where the industrial water was sold at 30 mils/m³.

From the sale of water the total income amounted to £93,028, whereas the operation and maintenance costs were £125,703. Details are shown on Table VI-56.

TABLE VI-56

PAPHOS IRRIGATION PROJECT - INCOME AND EXPENDITURE

Item No	Description	Qty m ³	Amount £
1	Water pumped from boreholes	6 914 604	—
2	Water pumped from pumping station	6 040 950	—
3	Water sold (Total) for irrigation	5 079 976	76 200

	for industrial use	560 945	16 828
4	Operation cost	—	11 000
5	Pumping cost	—	86 928
6	Maintenance cost	—	27 775
7	Total annual cost	—	125 703
8	Net Income	—	-32 675

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.

Project Operation data for the Last Two Years

Table VI-57 give details regarding the operation and maintenance for the last two years. The last columns show the percentage variation of this data with respect to 1980 figures.

TABLE VI-57

PAPHOS PROJECT - DATA ON OPERATION FOR THE LAST TWO YEARS

Item No	Description	Unit	1980	1981	% Change on 1980
1	Yield	1000 m ³	10 000	10 000	Nil
2	Water available	"	10 000	10 000	Nil
3	Water utilized	"	1 080	6 914	540
4	Water sold for irrigation	"	436	5 080	1 065
5	Water sold for industrial use	"	644	561	-13
6	Total water sold	"	1 080	5 641	422
7	Gross income	£	15 712	93 028	492
8	Operation cost	£	2 739	11 000	302
9	Power cost	£	3 959	86 928	2 095
10	Maintenance cost	£	4 638	27 775	4 988
11	Total annual cost	£	11 336	125 709	1008
12	Net income	£	4 376	-32 675	—
13	Area Irrigated	donums	1 900	9 750	413

From the above Table it is seen that the project water utilization is increased tremendously. However the cost/income ratio in worsening since the annual cost, are not recovered.

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. Irrigation in the project started late in March and was continued until mid of June, 1981. During the period a total quantity of 0.038 MCM of water was used for the irrigation of about 40 donums planted with cereals, vines and vegetables. The water is not charged. Maintenance cost £130.

KHAPOTAMI PROJECT

The KhaPotami irrigation project consists of a diversion weir and a diversion pipeline capable of diverting a flow of 500 cubic meter/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 Division. 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 m³/hr the water will be given in total to the Pissouri Irrigation Division.

★ If the works divert more than 225 m³/hr but less than 325 m³/hr the 225 m³/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 m³/hr then the water will be allocated as follows:-

- 225 m³/hr to Pissouri Irrigation Division.
- 100 m³/hr to Alektora Irrigation Division.
- 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 1981 and was completed in June 1981 when the river flow

diminished. In this period a total of 600,000 cubic meters of water was utilized for the supplementary irrigation of 4,235 donums of land planted with vines.

KHRYSOKHOU VALLEY PROJECT

The Khrysokhou valley project consist 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 regions 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 December 1981. During this period a total quantity of 211,510 m³ of water was utilized by the farmers and the income, at 25 mils/m³, amount to £5,288. The operation and maintenance expenses including pumping cost amount to £5,473.435. 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 £185.435 was observed.

Out of the 1770 donums commanded by the distribution system only an area of 711 donums was irrigated

AYIOS THEODHOROS SCHEME (LARNACA)

The Ayios Theodoros 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 upon completion was turned over to the irrigation 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 under review the scheme was in operation from August to October during which period a total quantity of 8010 m³ was pumped and used for irrigation. All the expenses for the operation and maintenance of the scheme totalling approximately £323 were undertaken by the irrigator. The area irrigated was around 36 donums planted mainly with citrus.

VII SMALL PROJECTS PLANNING DIVISION

by
C Andreou
Senior Water Engineer
Head of Division

Introduction

The Small 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 Intergrated 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, and the administration of capital aid from the Federal Republic of Germany.

By the end of 1981 the staff of the Division was consisting of the following:

- 1 Senior Water Engineer - Head of the Division
- 1 Executive Engineer - Class I
- 1 Technical Superintendent
- 1 Senior Technician
- 5 Technicians I
- 3 Technicians II
- 1 Hourly paid Technician
- 1 Secretary - Typist

VILLAGE WATER SUPPLY SCHEMES

The general village water supply situation during 1981 is described in Tables VII-1 and VII-2. There are no villages in Cyprus without piped water.

With the completion of one house to house

supply during 1981 only 58 out of a total number of 619 villages remain with public fountains representing 1.94 % of the total rural population.

Out of 561 villages with house to house supply systems 547 enjoyed a per capita daily rate of over 90 liters (20 gallons).

Water Supply Schemes Prepared During 1981

A total number of 65 schemes was prepared and submitted to the District Officers during 1981, at a total estimated cost of approx £1.5 million as shown on Table VII-3.

Another 53 schemes were in the course of preparation by the end of the year as per Table VII-4

Besides the above mentioned schemes a total number of 24 water supply schemes was prepared for the housing of displaced persons at a total estimated cost of £240,000 as per Table VII-3A, which were submitted to the Director of 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 water Boards, the Division is dealing also with the design of town water supply schemes.

TABLE VII-1
VILLAGE WATER SUPPLIES

Year	Villages with House-to-House distribution system			Village with Public Fountains			Village without a piped supply				
	Schemes completed	Total No. of Villages	Villages %	Population %	Total No. of Villages	Villages %	Population %	Total No. of Villages	Villages %	Population %	Total No. of Villages
1960	—	90	14.33	—	441	70.23	—	97	15.44	—	628
1961	41	131	20.86	—	428	68.19	—	69	10.95	—	628
1962	59	190	30.25	—	380	60.55	—	58	9.20	—	628
1963	67	257	40.90	—	324	51.60	—	47	7.50	—	628
1964	39	296	47.13	66.71	323	51.43	32.29	9	7.44	1.00	628
1965	5	301	47.93	68.86	321	51.11	30.44	6	0.96	0.70	628
1966	7	308	49.05	69.81	316	50.31	29.95	4	0.64	0.24	628
1967	11	319	50.80	71.40	307	48.88	28.46	2	0.32	0.14	628
1968	27	346	55.10	75.72	282	44.90	24.28	—	—	—	628
1969	14	360	57.32	78.60	268	42.68	21.40	—	—	—	628
1970	32	392	62.42	83.23	236	37.58	16.77	—	—	—	628
1971	16	408	64.95	85.42	220	35.05	14.58	—	—	—	628
1972	29	437	69.60	88.70	191	30.40	11.30	—	—	—	628
1973	67	504	81.40	95.10	115	18.60	4.90	—	—	—	619
1974	22	526	85.00	97.20	93	15.00	2.80	—	—	—	619
1975	6	532	85.94	97.55	87	14.06	2.45	—	—	—	619
1976	11	543	87.72	97.60	76	12.28	2.40	—	—	—	619
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	—	—	—	—

Brief description of Important Water Supply Schemes prepared during 1981

Laxia: A scheme was prepared to provide additional water to the village and nearby housing estates at a total estimated cost of £94,000 from BH 41/80.

Lakatamia: Additional water supply scheme from BHs 100/80 and 107/80 was prepared at a total estimated cost of £57,500.

Dhali: Additional water supply scheme from BH 94/80 was prepared at a total estimated cost of £124,800.

Aredhiou: Overall improvement of the existing water supply distribution system at a total estimated cost of £41,000.

Mammari: New scheme to supply domestic water to building sites at a total estimated cost of £30,500.

Pendakomo: Scheme prepared for additional supply and extensions at a total estimated cost of £34,900.

Asgata: Additional water supply scheme from BH 60/80 at a total estimated cost of £30,000.

Episkopi: This scheme was designed to provide with water the livestock-area at a total estimated cost of £36,500.

Trimiklini: Additional water supply scheme and new distribution system at a total estimated cost of £50,000.

Mari: New distribution scheme to replace the old existing systems at a total estimated cost of £31,000.

Voroklini-Livadhia-Aradhippou-Pyla: Scheme to provide additional water from several boreholes at a total estimated cost of £50,000.

Kalokhorio: This scheme was prepared to provide water to the livestock farming area at a total cost of £29,000.

Anavargos: Scheme for extensions and new storage tank at a total estimated cost of £37,800.

Paphos Town: New pumping scheme at a total estimated cost of £220,000.

Ayia Napa: New distribution scheme at a total estimated cost of £124,000.

TABLE VII-2
WATER SUPPLY SITUATION AT THE END OF 1981

District	Satisfactory piped supply supply rate 90 litres/head/day & over			Unsatisfactory piped supply supply rate below 90 litres/head/day			Total	Total popul 1969
	No.	%	Pop.	No.	%	Pop.		
Nicosia	138	81.66	112 215	90.28	8	4.73	1069	860
Kyrenia	39	82.98	30 786	93.50	2	4.26	59	1 542
Famagusta	82	83.68	82 644	92.12	3	3.06	444	1 542
Limassol	104	91.23	72 527	97.87	3	2.63	7	1 049
Paphos	102	77.27	46 156	89.29	13	9.85	2 202	1 224
Larnaca	51	86.44	36 845	90.90	2	3.39	156	445
Total	516	83.36	381 173	92.23	31	5.01	3 970	4 045

TABLE VII-3
VILLAGE WATER SUPPLY SCHEMES
PREPARED IN 1981 AND SUBMITTED TO
DISTRICT OFFICERS

Ser.	No. Village and Nature of Scheme	Est. Cost £
NICOSIA DISTRICT		
1	<i>Astromeritis</i> Extensions and improvements	27 500
2	<i>Argates</i> Additional supply from well	16 500
3	<i>Aredhiou</i> Improvements	41 000
4	<i>Lakatamia</i> WS to CYTA station	4 500
5	<i>Pera</i> WS to CYTA station	13 600
6	<i>Laxia</i> Additional supply from BH 41/80	94 000
7	<i>Pera</i> Extensions	16 500
8	<i>Lakatamia</i> Additional supply from BHs 100/80, 107/80	57 500
9	<i>Dhali</i> Additional supply from BH 94/80	124 800
10	<i>Paleometokho</i> Additional supply from BH 17/81	19 500
11	<i>Dheftera</i> Additional supply from BH 45/81	19 000
12	<i>Klirou</i> Extensions	13 000
13	<i>Laxia</i> WS to new cemetery	1 900
14	<i>Politiko</i> Additional supply from BH 48/79	20 200
15	<i>Kalokhorio</i> Installation of automatic control system	550
16	<i>Christos Ioannou (Foundation)</i> Laying of new pipeline	4 100
17	<i>Lakatamia</i> Temporary supply from BH 117/80	9 100
18	<i>Phlasou</i> Improvements	2 000
19	<i>Lincou</i> Laying of new main conveyor from 'Mahmouties' spring	10 000
20	<i>Dhenia</i> Supply of water to building sites	5 000
21	<i>Anayia</i> Extensions	450
22	<i>Mammari</i> Supply of water to building sites	30 500
23	<i>Ayii Trimithias</i> Extensions	2 600
24	<i>Alambra</i> Supply of water to Nisou cemetery	1 300
25	<i>Christos Ioannou (Foundation)</i> Laying of pipeline	3 600
26	<i>Laxia</i> Improvements on BH 97/78	2 000
27	<i>Sha</i> Connection to Nicosia main pipeline	17 000
28	<i>Lymbia</i> Connection to Nicosia main pipeline	2 600
Total		£560 300

LIMASSOL DISTRICT

1	<i>Omodhos</i> Additional supply	26 000
2	<i>Vouni</i> WS to LOEL factory	13 200
3	<i>Pendakomo</i> Additional supply & extensions	34 900
4	<i>Louvaras</i> WS to building plots	2 750
5	<i>Asomatos</i> WS from BH 11/81	14 000
6	<i>Apesha</i> Extensions	5 000

7	<i>Episkopi</i>	WS to livestock area	36 500
8	<i>Asgata</i>	Additional supply from BH 60/80	30 000
9	<i>Ayia Irini</i>	Building sites	1 570
10	<i>Pano Kividhes</i>	Improvements	440
11	<i>Pyrgos</i>	Extensions	18 200
12	<i>Ayios Athanasios</i>	Improvements	121 500
13	<i>Trimiklini</i>	New distribution system	50 500
14	<i>Erimi</i>	Improvements	24 000
		Total	£378 560

PAPHOS DISTRICT

1	<i>Letyrnbou</i>	New main conveyor	7 700
2	<i>Anavargos</i>	Extensions-New storage tank	37 800
3	<i>Pano Arodhes</i>	Additional supply (pumping scheme)	10 900
4	<i>Ayia Marinoudha</i>	Extensions	9 560
5	<i>Paphos Town</i>	New pumping scheme	220 000
		Total	£285 960

FAMAGUSTA DISTRICT

1	<i>Ayia Napa</i>	Improvement of village square	8 000
2	<i>Ayia Napa</i>	New distribution system	124 000
3	<i>F/sta Pipeline</i>	Connection of Maroni- Psematismenos BH to F/sta main pipeline	7 000
		Total	£139 000

LARNACA DISTRICT

1	<i>Psevdhas</i>	WS to building sites	5 500
2	<i>Klavdhia</i>	Additional supply from B/H 51/80	6 778
3	<i>Mosphiloti</i>	WS to building sites	2 800
4	<i>Mari</i>	New distribution system	31 000
5	<i>New L'ca Stadium</i>	WS from Kamares & Zenon sewage treatment plant	13 000
6	<i>Voroklini-Liva- dhia-Aradhip- pou-Pyla</i>	Additional supply from new BHs	50 000
7	<i>Voroklini</i>	New storage tank	4 500
8	<i>Kornos</i>	Connection to Nicosia main pipeline	41 000
9	<i>Mosphiloti</i>	Connction to Nicosia main pipeline	1 400
10	<i>Pyrga</i>	Connection to Nicosia main pipeline	400
11	<i>Psevdhas</i>	Connection to Nicosia main pipeline	400
12	<i>Aradhippou</i>	Livestock Farming area	10 500
13	<i>Kalokhorio</i>	Livestock farming rea	29 000
14	<i>Aglisidhes</i>	New conveyor pipeline	5 000
15	<i>Kornos</i>	New scheme for National guard camp	4 000
		Total	£205 278

SUMMARY OF TABLE VII-3

District	No. of Schemes	Estimated Cost £
Nicosia	28	560 300
Limassol	14	378 560
Paphos	5	285 960
Famagusta	3	139 000

Larnaca	15	205 278
Total		£1 569 098

VII-3A

WATER SUPPLY SCHEMES FOR REFUGEE HOUSING OR SELF-HOUSING ESTATES PREPARED AND SUBMITTED IN 1981

Ser No	Village	Nature of Scheme	Est. Cost £
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NICOSIA DISTRICT

1	<i>Ayios Pavlos</i>	WS to refugee housing estate	9 000
2	<i>Laxia</i>	Ayios Andreas refugee housing estate WS using BH 41/80	22 000
3	<i>Lakatamia</i>	Archangelos Michael refugee housing estate Phase II	9 000
4	<i>Ayios Pavlos</i>	Water Supply to building sites	11 400
5	<i>Peristerona</i>	Laying of WS mains	2 000
6	<i>Lakatamia</i>	Ayios Mamas refugee housing estate Permanent connection with Lakatamia distribution system	4 500
7	<i>Nisou</i>	Self housing Phase D (Temporary supply)	450
		Total	£58 350

LIMASSOL DISTRICT

1	<i>Kolossi</i>	Self housing estate D	12 700
2	<i>Polemidthia</i>	Self housing estate B (Kato Polemidhia)	28 000
3	<i>Polemidthia</i>	Extensions to Refugee housing estate (Ayios Ioannis)	4 900
4	<i>Tsiflikoudhia</i>	Government Housing Estate	3 250
5	<i>Trakhoni</i>	Refugee housing Estate (Phase C)	13 100
6	<i>Erimi-Kolossi</i>	Refugee housing Estate	864
7	<i>Trakhoni</i>	Refugee housing Estate	23 784
		Total	£86 598

PAPHOS DISTRICT

1	<i>Mandria</i>	Kiniras Refugee housing estate	2 700
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LARNACA DISTRICT

1	<i>Larnaca</i>	Zenon Refugee housing estate	28 000
2	<i>Kokkines</i>	Zenon Refugee housing estate	8 000
3	<i>Tsiakkilero</i>	Zenon Refugee housing estate	6 000
4	<i>Ayios Ioannis</i>	Zenon Refugee housing estate (from biological station)	22 000
5	<i>Psevdhas</i>	Extensions to self housing	1 850
		Total	£65 850

FAMAGUSTA DISTRICT

1	<i>Phrenaros</i>	Self Housing area D...	2 500
2	<i>Vrysoulles</i>	Extensions to self housing	2 000
3	<i>Vrysoulles</i>	Supplementary supply from BH	19 000
4	<i>Avgorou</i>	Ext. to self housing ...	3 000
	Total		£26 500

SUMMARY OF TABLE VII-3A

District	No of Schemes	Est. Cost £
<i>Nicosia</i>	7	58 350
<i>Limassol</i>	7	86 598
<i>Paphos</i>	1	2 700
<i>Larnaca</i>	5	65 850
<i>Famagusta</i>	4	26 500
Total		£239 998

TABLE VII-4

VILLAGE WATER SUPPLY SCHEMES PENDING DURING 1981

Ser. No. Village Nature of scheme

NICOSIA DISTRICT

1	<i>Mitsero</i>	New house to house scheme
2	<i>Ayii Trimithias</i>	New house to house scheme
3	<i>Koutraphas</i>	Repacement of pipeline
4	<i>Mammari</i>	Extensions
5	<i>Kapedhes</i>	Additional supply from BH
6	<i>Klirou</i>	Construction of new tank & improvements
7	<i>Aspres</i>	Refugee housing estate house to house scheme

LIMASSOL DISTRICT

1	<i>Apsiou</i>	Additional supply
2	<i>Ayios Tykhanas</i> ..	New storage tank and extensions
3	<i>Sotira</i>	Replacement of main conveyor
4	<i>Pano Kividhes</i> ..	Improvements
5	<i>Palodhia</i>	Additional supply
6	<i>Asomatos</i>	Extensions
7	<i>Yermasoyia</i>	Additional supply
8	<i>Kellaki</i>	Additional supply
9	<i>Ayios Athanasios</i>	Extensions
10	<i>Trooditissa Mon.</i>	Additional supply
11	<i>Polemichia</i>	PASYDY & OELMEK New scheme
12	<i>Moutayiaka</i>	Regional scheme
13	<i>Sotira</i>	Additional supply
		Improvements

14 *Kolossi*

Self housing

LARNACA DISTRICT

1	<i>Zyyi</i>	New conveyor pipeline
2	<i>Kophinou</i>	Supplementary supply from new BH
3	<i>Anaphotia</i>	WS scheme for Govt. building sites
4	<i>Alethriko</i>	New scheme from F'sta main pipeline
5	<i>Mazotos</i>	New scheme from F'sta main pipeline
6	<i>Kivisil</i>	New scheme from F'sta main pipeline
7	<i>Aradhippou</i>	New WS scheme
8	<i>Aradhippou</i>	New scheme from the village spring (Livestock area)
9	<i>Ormidhia</i>	New scheme from F'sta main pipeline
10	<i>Xylophaghrou</i> ...	New scheme from F'sta main pipeline
11	<i>Pyla</i>	New scheme from F'sta main pipeline
12	<i>Xylotymbou</i>	Supplementary WS from new BH
13	<i>Athienou</i>	WS to livestock farming area

PAPHOS DISTRICT

1	<i>Akoursos</i>	Additional supply
2	<i>Khrysokhou</i>	Additional supply
3	<i>Goudhi</i>	Additional supply
4	<i>Arkhimandrita</i> ..	Improvements
5	<i>Polis-Prodromi</i>	Extensions
6	<i>Tala</i>	Additional supply
7	<i>Panayia</i>	Improvements of spring
8	<i>Akamas-Loutra Improv. Board</i> ..	Drilling of BHs, distribution and storage tank
9	<i>Lara-Coral Bay Improv. Board</i> ..	Drilling of BHs, distribution and storage tank
10	<i>Inia</i>	Drilling of BHs for additional supply
11	<i>Yeroskipos</i>	Extensions
12	<i>Khoulou</i>	Additional supply from new BH
13	<i>Khloraka</i>	New storage tank-Improvements
14	<i>Yialia</i>	Improvements
15	<i>Paphos</i>	Installation of fire hydrants

FAMAGUSTA DISTRICT

1	<i>Sotira</i>	Water supply to livestock farming area
2	<i>Dherinia</i>	Improvements
3	<i>Ayia Napa</i>	New WS to the tourist area
4	<i>Paralimni</i>	Improvements

TABLE VII-5
IRRIGATION SCHEMES PREPARED IN 1981 AND SUBMITTED TO DISTRICT OFFICERS

Ser. No.	Village	Division or Association	Locality	Nature of Proposed work	Est. Cost £	Villag. contr. %	Donums Perm. Seas.
NICOSIA DISTRICT							
1	Pyrgos	Division	Katouris River	Use of BHs 50/80, 65/80 and improvements	37 500		
2	Peristerona	Division	—	Pumping scheme from BH 24/52	13 500		
3	Peristerona	Division	—	Pumping scheme from BH 198/51	24 000		
4	Peristerona	Division	—	Pumping scheme from BH u/26	9 000		
5	Peristerona	Division	—	Pumping scheme from BH 20/57	16 000		
6	Potami	Division	Sikamies	Pumping scheme and improvements	21 500		
7	Tembria	Division	Tembria	Lining of canals	13 650		
8	Eyenja	—	Plati	Irrigation of Plati refugee housing estate	2 200		
9	Athalassa	—	Athalassa	Irrigation scheme for Veterinary Dept.	5 000		
10	Kochati	Division	Ayia Varvara - Kochati	Distribution pipes	14 500		
11	Peristerona	Division	Petalomeni	Distribution pipes	52 000		
12	Astromeritis	Division	Pissoyia	Distribution pipes	27 000		
13	Argates	Association	Kourtoudjis	Distribution pipes	1 320		
14	Peristerona	Division	Hareris	Distribution pipes	23 000		
15	Chakistra	Division	—	Distribution pipes	63 000		
				Total	£323 170		
LIMASSOL DISTRICT							
1	Pissouri	Division	—	Extensions	76 000	33 %	—
2	Ayios Mamas	Division	Kambos	Pumping scheme from BH 53/77	50 500	33 %	90 10
3	Kilani	Division	Ayia Mavri	Improvements - Extensions	9 800	33 %	90 —
4	Ayios Dhimitrios	Division	Kaloyiros	Extensions	7 400	33 %	80 —
5	Phini	Division	Vines	Improvements	15 900	33 %	100 30
				Total	£159 600		360 40
LARNACA DISTRICT							
1	Ayios Theodoros	—	—	Extensions to existing irr. scheme	3 000		
PAPHOS DISTRICT							
1	Khouliou	Division	Phillarotos	Replacement of pumping main	7 400	33 %	
2	Skoulli	Division	Ayios Andronikos	Pumping scheme from BH 39/80	2 000		
3	Yiolou-Miliou	Division	—	Pumping scheme from BH 55/78	85 800		
4	Nikoklia	Division	—	Pumping scheme from BH 51/72	135 000		
5	Ayios Yeoryios	Division	—	Pumping scheme	33 500		
6	Miliou	Division	Kolokouris	Replacement of pump	6 000		
				Total	£269 700		

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.

The main target is to increase permanent irrigation by 1000 to 1500 donums 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 small 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 agro-economic 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 higher or seasonal storage, the exploitations of new boreholes and the artificial recharge of depleted aquifers.

A certain number of schemes has been designed and it is now under construction with full government contribution.

During 1981 a total number of 27 irrigation schemes was prepared and submitted to District Officers at a total estimated cost of £755,470 as per Table VII-5

Another 59 schemes were in the course of preparation or under investigation by the end of 1981 as per table VII-7.

Brief description of Some Important Irrigation Schemes prepared during 1981

Kato Pyrgos: Pumping irrigation scheme and improvements of the existing one from

BHs 50/80 & 65/80 at a total estimated cost of £37,500.

Pissouri: Extensions of the existing distribution system at a total estimated cost of £76,000.

Ayios Mamas: Pumping irrigation scheme from BH 53/77 at a total estimated cost of £50,500.

Yioliou-Miliou: Pumping irrigation scheme from BH 55/78 at a total estimated cost of £85,800.

Nikoklia: Pumping irrigation scheme from BH 51/72 at a total estimated cost of £135,000.

Interdepartmental Committee for Small Irrigation Projects

The Committee is functioning in conformity with directions of the Director General of the Ministry of Agriculture and Natural Resources, for the purpose of assessing Project viability for budgeting purposes and coordinates the activities of the District Agriculture Services, for the supply of Agro-economic data in the preparatory stages of the projects. During 1981, 18 schemes have been considered by the Committee as per tables VII-6 & VII-7.

Capital Aid from the Federal Republic of Germany

During 1981 a total sum of £580,140 was reimbursed from the Loan of 18 Million D M for irrigation projects either completed or under construction as detailed below:

Major Projects

Total number of projects	3
Investment cost of projects	£553,405
Amount which can be claimed from loan	£553,405
Amount reimbursed upto the end of 1981	£360,722

Minor Projects (Over £15,000)

Total number of projects	5
Investment cost of projects	£173,896
Amount which can be claimed from loan	£173,896
Amount reimbursed upto end of 1981	163,145

Minor Projects (Up to £15,000)

Total number of projects	10
Investment cost of projects	£74,199
Amount which can be claimed from loan	£74,199
Amount reimbursed up	

to end of 1981 £56 273
 Total amount reimbursed from loan up to
 end of 1981 £580,140

TABLE VII-6

**SMALL IRRIGATION SCHEMES
 APPROVED BY THE
 INTERDEPARTMENTAL COMMITTEE
 IN 1981**

Ser. No.	Village and Scheme
1	<i>Yioulou-Miliou</i> ID
2	<i>Akaki</i> IA - Kalokerino Nero
3	<i>Potami</i> ID - Sykamies-Mosphilera-Kambos
4	<i>Peristerona</i> ID
5	<i>Ayios Mamas</i> ID
6	<i>Kilani</i> ID
7	<i>Ayios Dhimitrios</i> ID - Kaloyiros
8	<i>Phini</i> ID - Vinnos
9	<i>Dhenia</i> ID - Neron tou Hodjia
10	<i>Tembria</i> ID
11	<i>Trimiklini</i> ID - Fraktis
12	<i>Prodhromos</i> ID - Hardjis-Mazourka
13	<i>Potami</i> ID - Stavrodhromi
14	<i>kelokedhara</i> ID - Psathaes (BHPB 69/78)
15	<i>Kelokedhara</i> ID - Ziripillis (BHPB 65/64)
16	<i>Apsiou</i> ID

SCHEMES NOT APPROVED

- 1 *Akaki* IA - Riatikon
- 2 *Ayios Therapon* ID - Koukoutas - Kephaloveryos

TABLE VII-7

**IRRIGATION SCHEMES IN THE COURSE
 OF PREPARATION UNDER
 INVESTIGATION OR PENDING
 DURING 1981**

Ser. No.	Village and Nature of proposed work
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NICOSIA DISTRICT

- 1 *Kochati* ID - Lining of canals
- 2 *Lythrodhonda* IA - Kato Pervolia, distribution pipes
- 3 *Psomolophou* ID - Lining of canals
- 4 *Kalopanayiotis* ID - Kato Gnoudhia, construction of irr. tank
- 5 *Mitsero* ID - Improvements or construction of intake
- 6 *Potami* ID - Reactivation of old ID
- 7 *Potami* ID - Stavrodhromi design of irr. scheme
- 8 *Potami* ID - Potamos pumping scheme

- 9 *Kambos* ID - Irr. scheme from BH 78/78
- 10 *Peristerona* ID - Hareris pumping scheme
- 11 *Phlasou* ID - Selloshies, lining of canals

LIMASSOL DISTRICT

- 1 *Ayios Dhimitrios* - Use of BH 58/77
- 2 *Arsos* - Distribution pipelines
- 3 *Pano Platres* - Extensions
- 4 *Lemithou* - Use of BH 49/77
- 5 *Kilani* - Use of BH 89/77
- 6 *Kato Mylos* - Improvements
- 7 *Prodhromos* - Development of springs
- 8 *Ayios Therapon* - New BH to be drilled
- 9 *Tris Elies* - New BH to be drilled
- 10 *Anoyira* - New BH to be drilled
- 11 *kandou* - New BH to be drilled
- 12 *Paleomylos* - Improvements
- 13 *Kaminaria* - Use of BH 117/78
- 14 *Athrakos* - Extensions
- 15 *Kandou* - Improvements
- 16 *Parekklisha* - Improvements
- 17 *Ayios Yeoryios (Silikou)* - Construction of storage tank
- 18 *Yerasa* - Construction of storage tank
- 19 *Kouka* - Improvements

LARNACA DISTRICT

- 1 *Aglisidhes* - Extensions
- 2 *Livadhia* - Antiflood works
- 3 *Mari* - New irrigation division
- 4 *Skarinou* - Irrigation scheme from new BH
- 5 *Vavatsinia* - Improvements of the river bed through the village

PAPHOS DISTRICT

- 1 *Axylou* - Pumping scheme
- 2 *Ayia Marina* - Improvements
- 3 *Kallepia* - Mylos
- 4 *Kato Akourdhalia - Miliou* - New gravity scheme
- 5 *Kato Arodhes* - Improvements
- 6 *Kedhares* - Plistra
- 7 *Kholetria* - Pumping scheme
- 8 *Kholi* - Improvements
- 9 *Khoulou* - Phyllarotos
- 10 *Khoulou* - Pumping scheme
- 11 *Kilinia* - Improvements
- 12 *Kouklia* - Pumping scheme
- 13 *Lemona* - Ammati
- 14 *Nata* - Extensions & Pumping scheme
- 15 *Nea Dhimmata* - Symvoulos
- 16 *Nikoklia* - Pumping scheme
- 17 *Pano Arodhes* - Pumping scheme
- 18 *Polemi* - Pumping scheme
- 19 *Salamiou* - Pumping scheme
- 20 *Souskiou* - Pumping scheme
- 21 *Steni* - Pumping scheme
- 22 *Theletra* - New scheme
- 23 *Trakhypedhoula* - Pumping scheme
- 24 *Yioulou* - Pumping scheme

TABLE VII-9
IRRIGATION SCHEMES WITHIN PITSILIA PROJECT PREPARED IN 1981

Ser. No.	Village	Division or Association	Locality	Nature of Proposed works	Est. Cost £	Villag. contr. %	Donums Perm. Seas.
NICOSIA DISTRICT							
1	Kannavia	Division	Koumna	Reservoir and pipes	3,400	33%	4
2	Alona	Association	Kolymbos Pernias	Distribution pipes	9 200	44%	70
3	Palekhori	Division	Sklidri - Kamini	Weir and pipes	12 500	33%	25
4	Sarandi	Association	Agrosykia	Distribution pipes	3 400	44%	18
5	Sarandi	Division	Fonissa	Reservoir and pipes	5 300	33%	14
6	Sarandi	Division	Kambi	Distribution pipes	1 400	33%	4
7	Spilia	Division	Stravarkako 'B'	Reservoir and pipes	8 800	33%	—
8	Livadhia	Division	In Village 'A'	Distribution pipes	3 000	33%	—
9	Livadhia	Division	In Village 'B'	Distribution pipes	1 700	33%	—
10	Livadhia	Division	Gyros	Distribution pipes	5 000	33%	—
11	Alithinou	Division	Plimma	Distribution pipes	4 800	33%	20
12	Alithinou	Division	Reximo	Distribution pipes	3 200	33%	20
13	Palekhori	Association	Yiofiri	Distribution pipes	11 700	44%	18
14	Palekhori	Division	Milouri	Excavation of spring	1 300	33%	—
			Total		£74 700		
LIMASSOL DISTRICT							
1	Potamitissa	Division	Hassanis	Distribution pipes	3 600	33%	8.5
2	Ayios Konstantinos	Division	Merika-Reibern	Distribution pipes	10 500	33%	—
3	Agros	Division	Vrisi Tourzion	Distribution pipes	1 250	33%	2
4	Agros	Division	Kaoukkaris	Distribution pipes	2 850	33%	8
5	Dhierona	Division	Mylos	Distribution pipes	4 000	33%	54
6	Dhierona	Division	Dhiermoas	Distribution pipes	3 000	33%	9
			Total		£25 200		

Pitsilia Integrated Rural Development Project

The Division is dealing with the rural domestic water supply and rehabilitation of irrigation schemes within the PIRDP.

Water Supplies: During 1981 a total number of 5 schemes were prepared as per Table VIII-8, at a total estimated cost of £22,082.

Rehabilitation of Irrigation Schemes

The total number of schemes prepared and submitted to the co-ordinator of the project is 20 at a total estimated cost of £99,900 as per Table VII-9.

These projects are evaluated with the internal rate of return method.

Quarrying in River Beds

In order to coordinate the activities of the Departments concerned, i.e. the District Officers, the Department of Mines and this Department and in order to bring about effective supervision and the enforcement of conditions included in the quarry licences issued by the Department of Mines or the District Officers an advisory Committee was set up in 1976.

During 1981 this committee examined 135 cases and advised the Senior Mines Officer and the District Officer accordingly.

Encroachment in River and Streams

Some 50 cases for land encroachment in rivers and streams were examined in 1981 and the Director of Lands and Surveys was advised accordingly.

New Nicosia-Limassol Road

During 1981 the committee which was set up by several Departments to advise the Resident Engineer and the contractor on suitable places for dumping surplus material, and also suitable areas to borrow material for the new road examined some 32 cases.

Sewerage Schemes

During the year under review 10 sewerage schemes for Refugee housing estates were designed and studied at an estimated cost of £270,000 as per Table VII-10

TABLE VII-8
WATER SUPPLY SCHEMES WITHIN
PITSILIA PROJECT PREPARED AND
SUBMITTED IN 1981

Ser. Village	Nature of scheme	Est. Cost £
1	<i>Apliki</i> - Additional supply from BH 71/79	8 000
2	<i>Alithinou</i> - Additional supply from Pitsilia Reg. scheme	4 982
3	<i>Kannavia</i> - Additional supply from Pitsilia Reg. scheme	5 000
4	<i>Pharmakas</i> - Extensions	2,300
5	<i>Palekchori</i> - Extensions	1 800
	Total	£22 082

TABLE VII-10
SEWERAGE SCHEMES FOR
GOVERNMENT HOUSING ESTATES FOR
REFUGEES SUBMITTED IN 1981

Ser. No.	Housing estate	Est. Cost £
NICOSIA DISTRICT		
1	Apostolos Loucas (Laxia)	20 500
2	Apostolos Loucas (Laxia)	15 000
3	Ayios Pavlos	13 000
4	Khrysospiliotissa	24 000
	Total	£72 500
LARNACA DISTRICT		
1	Ayios Ioannis	22 000
2	Kamares II	37 000
3	Kamares II	13 000
4	Kophinou	50 000
5	Zinon	49 000
	Total	£171 000
PAPHOS DISTRICT		
1	Moutallos	26 500
	Grand total	£270 000

VIII LARNACA-FAMAGUSTA REGIONAL OFFICE

by
G Frangopoulos
Senior Technician

General

By the end of the year the staff of the Regional Office was composed of the following officers:

- 1 Executive Engineer
- 1 Senior Technician
- 1 Technician I
- 1 Assistant Chief Foreman
- 4 Technicians II
- 7 Regular Employees
- 1 Secretary-Typist

T N Hamatsos EEI who was on scholarship resumed his duties on 19.10.81.

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 groundwater conditions of the two districts, Famagusta and Larnaca were observed by means of 491 wells/boreholes.

The water levels (i.e. the distance from established bench marks on the top of the observation wells/boreholes to the ground water level) of 369 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 63 of these boreholes was taken every month and another 10 of them was taken every two months.

The water levels of 48 boreholes used for village water supplies were also taken once during the whole year.

Chemical Analyses

A total number of 738 samples were taken from Government and Communal or private boreholes or springs and were sent to the Government or Departmental Laboratories for Chemical Analysis.

Also a number of 123 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 5 boreholes for village water supply and for private use were carried out.

Plotting of Boreholes

During the year the plotting of wells/boreholes in the Famagusta-Larnaca Hydrological Area continued and the total number of wells/boreholes plotted were 793.

Questioning

The annual questionnaire was carried out in the areas where the plotting was completed. A total number of 7443 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 9 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 this year two officers were dealing partly in different studies concerning the Southern Conveyor.

The ground water level of 101 wells/boreholes was taken in the area of South-Eastern Mesaoria and another 46 in the Area of Kiti. In addition the water levels were measured by 4 automatic recorders situated at Kiti, Xylophaghos, Liopetri and Phrenaros and were visited once a month.

Well Sinking Permits

A total number of 652 applications for sinking, covering permits and the change of the condition 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.

609 applications are of cases lying in the conservation areas and the other 43 in the non-conservation areas.

Apart from the above applications 459 cases dealing with boreholes/wells were also examined direct from the Regional Office of WDD Larnaca/Famagusta and were submitted to the District Officer of Larnaca and Famagusta. These concerned cases for the renewal of lease agreements of boreholes/wells drilled on Government or Forest Land, or cases of cleaning or deepening of existing wells/boreholes. Of these 248 cases were approved and 37 were not, and 174 were returned to the District Officers for further explanations.

INVESTIGATIONS AND DESIGN

Investigations

During 1981 the following investigations were carried out:

LARNACA DISTRICT

Vavatsinia: Improvement of the river bed through the village

Livadhia: Anti flood works. Improvement of the village water supply network and for the connection of the village water supply to Khirokitia-Famagusta pipeline.

Zyyi: For the solution of water supply problems. Improvement of water supply to the army camp. Improvement of the village water supply network. Improvement of the village Water Supply from Khirokitia Treatment Plant.

Klavdhia: For the solution of water supply problems.

Anglisidhes: For expansion of the village Irrigation Division. For the solution of water supply problems. Improvement of village water supply. Water supply for new divisions of plots.

Alaminos: For the solution of water supply problems.

Skarinou: Improvement of Government boreholes for the irrigation division.

Kophinou: For the solution of water supply problems.

Ayios Theodoros: Expansion of the village Irrigation Division from BH 64/73. Water supply for new division of plots.

Kalokhorio: Water Supply of the village Stock Farming Area.

Voroklini: Investigation for the construction of a new tank for the village water supply. Improvement of village water supply from Khirokitia-Famagusta pipeline.

Kornos-Mosphiloti-Psevdhas-Pyrga-Shia: Improvement of the regional water supply from Nicosia pipeline.

Maroni: Expansion of the village Irrigation Division.

Tokhni: Investigation for improvement of the village water supply from springs.

Anaphotia: For the solution of water supply problems. Water supply for new division of plots. Water supply for village division plots. Recharge works in Xeropouzos river.

Kiti: Relocation of R C C channel to facilitate division of plots. For the connection of a dipping tank with the village water supply.

Alethriko: For the connection of a dipping tank with the village water supply. Investigation for improvement. Government borehole for irrigation division.

Mari: Investigation for improvement of the village water supply. For improvement of Government boreholes for irrigation divisions.

Kalavastos: For the solution of water supply problems of the village. Improvement of the irrigation division Syrmata-Kopetra.

Mazotos: Water supply for new division of plots.

Aradhippou: Anti flood and recharge works. Investigation for improvement of the village water supply from springs. For improvement of water supply of the village Stock Farming area.

Ormidhia: Investigation for improvement of the village water supply and solution of water supply problems.

Ayios Ioannis, Refugee housing estate: Effluent pipeline from biological station to absorption pits.

Pyla: Improvement of the village water supply from Famagusta pipeline.

Pseudhas: Investigation for improvement of spring of the village water supply. Water supply for new division of plots.

Xylophagou: Improvement of the village water supply.

E A C-Dhekelia: For the solution of water supply problems.

Zenon-Kamars II, Refugee housing estate: Effluent pipeline from biological station to Larnaca new stadium.

Athienou: Improvement of Government boreholes for irrigation divisions.

Ayia Anna: For the solution of water supply problems.

Mosphiloti: For the solution of water supply problems.

Perivolia: Relocation of R C C channel to facilitate division of plots.

Psematismenos-Maroni-Zyyi: Investigation for the water supply of the villages.

Kellia: Investigation for improvement of Government boreholes for irrigation division.

Pyrga: Investigation for water supply to new refugee self housing estates.

Xylymbou: Improvement of the village water supply.

Dhromolaxia: For the solution of water supply problems.

FAMAGUSTA DISTRICT

Sotira: Water supply of the village stock farming area. For improvement of Rodi recharge works.

Phrenaros: Investigation for water supply to new refugee plots.

Paralimni: For the solution of water supply problems.

Vrysoulles: Improvement of the refugee self

housing camp water supply. For water supply to new refugee plots.

Avgorou: Investigation for water supply to new refugee plots.

Ayia Napa: For the solution of water supply problems.

Dherinia: For the solution of water supply problems.

CONSTRUCTION

During 1981 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.

Labour Force Involved

The total number of staff employed by the Regional Office, for the execution of the construction works was as follows:

Monthly paid foremen	3
Hourly paid foremen	4
Regular employees	28
Casual employees	15

APPLICATION TO INSTALL PUMPING UNITS ON T/C WELLS

One application was submitted to the Larnaca Regional Office for installing a pumping unit on a T/C well thus raising the total number from the year 1976 to 1981 to 141.

MEETINGS

During 1981 the Regional Engineer attended several meetings as representative of the Director WDD.

TABLE VIII - 1
DESIGNS SUBMITTED TO
DIRECTOR FOR APPROVAL

Ser. No.	Village and Scheme	Est. Cost £
A VILLAGE WATER SUPPLY SCHEMES		
LARNACA DISTRICT		
1	<i>Anglisidhes</i> . Improvements	5 000
2	<i>Chakilero</i> . (Government Housing Estate)	6 000
3	<i>Kokkines</i> . (Government Housing Estate)	8 000
4	<i>Kornos</i> . Improvements	41 000
5	<i>Livadhia</i> . Improvements	1 200

6	<i>Mari</i> . House to house scheme	31 000	Effluent pipeline from biological station to absorption pits	22 000
7	<i>Mosphiloti</i> . Improvements	1 400		
8	<i>Psevdhas</i> . Improvements	400	2 <i>Zenon-Kameres II</i> Refugee housing estate. Effluent pipeline from biological station to Larnaca new stadium	13 000
9	<i>Pyla</i> . Improvements	12 500		
10	<i>Pyrga</i> . Improvements	400		
11	<i>Stavrovouni</i> balancing tank (Nicosia Water Supply). Pumping scheme from two Government boreholes (improvement of regional water supply of village Kornos-Mosphiloti-Pyrga-Psevdhas-Sha)	95 000		

D IRRIGATION WORKS

LARNACA DISTRICT

12	<i>Voroklini</i> . Construction of a new storage tank	4 500	1 <i>Ayios Theodoros</i> . Extension of irrigation division from BH 64/73 ..	3 000
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E DIVISION OF PLOTS

LARNACA DISTRICT

13	<i>Voroklini</i> . Improvements	1 800		
14	<i>Xylotymbou</i> . Improvements	3 000		
15	<i>Zyyi</i> . Extensions	5 700		
16	<i>Zyyi</i> . Improvements	50 000		

FAMAGUSTA DISTRICT

1	<i>Avgorou</i> . (Refugee self housing estate). House to house scheme ..	3 000	1 <i>Anaphotia</i> . Water supply for new division of plots	300
2	<i>Famagusta</i> WS. Improvements	57 000	2 <i>Ayios Theodoros</i> . Water supply for new division of plots	7 200
3	<i>Phrenaros</i> . (Refugee self housing estate). House to house scheme ..	2 500	3 <i>Mazotos</i> . Water supply for new division of plots	7 200
4	<i>Vrysoulles</i> (Refugee self housing estate). House to house scheme ..	19 000		
5	<i>Vrysoulles</i> (Refugee self housing estate). Improvements	2 000		

F VARIOUS MINOR SCHEMES

LARNACA DISTRICT

B STOCK FARM AREAS WATER SUPPLY SCHEMES

LARNACA DISTRICT

1	<i>Aradhippou</i> . Improvements	10 500	1 <i>Klavdhia</i> . Improvements to the village water supply network ie placing central sluice valves	300
2	<i>Kalokhorio</i> . Stock farm 'A'	29 000	2 <i>Livadhia</i> . Improvements to the village water supply network, ie placing central sluice valves and replacement of part of the network	200

FAMAGUSTA DISTRICT

1	<i>Sotira</i> . Water supply for stock farming area		3 <i>Ormidhia</i> . Improvement of the village water supply network, ie placing central sluice valves	300
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C SEWAGE DISPOSAL

LARNACA DISTRICT

1	<i>Ayios Ioannis</i> Refugee Government housing estate.		4 <i>Psevdhas</i> . Improvement of spring of the village water supply .	300
			5 <i>Pyrga</i> . Water supply to the new houses of the refugee estate, ie placing of water meters	150
			6 <i>Tokhni</i> . Improvement of spring of the village water supply and replacement of the destroyed water meter of the village water supply	150

IX LIMASSOL REGIONAL OFFICE

by
N E Neocleous
Executive Engineer
Regional Engineer

General

This Office is responsible for the activities of the District of Limassol. Its functions are divided into four main categories as follows:

- *Hydrology: Surface and groundwater measurements and studies.*
- *Design of irrigation and water supply schemes.*
- *Construction of irrigation and water supply schemes.*
- *Maintenance of all existing irrigation and water supply schemes.*

The Limassol Regional Office is manned by 32 staff who serve in the various sections as follows:

- Hydrology 9
- Design 7
- Construction 9
- Maintenance 2
- Clerical 4

For the execution of the construction works 21 foremen and 140 workers were engaged.

HYDROLOGY

Hydrological measurements were carried out in the prescribed areas which are under the Special Measures or Conservation Law as listed under WATER RESOURCES DIVISION.

Surface Water Hydrology

Rivers

The flow of the rivers is gauged by means of

automatic water level recorders and the results are calibrated by means of current meter measurements.

Eight gauging stations equipped with automatic water level recorders are established on main rivers of Limassol District, as follows:

- The total discharges calculated for each river are given in the Hydrological Year Book of the Department.
- Kourris 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 20 water samples were taken for suspended sediment analysis. Water samples (116 No.) were also taken periodically, from all rivers, for chemical analysis and 70 additional current meter measurements were taken in Amathos and Garyllis rivers, at the overflow of Yermasoyia and Polemidhia Dams.

Springs and Streams

The discharge of 69 springs and streams were measured at monthly or weekly 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 875 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 53 springs and streams and the water level of 24 wells/boreholes were measured, within the Pitsilia Project. A total of 668 springs and streams measurements and 214 water level measurements were taken.

Ground Water Hydrology

Hydrological investigations and measurements were carried out in the following areas, which are under the Special Measures Law or Conservation Law, as follow:

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 190 No. wells or boreholes strategically situated in the area.

Water level measurements are taken twice a year from the above wells or boreholes except from 135 No. 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 intrusion in the aquifer is observed and studied by means of 67 wells or boreholes at Zakaki-Asomatos area and 23 wells or 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 393) 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 1981

Water extracted from Akrotiri Aquifer.

Purpose	Quantity M.C.M
Irrigation	8.10
Domestic	2.84
Industrial	0.92
Total	11.86
Water supplied from Dams	5.40
Total supplied for irrigation	13.50

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 samples for analysis twice a year.

The number of observation wells/boreholes in the Hydrological Areas, which are under control, is 266.

Well Sinking Permits

Well sinking permits granted and applications to transfer water to other plots, or permits to install engine or adjustment of pumping permits were investigated as follows: Some 335 applications were investigated and permits were granted for 289 of them.

DOMESTIC WATER SUPPLIES

Limassol Water Supply

Water supply to Limassol, for domestic purposes 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 7.63 MCM was supplied, 1.98 MCM from springs and 5.65 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 source, for chemical analysis.

Meteorological Observations

Daily records were kept for rainfall (Max. 41.7 mm on 29.1.1981), water evaporation (Max. 12.9 mm 28.6.1981) temperature (max. 39.4° C on 27.8.1981), wind velocity and sun

reflection, at Yermasoyia Dam. Records were also kept for rainfall (Max. 48.6 mm on 10.1.1981) and water evaporation (Max. average 8.4 mm for 5 days period, 26.6.1981 - 30.6.1981), at Polemidhia Dam.

Quarry and Gravel Pits Permits

Eleven applications for quarries and gravel pits licences, were examined and submitted to the Senior Mines Officer.

Planning 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, 25 cases were examined and the relevant designs were prepared for the total cost of £1,390,560.

In addition to the above 87 cases were examined and the relevant technical advice was given to the people concerned.

Water Supply Branch

For the development of water supply systems of Limassol District, 77 cases were ex-

amined and the relevant designs were prepared for the total cost of £438,135.

In addition to the above 56 cases (applications) were examined, and the relevant technical advice was given to the people concerned.

CONSTRUCTION

Routine Irrigation and Domestic Water Supply Schemes

Several schemes were constructed by the Limassol Regional Office for minor irrigation schemes, villages 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 1981 the following materials and machinery for minor and major irrigation and water supply projects have been used.

MEETINGS

During the year under review, the regional Engineer attended several meetings as the representative of the Director of the Department.

TABLE IX - 1
IRRIGATION SCHEMES PREPARED
IN 1981

Ser. No.	Village & Description	Estimate Cost £
1	<i>Ayios Dhimitrios</i> . Improvement of new springs for Kaminia-Kryo Nero	4 100
2	<i>Arsos</i> . Improvement of distribution system and construction of storage tank for <i>Arsos</i> Irrigation Division	45 200
3	<i>Agridhia</i> . Improvement of <i>Konisero</i> Irrigation Association .	2 050
4	<i>Prodhromos</i> . Improvement of <i>Hartzi-Mazourka</i> Irrigation Division	4 900
5	<i>Apsiou</i> . Improvement of <i>Apsiou</i> Irrigation Division	28 200
6	<i>Ayios Dhimitrios</i> . Utilization of BH 58/77 for the improvement of <i>Kaminia-Kryo Nero</i> Irrigation Division	17 100
7	<i>Kyperounda</i> . Improvement of <i>Kardama-Parranga</i> Irrigation Division	1 060
8	<i>Akrounda</i> . Improvement of <i>Akrounda</i> distribution system ...	1 000
9	<i>Agros</i> . Improvement of <i>Kaoukaris</i> Irrigation Division	2 850
10	<i>Trakhoni Extension of Yermasoyia-Polemidhia Project</i> .	
	Improvement and extension of Distribution System	43 800
11	<i>Agros</i> . Improvement of <i>Vrysi tou Tourtjiou</i> prop. Irrigation Division	1 250
12	<i>Kandou</i> . Extension of Irrigation Distribution System of <i>Kandou Dam</i>	23 750
13	<i>Kato Polemidhia</i> . Extension to plot 396/2 Sh/PI 53/56 of <i>Kato Polemidhia</i> Irrigation Division...	340
14	<i>Pelendria</i> . Improvement of <i>Kato Phylagra</i> Irrigation Division	14 600
15	<i>Dhierona</i> . Improvement of <i>Mylos</i> Irrigation Division	3 800
16	<i>Dhierona</i> . Improvement of <i>Dhierona</i> Irrigation Works	2 800
17	<i>Akrounda</i> . Installation of sluice valves to plots 14 & 27 Sh/PI 54/11 E1 from <i>Yermasoyia</i> Project.....	210
18	<i>Trimiklini</i> . Fencing of part of <i>Trimiklini</i> Dam	1 000
19	<i>Paramali-Evdhimou</i> . Irrigation scheme from <i>Shiapani</i> and <i>Evdhimou</i> rivers.....	610 000
20	<i>Paleomylos</i> . Improvement of <i>Hartji-Ayios Yeoryios</i> Irrigation Division	10 250
21	<i>Kandou</i> . Substitution of new pipeline from the weir to collecting Box of <i>Kandou Dam</i> ..	6 300
22	<i>Limassol by pass</i> . Removing of pipelines on the new road <i>Yermasoyia-Omonia</i> quarter	15 300

23	<i>Kyperounda</i> . Removing of pipelines on the new road between Karvounas-Kyperounda village	35 500
24	<i>Pelendria</i> . Design of wash out of existing storage tank of Kato Phylagra Irrigation Division	3 200
25	<i>Khalassa</i> . Irrigation scheme for the new area near Khalassa village from the proposed Kouris dam	512 000
	Total	£1 390 560

TABLE IX - 2
DOMESTIC WATER SUPPLY SCHEMES
PREPARED IN 1981

Ser. No.	Village & Description	Estimate cost £
1	<i>Apsiou</i> . Improvement of water supply scheme	3 600
2	<i>Khandria</i> . Design to cover a storage tank to be used for water supply	1 150
3	<i>Pendakomo</i> . Improvement of BH 89/80 for Pendakomo water supply	34 000
4	<i>Yermasoyia</i> . Supplementary supply for Venus & Aktea buildings up to Hi-Chaparral restaurant	3 300
5	<i>Pano Kividhes</i> . Design to replace part of the pipeline from the springs of water supply	440
6	<i>Yermasoyia</i> . Supplementary for Crusader Beach Hotel on plot 132/1/1 Sh/Pl. 54/52	820
7	<i>Yermasoyia</i> . Supplementary supply for summer place buildings	1 120
8	<i>Asgata</i> . Improvement of BH 60/80 for the village water supply	26 500
9	<i>Erimi</i> . Replacement of pipeline in the village	11 200
10	<i>Louvaras</i> . Supplementary design of 21 plots in a Hali-Land plot 802 Sh/Pl. 48/34	2 750
11	<i>Pendakomo</i> . Extension of distribution system	900
12	<i>Trakhoni</i> . Refugee self-housing scheme	13 100
13	<i>Ayios Athanasios</i> . Re-evaluation of supplementary land division ..	1 600
14	<i>Kolossi</i> . Refugee self-housing scheme Phase D	12 700
15	<i>Ayios Athanasios</i> . Supplementary for land division	1 010
16	<i>Asomatos</i> . Improvement of distribution system	300
17	<i>Yermasoyia</i> . Re-evaluation of supplementary land division	3 120
18	<i>Yermasoyia</i> . Supplementary for land division	480
19	<i>Erimi</i> . Replacement of pipeline in the village	800
20	<i>Paramytha</i> . Extension to Ayia Irini church from Rotsos spring pipeline 1st solution	1 570
	2nd solution	200
21	<i>Moutayiaka</i> . Fencing of storage tanks in Panthea locality	1 100
22	<i>Pano Polemidhia</i> . Extension of distribution system to plot 44/1, Sh/Pl. 53/48	570
23	<i>Potamos Yermasoyias</i> . Supplementary for Peyiazis court on plot 143/4/2 Sh/Pl. 54/52	1 200
24	<i>Yermasoyia</i> . Supplementary for Terpsihori buildings on plot 134/2/2, 134/3/1 Sh/Pl. 54/52 ...	1 100
25	<i>Amathus</i> . Supplementary of Renada Complex	5 000
26	<i>Amathus</i> . Supplementary for Panorama Court on plot 248/1 Sh/Pl. 54/45	870
27	<i>Trakhoni</i> . Supplementary for 122 plots place D	26 200
28	<i>Yermasoyia</i> . Re-evaluation of supplementary of Terpsihori buildings	460
29	<i>Ayia Phyla</i> . Replacement of main pipeline from plot 16, Sh/Pl. 54/42	830
30	<i>Kato Polemidhia</i> . Refugee self-housing scheme place B	28 800
31	<i>Apesha</i> . Extension of distribution system	4 950
32	<i>Amathus</i> . Supplementary for Avenita Hotel on plot 212/2 Sh/Pl. 54/46	780
33	<i>Amathus</i> . Supplementary for Anemos Appartments	1 500
34	<i>Ayios Athanasios</i> . Re-evaluation of land division	2 000
35	<i>Yermasoyia</i> . Re-evaluation of land division	3 300
36	<i>Amathus</i> . Supplementary for plot 141 Sh/Pl. 54/45	80
37	<i>Perapedhi</i> . Supplementary for land division file D 181/81	1 800
38	<i>Perapedhi</i> . Supplementary for land division file D 182/81	860
39	<i>Perapedhi</i> . Supplementary for land division file D 174/81	6 100
40	<i>Kato Platres</i> . Supplementary for land division file D 771/71	2 600
41	<i>Ayia Phyla</i> . Supplementary for new elementary school	60
42	<i>Amathus</i> . Supplementary of plot 21/2/1 Sh/Pl. 54/46	780
43	<i>Amathus</i> . Supplementary of plot 232/1, 232/3, Sh/Pl. 54/45	260
44	<i>Amathus</i> . Supplementary of plot 110/1, Sh/Pl. 54/47	2 050
45	<i>Kato Polemidhia</i> . Ayios Ioannis Government Housing Estate	

	New scheme	4 800		266/1 & 266/2 Sh/Pl. 54/46 of Yankar Estates Ltd.....	1 850
46	<i>Limassol</i> . Tsifikoudhia Government Housing Estate (Temporary and permanent scheme)	3 250	73	<i>Asgata</i> . Supplementary for Government land division on plot 659 Sh/Pl. 55/2.....	850
47	<i>Yermasoyia</i> . Supplementary for Venus & Kouva buildings	1 500	74	<i>Yermasoyia</i> . Re-evaluation of land division on plot 269 Sh/Pl. 54/43	1 470
48	<i>Yermasoyia</i> . Supplementary for Romios beach apartments	220	75	<i>Ayia Phyla</i> . Supplementary for PASYDY & OELMEK building from Lambousa reform school water supply	14 700
49	<i>Trakhoni</i> . Proposed supplementary scheme from BH 70/66	7 050	76	<i>Yermasoyia</i> . Re-evaluation of land division of APTKBPT Ltd ..	12 000
50	<i>Amathus</i> . Supplementary for building on plot 246/1/1/1/4, Sh/Pl. 54/45	1 700	77	<i>Amathus</i> . Supplementary of Santa Barbara building on plot 224/1 Sh/Pl. 54/46.....	115
51	<i>Amathus</i> . Supplementary for Jacodec Developments Ltd.....	2 300		Total	£438 135
52	<i>Episkopi</i> . Stock farm water supply	36 500			
53	<i>Kato Amiandos</i> . Supplementary for land division.....	450			
54	<i>K. Polemidhia</i> . Substitution of part main pipeline in the village ..	4 550			
55	<i>Yermasoyia</i> . Supplementary for Pecora Food Ltd. buildings on plot 291/1 Sh/Pl. 54/51	330			
56	<i>Kolossi</i> . Supplementary for land division	2 160			
57	<i>Amathus</i> . Supplementary for plots 168/3, 167, Sh/Pl. 54/45 ...	2 330			
58	<i>Asomatos</i> . Utilization of BH 11/81 for the improvement of Asomatos water supply	12 200			
59	<i>Potamos Yermasoyias</i> . Supplementary for plot 201/1 Sh/Pl. 54/52	940			
60	<i>Ypsonas</i> . Replacement of pipeline from plot 120, Sh/Pl. 53/63	1 800			
61	<i>Trakhoni</i> . Supplementary for land division	4 100			
62	<i>Yermasoyia</i> . Re-evaluation of supplementary for Swepeco Construction Ltd.	1 350			
63	<i>Yermasoyia</i> . Improvement of water supply distribution system	500			
64	<i>Ayios Athanasios</i> . Re-evaluation of land division	420			
65	<i>Ayios Athanasios</i> . Supplementary for new cemetery of Limassol ...	8 000			
66	<i>Pyrgos</i> . Supplementary for plot 674/4 Sh/Pl. 54/39.....	1 300			
67	<i>Amathus</i> . Supplementary of Limonia Bay Hotel	840			
68	<i>Zakaki</i> . Supplementary of Land field division	1 450			
69	<i>Limassol</i> . Replacement of pipelines of Limassol Water Board along by-pass	87 000			
70	<i>Erimi</i> . Re-evaluation of land division.....	6 000			
71	<i>Erimi</i> . Re-evaluation of land division.....	200			
72	<i>Amathus</i> . Supplementary of plots				

TABLE IX - 3
MACHINERY USED BY LIMASSOL REGIONAL OFFICE

Machinery Employed	Major works	Minor works	Total hours
Dumper trucks	233	1 257	1 490
Compressors.....	2 162	1 935	4 097
Diggers	2 155	5 012	7 167
Land rover	3 776	16 848	20 624
Concrete mixers	201	180	381
Cutting machines	113	450	563
Centrifugal pump	71	—	71
Bus.....	2 472	232	2 705
Wheel loaders.....	1 356	60	1 416
Welding machine	904	1 023	1 927
Excavators	—	87	87
Vibrators.....	30	70	100

TABLE IX - 4
MATERIALS USED BY LIMASSOL REGIONAL OFFICE

Materials Used	Major works	Minor works	Total
Asbestos cement pipes (km)	10 402	19 000	29 402
Concrete Aggregates (m ³)	287	668	955
Cement (tons)	38	115	153
Steel Reinforcing bars (tons)	4	14	18
Special fittings	1 403	19 499	20 902
Sluice valves	60	2 587	2 647
Water meters.....	6	860	866
Galvanised iron pipes (km)	126	71 468	71 594
Sand bedding (m ³)	3 448	234	3 682
Steel pipes (km).....	195	5 010	5 205

X PAPHOS REGIONAL OFFICE

by
A Lambrou
Executive Engineer I
Regional Engineer

General

By the end of the year the staff of the Paphos Regional Office was composed of the following:

- 1 Executive Engineer I - Head
- 7 Technicians II
- 5 Technical Assistants
- 1 Assistant Chief Foreman
- 1 Secretary-Typist

The Technical Staff of the office was engaged in Water Resources, Investigation, Design and Construction of Works.

WATER RESOURCES BRANCH

The staff of the water resources branch 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 and calibration purpose by the use of current meter. A total number of 757 current meter measurements were taken during the year for calibration purposes. Also samples for suspended sediment and boron analysis were taken regularly.

Springs

During the year 29 springs were under observation and a total number of 509 spring discharges were gauged by current meter or

volumentrically.

Village Water Supply

The water supply of 132 villages was checked during the months of September and October and samples for Ionic & Nitrates were taken. Also the reading of 33 water meters of Paphos Lower Villages and nine of Arminou water supply were taken every month.

Rainfall Observing Stations

Six 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 the 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 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 levels were taken from 112 wells/BHs during the year for special studies.

Analysis

A total number of 553 samples for analysis were taken from wells/BHs, spring and

streams, 128 of which for Ionic & Nitrates, 115 for boron, 59 for suspended sediment and 251 were analysed in the Paphos Regional Office for Chloride content.

Questioning

The annual question was carried out in south western Paphos Hydrological area during summer for determining the ground water extracted, area irrigated and kind of crops planted. A total number of 2541 cases were carried out.

Well Sinking Permits

A total number of 119 applications for sinking and covering permits of wells/BHs were examined and submitted to the Regional office of Paphos.

These applications were finally examined and approved or not by the Advisory Committee of the Ministry of Agriculture and Natural Resources and 68 of them were approved.

Encroachment in Rivers and Streams

Nine cases for land encroachments in rivers and streams were examined and the Director of Lands and Surveys was advised accordingly.

Quarries and Gravel Pits Permits

Forty applications for quarries and gravel pits permits were examined and the supervision of the conditions especially in the river beds were carried out by this office.

Pumping Schemes on T/C Boreholes

Four applications regarding improvement of Turkish boreholes were received by this office and relevant investigations were carried out. Where necessary pumping schemes were prepared and reports were submitted to the General Committee for approval.

INVESTIGATION DESIGN AND CONSTRUCTION BRANCH

The staff of the above branch were engaged on the following works.

Investigations

Several applications and complaints regarding minor water supply and irrigation problems were investigated and reports submitted to the District Officer, Paphos. Also a number applications for removing and repairing water supply and irrigation pipelines from certain fields that might be levelled were investigated and relevant action was taken by the staff of this office.

Small Project Investigations and Design

During the year 15 new schemes were designed and with the estimated costs submitted to the headquarters for approval and inclusion in the budget of next year.

Applications to Divide Land and Building Permits

During 1981, 161 applications to divide land and building permits were examined by this office and reports submitted either to the Director of the Department or to Paphos District Officer.

Construction Works

The construction works carried out by the Paphos Regional Office are listed under Chapter V, CONSTRUCTION DIVISION.

Operation and Maintenance of Paphos Dams

The operation and maintenance of Paphos Dams was carried out by the staff of this office and routine visits were carried out for this purpose. Detailed reports were prepared separately and submitted to the Director of the Department.

Committee Meetings

The Regional Engineer sits on several committees and expresses the policy of the Department giving advice on various matters.