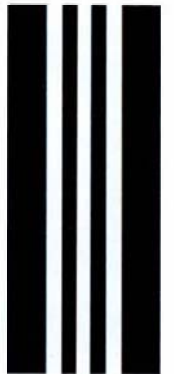
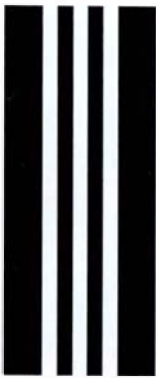


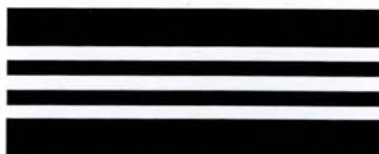
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Republic of Cyprus

Ministry of Agriculture and
Natural Resources

WATER DEVELOPMENT DEPARTMENT **ANNUAL REPORT 1984**

C St. Lytras M. Sc. DIC B. Sc. — Director

WATER DEVELOPMENT DEPARTMENT
ANNUAL REPORT 1984

Abbreviations

m metre
 mm millimetre
 MCM Million Cubic Metres
 m³ Cubic metres
 ha hectare
 WDD Water Development Dept.
 £ Cyprus pound

Conversion factors

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

In 1984 the value of the Cyprus £ on average (daily basis) was:-

\$.....	1.7333
£ st.	1.2734
DM.....	4.8234
Drachma.....	190.6007

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I GENERAL

Introduction

Significant developments in the activities of the Department during 1984 were:

Commencement of construction works for the Southern Conveyor Project and the Khrysokhou Irrigation Project; continuation of construction on all components of the Vasilikos-Pendaskinos Project; completion of construction of the Pitsilia Integrated Rural Development Project water development component works; the continuation of design and construction of emergency schemes for the augmentation of domestic water supplies for the main towns so as to avoid as far as possible restriction of supplies during the summer months.

During 1984 and for the tenth 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 north bar for communication through the good offices of the UN peace keeping force for the unified water supply of Nicosia.

Precipitation was around 82% of normal and flow recorded at most river gauging stations was well below normal due to low rainfall; as a result water accumulated in dam reservoirs was very low. A poor ground water recharge was also observed.

In July 1984 an agreement was signed with the Italian Company Impregilo and J & P of Cyprus for the construction of Kouris Dam for the contract sum of £19,954,512. Work on the construction of the dam started on 1.12.1984. Kouris Dam with a reservoir capacity of 115 MCM and 110 m height is the main source of water for the Southern Conveyor Project. During 1984 a US\$27 million loan was contracted with the World Bank, a US\$24 million (approx.) from the Kuwait Fund for Arab Economic Development and approx. US\$22.65 from the European Investment Bank for the Southern Conveyor Project (SCP). In the meantime tenders were issued for the supply of valves for the SCP 110 km long main conveyor pipeline 1400-800 mm diameter. The total expenditure for the Southern Conveyor Project for 1984 was £2,659,866 out of which £2,378,263 was for Kouris Dam. The total estimated cost for the 1st phase of SCP is approx. £100 million.

The construction of Evretou Dam which is the main water source of Khrysokhou Irrigation Project started at the beginning of 1984 by the Joint Venture of Shephard-Hill of UK and G P Zachariades of Cyprus for the contract sum of £3 million. The expenditure for the Evretou dam during 1984 was approx. £3 million. The total cost of the 1st phase of the Khrysokhou Irrigation Project is estimated at £20 million.

The water development component works for the Pitsilia Integrated Rural Development Project (PIRDP) were completed during the first half of 1984. The storage capacity of the PIRDP works - 20 ponds and 2 dams - is approx. 3.5 MCM. In addition some 20 borehole irrigation schemes were completed as well as several rehabilitation schemes for domestic water supplies and irrigation. The total area irrigated by the PIRDP schemes is approx. 1530 ha.

Vasilikos-Pendaskinos Project (VPP) works construction was well advanced in 1984 and accounted for the single biggest expenditure of the Department during the year, rising to just over £9 million; the gates of the two dams of the VPP Kalavassos and Dhyptomatos were closed at the end of 1984 to start impoundment before actual completion of their construction; the total expenditure for the project upto the end of 1984 was just over £18 million and the total estimated cost of the whole project is £27 million.

Emergency schemes for the augmentation of the water supply of Nicosia, Larnaca and Famagusta continued throughout 1984 mainly through the connection of new boreholes to the Central Water Supply System which serves also the Famagusta-Larnaca tourist installations and several villages and Refugee housing estates.

The level of construction works expenditure of the Department for 1984 was £18,844,155 compared to £12,654,747 for 1983.

The total expenditure of the Department during 1984 was £23,370,704 out of a total budgeted of £30,095,237.

BRIEF DESCRIPTION OF PROJECTS

Major Projects Under Full Operation and Maintenance

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

Construction of the civil works of the Project commenced in 1976 and the target date for its full completion was the year 1981 while irrigation supplies from the boreholes in the river aquifers were available to the adjacent areas of the Project where distribution networks were completed as early as 1979. The PIP was fully completed in mid 1983 and the total cost of the Project up to the end of 1983 reached the amount of £24,450,000.

The main items of the project are a) Asprokremmos Dam with a 51 MCM capacity reservoir b) 24 boreholes c) the 12 km 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 were constructed by the same authority. In addition 26 km of farm access roads were built by the PIP.

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

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

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

Major Projects Under Construction

Pitsilia Integrated Rural Development Project

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 PIRDP, which has now been completed is the stimulation of the economically depressed until now, mountainous region of Pitsilia thus raising the standard of living of the 21,000 inhabitants of some 50 villages of the region and checking the population drain to the towns.

The total cost of the PIRDP has exceeded £10 million of which \$10 million represents a loan from the World Bank.

Construction of the water development works started in 1978 and has been completed early in 1984 at a total cost of about £7 million.

The water development component of the project consists of:

- One earth-rockfill dam at Xyliatos of 1.25 MCM water capacity for the irrigation of an area of 308 ha of land.
- One small concrete gravity arch dam at Ayii Vavatsinias of 0.054 MCM capacity belonging to Ayii Vavatsinias irrigation scheme.
- 19 PVC lined off-stream earth ponds of a combined capacity of approx. 2 MCM for the irrigation of 495 ha of land.
- 20 borehole irrigation schemes for the irrigation of an area of 479 ha.

- Rehabilitation of numerous small irrigation schemes involving an area of approx. 250 ha.
- Domestic water supplies for various villages of the region.

The ponds are fed with water from diversion weirs which have been constructed on nearby streams through diversion pipelines laid for this purpose. The ponds are filled during the winter and early spring months so that the water can be used during the dry summer months.

The main crops irrigated are vegetables, deciduous fruit trees, citrus and olives. Land consolidation has been applied in some of the areas of the project and irrigation distribution networks have been constructed with farm hydrants reaching all farm holdings.

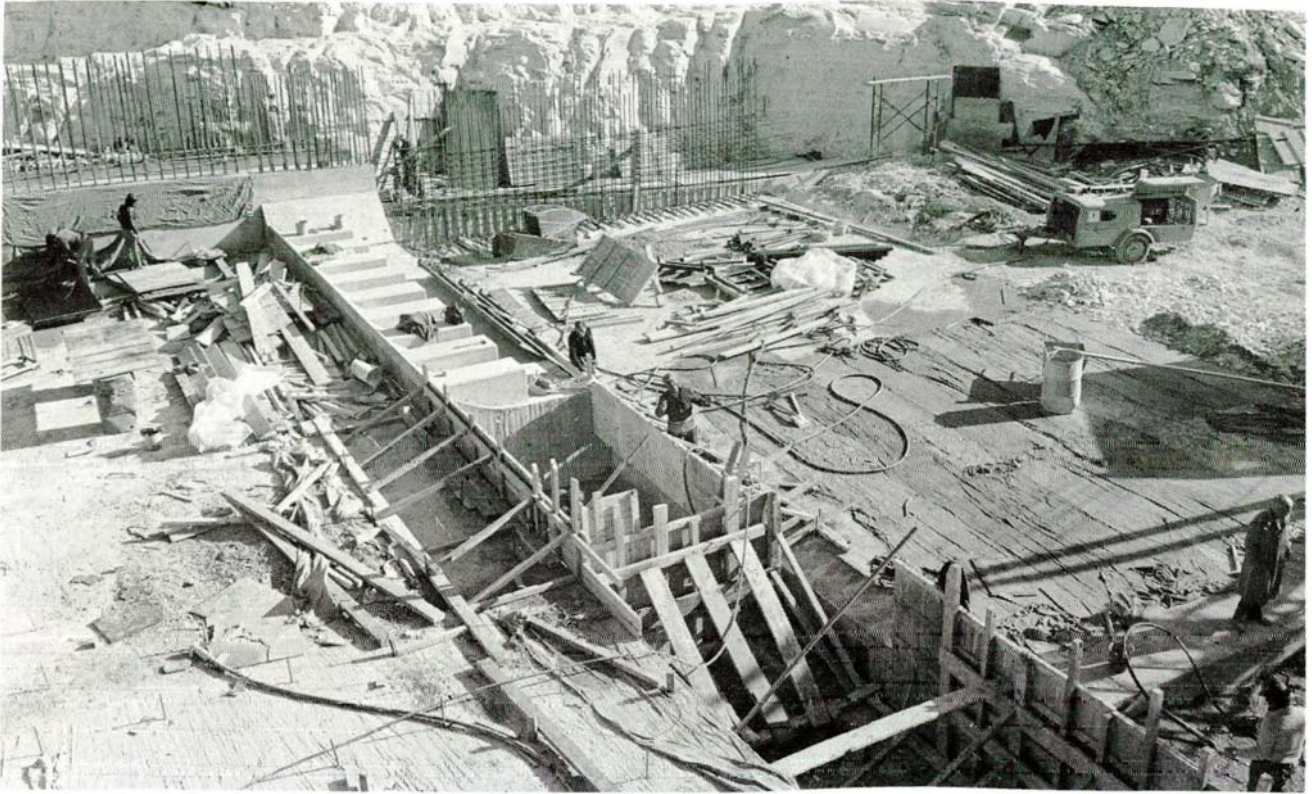
Vasilikos-Pendaskinos Project

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.

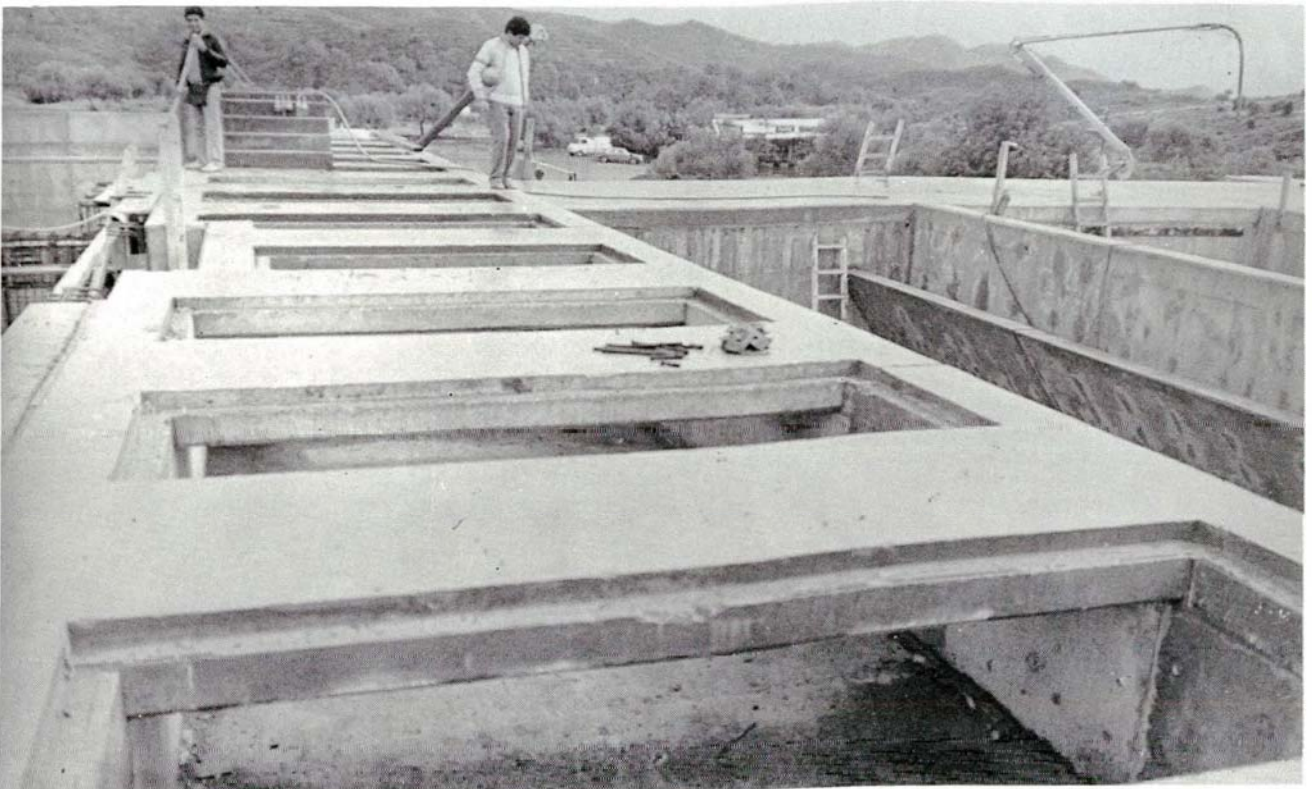
The basic objective of the Vasilikos-Pendaskinos Project is the development of the surface water resources of the region and their use for the agricultural development of the area as well as for the augmentation of the domestic water supply of other areas, particularly the Nicosia, Larnaca and Famagusta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

The main components of the project as it stands now, are:

- Kalavastos Dam on Vasilikos river, having a capacity of 17 million cubic meters (MCM) of water,
- Dhypotamos Dam on Pendaskinos River, having a capacity of 15 MCM,
- A diversion system to convey the excess flows of Maroni river to the Dhypotamos Dam reservoir,
- A conveyance and distribution system for irrigation from kalavastos Dam comprising, main conveyor, break pressure tank, and pipeline network covering an area of about 765 hectares net (Vasilikos Irrigation Scheme),
- A conveyance and distribution system for irrigation from Kalavastos Dam covering an area of about 215 hectares net in the area of Maroni village,
- A conveyance and distribution system for irrigation from Dhypotamos Dam covering an area of 295 hectares net (Pendaskinos Irrigation Scheme),
- A conveyance system comprising main conveyor (common with that from Kalavastos Dam up to the break pressure tank), pumping station at Tokhni and balancing reservoir at Khirokitia to convey water from Kalavastos Dam to the Khirokitia Water Treatment Plant,
- A water treatment plant, reservoirs and pumping station at Kornos for the water supply of Nicosia and
- A conveyor from Skarinou to Lakatamia reservoirs Nicosia which was completed



Maroni Diversion. Placing infill concrete beneath western bay of stilling pool. Viewed from right abutment. WDD Photo E75-5 (5.12.84).



Kornos Treatment Works. Common settled channel. Openings awaiting fitting of aluminium floor panels. WDD Photo E67-6. (6.11.84).

in Jan. 1982 and has been under operation since. This work which is known as Nicosia Water Supply Scheme Phase I, includes also the Dhyptomamos Pumping Station, the Stavrovouni Balancing Reservoir and a break pressure tank at Nisou.

A quantity of 8.95 MCM of water will be allocated per year for the irrigation of an area of 1275 ha, mainly citrus and vegetables, a further quantity of 7.00 MCM per year will be allocated for the augmentation of the domestic water supply of Nicosia, Larnaca and Famagusta, several villages, refugee estates and tourist installations.

The agricultural development of the project will be mainly in 3 areas.

- The Vasilikos area of 765 ha of land belonging to Kalavastos, Mari, Zyyi, Tokhi and Psematismenos,
- The Pendaskinos area of 295 ha of land belonging to Ayios Theodoros and Skarinou and
- The Maroni area of 215 ha of land belonging to the homonymous village.

Land consolidation has been carried out in three areas of the project.

- Maroni for an area of 140 ha
- Kalavastos-Tokhni for an area of 243 ha
- Zyyi, Psematismenos-Maroni for an area of 120 ha.

The Agricultural Research Institute has set up an Agricultural Research Station in the project area to carry out research on varieties of plants to be cultivated and experiments on cultivation and irrigation methods.

The land consolidation scheme includes a length of 30 km of farm roads. Agricultural Extension Services of the Department of Agriculture will be based at the VPP operation control centre in the project offices already built at Khirokitia Treatment works.

In order to cover part of the foreign exchange component of the cost of the project, Government has secured three loans. One from the World Bank for an amount of \$11 million, a second for KD 2.5 million from the Kuwait Fund for Arab Economic Development and the third from the European Investment Bank of 8.3 million ECU's. The three loans are used for a parallel financing of the project, that is financing of separate components of the project, and are worth in total about 14.2 million Cyprus Pounds.

The foreign exchange component of the cost of Phase I was financed by a DM10 million loan (=approx. £1.9 million) from Kreditanstalt Fur Wiederaufbau of West Germany who have also financed the construction of Lefkara Dam in the early 1970's. The overall project cost, including Phase I is estimated as about 27 million Cyprus Pounds.

Southern Conveyor Project

The basic objective of the Southern Conveyor Project (SCP) is to collect and store surplus water and convey it by means of a regional water carrier for use in areas where the water is most needed.

In aiming to devise a socially and financially acceptable and economically viable scheme the SCP will promote irrigated farming development in the south coastal region between Limassol and Famagusta that would benefit most from the Project. In addition the SCP will meet the future domestic and industrial water demands up to the year 2010 for the towns of Limassol, Larnaca, Famagusta and Nicosia and numerous village communities, and also supply the needs of touristic development.

Following a pre-appraisal by a World Bank mission in Cyprus and because of the large size of the Project and its high financial cost, it was decided to implement the Project in two phases.

Phase 1 will cover the irrigation requirements of Kokkinokhoria and domestic water demands until 1993, when Phase 2 is expected to come into operation.

Phase 1 includes the construction of the Kouris Dam, the main conveyer, the Akhna Dam and the Kokkinokhoria Irrigation System. In 1992 just before the operation of Phase 2 the Project is expected to supply 33 MCM out of which 17 MCM will be used for irrigation at Kokkinokhoria and around 16 MCM will satisfy domestic demands. The construction of Phase 1 is expected to be completed in 5-6 years.

The main works of the Project are as follows:

- Kouris Dam: This 115 MCM capacity dam is the main water storage component and is designed to provide seasonal and interannual storage of the flows of Kouris River and its tributaries. Such storage, by balancing the variable inflows will permit a steady and reliable supply to the project benefit areas via the Main Conveyor. The Kouris Dam, of zoned earthfill embankment construction will be around 110 m high. The 5 km long reservoir will have a surface area of 360 ha.
- Main Conveyor: This 110 km long pipeline of diameters ranging from 1400 mm down to 800 mm will convey the stored water at Akhna reservoir.
- Akhna Reservoir: A 16 m high earthfill embankment dam will retain 5.8 MCM of water conveyed from Kouris Dam enabling the reservoir to provide balancing storage in the Kokkinokhoria area. Water will be pumped to the nearby irrigation areas at times of peak irrigation demand to supplement flows in the main conveyor and thus reduce the size of pipeline otherwise required.
- Kokkinokhoria Distribution Network: will cover an area of 5125 ha.
The construction of the Project begun in 1984, with the construction of Kouris Dam.

The installation of the main conveyor is expected to commence in 1985. At the end of 1983 through to the beginning of the year under review the Construction Division of the Department laid a length of 2.5 km of the main conveyor at various points of the pipeline route to enable the construction of road works and the erection of pylons by the Electricity Authority.

The cost of Phase 1 of the Project is estimated to reach the amount of £100 million.

Khrysokhou Irrigation Project

The Khrysokhou Irrigation Project (KIP) will develop the water resources of the north western part of Cyprus. When all three phases of the project will be completed it will irrigate 4200 ha net.

The first phase includes the construction of Evretou Dam of 25 MCM capacity on the Stavros tis Psokas river, near Evretou village, and the irrigation of 2000 ha (net) of land in the Khrysokhou valley mainly from the dam to the coast, except for an area of 150 ha in the Sarama valley where water requires pumping. Elsewhere irrigation will be done by gravity; water will be conveyed through a main conveyor of maximum diameter 900 mm to 4 overnight storage ponds and a break pressure tank, from there to the farm hydrants via asbestos cement pipes and then to the fields via plastic pipes. Each field will have its own outlet and water meter, with 2 to 3 atmospheres available pressure.

Construction of the dam started in January 1984, and will cost about £9 million. It will be completed in 1987 with the first water impoundment expected to start early in 1986. The dam is of earth-rockfill type with clay core.

The final designs of the irrigation networks and conveyor are scheduled to be completed by the end of 1984 and construction is expected to start in 1985 and completed by mid 1987. In some areas the network will be ready for the irrigation season of 1986 to take advantage to the impoundment of the dam.

Land consolidation will be applied in about 250 ha of the area as the rest has a high percentage of Turkish Cypriot property and was therefore excluded.

In addition to the network, farm roads will be constructed to serve almost all the fields.

The overall cost of the first phase is about £20 million including the cost of on-farm systems and a groundwater scheme that will extract water from the Khrysokhou river aquifer. The World Bank has financed the 1st phase with a loan of \$16 million.

The second phase includes the extension of the irrigated area from Limni mines to Pomos, adding another 1000 ha net. This is achieved by extending the conveyor, and connecting it to the three existing dams of the area (Argaka, Ayia Marina, Pomos), and by diverting winter flows of three rivers into Evretou Dam (Magounda, Yialia, Livadhi). No decision has been taken as to the completion of the final designs and implementation of the second or the third phase.

The third phase includes the construction of Ezousas Dam on the Ezousas river between Ayia and Kannaviou, a rockfill dam of 8 MCM capacity. Water will be conveyed by pipeline to the areas of Polemi, Stroumbi and Yioulou mainly, to irrigate 1000 ha net of land. Another 200 ha will be irrigated from groundwater in the upper Khrysokhou valley.

The overall project cost is about £40 million at current prices and is expected to provide work for 4000 people and increase the farm income of the area by 8 times. Crops to be cultivated include citrus and avocado, early and late vegetables, nuts, olives, and early table grapes. The area is most suited for early crops due to its mild climate and most produce will be export orientated.

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. As from 1982 the Department undertakes also the design and construction of sewerage and sewage disposal 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

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

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

The Division of Hydrology which is responsible for the evaluation of the surface and groundwater resources and their present and future management.

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.

The Division of Rural Projects Planning which deals with the planning and designing of rural irrigation and domestic water supply projects and sewage disposal schemes which are of a rather routine nature and do not need elaborate planning and design procedure.

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 (Town Water Supply) which controls the administration, operation and maintenance of Government Town Water Supply schemes and Rural Regional Water Supply schemes.

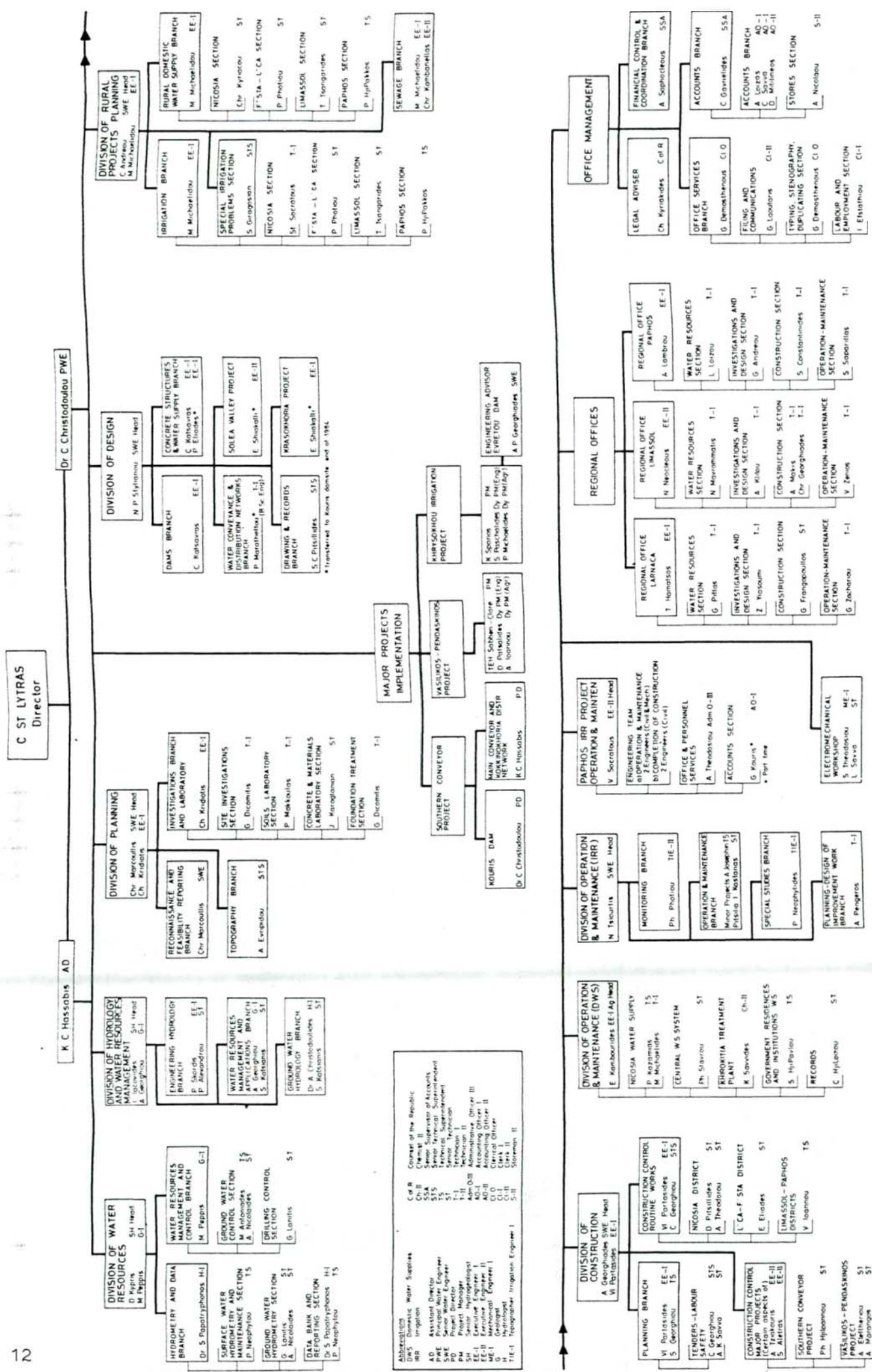
The Division of Operation and Maintenance (Irrigation) which deals with the management, operation and maintenance of Government irrigation works.

TECHNICAL STAFF OF WDD ON 31.12.1984

DRG No BM/G/217

TECHNICAL STAFF		D	AD	P	W	S	W	E	SH	EE	ME	Geo	H	CH	TIE	STS	TS	ST	T	CF	ACF	F	SE	TOTAL	REFERENCE		
1	Permanent Ordinary Staff	1	1	1	6	2	15	1	2	2						4	8	22	73	4	9	40		191	D Director		
2	Permanent Development Staff						15	1	2	1	4							3	48	2	9	17	2	104	AD Assistant Director PWE Principal Water Engineer SWE Senior Water Engineer SH Senior Hydrogeologist EE Executive Engineer		
3	Casual Staff						8												49					57	ME Mechanical Engineer Geo Geologist H Hydrologist CH Chemist TIE Topographer Irrigation Eng. STS Senior Tech. Superintendent TS Technical Superintendent ST Senior Technician T Technician CF Chief Foreman ACF Assistant Chief Foreman F Foreman SE Sanitary Engineer		
TOTAL NUMBERS		1	1	1	6	2	38	2	4	4	1	4	1	4	1	4	8	25	170	6	18	57	2	352			
DISTRIBUTION OF STAFF																											
4	DIRECTORATE	1	1	1																							
	i Water Resources Management					1			1	2						2	2	17				1			3		
	ii Hydrology					1			1	1								2	2						26		
	iii Planning															1	1	1	19	1					7		
	iv Design															1	1								29		
	v Construction					1										1			16						18		
	vi Rural Projects Planning					1										1	2	7	7	3	3	10			37		
	vii Operation & Maintenance (DWS)					1										1			3	3	1				10		
	viii Operation & Maintenance (Irrig)																					2	2		11		
	i Paphos Irrigation Project (PIP)																								9		
	ii Southern Conveyor Project (SCP)																								12		
	iii Vasilikos - Pendaskinos Project (VPP)																								20		
	iv Khrysoxhou Irrigation Project (KIP)																								10		
	i Regional Office, Famagusta - Larnaca																								24		
	ii Regional Office, Limassol																								9		
	iii Regional Office, Paphos																								37		
	i Mechanical and Electrical Services																								29		
<small>Note: Three Executive Engineers one senior Technician and six Technicians were transferred to Limassol Regional Office, are posted at Kouris Dam but are listed under SCP on this table</small>																											
9	Various Postings					1*																			6		
10	Vacancies																								44		
TOTAL NUMBERS		1	1	1	6	2	38	2	4	4	1	4	1	4	1	4	8	25	170	6	18	57	2	352			

• Missing since 1974 invasion
 • On scholarship
 * Temporary transfer to MANR



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

In these Regional Offices the main works carried out are:

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

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

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

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

FOREIGN TECHNICAL ASSISTANCE

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

United Nations

Technical assistance received from United Nations during 1984 was:

Experts - Vailikos-Pendaskinos Project

T E H Sabben-Clare FAO expert, continued his services with us throughout the year as the Project Manager of the Vasilikos-Pendaskinos Project.

CONSULTANTS EMPLOYED BY THE DEPARTMENT

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

SOGREAH in association with Hydroconsult, Nicosia for the design and supervision of Kouris dam, Southern Conveyor Project,

Sir William Halcrow and Partners, Swindon, England in association with Balfours, London for design and contract documents of the Southern Conveyor Project together with the SCP team of WDD staff,

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,

Sir William Halcrow and Partners in association with A Prastitits and Associates, Nicosia for the detail design and supervision of Evretou Dam, KIP.

SUMMARY OF ACTIVITIES

Water Resources

The collection and evaluation of hydrological data continued through 1984 especially with reference to the requirements of the major projects.

The general conclusion obtained from the study of 61 river flow gauging stations is that the flow in most of them was well below normal. Groundwater recharge was again poor this year and a general drop in the static water level of all important aquifers was observed.

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

The precipitation during the hydrometeorological year 1983-1984 averaged 451 mm which is 85% of normal. The rainfall was below normal at almost all places ranging from 75-95%.

The maximum amount of rainfall in a 24-hour period was 101 mm recorded by an autographic rain gauge on 28th October 1983 at Kholetria village, Paphos.

The first snowfall occurred on Mount Olympus, the highest peak of Troodos mountain range, on the 10th December 1983 and the last snowfall on the 23rd April, 1984.

The air temperature was around normal. The extreme maximum temperature was 41.8°C reported by Nicosia town Climatological Station on the 4th July 1984 and the extreme minimum temperature was -2.1°C reported by Prodhromos Forestry College on the 15th March, 1984.

As extracted from the available data the maximum annual evaporation measured from a USWB pan was 2085 mm reported by Larnaca Airport Synoptic Station and the minimum annual evaporation was 1143 mm at Prodhromos.

Hydrology

The Division of Hydrology and Water Resources Management which was established in 1982, continued in 1984 in the formulation of methodology and processing of hydrological and hydrogeological data with the aim of providing the Department with the basic information about the water resources of the island so that decisions could be made on the exploitation, additional development and allocation for use of these resources.

Appraisal of the exploitation and development of water resources and its consequences as to quantity and quality as well as management and conjunctive use is carried out through the latest techniques including radioisotopes and mathematical models.

Some highlighted activities of the Division during 1984 were:

- Updating of the Kouris river hydrology,
- Assessment of the hydrology at 17 sites for dams and diversions required for the identification and selection of alternatives for the Krasokhoria Integrated Rural Development Project,

- Review and updating of the hydrology of the Karyotis, Atsas, Elea and Peristerona rivers for the Karyotis Project Feasibility Study,
- Statistical analysis of the rainfall in Cyprus for the evaluation of drought and flood frequencies,
- Other hydrologic studies involving Pouzis, Pedhieos and Maroni rivers as well as the flow and infiltration in the aquifer of the Yermasoyia aquifer,
- Study of the Argaka-Magounda aquifer and the Gypsum aquifer at Maroni,
- Use of environmental radioisotopes in the Kouris Delta for assessing the recharge due to Kouris River,
- Monitoring and trend evaluation of water levels, use and sea-intrusion in the Akrotiri, Yermasoyia, Parekklissha, Kiti and Kokkinokhoris aquifers,
- Management and operation of the Kouris Delta Emergency Scheme and releases of water from the Yermasoyia dam for recharge of the aquifer which supplies water for domestic purposes of Limassol and neighboring villages.

Planning and Design of Projects

During the year under review planning and design was concentrated on the two new major projects i.e. the Krasokhoris Integrated Rural Development Project and the Karyotis Project, both initiated during 1984. Work on the first one had substantially covered its formulation, whereas for the second work was limited to the preparation of contract documents for the appointment of Consulting Engineers for the feasibility study.

In addition to these major projects several other smaller irrigation projects were studied either at reconnaissance or feasibility stage. These include Solea Valley Project, Vizakia and Akaki-Malounda dam irrigation schemes.

The Southern Conveyor Project and the Khrysokhou Irrigation Project have officially entered the implementation stage and therefore are not examined here any longer, except for covering the needs for further geotechnical investigations and topographic surveys if necessary.

Construction of Projects

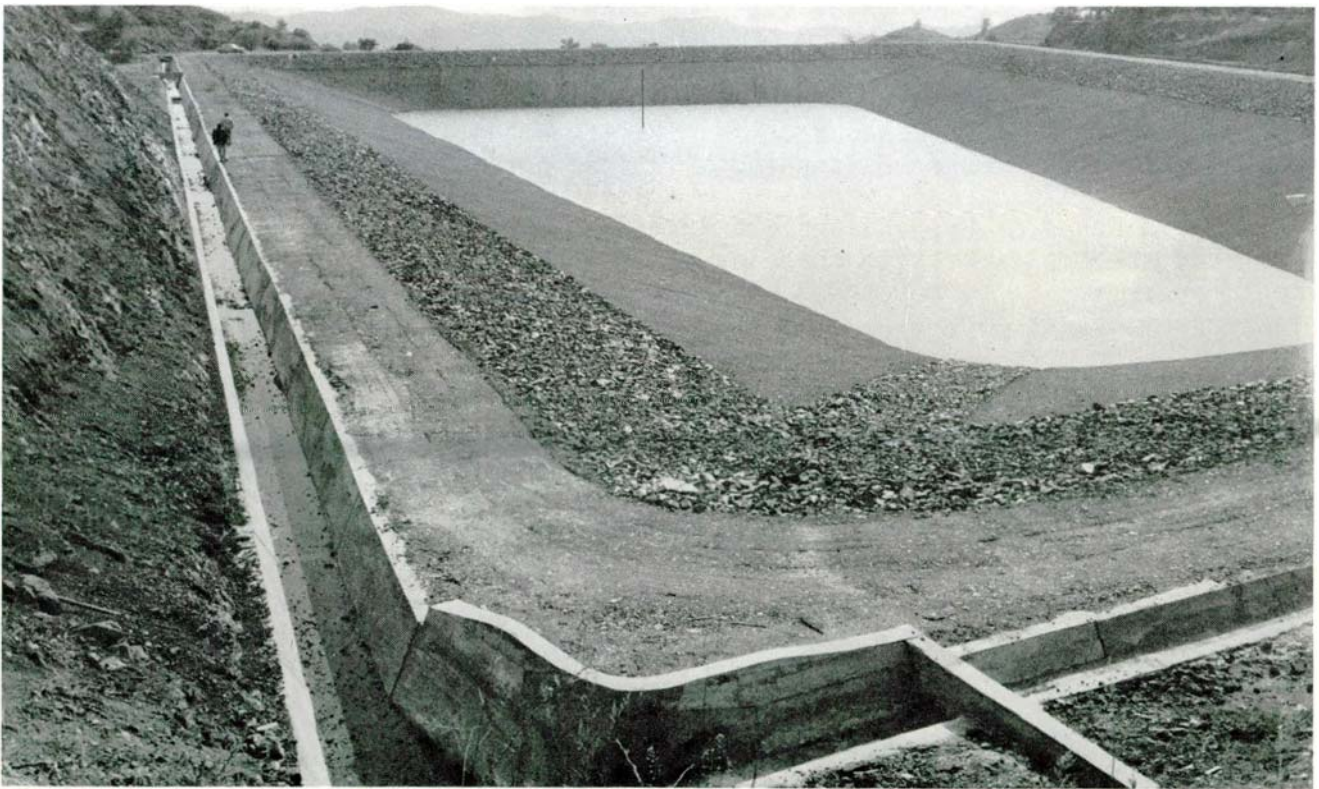
Construction expenditure of the Department during 1984 reached the amount of £18,905,999 against £12,654,747 for 1983. (See table VII-1 under DIVISION OF CONSTRUCTION).

Pitsilia Integrated Rural Development Project (PIRDP) entered its sixth year of construction in 1984. The expenditure incurred in the sector of water development reached the amount of £697,716.

During the year the activities were continued on the construction of ponds, distribution systems, borehole schemes, rehabilitation schemes and domestic water supply schemes. In addition construction works on the Xyliatos dam distribution system were completed.



Southern Conveyor Project. Installation of part of main conveyor to facilitate EAC structures along Limassol by-pass at Ayia Phyla. WDD Photo E16-12. (21.2.84)



Pitsilia Integrated Rural Development Project. Ora pond. Capacity 60,000 m³. WDD Photo E8-4. (2.2.84)

Vasilikos-Pendaskinos Project (VPP) features first on the construction expenditure for 1984 with £8,985,461. Also an amount of £61,844 was spent on the 1st Phase. The expenditure on Kalavassos dam for which a certificate of completion to impounding level was issued at November 1984, reached the amount of £2,896,678.

The Dhypotamos dam construction progressed very well and completion to impounding level was achieved at December 1984. The spillway and the valve shaft were also completed, whereas the expenditure reached the amount of £1,283,514.

The contract for the Maroni Diversion was awarded to G P Zachariades Ltd and the works started in May 1984, progressing slow but steady.

The expenditure during the year reached the figure of £712,382.

Most of the equipment for mechanical and electrical plant for the VPP pumping Stations have been delivered to the sites, while the building of the Tokhni Pumping Station was virtually completed and ready for pump installation.

The equipment for the mechanical and electrical plant for the Kornos Treatment Works have been delivered to the site and installation will start early in 1985.

For Kornos Treatment Plant, works have continued on all parts of the works, but the pumping station was still behind schedule.

The Kalavassos-Khirokitia pipeline was almost completed, while the Vasilikos irrigation network is programmed to start in February 1985.

For Pendaskinos irrigation network construction started in October 1984.

Pipelaying for Maroni irrigation network which started in October 1984, has proceeded ahead of programme.

The Khrysokhou Irrigation Project (KIP) Phase I entered the construction Phase with the commencement of works of Evretou dam on January 1984. The actual expenditure during the year reached the total of £3,150,594, mainly spent on the construction of Evretou dam.

The remaining parts of Phase I of KIP i.e. the Installation of Irrigation Networks and construction of Farm Roads (KC2), the Installation of Main Conveyor and Construction of Ponds (KC3) and 5 supply contracts for which tender documents were prepared by WDD during 1984, are planned to be executed in 1985-1988.

Although Paphos Irrigation Project (PIP) was completed before 1984, there are outstanding claims on Asprokremmos dam which have entered into Arbitration procedure. Also an amount of £287,233 was spent during the year mostly on land acquisition and completion of irrigation networks.

The Southern Conveyor Project (SCP) entered the implementation stage and during the year 1984 an amount of £2,659,686 was spent mostly on Kouris dam and certain lengths of the main conveyor to facilitate road construction and EAC structures.

The contract for the construction of Kouris Dam was awarded to Impregilo S p A (Italy) which formed a Joint Venture with J & P of Cyprus in July 1984. Work started on clearing of the site, on excavation of the diversion tunnel, intake galleries, and intake shaft and chamber.

Last but not least a total sum of £1,170,868 was spent on the construction of domestic water supply schemes for towns, villages, and refugee estates and a sum of £876,270 for minor irrigation schemes and up keep of major irrigation projects.

It must also be mentioned that £1,016,327 was spent for construction of water works for other government departments the private sector and from deposits of village authorities.

An amount of £156,589 was spent during 1984 on the extension of Khirokitia Treatment Works which was included with SCP works.

Operation and Maintenance-Domestic 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 at 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 the area of supply. This division of responsibility has been in force since early 1980 when by decision of the Council of Ministers, the Nicosia Water Board extended its Area of Supply to cover the area of the Greater Nicosia Scheme.

The year 1984 was the third consecutive year of drought. The 1983-84 winter season, was again very poor in rainfall with a result that the aquifers depleted further which had an adverse effect on the yield of existing water supply sources.

In order to encounter the effect of the drought the execution of emergency schemes continued during 1984. During 1984 new B/Hs were connected to the conveyors of the Nicosia and Central Water Supply Systems and put into operation. More details of these emergency schemes are given elsewhere in this chapter. The total quantity of water produced by all B/Hs of the 1982-84 emergency schemes was 3.6 MCM.

The total quantity of water produced in 1984 was 10.131 MCM out of which 8.464 MCM came from Government Sources 1.277 MCM was purchased from private sources and 0.39 MCM was the yield of Nicosia Water Commission Services. Of the total production, the quantity of water delivered to the Nicosia service reservoirs was 9.495 MCM. The remaining 0.636 MCM was partly consumed en-route by a number of villages, camps and industries connected to the system and partly unaccounted for. The total quantity of water delivered to the Nicosia Water Board service reservoirs was 9.495 MCM and compared to the unrestricted demand of the town which is estimated for 1984 at 13.77 MCM per annum, there was a deficit of 4.275 MCM per annum and restrictions on the hours of supply to Nicosia town were in force throughout the year. The total expenditure during 1984 for the operation and maintenance of all sources and conveyance systems supplying Nicosia town was £847,539 and the revenue generated from the sale of water was £1,333,732, including outstanding accounts.

Water continued to be supplied to the Turkish sector of Nicosia and the occupied town of Famagusta although no payment is being received for the supply.

The Department managed operated and maintained also the Central Water Supply System which includes the Khirokitia Treatment Works, the Lefkara Dam and Yermasoyia Dam which was connected to the system in 1983, as its main sources of water Vasilikos Subsurface Dam and a number of boreholes at Psematismenos, Khrokitia, Alethriko, Skarinou, Tokhni, Klavdhia, and Mennoyia areas and the Lefkara-Khirokitia, Khirokitia-Famagusta and Khirokitia Nicosia conveyors.

The scheme supplies water to Nicosia, Famagusta and Larnaca towns and a number of villages and Refugee Housing Estates in the Districts of Nicosia, Larnaca and Famagusta.

The total quantity of water produced by the system was 6.639 MCM. The quantity of water drawn from Yermasoyia and Lefkara Dams was 1.618 and 2.487 MCM respectively (net of losses at the treatment works). The total expenditure for the operation

and maintenance of the system (excluding Khirokitia-Nicosia pipeline) during the year was £612,934 and the revenue generated £1,102,847 (including outstanding accounts).

The town of Larnaca received 2.467 MCM of water from the Central Water Supply System and the production of its own and lease sources was 0.4831 MCM totalling the water at its disposal to 2.950 MCM. This quantity could not meet the increased demand of the town and the Water Board of Larnaca had to impose restrictions on the supply.

The Water Board of Limassol controls both the sources of supply and the distribution system of the town. Despite the drought the water supply demand was met satisfactorily and the town enjoyed a regular supply throughout the year. The total quantity of water produced from all sources during 1984 was 8.227 MCM.

Paphos Water Supply comes under the direct control of the Municipality. Due to carrying capacity limitations of the main conveyor of the town, the water supply of the town was augmented from Paphos Lower villages Water Supply Scheme by 0.39 MCM. The total quantity of water available to the town during the year was 1.48 MCM which could not meet the increased demand and restrictions on the supply had to be introduced during the summer months.

Operation and Maintenance 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 and from the boreholes or river diversions in Cyprus, in the Government controlled areas, amounted to 48.84 MCM. From this quantity 26.92 MCM were used for the irrigation of 56,505 donums, 4.29 MCM were used for domestic water supplies, 4.06 MCM were used for recharge, 0.75 MCM seeped through or below the dams and 4.46 MCM were lost as evaporation. The remaining 8.22 MCM were retained in the dams as over annual storage.

Water available for utilization from Government projects reached the figure of 55.02 MCM. Out of this only 30.90 MCM were utilized, 23.27 MCM for irrigation 4.29 MCM for domestic water supply and 3.20 MCM for recharge. Irrigation water was utilized on 50,055 donums of land planted with citrus, bananas, vines, deciduous, vegetables, potatoes cereals and olives. The gross income from the sale of water amounted to £688,686. The total operation, maintenance and energy cost amounted to £728,788 and the net income to the Government was a deficit of £40,102. The M & O expenses breakdown is as follows: Operation, £212,831, Maintenance £160,771 and energy cost £355,186.

Water available for utilization from contributory schemes was 3.30 MCM out of which 2.09 MCM were used for the irrigation of 2,792 donums.

Water available for utilization from contributory schemes of the Pitsilia Integrated Rural Development Project was 1.87 MCM out of which 1.56 MCM were used for irrigation of 3,658 donums of land.

Recharge works in the Government controlled areas represent only 13.1% of the total recharge capacity available in Cyprus and collected a total quantity of 959,000 m³ out of which 863,000 m³ were used for recharge whereas the rest were 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 construction for minor projects.

Legal Adviser

The legal adviser is a member of the staff of the Legal Department and he holds the position of Counsel of the Republic. Apart from the legal work which is indispensable for the day to day operation of the Department of Water Development, he performs also duties which the Ministry of Agriculture and Natural Resources may assign to him from time to time.

The legal work and/or legal duties involve the preparation of legal advice given either in writing or orally in all aspects of the various activities and operations of the Department of Water Development as well as the Ministry of Agriculture and Natural Resources involving Administrative Law, Constitutional Law, Contract Law, Law of Tort, Immovable Property Tenure Registration and Valuation Law, Sale of Goods Law, Wells Law, Special Measures Law, Irrigation Divisions Law, Irrigation Association Law, Government Waterworks Law, Streets and Buildings Regulations Law, Compulsory Acquisition and Requisition Laws, Workmens Compensation Law, Public Service Commission Law and many other Laws, which are relevant to the ones above.

The legal adviser carries out all duties which any counsel of the Republic is obliged to perform. He appears before all Courts of the Republic, in actions for and against the Republic of Cyprus.

Apart from the above, the legal adviser is a member of several committees which meet from time to time to discuss matters assigned to such committees.

These committees are:

- . The Committee for fixing prices in Contracts for the Construction of Civil Works.
- . The Committee for studying and recommending revision and consolidation of water legislation prevailing in the island.
- . The Committee, specially constituted for advising the Director of WDD whether to give or refuse to give his concurrence to the granting of permit by the District Officer for the sinking and constructing a well and/or using underground or surface water.

Notwithstanding the above the legal adviser performs every other duty and assignment which the Attorney General's Office may decide to forward to him to handle.

CYPRUS NATIONAL INTERDEPARTMENTAL AND DEPARTMENTAL COMMITTEES

International Hydrological Program

The main objective for the I H P, which is the major component of UNESCO's Water Resources program, is to develop a scientific and technological basis for the rational management of water resources, both as regards quantity and quality.

The Cyprus National Committee for the I H P consists of the following:

Chairman

C St. Lytras, Director of WDD

Secretary

I St Iacovides

Members

The Directors of

Agricultural Research Institute,

Department of Forests,

Geological Survey Department,

Meteorological Service.

During the year a number of questionnaires and data were prepared and supplied as requested by the IHP Secretariat of UNESCO regarding ongoing activities of the program. The Cyprus National Committee is convened only when special cases arise.

International Atomic Energy Agency (IAEA)

The IAEA continued to support studies and research on the use of radioisotopes in hydrology in Cyprus through their Regular Technical Assistance Program and also through the Research Contracts Program.

The study of "Isotopes in Hydrology-Kouris Delta", initiated in 1982 and continued in 1983 was extended to cover the whole of the Akrotiri aquifer in 1984.

In the same year a research contract was initiated for the "Use of isotopes in the operation and management of the Yermasoyia aquifer".

These two studies are being carried out with Mr I Iacovides, Senior Hydrogeologist as the chief investigator.

The IAEA, besides the technical assistance and analytical facilities that it offers, it provides considerable support in equipment and it is expected to supply computing facilities in terms of hardware in 1985.

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 local point for the Decade activities. The committee consists of the following WDD officials.

Chairman

C St Lytras, Director

Secretary

E Kambourides, Executive Engineer I

DAMS CONSTRUCTED UP TO 1960

No	DAM	TYPE	HT 1000m	YEAR
1	Kouklia	Earth	6	1900
2	Lymbia*	Gravity	5	18
3	Lythrodhonda	Gravity	11	32
4	Kalokhorio (K1)	Gravity	9	82
5	Akraunda	Gravity	7	23
6	Gallini	Gravity	11	23
7	Petra	Gravity	9	32
8	Petra	Gravity	9	32
9	Lythrodhonda	Gravity	10	32
10	Kalifizes	Gravity	23	113
11	Ayios Loucas	Earth	3	455
12	Gypsos	Earth	3	100
13	Kandou	Gravity	15	34
14	Perapedhi	Gravity	22	55
15	Pyrgos	Gravity	22	285
16	Trimiklini	Gravity	33	340

Total Storage Capacity 6.174 m³ x 10⁶

MAJOR DAM PROJECTS FROM 1960-70

No	DAM	TYPE	HT 1000m	YEAR
17	Prodhromos	Earth	10	122
18	Morphou	Earth	13	1,879
19	Lefka	Gravity	35	368
20	Granyeli	Earth	15	1,045
21	Athlassa	Earth	18	791
22	Kanli Keyi	Earth	19	1,113
23	Argaka	Rockfill	41	1,150
24	Mia Milia	Earth	22	355
25	Ovgos	Earth	16	845
26	Kithi	Earth	22	1,614
27	Agros	Earth	26	99
28	Lipetri	Earth	18	340
29	Polemithia	Earth	45	3,864
30	Ayia Marina	Rockfill	33	311
31	Kalapanoyiotis	Earth	40	391
32	Mavrokalymbos	Earth	45	2,180
33	Pamos	Rockfill	38	859
34	Termasoyia	Earth	49	13,600
35	Syngراس	Earth	7	1,115

Total Storage Capacity 32.041 m³ x 10⁶

MAJOR RECHARGE DAMS FROM 1960-70

No	DAM	TYPE	HT 1000m	YEAR
36	Ayios Yeoryios	Earth	6	90
37	F'ita Antiflood	Earth	8	165
38	Ayios Nikolaos	Earth	2	1,365
39	Paralimni Lake	Earth	1	1,365
40	Fresh Water Lake	Earth	3	4,545
41	Makrasyka	Earth	8	195
42	Akhna (Mesania)	Earth	4	90
43	Morphou spread	Earth	5	130
44	Ormidhia	Earth	5	100
45	Vrysoules	Earth	7	140
46	Protapapas	Earth	6	90

Total Storage Capacity 8.275 m³ x 10⁶

HT refers to height in meters from foundation
YEAR is the year of completion
Phrenaros (6) means six small dams in Phrenaros area
*Inundated by New Lymbia Dam See ref. No. 69

MINOR RECHARGE DAMS FROM 1960-70

No	DAM	TYPE	HT 1000m	YEAR
47	Sotira	Earth	8	45
48	Panayia (F)	Earth	7	45
49	Paralimni (45)	Earth	5	115
50	Ayia Napa (7)	Earth	8	55
51	F'ia Recharge	Earth	5	50
52	Phrenaros (6)	Earth	5	115
53	Dherynia	Earth	6	23
54	Phrenaros (3)	Earth	7	45
55	Avgarou (7)	Earth	3	68
56	Kondea (2)	Earth	5	82
57	Xylophaghou (4)	Earth	7	86
58	Sotira (4)	Earth	5	32
59	Lysi	Earth	7	77
60	Ay. Yearajios (9)	Earth	3	68
61	Ay. Epiklitos (6)	Earth	6	34
62	Akanthou (6)	Earth	6	45
63	Akhna (3)	Earth	4	40
64	Xyloymbou (5)	Earth	5	50

Total Storage Capacity 1.075 m³ x 10⁶

MAJOR DAM PROJECTS FROM 1971-80

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

Total Storage Capacity 17.544 m³ x 10⁶

MAJOR DAM PROJECTS FROM 1981-90

No	DAM	TYPE	HT 1000m	YEAR
76	Ephthagonia No 3	Earth	10	65
77	Alapnou-Ephthagonia	Earth	9	132
78	Kato Mylos	Earth	10	104
79	Ephthagonia No 2	Earth	8	127
80	Arakapas	Earth	10	192
81	Asprokremmos	Earth	53	51,000
82	Xyltiatos	Rockfill	42	1,250
83	Agriathia	Earth	10	59
84	Kyperounda	Earth	10	270
85	Lagouthera	Earth	10	71
86	Ora	Earth	10	62
87	Ayii Vavatsinias No 2	Earth	10	43
88	Pharmakos No 1	Earth	10	21
89	Pharmakos No 2	Earth	10	61
90	Arakapas No 2	Earth	8	120
91	Dhierona	Earth	10	159
92	Khiroklitia	Earth	10	205

Total Storage Capacity 53.941 m³ x 10⁶

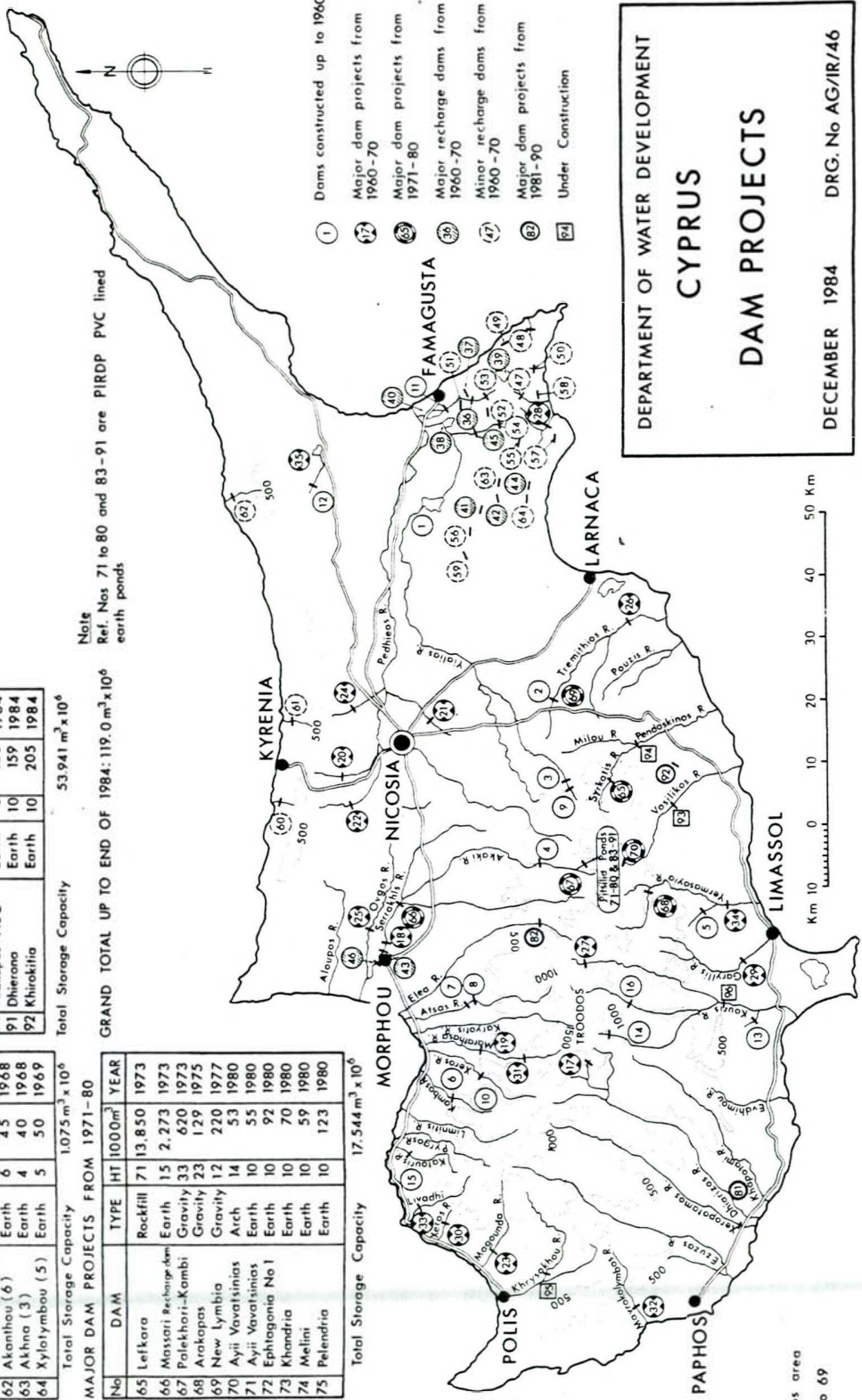
GRAND TOTAL UP TO END OF 1984: 119.0 m³ x 10⁶

UNDER CONSTRUCTION

No	DAM	TYPE	HT 1000m	YEAR
93	Kalavatos	Rockfill	60	17,000
94	Dhyopotamos	Rockfill	60	15,000
95	Evretou	Rockfill	70	25,000
96	Kouris	Rockfill	110	115,000

Total Storage Capacity 172.000 m³ x 10⁶

Note
Ref. Nos 71 to 80 and 83-91 are PIRDP PVC lined earth ponds.



DEPARTMENT OF WATER DEVELOPMENT
CYPRUS
DAM PROJECTS
DECEMBER 1984
DRG. No AG/IR/46

Members

Mr K Hassabis, Assistant Director
D Kypris, Senior Hydrogeologist
C Andreou, Senior Water Engineer

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

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

International Commission on Large Dams

The International Commission on Large Dams (ICOLD) is a non-profit seeking organization with 75 member countries. As set out in its constitution: "The objects of the Commission are to encourage improvement in the design, construction, maintenance and operation of large dams by bringing together information thereon and by studying questions relating thereto".

The Cyprus National Committee on Large Dams (CYNCOLD) was elected to full membership of ICOLD in 1969. During 1983 and 1984 the National Committee was composed of the following:

Chairman

C St Lytras, Director, WDD

Vice-Chairman

K C Hassabis, Assistant Director, WDD

Past-Chairman

C A Konteatis, Ex. Director, WDD

Secretary

N P Stylianou, Senior Water Engineer, Head, Design Division, WDD

Members

Dr C A Christodoulou, Principal Water Engineer, WDD

Chr Marcoullis, Senior Water Engineer, Head, Planning 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 52nd Executive Meeting of ICOLD was held in Tokyo, Japan between 29 May and 1 June 1984. Unfortunately the Cyprus National Committee was not represented at this meeting.

REGISTER OF DAMS IN CYPRUS

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19

S E R. No	NAME OF DAM	YEAR OF COMPLETION	LOCATION			TYPE	POSITION AND NATURE OF SEALING ELEMENT	FOUNDA- TION	HEIGHT ABOVE LOWEST FOUN- DATION (m)	LENGTH OF CREST (m)	VOLUME CONTENT OF DAM (10 ³ /m ³)	GROSS CAPACITY OF RESERVOIR AREA (10 ³ /m ²)	P U P O S E	MAXIMUM DIS- CHARGE CAPACITY OF SPILL- WAYS (m ³ /s)	TYPE OF SPILL- WAYS	OWNER	ENGINEERING BY	CONSTRUCTION BY	S E R. No	
			RIVER	NEAREST CITY	STATE PROVINCE OR COUNTRY															
1	KAFIZES	1953	Xeros	Morpi	Nicosia	PG	R	23	27	4	113	I	54	L	Lefka Irr. Div.	W D D	W D D	1		
2	KANDOU	1956	Kouris	Limassol	Limassol	PG	R	15	53	2	20	I	59	L	Kandou Irr. Div.	W D D	W D D	2		
3	PERAPEDHI	1956	Kouris	Limassol	Limassol	PG	R	22	62	4	55	I	107	L	Perapedhi Irr. Div.	W D D	W D D	3		
4	PYRGOS	1957	Kalouris	Nicosia	Nicosia	PG	R	22	66	5	12	I	125	L	Pyrgos Irr. Div.	W D D	W D D	4		
5	TRIMIKLINI	1958	Kouris	Limassol	Limassol	PG	R	33	76	6	285	I	59	L	Trimiklini Irr. Div.	W D D	W D D	5		
6	ATHALASSA	1962	Pedhieos	Nicosia	Nicosia	TE	R/S	18	447	103	791	I	48	L	Government	W D D	W D D	6		
7	GEUNYELI	1962	Pedhieos	Nicosia	Nicosia	TE	R/S	15	254	50	230	I	173	L	Geunyeli Irr. Div.	W D D	W D D	7		
8	LEFKA	1962	Maralhasa	Nicosia	Nicosia	PG	R	35	149	11	276	I	246	L	Lefka Irr. Div.	W D D	W D D	8		
9	MORPHOU	1962	Serakhis	Nicosia	Nicosia	TE	S	13	1436	206	45	I	764	L	Morphou Irr. Div.	W D D	W D D	9		
10	PRODHROMOS	1962	off stream	Limassol	Limassol	TE	R/S	10	756	73	1879	I	—	L	Prodhromos Irr. Div.	W D D	W D D	10		
11	KANLI KEUY	1963	Pedhieos	Nicosia	Nicosia	TE	R/S	19	311	47	1113	I	116	L	Kanli Keuy Irr. Div.	W D D	W D D	11		
12	AGROS	1964	Kouris	Limassol	Limassol	TE	R	26	180	61	390	I	6	L	Agros Irr. Div.	W D D	W D D	12		
13	ARGAKA	1964	Magounda	Paphos	Paphos	ER	R	41	173	138	15	I	280	L	Government	Howard Humphreys & Sons of U K	W D D	W D D	13	
14	KITI	1964	Tremithos	Larnaca	Larnaca	TE	S	22	990	183	107	I	602	L	Government	Il Nuovo Castoro of Italy	W D D	W D D	14	
15	LIOPETRI	1964	Potamos	Famagusta	Famagusta	TE	S	18	579	50	1614	I	150	L	Liopetri Irr. Div.	W D D	W D D	15		
16	MIA MILEA	1964	Pedhieos	Nicosia	Nicosia	TE	R/S	22	140	54	355	I	24	L	Mia Milea Irr. Div.	W D D	W D D	16		
17	OVGOS	1964	Serrakhis	Nicosia	Nicosia	TE	S	16	745	130	68	I	786	L	Morphou Irr. Div.	W D D	W D D	17		
18	AYIA MARINA	1965	Xeros	Paphos	Paphos	ER	R	33	142	61	260	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	R/S	45	196	215	33	I	581	L	Government	Energoprojekt of Yugoslavia	Mowlem & Ridgway of U K	W D D	W D D	19
20	KALOPANAVIOTIS	1966	Maralhasa	Nicosia	Nicosia	TE	R	40	137	156	3864	I	207	L	Government	Howard Humphreys & Sons of U K	W D D	W D D	20	
21	MAVROKOLYMBOS	1966	Mavrokolymbos	Paphos	Paphos	TE	R/S	45	528	267	2180	I	340	L	Government	Energoprojekt of Yugoslavia	CYBARCO of Cyprus	W D D	W D D	21
22	POMOS	1966	Livadi	Paphos	Paphos	ER	R	38	302	153	175	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	R	49	409	539	83	I	850	V	Government	Energoprojekt of Yugoslavia	CYBARCO of Cyprus	W D D	W D D	23
24	LEFKARA	1973	Syrkalis	Larnaca	Larnaca	ER	R	74	240	820	1100	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	Serrakhis	Nicosia	Nicosia	TE	S	15	929	245	13850	I	622	V	Government	Government	W D D	W D D	25	

REGISTER OF DAMS IN CYPRUS

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19

S E R. No.	NAME OF DAM	YEAR OF COMPLETION	LOCATION			TYPE OF DAM	POSITION AND NATURE OF SEALING ELEMENT	FOUNDA- TION	HEIGHT ABOVE LOWEST FOUNDATION (m)	LENGTH OF CREST (m)	VOLUME CONTENT OF DAM (10 ³ /m ³)	GROSS CAPACITY OF RESERVOIR AREA (10 ³ /m ³)	P U R P O S E	MAXIMUM DIS- CHARGE CAPACITY OF SPILL- WAYS (m ³ /s)	TYPE OF SPILL- WAYS	OWNER	ENGINEERING BY	CONSTRUCTION BY	S E R. No.
			RIVER	NEAREST CITY	STATE PROVINCE OR COUNTRY														
26	PALEKHORI KAMBI	1973	Akaki	Nicosia	Nicosia	PG	R	33	131	27	620	I	65	L	Government & Palekhori Irr. Div.	W D D	J & P Cyprus	26	
27	ARAKAPAS	1975	Yermasoyia	Limassol	Limassol	PG	R	23	97	10	129	I	205	L	Arakapas Irr. Div.	W D D	W D D	27	
28	AVII VAVATSIKIAS No1	1980	off stream	Larnaca	Larnaca	TE	S	17	125	32	55	I			Palambella - Mosphilomouth Irr. Div.	W D D	Iacovou Bros, Cyprus	28	
29	EPHTAGONIA No1	1980	off stream	Limassol	Limassol	TE	S	16	390	46	92	I			Kokkinoyia Irr. Div.	W D D	Iacovou Bros, Cyprus	29	
30	KHANDRIA	1980	off stream	Limassol	Limassol	TE	S	35	82	41	70	I			Kambos Iou Paphiti Irr. Div.	W D D	CYBARCO Ltd.	30	
31	MELINI	1980	off stream	Limassol	Larnaca	TE	S	22	116	32	59	I			Melini Irr. Div.	W D D	Iacovou Bros, Cyprus	31	
32	PELENDRIA	1980	off stream	Limassol	Limassol	TE	S	18	229	59	123	I			Ammos Irr. Div.	W D D	FYSCO, Cyprus	32	
33	AKAPNOU-EPHTAGONIA	1981	off stream	Limassol	Limassol	TE	S	18	280	67	132	I			Akapnou - Ephantonia Irr. Div.	W D D	Iacovou Bros, Cyprus	33	
34	AVII VAVATSIKIAS	1981	Vasilikos	Larnaca	Larnaca	VA	R	19	58	2	53	I			Palambella - Mosphilomouth Irr. Div.	W D D	W D D	34	
35	KATO MYLOS	1981	off stream	Limassol	Limassol	TE	S	23	240	41	104	I			Vatera Irr. Div.	W D D	Phoenix Constructions, Cyprus	35	
36	AGRIDHIA	1982	off stream	Limassol	Limassol	TE	S	18	119	25	59	I			Kiadhos Irr. Div.	W D D	Iacovou Bros, Cyprus	36	
37	ASPROKREMOS	1982	Xeropotam	Paphos	Paphos	TE	R/S	56*	700	2097	51000	I	1484	L	Government	Sir M MacDonald & Partners U K	Joint Venture J & P and MEDCON, Cyprus	37	
38	KYPEROUNDA	1982	off stream	Limassol	Limassol	TE	S	27	172	94	273	I			Phterika Irr. Div.	W D D	Iacovou Bros, Cyprus	38	
39	XYLIATOS	1982	Lagouthera	Nicosia	Nicosia	ER	R	42	155	240	36	I	100	L	Government	W D D	General Construction Co Cyprus	39	
40	LAGOUDHERA	C(1983)	off stream	Nicosia	Nicosia	TE	S	36	123	63	96	I			Axousa Irr. Div.	W D D	Joint Venture Phoenix Constr. & KYKON, Cyprus	40	
41	AVII VAVATSIKIAS No2	C(1983)	off stream	Larnaca	Larnaca	TE	S	25	130	30	43	I			Petalia - Palovato Irr. Div.	W D D		41	
42	DHERONA	C(1983)	off stream	Limassol	Larnaca	TE	S	24	167	59	159	I			Dhiastera Irr. Div.	W D D		42	
43	KHIROKITIA	C(1983)	off stream	Larnaca	Larnaca	TE	S	16	460	95	205	I			Irr. Div. to be set up	W D D		43	
44	DHYPOTAMOS	C(1985)	Pendaskinos	Larnaca	Larnaca	ER	R	49	390	1090	15000	S/I	1130	L	Government	Rofe, Kennard & Lapworth & W Evans & Partners, U K		44	
45	KALAVASOS	C(1985)	Vasilikos	Larnaca	Larnaca	ER	R	57	482	1700	17000	I/S	1268	L	Government	Rofe, Kennard & Lapworth & W Evans & Partners, U K		45	
46											875								46
47																			47
48																			48
49																			49
50																			50

FOOTNOTES *3 Concrete cut-off wall 29m deep below lowest foundation
Irr. Div - Irrigation Division
W D D : Water Development Department

During the year the secretary continued the exchange of correspondence with the Central Office of ICOLD in Paris and its technical committees and has both received and supplied technical information on dams and related subjects. The Departmental Technical Library has been enriched by the addition of several recent ICOLD publications.

The 53rd Executive Meeting will be held in Lausanne, Switzerland 18 and 22 June 1985. Following the 53rd Executive Meeting the 15th Congress will be held in Lausanne between 24 and 28 June 1985. A number of Study Tours will take place during and after the Executive Meeting and Congress. Technical Questions or topics for which technical papers will be presented are the following:

Question 56: Dam and foundation monitoring

Question 57: Concrete dams - An old problem always present: cracking; a new technology: rolled concrete (Rollcrete).

Question 58: Foundation treatment for control of seepage.

Question 59: Rehabilitation of dams to ensure safety.

International Commission on Irrigation and Drainage

The International Commission on Irrigation and Drainage is 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 80 National Committees with the admission of the National Committees of the Chinese People Republic and Madagascar. Cyprus is a member country of the ICID since 1954 and the Cyprus National Committee in its present form was established in 1964. The Cyprus National Committee is now composed of the following:

Chairman

C St Lytras, Director, WDD

Secretary

N Tsiourtis, Senior Water Engineer, WDD

Members, Ex-officio

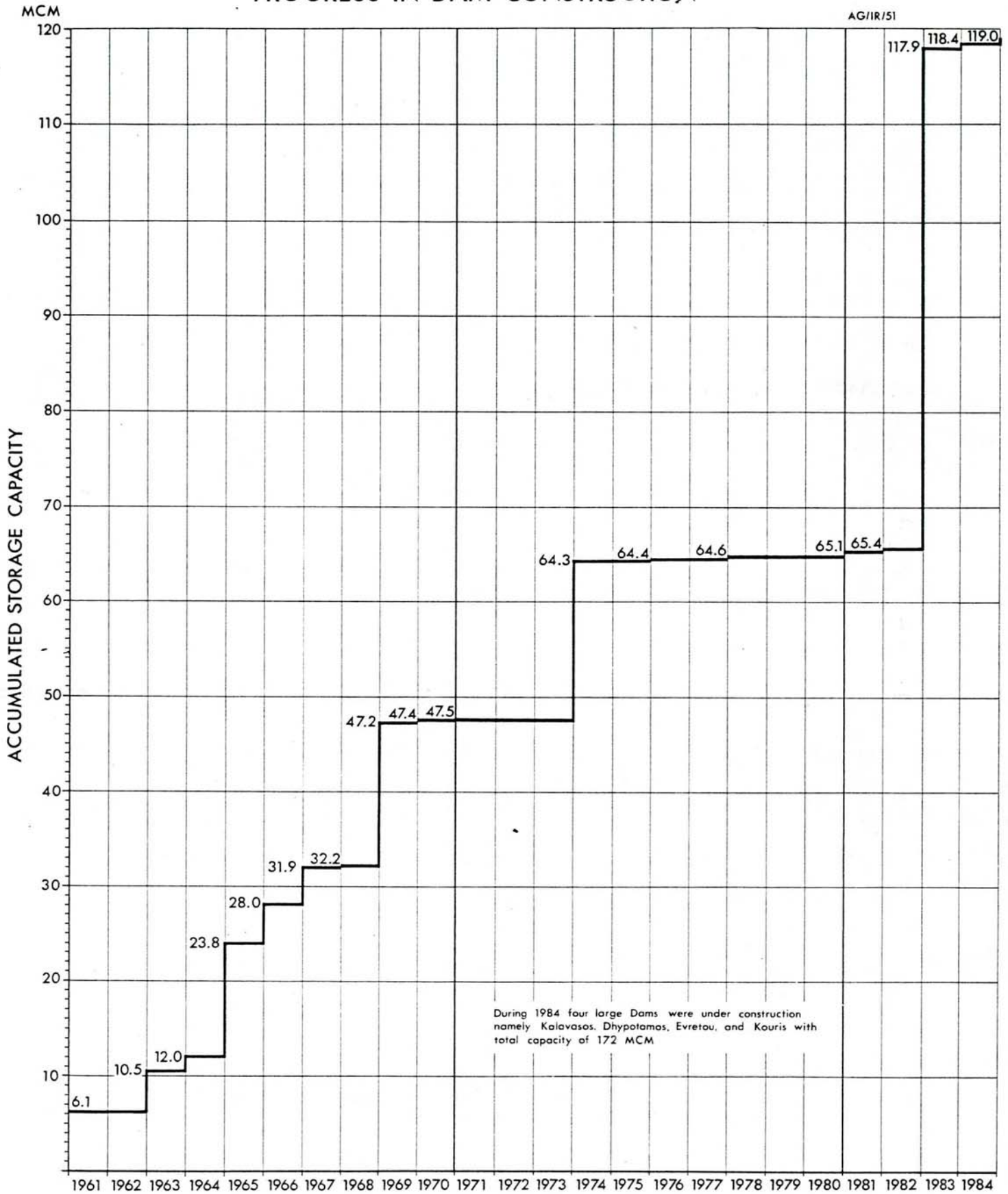
Director, Department of Forests

Director, Department of Agriculture

Director, Agricultural Research Institute

During the year 1984 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.

PROGRESS IN DAM CONSTRUCTION



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

The thirty fifth (35th) International Executive Council Meeting combined with the 12th congress on Irrigation and Drainage was held in Fort Collins USA from 21 May - 2 June 1984. In the congress two Questions were dealt with as follows.

Question 38: Water Management Factors

Question 39: Irrigation and Drainage of Problem Soils

Other works of the Congress included a Special Session on "Impact of Energy Crisis on Irrigation and Drainage" a Symposium on "New Developments in the Protection of Irrigation Drainage and Flood Control Structures on Rivers" an exhibition of irrigation, drainage and flood control works, a "Second N D Gulhat Memorial Lecture for International Cooperation in Irrigation" and Special Programme on "The Problem Evaluation and Equipment Requ and Problem Evaluation and Engineering Needs".

The Executive Council meetings dealt with the following.

- . Considered the report of the permanent finance committee
- . Passed the statement of accounts for the calendar year 1983
- . Approved the budget of estimates for 1984
- . Approved the future hosting of the First Pan-American Regional Conference, of the Fourteenth European Regional Conference and of that of the Sixth Afroasian Regional Conference.

Unfortunately Cyprus did not participate in the above activities and its Contribution was limited to the interchange of information.

International Water Supply Association

The Department of Water Development was an associate member of the International Water Supply association (IWSA) until 1969. Late in 1969 a National Committee was established. During 1984 the National Committee was composed of the following:

Chairman

C St Lytras, Director, WDD

Secretary

E Kambourides, Executive Engineer I, WDD

Members, Ex-officio

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

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

MEETINGS OF THE DIRECTOR WITH THE STAFF

Several meetings were held during the year under the chairmanship of the Director with the Heads of the various Divisions, Regional Engineers as well as with other members of the staff to discuss various aspects of works and personal matters. Interdepartmental meetings with the Departments of Agriculture, Forests, ARI, the Geological Survey Department, Meteorological Office, Fisheries Department and the District Administration were also held during the year.

FINANCE EXPENDITURE AND REVENUE

During the year 1984 the total actual expenditure by the Department from WDD budgeted and other non-budgeted votes amounted to £23,370,704 out of a total budget of £30,095,337.

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 1984

Description	Budget £	Expenditure £
W D D Development Estimates		
Govt. £22 972 408		17 549 435
including loans	23 835 338	<u>606 658</u>
Loan: 862 930		18 156 093
W D D Ordinary Estimates	3 604 440	3 279 201
Non-budgeted votes for Pitsilia Project, refugee housing estates, works for other Government Departments, private developers and village deposits	2 655 559	<u>1 935 410</u>
Total	£30 095 337	£23 370 704

The level of construction works carried out during 1984 was again at all time record expenditure amounting to £18,905,999 from WDD and other votes See table VII-1 under CONSTRUCTION DIVISION.

The largest single item of expenditure was Vasilikos-Pendaskinos Project at £9,047,305.

Loan Proceeds

Description of loans	Amount with drawn during 1984 £
- Loan No. 1658/5 CY (IBRD) US\$9,910,000 for VPP	584 163

- Loan No. 158 KUWAIT FUND KD2,500,000 for VPP	870 023
- Loan No. 1.1572.00 EUROPEAN INVEST. BANK ECU's 9,000,000 for VPP	2 371 838
- Loan No. 76.65.045 KREDITANSTALT FUR WIEDERAUFBAU for Rural Project	40 504

Revenue

A sum of £2,772,366 was collected during the year 1984 as revenue mainly from the sale of water for Nicosia and Famagusta Water Supplies and Paphos Irrigation Project (See table I-5)

TABLE I-2

EXPENDITURE FOR THE YEAR 1984

Ser No	Details	E x p e n d i t u r e			Total £
		Government Ordinary £	Development £	Village (Loans) £	
A	W D D Votes				
1	Administration	1 112 302	773 247	-	1 885 549
2	Greater Nicosia WS scheme running expenses.....	741 596	-	-	741 696
3	Nicosia-Larnaca-Famagusta, Central WS system (formerly styled Famagusta WS scheme)	751 010	-	-	751 010
4	Regional village WS schemes running expenses	70 933	-	-	70 933
5	Irrigation, drainage and dams	578 024	15 767 867	261 775 16	607 666
6	Town water supplies	-	172 765	-	172 765
7	Village water supplies	-	512 718	344 883	857 601
8	Drilling & prospecting	15 814	-	-	15 814
9	Hydrology	-	162 187	-	162 187
10	Surveys & investigations	-	110 556	-	110 556
11	Purchase of machinery and equipment.	-	25 099	-	25 099
12	Stores	9 422	-	-	9 422
13	Others	-	5 014	-	5 014
14	Save water campaign	-	19 982	-	19 982
	Total	£3 279 201	£17 549 435	£606 658	£21 435 294
B	Non-budgeted Votes				
1	Pitsilia Project				697 718
2	Refugee housing estates				140 509
3	Works for other Government Departments				609 682
4	Works for private developers				404 894
5	Works through village deposits				82 607
	Total				£1 935 410
	Grand total				£23 370 704

(i) Breakdown of administration

	Ordinary £	Development £	Total £
1 Personal emoluments	1 051 308	577 731	1 629 039
2 Casual technical assistance	-	112 848	112 848
3 Travelling	9 490	72 624	82 114
4 M'ce & operation of motor transport	10 736	-	10 736
5a Office expenses	29 747	6 786)	39 791
5b Purchase of drawing materials ...	-	3 258)	
6 Government water supply	11 021	-	11 021
Total	£1 112 302	£773 247	£1 885 549

(ii) Breakdown of Irrigation,
Drainage & Dams

	Ordinary £	Development £	Total £
1 Minor irrigation works	339 081	173 282	512 363
2 Consultants fees	8 552	-	8 552
3 Major waterworks Paphos	287 233	-	287 233
4 Major waterworks Vasilikos- Pendaskinos	9 047 305	-	9 047 305
5 Major waterworks Southern Conveyor	2 659 686	-	2 659 686
6 Major waterworks Khrysokhou	3 150 594	-	3 150 594
7 Other major waterworks	275 416	88 493	363 909
8 M'ce of dams & distribution system	573 024	-	573 024
Total	£16 345 891	£261 775	£16 607 666

TABLE I-3

W D D ORDINARY BUDGET
STATEMENT OF MONTHLY EXPENDITURE FOR THE YEAR 1984

Head 20A Water Development	C£
1984 Approved	3 571 780
Add Special warrants	32 660
	<u>3 604 440</u>

Month	Monthly expenditure £	Cumulative expenditure £	%
January	118 118	118 118	3.28
February	228 101	346 219	9.61
March	167 062	513 281	14.24
April	216 871	730 152	20.26
May	255 291	985 443	27.34
June	223 286	1 208 729	33.53

July	147 873	1 356 602	37.64
August	310 386	1 666 988	46.25
September	360 194	2 027 182	56.24
October	359 431	2 386 613	66.21
November	278 672	2 665 285	73.94
December	613 916	3 279 201	90.98

Summary

	£	%
Amount approved	3 604 440	100.00
Less actual expenditure	3 279 201	90.98
Balance	£325 239	9.02

TABLE I-4

W D D DEVELOPMENT BUDGET
STATEMENT OF MONTHLY EXPENDITURE FOR THE YEAR 1984)

(Not including village loans)
Head 2D Water Development

	£
1984 Approved	20 346 189
Add Special warrants	2 626 219
Total	£22 972 408

Month	Monthly expenditure £	Cumulative expenditure £	%
January	115 320	115 320	0.50
February	562 037	677 357	2.95
March	2 051 259	2 728 616	11.88
April	583 838	3 312 454	14.42
May	1 487 232	4 799 686	20.89
June	831 418	5 631 104	24.51
July	2 323 924	7 955 028	34.63
August	1 550 777	9 505 805	41.38
September	1 130 850	10 636 655	46.30
October	3 003 608	13 640 263	59.38
November	1 565 898	15 206 161	66.19
December	2 343 274	17 549 435	76.39

Summary

	£	%
Amount approved	22 972 408	100.00
Less actual expenditure	17 549 435	76.39
Balance	£5 422 973	23.61

TABLE I-5

STATEMENT OF REVENUE COLLECTED DURING THE YEAR 1984

Description	£
Drilling charges	35
Nicosia water supply	1 349 226
Paphos Irrigation scheme	473 777
Central WS system	
Nicosia-Larnaca-Famagusta	758 392
Village water supplies	38 249
Khrysokhou Irrigation scheme	12 798
Other fees	134 911
Xyliatos Irrigation scheme	4 978
Total	£2 772 366

Note: For construction works budget-expenditure tables see under chapter VI
CONSTRUCTION DIVISION

STAFF MATTERSAppointments

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

- Katerina A Christodoulou, was appointed to the Temporary (Ord.) post of Telephone Operator, General Clerical Staff, as from 22 July, 1983.
- Maroulla Constantinou was appointed to the Temporary (Dev.) post of Clerk 2nd Grade, General Clerical Staff, as from 22 July, 1983.

The following were appointed to the Permanent (Ord.) post of Foreman on probation as from 15 May, 1984.

Tasos Pitta	Theophilos Theophilou
Charalambos Neophytou	Kyriakos Charalambous
Michalakis Pavlou	Michalis Moyseos
Panayiotis Lazarou	George Hajipakkos
Evgenios Neophytou	Savvas Yerocosta
Neophytos G Orphanides	Costas Tsioullis
Onoufrios Neophytou	Charalambos Ioannou

- Georghoulla Chrysostomou, Executive Engineer II, Temporary (Dev.) was appointed to the Permanent (Dev.) post of Executive Engineer II, on probation with effect from 1 June 1984.
- Eleni Shakalli, Executive Engineer II, Temporary (Dev.) was appointed to the Permanent (Dev.) post of executive Engineer II with effect from 1 June 1984.
- Xanthippi Zenonos, was appointed as Clerk 2nd Grade, on casual basis, General Clerical Staff, for Khrysokhou Irrigation Project as from 9 July 1984.
- Neophytos Michael, was appointed as Clerk 2nd Grade on casual basis, General Clerical Staff, for Khrysokhou Irrigation Project as from 23 July 1984.
- Kyriaki Ioakim, was appointed as Clerk 2nd Grade, on casual basis, General Clerical Staff, for Kornos Treatment Plant, Vasilikos-Pendaskinos Project as from 9 July 1984.

- Katerina A Christodoulou, was appointed to the Permanent (Dev.) post of Telephone Operator, on probation, General Clerical Staff, as from 15 June 1984.

The following officers were appointed to the Permanent (Dev.) post of Executive Engineer II, on probation as from 15 September 1984.

Kyriakos Kyrrou

Nicos Neocleous

- Chrysostomos Kambanellas, Technician 1st Grade, was appointed to the Permanent (Dev.) post of Executive Engineer II as from 15 September 1984.

Promotions

The following were promoted as follows:

Andreas Evripidou. To the Permanent (Ord.) post of Senior Technical Superintendent with effect from 1 February 1984.

Savvas HajiPavlou. To the Permanent (Ord.) post of Technical Superintendent with effect from 1 February 1984.

Zacharias Yiasoumi. To the Permanent (Ord.) post of Technician 1st Grade with effect from 15 February 1984.

The following officers were promoted to the Permanent (Dev.) post of Technician 1st Grade with effect from 15 February 1984.

Andreas Demetriades
Anthoulla Andreou
Adamos Neophytou
Michael A Michaelides
Charalambos Constantinou

Polyxeni Georghiou
Omiros Georghiou
Christos Theodorou
Ioannis Koulas

Takis Kallis. To the Permanent (Ord.) post of Assistant Chief Foreman with effect from 1 February 1984.

The following were promoted to the Permanent (Dev.) post of Assistant Chief Foreman with effect from 1 February 1984.

George Kostrikki
Cosmas Karayiannis
Andreas Florides

George Poullos
Aristotelis Constantinou
Andreas Eleftheriou

- Pantelis Eliades. To the Permanent (Dev.) post of Executive Engineer I with effect from 15 February 1984.
- Andreas Makrides. To the Permanent (Ord.) post of Technical Superintendent with effect from 31 March 1984.
- Kyros Savvides. To the Permanent (Dev.) post of Chemist 1st Grade, with effect from 15 February 1984.
- Ioanna Nicolaou. To the Permanent (Dev.) post of Technician 1st Grade with effect from 15 October 1984.
- Costas Charalambous. To the Permanent (Ord.) post of Chief Foreman with effect from 1 December 1984.

Retirements

Sofoclis Pitsillides, Chief Foreman retired from the Government Service with effect from 1 March 1984.

- Andreas Makrides, Technical Superintendent retired from the Government Service with effect from 1 April 1984.
- Achilleas Sofocleous, Senior Superintendent of Accounts retired from the Government Service with effect from 1 October 1984.

Transfers

- George Tantaş, Clerical Officer was transferred from this Department to Medical Services with effect from 3 February 1984.
- Eleni Georghoudhi, Clerk 2nd Grade, on casual basis, General Clerical Staff, was transferred from this Department to Press and Information Office with effect from 23 February 1984
- Eleni Papaconstantinou, Clerk 2nd Grade, General Clerical Staff, was transferred to this Department from Press and Information Office with effect from 23 February 1984.
- George Loucaides, Executive Engineer 2nd Grade, on Contract, was transferred to this Department from Geological Survey Department with effect from 1 March 1984.
- Christodoulos Loizides and Kyriaki Panayiotou, Technicians 1st Grade were transferred from District Office of WDD Paphos to Khrysokhou Irrigation Project, Polis, with effect from 12 March 1984.
- Georgoulla Chrysostomou, Executive Engineer II, was transferred from Paphos Irrigation Project to Khrysokhou Irrigation Project, Polis, with effect from 12 March 1984.
- Demosthenis Antoniou, Executive Engineer I was transferred from Paphos Irrigation Project to Khrysokhou Irrigation Project, Polis, with effect from 12 March 1984.
- Tasos Magos, Technician II, on casual basis, was transferred from Vasilikos-Pendaskinos Project to Khrysokhou Irrigation Project, Polis, with effect from 26 March 1984.
- Photis Christodoulou and Panayiotis Kitsis, Technicians 2nd Grade on casual basis, were transferred from District Office of WDD Limassol to Khrysokhou Irrigation Project, Polis, with effect from 13 February, 1984.
- Lambros Christou, Technician 2nd Grade on a casual basis, was transferred from the District Office of WDD Limassol to Khrysokhou Irrigation Project, Polis, with effect from 20 February, 1984.
- Maria Chrysostomou, Clerk 2nd Grade, General Clerical Staff, was transferred from this Department to the Ministry of Defence with effect from 26 March 1984.
- Iacovos Mazaraki, Clerk 1st Grade, General Clerical Staff, was transferred to this Department from the ministry of Defence with effect from 26 March, 1984.
- Erene Papaconstantinou, Clerk 2nd Grade, General Clerical Staff, was transferred from this Department to Public Administration and Personnel Services with effect from 2 April 1984.
- Kyriakos I Constantinou, Technician 2nd Grade on a casual basis was transferred from the District Office WDD Limassol to District Office WDD Paphos with effect from 2 April 1984.
- Costakis Christofi, Technician 2nd Grade on a casual basis was transferred from the District Office WDD Limassol to Khrysokhou Irrigation Project, Polis, with effect from 9 April 1984.
- George HjiSoteriou, Superintendent of Accounts was transferred from this Department to Motor Car Registration Office with effect from 16 April 1984.
- Georhia Katsounotou, Accounting Officer 3rd Grade was transferred to the District Office WDD Limassol from Merchant Shipping Department with effect from 16 April 1984.
- Maroulla Theodorou, Clerk 2nd Grade, General Clerical Staff, was transferred from this Department to Aliens Department with effect from 18 June 1984.
- Varnavas Papanicolaou, Clerk 2nd Grade, General Clerical Staff, was transferred to this Department from Aliens Department with effect from 18 June 1984.
- Spyros Stephanou, Executive Engineer II, was transferred from Nicosia Offices to Khrysokhou Irrigation Project, Polis, with effect from 18 June 1984.

- Sophia Spyrou, Clerk 2nd Grade, General Clerical Staff, was transferred from this Department to Forest Department with effect from 2 July 1984.
- Karmella Frangoudhi, Clerk 2nd Grade, on casual basis, General Clerical Staff, was transferred to this Department from Pharmaceutical Services with effect from 2 July 1984.
- Sotiris Paschalides, Executive Engineer Class I, was transferred from District Office of WDD Paphos to Khrysokhou Irrigation Project, Polis, with effect from 16 July 1984.
- Neophytos A Neophytou and Dhiamanto Iacovou, Technicians 2nd Grade were transferred from District Office, WDD Paphos, to Khrysokhou Irrigation Project, Polis, with effect from 16 July 1984.
- Anna Achilleos, Clerk 2nd Grade, on casual basis, General Clerical Staff, was transferred from this Department (WDD Paphos) to the District Office Paphos, Ministry of Education with effect from 16 July 1984.
- Ioanna Nicolaidou, Clerk 2nd Grade, on a casual basis, General Clerical Staff, was transferred to this Department (WDD Paphos) from District Office of Turkish Properties Paphos with effect from 16 July, 1984.
- George Demetriades, Clerical Officer, General Clerical Staff, was transferred to this Department (WDD Paphos) from the Paphos District Office Ministry of Education with effect from 23 July 1984.
- Ioanna Nicolaidou, Clerk 2nd Grade, on a casual basis, General Clerical Staff, was transferred from this Department (WDD Paphos) to Paphos District Office of Ministry of Education with effect from 20 August 1984.
- Kyriaki Christodoulou, Administrative Officer 2, was transferred from Paphos Irrigation Project to the Ministry of the Presidency with effect from 27 August 1984.
- Michael Poupouris, Technician 2nd Grade, on casual basis, was transferred from District Office, Limassol to Khrysokhou Irrigation Project, Polis, with effect from 27 August 1984.
- Andreas Evripides, Messenger on a casual basis, was transferred from this Department to District Court with effect from 17 September 1984.
- Panayiotis Scordis, Executive Engineer I, was transferred from Nicosia Offices to Khrysokhou Irrigation Project, Polis, with effect from 15 October 1984.
- Pavlos Neophytides, Executive Engineer II, on a casual basis, was transferred from Nicosia Offices to Khrysokhou Irrigation Project, Polis, with effect from 29 October 1984.
- Nicodemos Nicodemou, Executive Engineer I, was transferred from Paphos Irrigation Project to Khrysokhou Irrigation Project, Polis, with effect from 15 October 1984.
- Phivos HjiIoannou, Senior Technician was transferred from Nicosia Offices to Limassol District Office for Kouris Dam with effect from 22 October, 1984.
- Eleni Shiakalli and Pantelis Eliades, Executive Engineers were transferred from Main Offices to District Office of WDD Limassol for Kouris Dam with effect from 1 December 1984.
- Odysseas Odysseos, Marios Terzis, Elias Kanonistis, Technicians 2nd Grade on casual basis, were transferred from Nicosia Offices to District Office of WDD Limassol for Kouris Dam with effect from 1 November 1984.
- Charalambos Paroutis, Technician 2nd Grade on casual basis, was transferred from Nicosia Office to Khrysokhou Irrigation Project, Polis, with effect from 1 November 1984.
- Eugenia Parpouna and Ivi Pavlidou, Technicians 2nd Grade on casual basis, were transferred from Nicosia Offices to District Office of WDD Limassol for Kouris Dam with effect from 5 November 1984.
- Paraskevoulla Maratheftou, Technician 1st Grade was transferred from Nicosia Offices to District Office, WDD Limassol, for Kouris Dam with effect from 12 November 1984.
- Kyriakos Kyrou, Executive Engineer II, was transferred from Vasilikos-Pendaskinos Project to District Office, WDD Limassol, for Kouris Dam with effect from 10 December 1984.

Conferences and Duty Abroad

- Dr C A Christodoulou, Principal Water Engineer, visited USA between 6 January 1984 - 15 January 1984 to discuss with IBRD the Financing of Southern Conveyor Project.
- C St Lytras, Director, visited Strasbourg between 19 January 1984 - 20 January 1984 to attend the 2nd Meeting of the Committee of Senior Officials to examine the subjects of a Conference of Ministers responsible for Research.
- C St Lytras, Director, visited Marceilles France, between 22 March 1984 - 23 March 1984 to attend the Meeting of the Board of Directors of the Orientation Committee of the Mediterranean Water Institute.
- C St Lytras, Director and K C Hassabis, Assistant Director, visited London and Frankfurt between 7 March 1984 - 13 March 1984 in order to carry out interviews of candidates for the Project Manager of Southern Conveyor Project and the Engineering Advisor of Khrysokhou Irrigation Project posts.
- Iacovos Iacovides, Senior Hydrogeologist, participated to a programme organized by United Nations Environment Programme on Water Resources Development of Islands between 13 April 1984 - 30 April 1984.
- C St Lytras, Director, visited Paris between 18 June 1984 - 19 June 1984 to attend a Meeting for the Workshop on Hydrological Management in Mediterranean Islands which will be held in Cyprus in October 1984.
- Iacovos Iacovides, Senior Hydrogeologist, visited Austria between 25 June 1984 - 2 July 1984 to study and discuss results of radioisotope survey in Kouris Delta for evaluating component of groundwater recharge due to Kouris river flow and that due to local rainfall.

Study Leave

George Socratous, Executive Engineer I, who has been granted study leave in USA completed his studies and resumed his duties on 1 June 1984.

Scholarships

- Andreas Christodoulides, Hydrologist I, has been granted a scholarship by IAEA Vienna for six months (10 January 1984 - 10 July 1984) to study and training in the use of tracer models.
- Stavros Aletras and Socratis Koundouris, Executive Engineer II, have been granted a scholarship for three months (18 June 1984 to 16 September 1984) by the Government of the Socialist Federal Republic of Yugoslavia on Water Resources Engineering.
- Savvas Theodosiou, Mechanical Engineer I, has been granted a scholarship by the UK Water British Technical Co-operation Programme for training on the Operation and Maintenance of Water Supply Equipment.
- Maria Zachariou, Executive Engineer I, has been granted 13 months scholarship by the UK Government under its Technical Co-operation Training Programme in Water and Waste Water Engineering at the University of Laonhborough.
- Constantinos Katsavras, Executive Engineer I, has been granted 24 months scholarship in USA (CASP) to obtain an MSc degree in Geotechnical Engineering at Colorado State University.
- Andriani Nicolaou, Technician 1st Grade who has been granted a scholarship in Civil Engineering in UK completed her studies and resumed her duties on 27 August 1984.
- Nicodemos Nicodemou, Executive Engineer I, who has been granted a scholarship in Construction Management to obtain an MSc degree completed his studies and resumed his duties on 2 October 1984.
- Elias Kamourides, Executive Engineer I, has been granted a scholarship (2 October 1984 - 27 November 1984) by the Netherlands Government in Local Authority Management of Water Supplies.

II DIVISION OF WATER RESOURCES

by
D C Kypris
Senior Hydrogeologist
Head of Division

General

During 1984 we had no possibility again to collect hydrological data in the part of Cyprus still occupied for the tenth year by the Turkish troops amounting to 40% of the Cyprus land. So the behaviour of both surface runoff and groundwater bodies could not be followed or recorded in the Northern part of the country during the year under examination.

The new areas brought under hydrological observation during the year have an extent of about 37 square kilometers. A number of 208 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 1259 new wells/boreholes.

INTRODUCTION

The main tasks assigned to the Division of Water Resources are the collection and processing of Hydrological and Hydrogeological data, regarding both ground and surface water, to deal with hydrogeological problems as connected with the planning and execution of water works projects, to carry out auxiliary drilling operations, to control groundwater extraction and use and monitor water quality for the purposes of pollution controll.

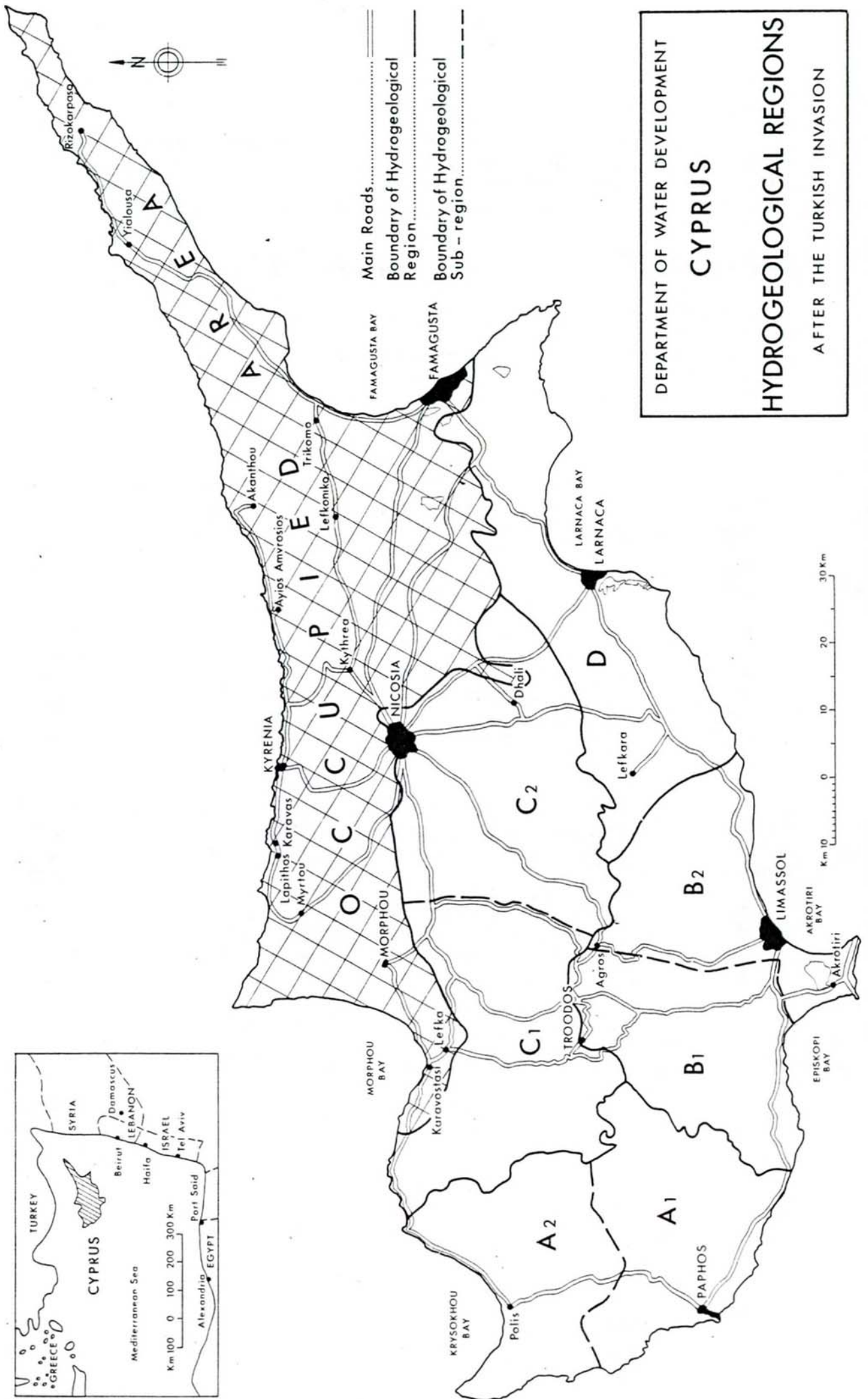
Cyprus has been divided into eleven hydrogeological regions based on both hydrogeological and administrative criteria, which were followed for reasons of better control on the collection of hydrogeological data and thorough hydrogeological studies, until July 1974 when the Turkish invasion occurred.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

During 1984, D C Kypris, Senior Hydrogeologist, was the Head of the Division. M Peppis, Geologist Class I, was the Assistant Head, the Head of the Drilling Permits and Water Control Branch and he acted also as the chairman of the specially formed advisory committee for the issue of well permits. Dr. St. Papatryphonos, Hydrologist I was the Head of Hydrometry Branch.

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 nine existing boreholes
- Drilling of ten boreholes. Four of them were observation boreholes in Yermasoyia aquifer, one was drilled for the Department of Agriculture at Zakaki and five exploratory boreholes for engineering purposes at the new site of Khalassa village.
- Removal of a number of pumps stuck or broken in boreholes.



TEST PUMPING

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 1984, 89 test pumpings were carried out as follows:-

- 21 for division of land with total hours pumped..... 469
- 60 for building permits with total hours pumped..... 171
- One for irrigation divisions with total hours pumped..... 22
- Seven for town and village water supplies with total hours pumped..... 115

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 it is occupied by Turkish troops, the data given below relate to the weather experienced in the southern part of the island during the hydrometeorological year 1983-1984.

Precipitation

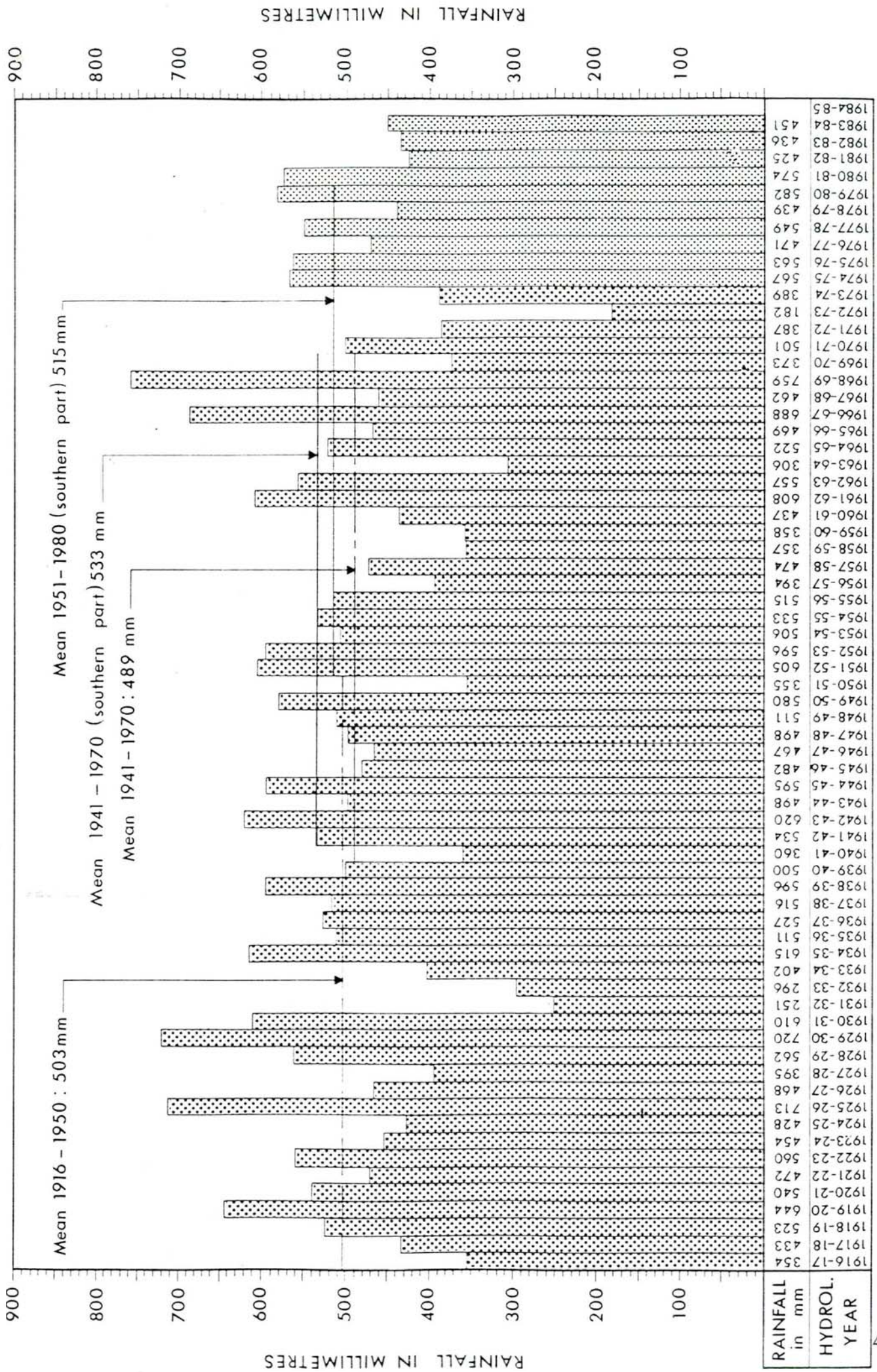
The yearly total precipitation averaged over the southern part of the island during the hydrometeorological year October 1983 - September 1984 was 451 mm which is 85% of normal (Normal is considered the average rainfall over the southern part of the island during the period 1941-70). Annual average rainfall over Cyprus is given on page ().

The total precipitation amounts during the period were lower than normal almost in all areas and ranged mainly between 75% and 95% of normal. Isohyetal map of Cyprus is on page ().

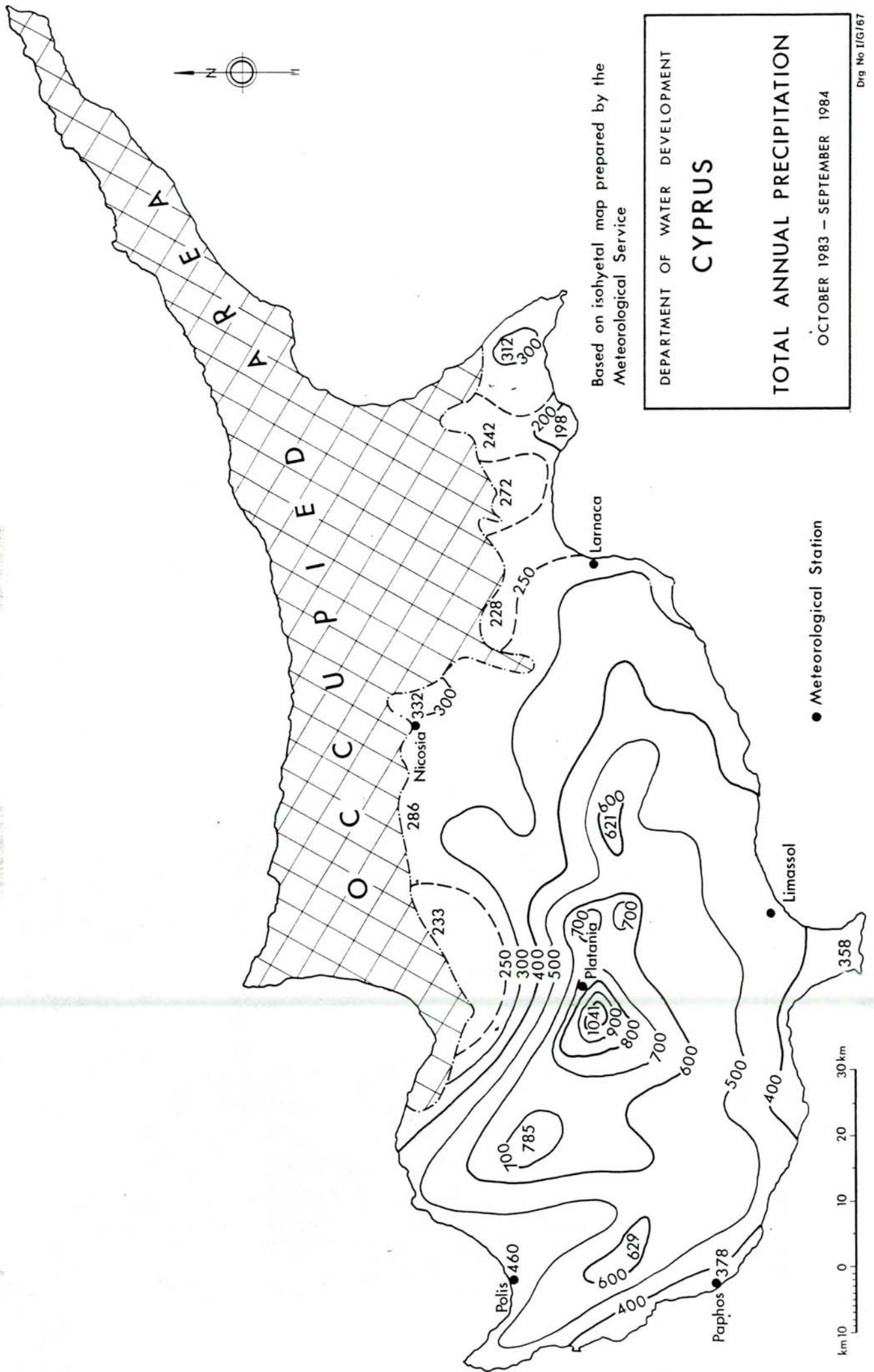
As regards the monthly distribution of precipitation, it was below normal in December, January, February, March, May, June, July and September and above normal in October, November, April and August.

Table II - 1 and graphical representation giving the incidence of rainfall during the hydrometeorological year 1983-1984, illustrates the situation:

ANNUAL AVERAGE RAINFALL OF CYPRUS 1916 - 1984



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



GRAPHICAL PRESENTATION
OF INCIDENCE OF RAINFALL 1983-1984

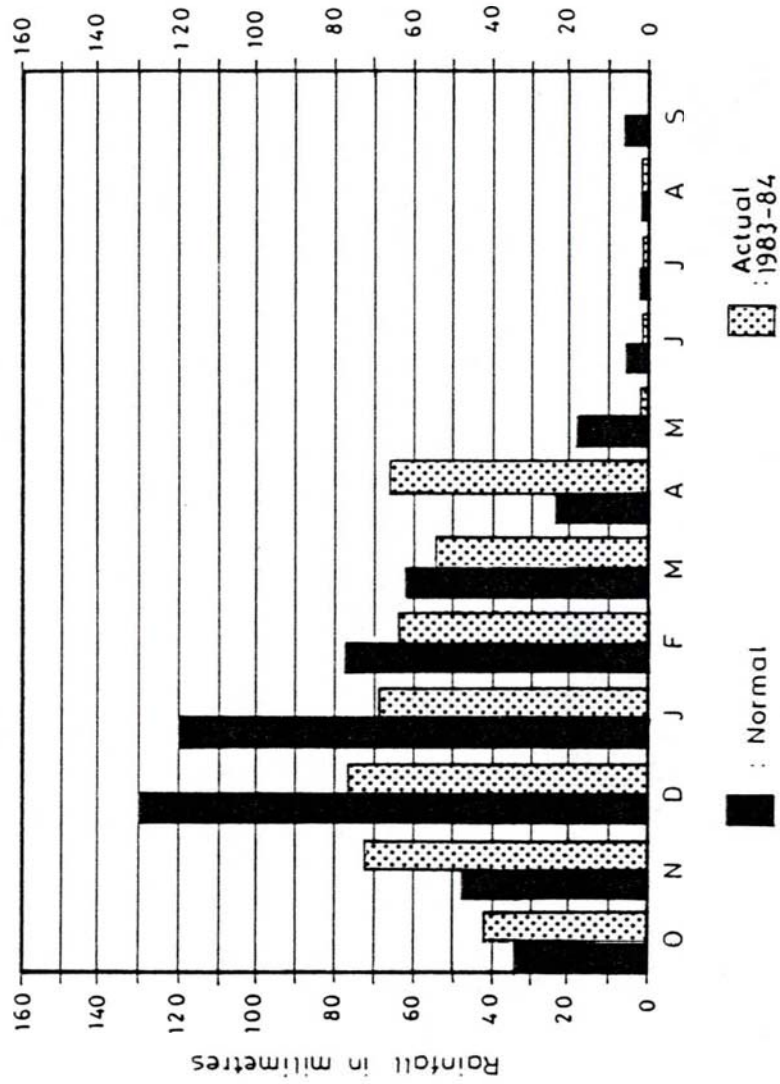


TABLE II - 1
INCIDENCE OF RAINFALL DURING THE HYDROMETEOROLOGICAL YEAR
1983-1984

Months	Rainfall (in mm)	Rainfall (in inches)	Percentage of yearly total	Percentage of monthly normal
October	42.0	1.65	9.3	122
November	72.0	2.83	16.0	147
December	77.1	3.04	17.1	59
January	69.2	2.72	15.4	58
February	64.1	2.52	14.2	82
March	54.6	2.15	12.1	87
April.....	66.0	2.60	14.6	280
May	2.1	0.08	0.5	11
June	0.9	0.04	0.2	15
July	1.1	0.04	0.2	65
August.....	1.9	0.08	0.4	136
September.....	Trace	Trace	0	0
Totals	451.0	17.75	100.0	-

Note: Yearly total on percentage of yearly normal: 85%

The maximum amount of rainfall in a 24-hour period during the hydrometeorological year was 101.2 mm, recorded on the 28th October, 1983 by an autographic raingauge installed at Kholetria village in Paphos.

The first snowfall occurred on Mount Olympus on the 10th December 1983, which is close to the median date for the first snowfall in Cyprus. Subsequent snowfalls occurred during the ensuing months till April. The last one occurred on the 23rd April 1984 which is two weeks beyond the median date for the last snowfall in Cyprus.

Hail occurred in the period from October 1983 to May 1984 and in August 1984.

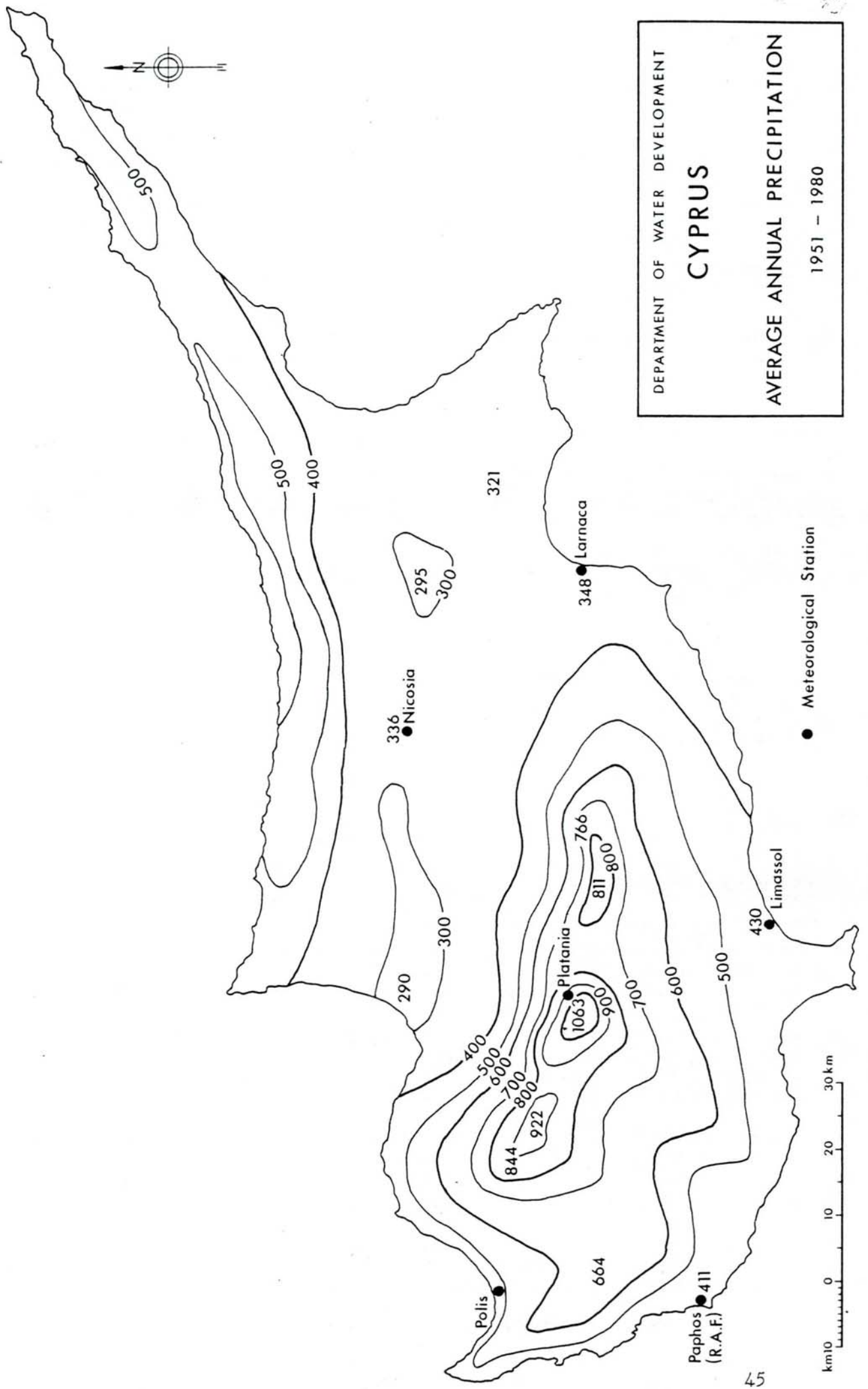
Temperature

During the hydrometeorological year 1983-84 as a whole air temperature was around normal. In particular, monthly mean temperatures were below normal in October, April and August; they were above normal in January, February and May and around normal in November, December, March, June, July and September.

The extreme maximum and extreme minimum temperatures recorded during the hydrometeorological year under review are shown on table II - 2.

TABLE II-2 INCIDENCE OF MAXIMUM AND MINIMUM TEMPERATURES 1983 - 1984

Station	Extreme maximum temperature and date		Extreme minimum temperature and date	
	C		C	
Nicosia	41.8;	4 th July	3.0;	15 th March
Limassol	35.5;	4 th & 19 th July	5.0;	28 th January
Larnaca Airport	35.4;	9 th June	3.7;	15 th March
Paphos Airport	32.9;	13 th May	4.7;	28 th January
Panayia Bridge	38.6;	4 th July	-0.4;	23 rd March
Saittas	37.0;	4 th July	1.0;	15 th March
Amiandos	31.5;	4 th July	-1.7;	15 th March
Prodhromos	32.5;	4 th July	-2.1;	15 th March



DEPARTMENT OF WATER DEVELOPMENT

CYPRUS

AVERAGE ANNUAL PRECIPITATION
1951 - 1980

● Meteorological Station

km 0 10 20 30 km

<u>Station</u>	<u>Extreme maximum temperature and date</u>	<u>Extreme minimum temperature and date</u>
Stavros	38.0; 4 th July	1.0; 27 th January
Kornos	38.0; 4 th July	2.8; 16 th March
Platania	34.7; 4 th July	-1.5; 16 th March
Phassouri	34.0; 8 th & 11 th August	1.0; 28 th January

Evaporation

Monthly total evaporation (in mm) measured from United States Weather Bureau (U.S.W.B.) class "A" pan during the hydrometeorological year 1983-1984 at selected stations is given in table II-3.

TABLE II-3

MONTHLY EVAPORATION FROM CLASS "A" PAN IN mm

Station	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Total
Nicosia	131	59	42	42	60	84	119	246	277	306	272	202	1840
Paralimni	165	103	65	61	85	102	132	240	282	317	302	213	2067
Larnaca Airport	188	110	79	71	103	108	168	222	270	267	277	222	2085
Saittas	126	60	54	42	70	72	107	209	242	265	237	189	1673
Akhelia.....	143	80	74	73	81	90	123	182	220	215	218	179	1678
Yermasoyia	127	73	49	42	75	79	117	206	243	261	251	181	1704
Polemidhia	154	79	52	53	81	86	124	211	247	266	261	192	1806
Prodhromos	93	52	24	21	24	45	103	169	203	228	181	161	1143

SURFACE WATER

Permanent Stream Gauging Stations

On important streams 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 measurements and sampling for suspended sediment and chemical analysis. The condition of float wells and weirs is also checked and cleaned when necessary.

Out of all our stations only 61 could be regularly inspected because, in the northern part of the island we have not been able to attend any flow gauging stations, due to the presence of the Turkish invasion troops, still occupying almost 40% of Cyprus for the tenth year now.

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

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

TABLE II - 4

DISCHARGE OF SELECTED STREAMS AS CALCULATED AT SELECTED FLOW GAUGING STATIONS FOR THE YEAR 1983-84

Ser. No.	Station	Stream	Location	Annual flow 10^6 m^3
1	1-2-7-90	Dhiarizos	Kouklia.....	19.0
2	2-2-8-95	Khrysokhou.....	Coast.....	4.6
3	2-8-3-10	Limnitis	Saw Mill.....	8.5
4	3-3-1-70	Ay. Nikolaos	Kakopetria	8.3
5	3-3-3-95	Karyotis	Evrykhou.....	7.3
6	3-5-4-40	Elea.....	Vyzakia.....	1.8
7	3-7-1-50	Peristerona.....	Panayia Br.	8.6
8	3-7-3-90	Akaki	Malounda.....	4.6
9	6-1-1-80	Ay. Onoufrios	Kambia.....	0.8
10	6-1-1-85	Pedhieos	Kambia.....	1.8
11	6-5-3-15	Yialias	Nisou	0.8
12	8-4-5-30	Tremithios.....	Klavdhia.....	0.2
13	8-9-7-50	Vasilikos.....	Kalavasos	2.9
14	9-6-2-90	Kryos	Khalassa.....	2.7
15	9-6-7-75	Zyghos	Khalassa.....	8.8

New flow gauging stations

During the year under review 5 new flow gauging stations were constructed.

- Stavros-tis-Psokas river, upstream of Evretou dam. Construction of a "V" shaped structure 5m wide, slope 1:10, and installation of a foot bridge for high flow measurements.
- Kouris river, upstream of Kouris Dam. Construction of a "V" shaped structure 10m wide slope 1:10, and installation of a foot bridge for high flow measurements.
- Limnatis river, upstream of Kouris Dam. Construction of a half "V" shaped structure 10m wide, slope 1:10, and installation of a foot bridge for high flow measurements.
- Aradhippou river near Aradhippou. Construction of a "V" shaped structure 4 m wide slope 1:10, and installation of a foot bridge for high flow measurements.
- Pouzis river near Alethrico Dam site. Construction of a "V" shaped structure 4 m wide, slope 1:10.

Repairs and Improvements to Existing Flow Gauging Stations

- Khapotami river near the coast: Improvements to the invert of the site by the construction of a "V" shaped structure 5m wide, slope 1:10.
- Limnitis river near Limnitis saw mill. Repairs to the invert of the sill which buffered serious damages.

- Atsas river near Evrykhou. Alterations to the invert of the weir by the construction of a "V" shaped structure 7.8 m wide, slope 1:10
- Lagoudhera river, upstream of Xyliatos Dam. Alterations to the invert of the weir by the construction of a "V" shaped structure 4m wide slope 1:10.
- Ayios Onoufrios river near Kambia. Alterations to the invert of the weir by the construction of a "V" shaped structure 6m wide slope 1:10.

Flood discharges

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

- Tremithios river near Klavdhia about $30\text{m}^3/\text{s}$ on the 25th March 1984. Its catchment area is 135 km^2 .
- Yialias river near Nisou about $29\text{ m}^3/\text{s}$ on the 11th November 1983. Its catchment area is 91 km^2 .
- Dhiarizos river near Kouklia about $22\text{m}^3/\text{s}$ on the 28th October 1983. Its catchment area is 260 km^2 .



Pedhieos river. Flow gauging station on Ayios Onouphrios stream improved in summer 1984. WDD Photo B91EN-5 (12.2.85).

- Mylou river near Kornos about 11.5 m³/s on the 11th November 1983, and about 15 m³/s on the 25th December 1983. Its catchment area is 32 km².
- Garyllis river upstream of Polemidhia Dam about 14.5 m³/s on the 24th December 1983. Its catchment area is 66 km².
- Akaki river near Malounda about 12.5 m³/s on the 11th November 1983. Its catchment area is 90 km².
- Dhiazizos river near Philousa about 9 m³/s on the 9th February 1984. Its catchment area is 125 km².
- Aradhippou river near Panayia Yematousa about 8.5 m³/s on 7th November 1983. Its catchment area is 28 km².

Inflow of Water in Dams

During 1984 out of 70 most important Dams and ponds in Cyprus which were under regular observations in the past, only 53 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 53 dams under regular observations was very low because of the low precipitation during the hydrological year under review; The maximum volume accumulated was 45 MCM or 46% of the total capacity of these dams, which is 97 MCM. Out of these dams 26 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 Departmental Division.

During the hydrological year 1983-84 2460 spring and minor stream discharges were taken on 161 springs and minor streams; 744 discharges were taken on 62 springs which are under regular monthly observations and 1716 discharges were taken on 99 springs and minor streams for a certain period at various intervals.

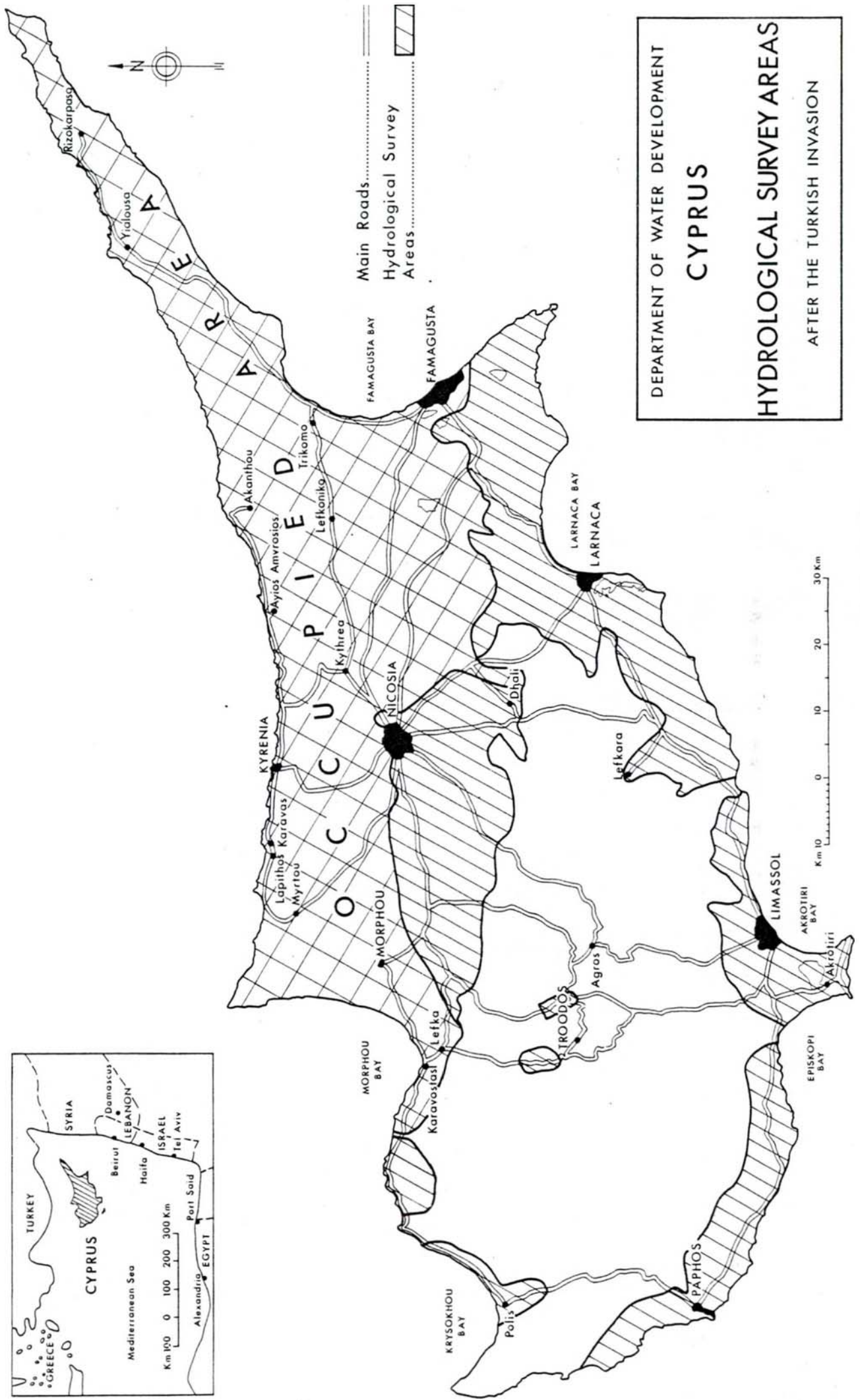
As the rainfall during the hydrological year under review was below normal for the third successive year most of the springs maintained a low flow during the whole year.

GROUND WATER

Ground Water Hydrological Work

Hydrological surveys of the ground water bearing systems were carried out on small scale by this Department before 1960. Since then, they were rapidly amounting in scale until the most important known aquifer systems were brought in a few years time under Hydrological Observations. It is unfortunate that most of our maps with the well location and other information were destroyed by fire, during the events of 1974, or lost in the area occupied by the Turkish troops. So, during the year under review, the plotting of boreholes/wells and the collection of other hydrological information continued in the free areas, where hydrological work was being carried out before. The area during the current year where such work has been carried out was 2966 km² (see map on page 51)

The springs wells/boreholes which were on register at the end of 1984 were 27,352.



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

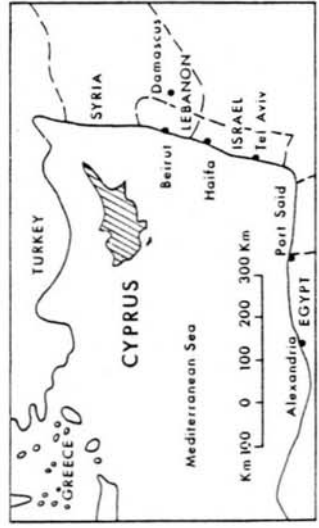


TABLE II - 5

VOLUME OF WATER ACCUMULATED AND COMMENCING DATE OF INFLOW FOR VARIOUS DAMS DURING THE YEAR 1984 (Calendar year)

Ser. No.	Dam	Capacity 10^3 X m^3	Inflow Commencing Date (1984)	Maximum Volume Accumulated 10^3 X m^3	Date of Maximum Accumulation (1984)	Minimum Volume Accumulated 10^3 X m^3	Date of Minimum Accumulation (1984)	Remarks
1	Agridhia	59	January	41	25.5.84	0.9	5.1.84	
2	Agros	72	"	27.5	27.4.84	Empty	22.8.84	
3	Akrounda	22	"	22	1.1.84	11	18.6.84	Overflowed 1.1.84
4	Akapnou - Ephtagonia ..	132	"	132	4.1.84	10.5	5.11.84	" 4.1.84
5	Arakapas Dam	128	"	128	1.1.84	17.8	28.9.84	" 1.1.84
6	Arakapas No. 1	192	"	192	23.3.84	79.1	5.11.84	" 23.3.84
7	Arakapas No. 2	119	March	79.3	10.12.84	31.7	2.4.84	Gate closed first time 17.3.84
8	Argaka	990	January	990	18.2.84	18.5	2.11.84	Overflowed 18.2.84
9	Asprokremmos	51000	"	25689	14.5.84	14270	2.11.84	
10	Athalassa	790	"	35	27.4.84	Empty	10.9.84	
11	Ayia Marina	298	"	279	7.5.84	10	2.11.84	
12	Ayii Vavatsinias Dam.	53	"	53	17.1.84	18	23.10.84	Overflowed 17.1.84
13	Ayii Vavatsinias No.1	55	"	55	1.1.84	23	23.10.84	" 25.11.83
14	Ayii Vavatsinias No.2	43	March	5.5	11.12.84	1.5	28.3.84	Gate closed first time 9.3.84
15	Dierona	159	April	73.3	25.5.84	28.6	5.11.84	" " " 10.4.84
16	Ephtagonia I	92	January	65.7	11.5.84	5.6	5.1.84	
17	Ephtagonia II	127	"	103	25.5.84	12.9	5.1.84	
18	Ephtagonia III	65	"	25	27.4.84	1	28.9.84	
19	Kalokhorio	32	February	32	17.1.84	Empty	24.10.84	Overflowed 17.1.1984

VOLUME OF WATER ACCUMULATED AND COMMENCING DATE OF INFLOW FOR VARIOUS DAMS DURING THE YEAR 1984 (Calendar year)

Ser. No.	Dam	Capacity 10^3 X m^3	Inflow Commen- cing Date (1984)	Maximum Volume Accumu- lated 10^3 X m^3	Date of Maximum Accumu- lation (1984)	Minimum Volume Accumu- lated 10^3 X m^3	Date of Minimum Accumu- lation (1984)	Remarks
20	Kalopanayiotis.....	363	February	363	15.3.84	23	4.10.84	Closed 25.2.84 overfl. 17.3.84
21	Kandou	38	January	32	7.5.84	6	13.9.84	
22	Kato Mylos	104	"	104	17.1.84	21	16.10.84	Overflowed 17.1.84
23	Khandria	90	"	70	2.3.84	1	28.11.84	" 2.3.84
24	Kiti	1625	-	-	-	-	-	No inflow 1984
25	Kyperounda I	50	January	50	20.2.84	3	26.10.84	Overflowed 20.2.84
26	Kyperounda II	273	"	273	26.4.84	23.8	20.1.84	" 26.4.84
27	Lefka Marathasa	368	"	368	1.1.84	160	31.8.84	Overflowed 3.12.83
28	Lefka Kafizes	113	"	113	1.1.84	70	29.9.84	" 14.12.83
29	Lefkara	13850	"	1787	12.5.84	288	10.11.84	
30	Liopetri	325	November	46	17.12.84	Empty	4.11.84	
31	Lymbia	220	January	220	1.1.84	28	26.10.84	Overflowed 12.11.83
32	Lythrodhonda Upper..	32	"	32	1.1.84	Empty	16.8.84	
33	Lythrodhonda Lower..	32	"	32	13.1.84	Empty	28.9.84	Overflowed 13.1.84
34	Melini	59	"	59	4.1.84	14.8	23.10.84	" 5.12.83
35	Mavrokolymbos	2180	"	446.6	5.5.84	136	31.10.84	
36	Ora Pond	62	February	53.5	8.5.84	2	23.10.84	Records as from 29.2.84 Gate closed 11.11.83
37	Ormidhia (Vathys) ..	100	November	100	5.11.84	Empty	20.11.84	Overflowed 5.11.84
38	Pakhyamos	43	January	33	24.3.84	Empty	28.6.84	

VOLUME OF WATER ACCUMULATED AND COMMENCING DATE OF INFLOW FOR VARIOUS DAMS DURING THE YEAR 1984 (Calendar year)

Ser. No.	Dam	Capacity 10^3 X m^3	Inflow Commencing Date (1984)	Maximum Volume Accumulated 10^3 X m^3	Date of Maximum Accumulation (1984)	Minimum Volume Accumulated 10^3 X m^3	Date of Minimum Accumulation (1984)	Remarks
39.	Palekhori (Kambi)...	620	January	620	19.2.84	8	24.10.84	Overflowed 19.2.84
40.	Paralimni Lake	1365	November					Constantly open
41.	Pelendri	123	January	106.4	11.5.84	5.1	26.10.84	Overflowed 14.1.84
42.	Pera Fedhi	55	"	55	14.1.84	Empty	13.11.84	"
43.	Petra Upper	10	"	10	5.1.84	Empty	1.9.84	" 5.1.84
44.	Petra Lower	25	"	25	26.1.84	"	10.8.84	" 26.1.84
45.	Pharmakas No.1	20.4	March	17.5	8.5.84	4.3	24.10.84	Records as from 23.3.84 Gate closed 15.3.84
46.	Pharmakas No.2	43	March	28.5	25.4.84	Empty	4.10.84	" " 27.3.84 " 23.1.84
47.	Pomos	860	January	860	13.2.84	34	29.10.84	Overflowed 13.2.84
48.	Polemithia	3400	"	995	4.5.84	172	1.11.84	
49.	Prodromos	110	"	85	26.4.84	Empty	11.10.84	
50.	Pyrgos	283	January	283	10.5.84	Empty	25.7.84	Overflowed 20.5.84
51.	Trimiklini	340	April	340	8.5.84	Empty	20.10.84	Gate closed April. Overfl. 8.5.84
52.	Xyliatos	1220	January	1220	14.1.84	1057	2.11.84	Overflowed 14.1.84
53.	Yermagoyia	13600	"	8157	14.5.84	2357	2.11.84	

Through the Hydrological Surveys all wells/boreholes, springs and chain-of-wells are registered and plotted on maps. A dense network of observation boreholes, is being levelled. Through these observation boreholes/wells, the water level is being measured twice a year, at the end of the dry season (November), when it is expected to be at lowest and at the end of the wet season (March), when it is expected to be at highest level. In areas where more detailed information is necessary, a network has been established of observation boreholes where monthly or bimonthly measurements are taken. The number of observation borehole monitored twice during 1984 is 1,472 and, every month or fortnight 567.

For the purpose of establishing the quantity of water pumped from our aquifers a questioning program is carried out once a year, through which information from our farmers is sought as regards the extent and type of plantations, the irrigation system used and other relative information from which the amount of water used is determined, crosschecked wherever possible from water meter readings, or electricity meter readings, and pump output. It has been established through questioning that during 1984 12057 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 1984 the number of groundwater samples from observation boreholes analysed for Cl was 2,030.

As regards groundwater situation, due to this year's low rainfall and poor groundwater recharge a general drop of the water table in all important aquifers was noted and in some of them considerably. The water level rise between November 1983 and November 1984 is due to the high rainfall during November 1984. Details may be seen in the table II-6 selected observation boreholes.

TABLE II-6

SELECTED OBSERVATION BOREHOLES

Serial No.	Hydr. No.	Village	Water levels, m.				Water level change increase (+), decrease (-)		
			1983		1984		March	November	November
			March	November	March	November			
56/56	192	Liopetri	+ 0.48	+ 0.37	+ 0.38	+ 0.32	- 0.10	- 0.05	
20/63	1516	Paralimni	+19.20	Blocked	+18.98	Blocked	- 0.22	-	
22/63	1518	"	+ 5.74	+ 5.53	+ 6.06	+ 6.09	+ 0.32	+ 0.56	
51/51	774	Phrenaros	+ 0.93	+ 0.52	+ 0.12	+ 0.76	- 0.81	+ 0.24	
79/56	975	"	+ 8.28	+ 8.39	+ 8.01	+ 8.28	- 0.27	- 0.11	
88/54	24	Kolossi	+ 2.60	- 0.60	+ 2.05	- 0.10	- 0.55	+ 0.50	
51/63	813	Limassol	+ 1.53	+ 0.63	+ 1.33	+ 0.78	- 0.20	+ 0.15	
45/63	811	Zakaki	+ 1.13	+ 0.03	+ 0.83	+ 0.33	- 0.30	+ 0.30	
107/61	17	Yermasoyia	+ 0.36	+ 3.78	+ 1.38	+ 2.57	+ 1.02	- 1.21	
180/59	8	"	+14.26	+17.08	+18.64	+14.45	+ 4.38	- 0.63	
7/60	22	"	- 0.02	+ 1.18	- 0.12	-	- 0.10	-	
134/59	27	"	+ 0.39	+ 2.50	+ 0.12	+ 1.78	- 0.27	- 0.72	
161/50	180	K. Trimithia	+187.03	+184.71	+185.73	+186.06	- 1.30	+ 1.35	
90/50	106	"	+191.20	+191.02	+191.00	+190.85	- 0.20	- 0.17	
125/60	15	Episkopi	+24.31	+17.88	+22.81	+21.53	- 1.50	+ 3.65	
EB 94/70	1236	Akrotiri	+ 1.44	- 0.79	+ 0.66	+ 0.01	- 0.78	+ 0.80	
P.B. 12	2671	Kouklia	+ 1.40	+ 0.75	+ 1.50	+ 1.19	+ 0.10	+ 0.44	
P.B. 17	2673	Akhelia	+ 6.92	+ 5.62	+ 6.87	+ 5.62	- 0.05	0.00	

Control and Conservation of Ground Water

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

The committee performed during 1984, 32 meeting and examined 3599 applications sent to the Director, WDD by the District Officers, as follows:-

Water Supply (Special Measures) Law areas.....	272
Water Conservation areas.....	2754
Non Water Conservation areas.....	573

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 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.

Application 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 58 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 with draw 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.

TABLE II - 7

WATER CONSERVATION AREAS

Ser. No.	Water Conservation Area	Order No	Date	Cazette No	Date
1	Kokkinotrimithia-Ayii Trimithias, Paleometokho, Mammari.....	556	31.10.51	3584	31.10.51
2	Nicosia.....	556	31.10.51	3584	31.10.51
3	Tersephanou-Klavdhia.....	376	18. 8.52	3639	27. 8.52
4	Laxia.....	374	18. 8.52	3639	27. 8.52
5	F'sta, Phrenaros, Paralimni, Ormidhia, Xylotymbou, Pergamos, Kouklia, Avgorou etc.....	164	3. 3.56	3924	8. 3.56
6	Akrotiri, Phasouri, etc.....	165	3. 3.56	3924	8. 3.56
7	Morphou, Syrianokhori, Prastio, Nikitas Elea, Pendayia.....	1052	30.10.56	3995	8.11.56
8	Dhali, Potamia.....	1194	29.11.56	4008	6.12.56
9	Ayios Andronikos, etc.....	916	26. 9.57	4081	3.10.57
10	Morphou, Peristerona, Astromeritis, Akaki etc.....	314	3. 5.58	4133	15. 5.58
11	Vasilias, Lapithos, Kyrenia, Ayios Epiktitos, etc.....	245	28. 4.59	4228	30. 4.59
12	Makedonitissa, etc.....	544	16.11.59	4277	26.11.59
13	Moni Pyrgos.....	226	27. 7.61	75	27. 7.61
14	Yermasoyia.....	443	8.12.61	112	8.12.61
15	Dhiorios (Djipi Loc.).....	324	21. 6.62	163	21. 6.62
16	Yialia, Ayia Marina, Argaka, Polis.....	359	7. 7.62	168	7. 7.62
17	Yialias River (Potamia, Dhali, Nisou, Mathiati).....	189	25. 4.63	245	25. 4.63
18	Kiti, Pervolia, Meneou, Dhromolaxia.....	50	28. 1.65	384	28. 1.65
19	Kouklia, Anarita, Timi, Akhelias.....	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	25.11.65
23	Ayia Erini.....	280	19. 5.66	499	2. 6.66
24	Paramali, Evdhimou.....	SBA			
25	Lysi, Kondea.....	68	29. 7.67	212	29. 7.67
26	Akanthou.....	776	7. 9.67	599	22. 9.67
27	Pergamos (Extension).....	777	7. 9.67	599	22. 9.67
28	Ayios Amvrosios.....	889	19.10.67	606	3.11.67
29	Kyrenia Range Limestone Mass.....	890	19.10.67	606	3.11.67
30	Vasilikos, Xeropotamos.....	817	7.11.68	693	22.11.68
31	Yeroskipos, Konia, Ktima, Peyia.....	862	28.11.68	697	13.12.68
32	Karavostasi, Peristeronari.....	741	4. 9.69	748	19. 9.69
33	Yeri.....	50	29.12.69	771	16. 1.70
34	Neokhorio, Androlidou.....	75	8. 1.70	773	23. 1.70
35	Yiolou, Loukrounou, Skoulli.....	845	14.10.71	904	29.10.71
36	Pissouri, Evdhimou.....	845	14.10.71	904	29.10.71
37	Kormakitis, Myrtou, Dhiorios.....	576	10. 8.72	958	25. 8.72
38	Akanthou (Extension).....	851	7.12.72	979	15.12.72
39	Ayios Ioannis (Malounda).....	288	15.11.73	1054	30.11.73
40	Kambos Chakistra.....	307	25.11.74	1158	25.11.74
41	Parekklisha.....	-	-	1180	4. 4.75
42	L'ssol-Paphos-L'ca Extension pf W. Conservation areas.....	206	23.10.75	1233	7.11.75
		215	30. 9.77	1429	3. 3.78

TABLE II - 8

WATER SUPPLY (SPECIAL MEASURES) LAW AREAS

Ser. No.	Area	Order No	Date	Cazette No	Date
1	Western Mesaoria (Pendayia-Morphou Kokkinotrimithia).....	-	-	331	9. 7.64
2	Akrotiri peninsula.....	-	-	331	9. 7.64
3	South-Eastern Mesaoria (F'sta - Paralimni-Ormidhia-Akna), later with draw.....	-	-	331	9. 7.64
4	Potami.....	89	12. 2.66	479	24. 2.66
5	Dhiarizos River.....	196	23. 5.74	1104	21. 6.74
6	Xeropotamos River.....	196	23. 5.74	1104	21. 6.74
7	Ezouzas 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	Mavrokolympos River (Ext. of Yeroskipos-Peyia W C A).....	196	23. 5.74	1104	21. 6.74
10	Kouklia-Paphos-Peyia.....	111	6. 6.75	1193	6. 6.75
11	Nisou-Potamia valley.....	274	15.12.78	1488	15.12.78
12	Xylophagou-Ormidhia Area.....	72	12. 3.82	1760	12. 3.82

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 boreholes or well.

According to the provisions of the above referred law, water meters should be installed in the Water Supply (Special Measures) Law areas. Information about the installation and operation of water meters are not available for Western Mesaoria area, since this area is still under Turkish occupation. For Paphos, Xylophagou-Ormidhia and Nisou-Potamia valley Area, the Law has not yet been completely enforced. In Limassol-Akrotiri area during 1984 there were 394 water meters installed of which 275 are in continuous operation. The total volume of water recorded is 15.68 MCM. During the year 78 illegal pumpings have been reported to the District Officer, out of which 48 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 applicant is competent to carry out such a job. A fee is paid for the licence and each year for its renewal.

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

During 1984 this Department issued 13 Drillers licences and renewed 58 others. The number of private drilling rigs which drilled for water during 1984, was 86 and this Department has been notified about the drilling or cleaning of 158 boreholes. Information from private drillers have been received by this Department for 155 boreholes.

During 1984, 7 private Drillers were reported to the District Officers for illegal drilling.

WATER QUALITY

Chemical Analyses

During the year, 560 samples of water were sent to the Government Analyst and 1312 to the WDD Laboratory for chemical analyses. Out of these, 854 samples were taken from springs, wells or boreholes, which are used or proposed as water supply sources. The remaining 1018 samples were taken from rivers, springs, observation boreholes and other miscellaneous sources.

Bacteriological Analyses

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

During the year 41 samples were sent to the Government Analyst.

Suspended Sediment Analyses

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

During the year 60 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 application from Greek Cypriot displaced farmers to use wells/boreholes abandoned by their Turkish cypriot owners and to grant loans for the purchase, repair and installation of pumping plants and pipelines for the irrigation of abandoned fields of Turkish cypriot ownership. For this purpose, the Government placed at the disposal of the Committee, the sum of £457,500 for the above said loans.

According to the above said decision of the Council of Ministers, the Committee is chaired by the Director-General, Ministry of Agriculture and Natural Resources, who transferred the chairmanship to the Director of Water Development Department. Other members are the Director-General, Ministry of the Interior, the Director-General, Ministry of Finance, the Director-General, Planning Bureau, the Commissioner for Co-operative Development, the Director, Department of Agriculture and the representatives of the Ministry of Agriculture and Natural Resources at the District Committees for the protection of Turkish Cypriot properties, or their representatives.

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

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

The decisions of the Committee are then notified to the Loan Commissioner who releases the proper amount, to the interested farmers, who sign an agreement for the repayment of 1/3 of loan and the running expenses as well. The remaining 2/3 of the amount is given to the farmer ex gratis. The repayment period for the loans has been set to ten years with an interest of 4.5%.

When part or the whole pumping unit of Turkish Cypriot ownership exists on the borehole/well, a loan may be granted for the purchase of what is missing and the value of the existing equipment with its anticipated life is calculated. Taking into account these parameters and after 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. The farmer has to repay only the 1/3 of the amount the remaining 2/3 is given ex gratis.

From its establishment the Central Committee for the issue of loans and the reactivation of Turkish Cypriot owned wells/boreholes had 57 meetings during which it approved 441 applications from 1275 displaced farmers for the irrigation of 12293 donums of land. The amount of loans granted by the end of this year was £376904 and the pumping plants of Turkish Cypriot ownership to £42,190.-

During the year under examination, the Committee had one meeting during which it approved 3 applications from 14 farmers for the irrigation of 88 donums of land. The amount of loans granted is £4,200.

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	Limassol	Larnaca	Paphos	Total
Applications approved (Number).....	-	1	1	1	3
Wells/boreholes allocated (Number).....	-	1	1	1	3
Farmers benefited (Number).....	-	9	1	4	14
Area to be irrigated (donums).....	-	45	13	30	88
Loans granted (Number).....	-	1	1	1	3
Loans granted (Pounds £).....	-	1200	1600	1400	4200
Loans issued (Pounds £).....	-	1200	1600	1400	4200

III DIVISION OF HYDROLOGY
AND WATER RESOURCES MANAGEMENT

by

I. St. Iacovides
Senior Hydrogeologist
Head of the Division

Introduction

The Division of Hydrology and Water Resources Management was formally established in late 1982 within the framework of the reorganization of the Department.

The main tasks and activities of the Division aim at providing the Department with basic information about the water resources to enable

- Decisions on the exploitation of water resources
- Development for additional water resources
- Allocation for water use
- Appraisal of the exploitation and development policy of water resources and its consequences as to quantity and quality
- Formulation and evaluation of new water projects
- Management and conjunctive use of surface and groundwater resources
- Applied research in all the above fields

The structure of the Division consists of the following three branches with their main functions as described.

Engineering Hydrology Branch

Main function: Watershed behaviour evaluation of runoff and flood studies; forecast of flow; recommendations for updating and readjustment of surface water network; computer applications on watershed runoff simulation and divertible quantities; optimization and forecast models for operating and managing surface water systems and resources; surface water pollution evaluation and studies for its prevention.

Groundwater Hydrology Branch

Main function: Regional groundwater evaluations; updating of the inventory of groundwater resources; investigations into obtaining and updating of hydrogeological properties of aquifers; spring flow phenomena; groundwater (streambed) recharge; status and inventory of domestic water supply sources; groundwater pollution evaluation and management; aquifer simulation models (description and forecast of behaviour as to quantity and quality); environmental radioisotope studies.

Water Resources Management and Operation Branch

Main function: Based on the studies of the Surface and Groundwater Branches formulation of constraints and criteria for decision making on the availability of the water resources; advice on new development projects and follow up of these projects; recommendations with respect to pollution control; operation studies on surface and groundwater resources and their conjunctive use; appraisal of the exploitation policy of water resources and its consequences as to quantity and quality.

During 1984 the Division consisted of the following staff:

- 1 Senior Hydrogeologist - Head
 - 1 Geologist I - Ast. Head
 - 1 Hydrologist I
 - 1 Executive Engineer I until 20.8.84 (transferred to Evretou Dam)
 - 2 Senior Technicians
 - 2 Technicians I
 - 2 Technicians II (on contract)
 - 1 Hourly Technician
-
- 11 total staff

MAIN ACTIVITIES

ENGINEERING HYDROLOGY BRANCH

The work carried out during the year in the framework of the various projects of the department was as follows:

Southern Conveyor Project

The runoff of Kouris River continued to be updated during 1984 and data were supplied for the assessment of the optimum operation of the Kouris Dam in conjunction with the other water resources especially on the occasion of drought.

Krasokhoria Integrated Rural Development Project

An interim assessment of the hydrology at 17 sites for dams and diversions required for the identification and alternatives selection stage for the Krasokhoria Project was carried out.

The information that was provided on a 145-page report (WDD-H/16) included among other data of inventory nature, the following:

- Monthly computed gross discharge for the available period of the rainfall record (65 years)
- Flow duration data
- Statistics on the simulated flows
- Average monthly divertible quantities at various diversion sites;
- The parameters of the rainfall-runoff model used for the simulation of the flow at each site.

Karyotis Project

In anticipation of the technoeconomic study for the utilization of part of the flow of Karyotis River mainly for the Nicosia Water Supply a review and updating of the hydrology of the rivers of Karyotis, Atsas, Elea and Peristerona was carried out. Calibration of the rainfall-runoff model and simulated flows up to 1982 were obtained at four sites on Karyotis River, four sites on Elea River and one site on Atsas River. For Peristerona River only the basic input data were prepared and made ready for the calibration of the model.

Statistical Analysis of Rainfall in Cyprus

The statistical analysis on the record of 1916 to 1981 for 62 rainfall-stations was carried out in the framework of the evaluation of the drought and flood frequency. This evaluation is extremely

useful in the operation of the major water works and the use of the aquifers.

All the work was performed on an IBM-370 computer. The study resulted to frequency tables of various magnitudes of rainfall in Cyprus. This work has also been presented to the Meteorological Service.

Other Projects and Studies of the Department

During the year under review, the following hydrologic studies which involved preparation of basic data, runoff series and frequency of flow were completed for the following sites:

- Pouzis River at the proposed site for a dam at Alethriko
- Pedhieos River at the proposed damsite at Moulos
- Akaki River at the proposed damsite at Malounda
- Assessment of the Maroni river flow and inflow into the Maroni Sinkhole; this was part of a general study for the evaluation of recharge of the Gypsum aquifer
- Evaluation of the flow and infiltration at four sites in the aquifer of Yermasoyia River downstream of the dam; this was part of the conjunctive use of the dam and the aquifer through controlled releases.

GROUNDWATER HYDROLOGY BRANCH

The work carried out during the year by this Branch of the Division in the framework of the various projects of the Department was as follows:

Study of the Argaka-Makounda Aquifer

Due to the rising trend of water demand for irrigation from the aquifer the water-balance and yield potential were reviewed since the extraction rate reached the safe limit. A new irrigation borehole was sited and drilled and the safe yield was evaluated. A monitoring program was established so that a conjunctive use of the aquifer and the dam is carried out in the immediate future for the most effective utilisation of the water resources of the area.

Study of the Gypsum Aquifer at Maroni:

The water-balance of this aquifer was evaluated. The potential contribution of the aquifer to the overall Vasilikos-Pendaskinos scheme was assessed. At the same time the effects on the aquifer due to the anticipated diversion of the major portion of the flow of Maroni at Vavla towards Dhypotamos dam were estimated.

The conditions near the Sinkhole area at Maroni are continuously being monitored since it affects the security of a nearby road and neighbouring houses.

Use of Radioisotopes in Hydrology:

The sampling of groundwater in the area of the Kouris Delta aquifer continued throughout 1984. The analytical work for Tritium and the Stable Isotopes is being carried out in Vienna at the Laboratory of the International Atomic Energy Agency which finances this study.

The purpose of this work is the application of radioactive techniques in hydrology for the evaluation of recharge which originates from the Kouris River flows and that from local rainfall. Initial results indicate that some 75% of the annual recharge may be due to Kouris runoff infiltrating in the riverbed alluvium.

Study of the Dhiarizos Riverbed Aquifer

This study is being carried out in the framework of the Krasokhoria Project and in connection to all the other schemes which envisage or are presently utilizing water from the Dhiarizos River.

Various other Studies

- The aquifers within the Southern Conveyor Project, namely those of Akrotiri, Yermasoyia, Parekklissha, Kiti and Kokkinokhoria continued to be monitored. The water level fluctuations, sea-intrusion and use continued to be assessed so that any changes on the ongoing plans are timely made.



Water spreading in the Kouris riverbed for increased infiltration. (25.11.84)

- A monitoring network was established on the Phassouri recharge pond so that an estimate on the performance and effective recharge could be made. This information will be utilized in the future after the construction of Kouris Dam in the event that similar recharge ponds are implemented to augment the local recharge.

WATER RESOURCES MANAGEMENT AND OPERATION BRANCH

Kouris Delta Emergency Scheme

The boreholes of the Kouris Delta aquifer continued to supplement the supply from Yermasoyia and Polemidhia Dams for the irrigation in the Akrotiri-Phasouri area. A new borehole and an old one were added to the wellfield being utilized for this purpose. The total quantity extracted during 1984 was 1.8 MCM from 8 boreholes. In addition, a quantity of 0.8 MCM was extracted and exported for the recharge of the Yermasoyia aquifer utilizing the same conveyor that brings water for irrigation in the summer period. Table III-1 lists the new boreholes.

The performance of the Kouris Delta was monitored throughout the year and water levels, quality changes and progressive yield records were maintained.

Simple recharge works were recommended and carried out in the riverbed immediately downstream of the M1 highway. These consisted of widening and levelling the riverbed, providing more time for infiltration of the river flow.

Table III-1 Drilling and Pumping Tests in the Kouris Delta Aquifer

Bore-hole	Elev. m amsl	Depth m	Casing dia. (inch)	Bridge-slotted screens (m)	Trans-missivity m^2/h	Specific yield	Recommended	
							Pump suction (m)	Yield (m^3/h)
130/84	23.0	70.1	8	61.0-66.5	1000	2×10^{-4}	58	120
			10	36.6-54.9				
87/77							45	160

Release of Water from the Yermasoyia Dam for Recharge

The extraction from the Yermasoyia Riverbed aquifer downstream of the dam depends almost entirely on the recharge through spills or controlled releases of water from the Yermasoyia dam.

The total extraction during 1984 for water supply purposes was 4.86 MCM.

To maintain this extraction releases were made from the dam and water was imported from the Kouris Delta area for recharge. A total of 3.38 MCM were recharged into the aquifer as follows:

<u>Period</u>	<u>Quantity MCM</u>
22 February - 11 May	0.69 (imported from Kouris Delta)
27 June - 9 July	0.80
27 August - 7 September	0.77
18 October - 29 October	0.62
13 December - 21 December	0.51
Total	3.38

The monitoring of all the hydrologic and hydrogeologic changes was maintained throughout the year and the preparation and calibration of a hydrogeologic model was continued. This will allow the optimization of the management and conjunctive use of the surface reservoir and the aquifer.

In the same year four observation boreholes were drilled near the coast of the Yermasoyia aquifer for monitoring the fresh-sea water interface. These are listed in Table III-2

Table III-2 Data of the Observation Boreholes Drilled in Yermasoyia Aquifer

Hydr. No.	Serial No.	Elevation m (amsl)	Depth (m)	Diameter (inches)	Perforated PVC casing
1075	76/84	4.96	45.1	4	6-45.1
1076	77/84	1.92	38.1	4	6-38.1
1077	78/84	4.98	43.6	4	6-43.6
1078	109/84	4.26	47.9	4	6-47.9

Groundwater Use in Kokkinokhoria

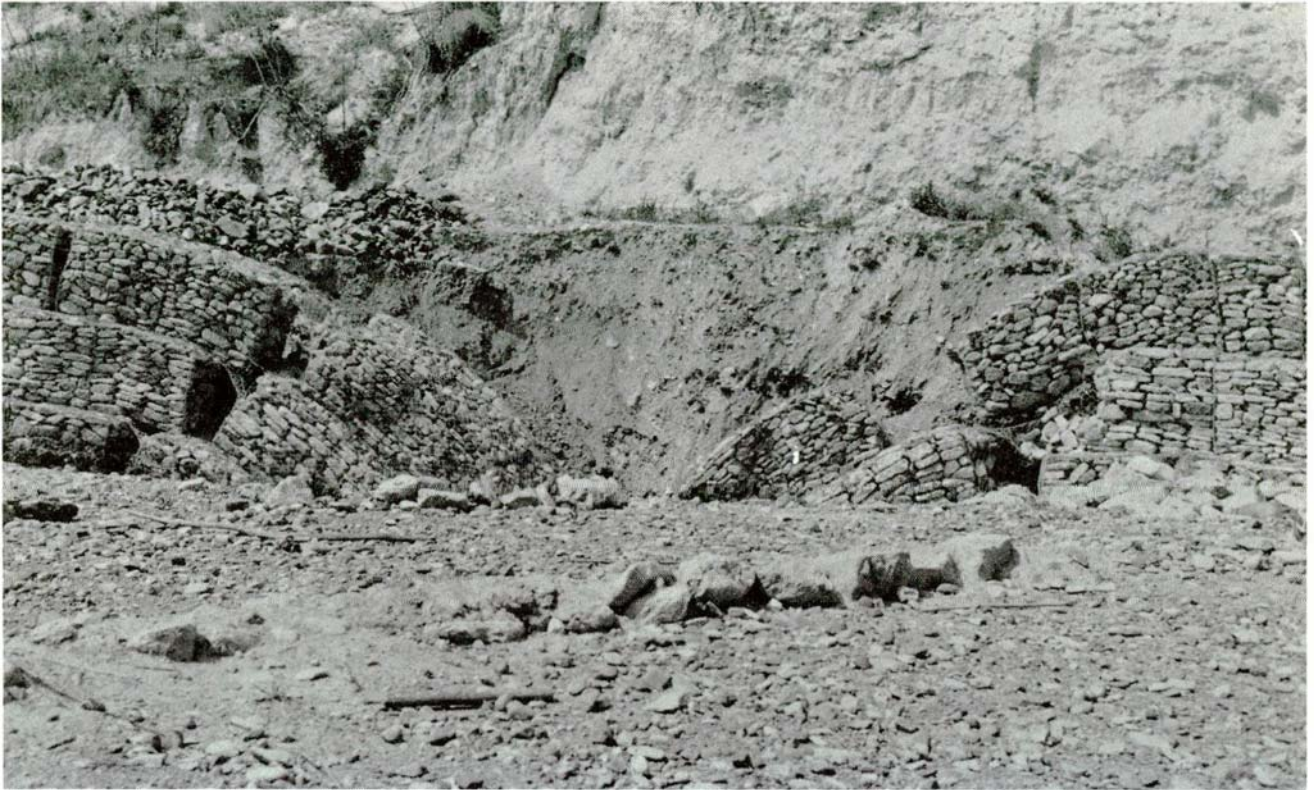
Within the framework of the Southern Conveyor Project and the design of the surface water irrigation network a study was carried out for the identification of areas and boreholes which could be utilized conjunctively with the surface water. Various ways of joint use were studied and put forward.

Evaluation of the Required Release from Kouris Dam to Maintain the Akrotiri Aquifer Water-Balance

A number of simulation runs were executed using the Akrotiri groundwater model to determine the required release of water from the Kouris dam, which is under construction, to maintain the water-balance of the aquifer.

A steady release of $0.76 \text{ m}^3/\text{sec}$ in the dry months of March to August (a total of 12 MCM/yr) will provide such conditions in the aquifer that the present extraction could continue without any detrimental effect on the aquifer.

In the future, when irrigation water will be supplied directly from Kouris dam and the extraction will be decreased then a far less quantity will be needed for release.



Sinking of gabion protection wall in the sinkhole developed in spring 1984 at Maroni.
WDD Photo B40EN-3A (8.5.84)



A new sinkhole developed in the Vasilikos riverbed at the same elevation as that
of Maroni. WDD Photo B44EN-21A (16.5.84)

SCHOLARSHIPS AND TRIPS ABROAD

Mr A Christodoulides, Hydrologist (I), attended a training course at the International Atomic Energy Agency Headquarters in Vienna on the Use of Radioisotopes in Hydrology between the 10th of January to 10th of July 1984 under a fellowship from IAEA within the Regular Technical Assistance Programme of IAEA.

Mr I St Iacovides, Senior hydrogeologist made a Scientific Visit to IAEA Headquarters in Vienna, sponsored by the same Agency, to discuss the findings of the Environmental Isotope Survey in Akrotiri Aquifer on 1st to 10th July, 1984.

SYMPOSIA - WORKSHOPS

A workshop titled "European Workshop on Hydrologic Management in Mediterranean Islands" was organized by the Council of Europe with the cooperation of the Ministry of Agriculture and Natural Resources of Cyprus at Nicosia on the 15th to 17th October, 1984.

The workshop which was organized and run by the Division of Hydrology was attended by 35 local scientists and 23 foreign participants from 6 countries and two International Organizations was successful and fully met the envisaged objectives.

IV DIVISION OF PLANNING

by
Chr. Marcoullis
Senior Water Engineer
Head of Division

Introduction

The Planning Division of the Water Development Department comprises the following three branches:

- . Reconnaissance and Feasibility Studies
- . Geotechnical Investigations and Laboratory
- . Topography

Summary of Activities

During 1984 the Southern Conveyor Project and the Khrysokhou Irrigation Project have officially entered the implementation stage and therefore are not examined here any longer, except for covering the needs for further geotechnical investigations and topographic surveys if necessary.

Two new major projects i.e the Krasokhoria Integrated Rural Development Project and the Karyotis Project were initiated during 1984. Work on the first one had substantially covered its formulation, whereas for the second, work was limited to the preparation of contract documents and the appointment of Consulting Engineers for the feasibility study.

In addition to these major projects several other smaller irrigation projects were studied either at reconnaissance or feasibility stage. Such projects are:

- . The Solea Valley Project where a great number of schemes (mostly ponds) were studied at a preliminary stage and proposed as a solution to the irrigation problem of the valley.
- . The Vizakia and Akaki Malounda dam irrigation schemes which were studied at a feasibility stage.
- . Other minor projects at reconnaissance stage.

As a result of the effort of the Department to cope with the personnel requirements of the major projects, which were under implementation, a shortage of personnel was experienced by this Division during 1984. In order to proceed with the preparation of the above studies the assistance of the Design Division was necessary. Therefore, some of the above projects are reported under Design Division in Chapter V.

Krasokhoria Integrated Rural Development Project

This project was initiated in 1984 on the basis of the successful precedent of the Pitsilia Project. The project area, which extends over the vine growing region of the Limassol District and the western part of Paphos District, was selected among five alternative areas that were considered in

1983. As in the case of Pitsilia Project, water development and irrigation would constitute the major component of the Project.

During 1984 the study was limited to the formulation of the project. The hydrology of all the major rivers of the project area, which include the Garyllis river, the three main tributaries of the Kouris river, the Khapotami and the Dhiarizos rivers, was studied and possible damsites and pondsites were located. In particular 7 damsites and 9 pondsites were originally selected and preliminary designs were carried out. Topographic surveys were completed and geotechnical investigations commenced on the most promising damsites.

These data along with the necessary agroeconomical information formed the basis of short preliminary reports, which were further appraised by the end of the year in cooperation with an FAO/W.B C.P Progress Mission. As a result of this appraisal, which took in consideration various specific limiting factors such as the suitability of lands to be irrigated and the necessity of uprooting vines, the selected damsites were reduced to two and the pondsites were limited to 6. Although a decision to proceed with the feasibility studies of these schemes was taken, some other schemes could be reconsidered in the future in the light of new information regarding the suitability of land to be irrigated. The feasibility studies will be carried out in 1985.

Karyotis Project

In an effort to investigate the possibility of securing additional water supplies for Nicosia and some neighbouring villages, Government has initiated in 1984 the study of the Karyotis Project.

The main objectives of the Project would be:

- . Hydrological studies of the Karyotis river to determine availability of water.
- . To examine the present and future water use for irrigation in the whole of the Solea valley.
- . To calculate any surpluses which could be transferred to Nicosia for domestic water supplies and the engineering works involved.
- . During 1984 the relevant contract documents were prepared and the final negotiations with the Soviet Organization "Shelkozpromexport" took place, for them to undertake the feasibility study of the Project, within the framework of a Protocol signed between the two countries in 1984. The consultancy contract was signed late in October 1984 and the study is to commence early in 1985.

Solea Valley

Up until 1984 several individual schemes were studied at various stages in the Solea Valley, which, however, had the disadvantage of interference with the existing complicated system of water rights. In an effort to overcome this problem and facilitate a more global planning of a solution, a preliminary study was undertaken with a view of :

- . Locating all physically feasible storage possibilities in the valley, surveying and preparing engineering solution to each one and
- . Preparing preliminary cost estimates of the works involved.

The study, which was initiated in 1983 and completed in 1984 came up with the following:

- . 13 pond schemes capable of irrigating about 390ha of land.
- . One off-main river dam which can irrigate an area of 185ha.

Due to topographical limitations most of these works were located in the lower Solea Valley, where the water problem is more acute.

Within the study some associated problems were examined, such as the existing water rights along with the existing complicated irrigation infrastructure, future planning of irrigation, financing of the works etc. Since most of these problems are either matters of water policy or farmers decision only proposals for their solution were prepared.

INVESTIGATION AND LABORATORY BRANCH

General

The work of the site investigation, Laboratories and Grouting Section of the Division of Planning, during the year 1984 related to a number of major and more minor projects undertaken by the Department. Additionally and at the request of other Government Departments and private organisations, a number of projects were undertaken and completed during the year.

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

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

- . Khrysokhou Irrigation Project : Evretou Dam, Khrysokhou and Argaka Balancing Reservoirs.
- . Vasilikos Pendaskinos Project : Kalavastos Dam, Dhypotamos Dam, Kornos Treatment Works, Maroni Diversion, Tokhni PS, Maroni Distribution System, Maroni Reservoir.
- . Southern Conveyor Project : Kouris Dam, Main Conveyor, Mazotos/ Tersephanou/Ormidhia borrow areas.
- . Moulos Dam on Pedhieos River.
- . Krasokhoria Project : Platys Dam, Omodhos Dam.
- . Pitsilia Project : Dhierona Pond, Sykopetra Pond.

Site investigation or drilling work undertaken for other Governmental and private organizations was of a diverse nature and included:

- . Drilling for the Nicosia Sewage Board, Nicosia Municipality, Limassol Water Board, the Electricity Authority and the Public Works Department.

The work of the Soils and Concrete Laboratories may be distinguished into the work performed by the main and field laboratories. In the main laboratory in Nicosia tests were undertaken in connection with foundation investigations and to establish the suitability of fill materials for use in the construction of various projects of the Department. Tests were also performed at the request of other Government and semi-Government Departments and private organizations.

Site/Material Investigations.

Table IV -1 gives relevant details of all site/fill material investigations performed during the year.

Laboratories

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

TABLE IV -1
SITE/MATERIAL INVESTIGATIONS AND GROUTING-1984

Ser No	Project	Aim of investigation	Fieldwork as carried out	Machinery used	Expenditure
A. DEPARTMENTAL PROJECTS					
1	Khrysokhou Irrigation Project Evretou Dam	Subsurface geological and material investigation to establish foundation conditions and permeability	Coredrilling of 6 No. boreholes total depth 230.75 m. Overburden drilling of 3 No. boreholes total depth 111.20 m.	-Core drill -Flush pump -Compressor -Overburden drill	
	Khrysokhou Balancing Reservoir	Subsurface geological and material investigation to establish foundation conditions and permeability	Auger-drilling of 1 No. borehole total depth 16.00 m.	-Auger drill	
	Argaka Invest.	Subsurface geological and material investigation to establish foundation conditions and permeability	Auger-drilling of 15 No. boreholes total depth 161.15 m.		
2	Vasilikos Pendaskinos Project Kalavastos Dam	Subsurface geological and material investigation to establish thickness of overburden layers	Overburden-drilling of 2 No. boreholes total depth 48.50 m.	-Overburden drill -Flush pump -Compressor	
	Dhyptomamos Dam	Subsurface geological and material investigation to establish thickness of overburden layers	Overburden-drilling of 4 No. boreholes total depth 95.80 m.	-Digger -Grout pump -Grout mixer	

TABLE IV-1 SITE/MATERIAL INVESTIGATIONS AND GROUTING 1984 (Cont.)

Ser No	Project	Aim of investigation	Fieldwork as carried out	Machinery used	Expenditure
	Kornos Treatment Works	Subsurface geological and material investigation to establish thickness of overburden layers	Overburden-drilling of 1 No. borehole total depth 23.00 m.	-Grout Aggitator	
	Maroni Diversion	Geological investigation to establish foundation conditions and permeability	Drilling, watertesting and grouting of 6 No. boreholes total depth 109.65 m.		
	Tokhni Invest.	Geological investigation to establish foundation conditions and permeability	Overburden drilling of 3 No. boreholes total depth 71.00 m.		
3.	Maroni Distribution System Maroni Reservoir	Subsurface geological and material investigation to establish conditions of foundations	Auger-drilling of 2 No. boreholes total depth 13.50 m.	-Auger drill	
4.	Southern Conveyor Project Kouris Dam	Subsurface geological and material investigations to establish conditions of foundations	Auger-drilling of 15 No. boreholes total depth 96.40	-Auger drill	
	Main Conveyor	Subsurface geological and material investigation to establish conditions of foundations	Auger-drilling of 3 No. boreholes total depth 19.50 m	- Auger drill	

TABLE IV-1 SITE/MATERIAL INVESTIGATIONS AND GROUTING 1984 (Cont.)

Ser. No.	Project	Aim of investigation	Fieldwork as carried out	Machinery used	Expenditure
	Mazotos Invest.	Fill material investigation	Auger-drilling of 6 No. boreholes total depth 28.70 m	-Auger drill	
	Tersephanou Invest.	Fill material investigation	Auger-drilling of 7 No. boreholes total depth 44.35 m	-Auger drill	
	Ormidhia Invest.	Fill Material investigation	Auger-drilling of 3 No. boreholes total depth 30.70 m	-Auger drill	
5.	Moulos Dam	Subsurface geological and material investigation to establish foundation conditions and permeability	Drilling and watertesting 8 No. boreholes total depth 171.15 m	-Core drill -Overburden drill -Compressor -Flush pump	
6.	Krasokhoria Integrated Rural Development Project Platys Dam	Subsurface geological and material investigation to establish foundation conditions and permeability	Drilling and watertesting 3 No. boreholes total depth 157.00 m	-Core drill -Flush pump -Compressor	
7.	Pitsilia Rural Development Project Dhierona Pond	Geological investigation to establish thickness of overburden layers	Overburden-drilling of 2 No. boreholes total depth 67.00 m	-Overburden drill	
	Sykopetra Pond	Geological investigation to establish thickness of overburden layers	Overburden-drilling of 5 No. boreholes total depth 314.00 m.	-Overburden drill	

TABLE IV-1 SITE/MATERIAL INVESTIGATIONS AND GROUTING 1984 (Cont.)

Ser. No.	Project	Aim of investigation	Fieldwork as carried out	Machinery used	Expenditure
8.	Omodhos Dam	Geological investigation to establish foundation conditions and permeability	Drilling and watertesting 3 No boreholes total depth 110.00 m.	-Core drill -Flush pump -Compressor	
9.	Askas & Pera Orinis	Overburden drilling for earthing	Drilling of 13 No. boreholes total depth 260.00 m.	-Overburden drill	
B. GOVERNMENTAL PROJECTS					
	Nicosia Sewage Board Nicosia Municipality Limassol Water Board Electricity Authority Public Works Dept.	Geological investigation to establish conditions of foundations. Also drilling for earthing purposes	Total drilling of 97 No. boreholes total depth 576.50 m.	-Auger drill -Overburden drill -Digger	
C. PRIVATE PROJECTS					
	S. Dhemosthenous P. Paraskevaides Pikis N. Demetriou	Geological investigation to establish conditions of foundations	Drilling of 10 No. boreholes total depth 101.00 m.	-Auger Drill	

TABLE IV -2
SOILS LABORATORY TESTS DURING 1984

Project	Small Projects										Concrete Tests 1984										
	SCP	VPP	KIP	PIRDP	Small Projects					Total											
Type of Test	Kouris Dam	Dhypotamos Dam	Kalavasos Dam	Maroni Division	Maroni Reser.	Evreton Dam	Khrysokhou Balanc. Reser.	Arakapas Pond	Dhierona Pond	Ayil Vavatsinias	Khitrokittia Pond	Galata Pond	Xeropoulos	Malounda Dam	Vizakia Dam	Private Firms	Miscellaneous	Total	Private Firms	Total	
Sieve Analysis	37	3	7			37		3	8	1	2		3	13		46	7	167			
Hydrometer	70	1	10		5	19	2	4			6	3		7	2		4	4	137		
Atterberg Limits	66				5	5	2							4			4		86		
Specific Gravity	53	1	9		5	9	2				6	2		4			4	4	99		
Moisture Content					5	3													8		
Compaction Test	13	2	2			7		1		1	5		2	2			4	16	55		
Permeability	10	3	5			13					3	3	1	2				3	40		
Drained-Undr. Triax.						49											1	1	51		
Pin Hole	1					3												4			
Shear Box		1	7			1							2				1	12			
Relative Density						1												1			
Water Absorption						5											2	7			
Soundness						5											1	6			
Swelling Pressure																		1	2		
Los Angeles		1			1												1	2			
Creep Test						3												3			
Suspend. Sedim. Anal.																		59	59		
Colour																	27	27			
Crushing Strength (Cores)				7													19	30	56		
Cube Crushing Str.																	342	342			
Total	250	12	40	7	21	160	6	8	8	2	19	8	6	34	2	114	125	822	342	342	

TOPOGRAPHY BRANCH

The Topography Branch operates within the Planning Division, is staffed with 1 Technical Supt., 5 Technicians I, 10 Technicians II, 12 Chainmen, 5 Motorcar Drivers and 10 Labourers and is assigned to conduct all the surveying work of the Department of Water Development. The staff receives training within the Branch on the methods and procedures employed during the surveying operations in the field and office-work, using all types of modern surveying instruments and equipment. Surveys conducted are of the engineering type and consist of: Profile-levelling, cross-sectioning, topographic surveys, setting-out of project outlines, instrumental observations for detection of movement, settlement or deformation of major structures (Dams - Water Treatment Plants etc.) or the neighbouring slopes.

The activities of the Branch during the year under review were mainly concentrated on the Southern Conveyor, Vasilikos-Pendaskinos, Khrysokhou Irrigation and Krasokhoria Projects and routine surveys for minor schemes and other studies. A detail list of these surveying assignments is given below:

TABLE IV-3 SURVEYING WORK CONDUCTED DURING 1984

SCP - Kouris Dam

- . Setting out the boundaries of the borrow areas for land acquisition.
- . Setting out the boundary of the T.W.L. in the reservoir area for land acquisition.
- . Staking out and flagging the dam axis, the spillway axis, the tunnel axis and the access road to the dam crest for the contractors site visit.
- . Check levelling of the values of BM's according to the design plan for construction purpose.
- . Access road. Contour survey and cross - sectioning.
- . Right Abutment (D/S). Contour survey.

Main Conveyor

- . Re-establishing most of the route and structures for land acquisition purpose.
- . Ayios Athanasios (Limassol) storage yard site survey.

Kokkinokhoria Irrigation Area

- . Re-establishing most of the routes for land acquisition purpose.
- . Storage yard site survey.

Akhna Dam

- . Setting out the main design outlines and the access roads.
- . Setting out the boundary of the T.W.L. in the reservoir area for land acquisition purpose.

Vasilikos-Pendaskinos Project

Kalavassos Dam

- . Reservoir contour survey.
- . Borrow area contour survey.
- . Pipeline and break pressure tank land acquisition.

Maroni Diversion Weir

- . Setting out the boundary of the T.W.L. for land acquisition purpose.

Maroni Irrigation Scheme

- . Setting out of pipeline and profile levelling. Construction.

Pendaskinos Irrigation Network.

- . Construction.

Khrysokhou Irrigation Project

Evretou Dam

- . Setting out the spillway and the tunnel axis for construction.

Irrigation Schemes

- . Setting out of pipelines and profile levelling. Establishing of BM's and TBM's for vertical control.

Krasokhoria Integrated Rural Development Project

Omodhos Dam

- . Damsite survey, setting out of BH's and access roads.

Kryos Dam

- . Damsite survey.

Dhiplopotamos Dam

- . Damsite survey.

"Elea" Bridge Dam

- . Damsite survey.

Platys Dam

- . Damsite survey. Setting out of BH's and Access Roads.

Xylourikos Dam

- . Damsite survey. Setting out of BH's and Access Roads.

Ayios Mamas Dam

- . Damsite survey.

Dhora Pond

- . Site survey.

Arkhimandrita Pond

- . Site survey.

Silikou Pond

- . Site survey.

Kouklia Pond

- . Site survey.

Apsiou Pond

- . Site survey.
- . Conveying M.S.L. datum to all the above sites.

Other Routine Works

- . Phrenaros pipeline. (Extension)-Setting out and profile levelling.
- . Paralimni-Ayia Napa pipeline and alternatives -Setting out and profile levelling.
- . Athalassa pipeline -Setting out and profile levelling.
- . Larnaca, Pera Village and Kakopetria waste disposal schemes - Site surveys, profile levelling and settings out.
- . Kotsiatis treatment plant - Site survey, profile levelling for pipeline.
- . Nicosia Water Supply (Extension) - Setting out and profile levelling.
- . Merikas recharge scheme - Contour survey
- . Vavatsinia Pond - Site survey.
- . Aradhippou antiflood scheme - Contour survey and profile levelling.
- . Ormidhia antiflood scheme - Contour survey.
- . Contour survey and cross sections for the sediments in the reservoirs of Kalopanayiotis, Yermasogia, Arakapas, Lefkara, Kiti and Agros dams.
- . Measurements on settlement markers for Kalopanayiotis, Lefkara, Xyliatos and Asprokremos dams and Khirokitia Treatment Plant.

Y DIVISION OF DESIGN

by
N P Stylianou
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 local importance. 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 stage.

In addition to the Division Branches involved in the above mentioned type of works, this Division incorporates the Drawing and Records Branch of the Department. This Branch 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 photo-process lab work.

During 1984 the following qualified personnel were working with the Design Division.

- One Senior Water Engineer, Head of the Division
- Two Executive Engineers Class I
- One Executive Engineer Class II
- One Technician Class I, qualified Civil Engineer carrying out duties of Executive Engineer.

The personnel of the Drawing and Records Branch is given in the respective section of this chapter.

SUMMARY OF ACTIVITIES

During 1984 the Design Division has been engaged on both detailed and feasibility studies for various irrigation works. Detailed studies included the final design and preparation of construction drawings for the irrigation network of the Khrysokhou Irrigation Project, the redesign of concrete circular tanks of standard capacities and the design of Anaphotia recharge dam and diversion. Detailed studies for the Pitsilia Integrated Rural Development Project were completed in 1983.

Feasibility studies during 1984 included the continuation and completion of the studies for Vizakia and Akaki-Malounda dams. The Design Division contributed also to the work carried out by the Planning Division on the identification and preliminary studies of the various schemes to be included in the Solea

Valley Project, which started towards the end of 1983 continued and was completed in 1984. It contributed also to the preliminary studies undertaken for four dams proposed for inclusion in the Krasokhoria Integrated Rural Development Project.

Detailed Studies

Detail studies include the detail design and preparation of construction drawings and contract documents including specification, bill of quantities, and conditions of contract. Such studies were carried out for the following works:

Irrigation Network for Khrysokhou Irrigation Project

The design and preparation of the construction drawings and contract documents started during 1984 in co-operation with personnel assigned to the Khrysokhou Irrigation Project, and will be completed in 1985, when tenders will be invited. The area covered is about 1600 hectares net out of 2000 hectares gross, which is to be irrigated during the first phase of the Project. The area to be irrigated extends from Skoulli village northwards into the Khrysokhou valley. The area to be irrigated has been divided into irrigation units of about 3 hectares in size but some smaller units of 1.5 hectares have also been formed. The maximum irrigation design discharge is generally 0.6 l/sec/ha. Water for irrigating this area will be supplied from Evretou Dam now under construction.

Construction works will include the construction of field roads and the installation of the irrigation pipe network at an estimated cost of about £2.3 million excluding the cost of the main pipeline conveyor and night storage ponds.

Contract documents for a number of supply contracts for materials such as pipes, valves, water meters and hydrants will be prepared during 1985 in addition to two civil contracts one for the installation of the irrigation network, and construction of roads and the other for the installation of the main conveyor and construction of ponds.

Anaphotia Recharge Dam

The design and construction drawings for the Anaphotia Recharge Dam and diversion canal were prepared. No contract documents were necessary since, due to the relatively small size of the works, their construction would be undertaken directly by the Department.

The works comprise the construction of an earth dam and a canal. The dam will have a maximum height of about 12.0 metres and a capacity of 5,200 m³. The dam will be constructed on a small tributary of Xeropouzos river and the stored water will be used for recharge downstream. It will also serve as a diversion dam for diverting water through a short canal to an adjacent valley.

The dam will be constructed from river gravels and will incorporate a central clay core. The embankment slopes will be 1:2.5 upstream and 1:2.00 downstream.

The canal will be about 130 m₃ long and will have a trapezoidal section with a discharge capacity of 1.0 m³/sec. The base of the canal will be lined with concrete.

The estimated cost of the works is about £25,000.

Redesign of Water Tanks

Two of the standard circular type concrete tanks have been redesigned, and new construction drawings were prepared. The redesign became necessary since the existing old design and drawings were too old and out of date. One of the tanks has a capacity of 500 m³ and is founded on the ground and the other is elevated 12 m above the ground with a capacity of 135 m³.

These tanks are usually used for domestic water supply of villages but they can also be used in irrigation works.

Pitsilia Project

Detailed studies of various irrigation schemes have been completed in 1983 and no study was outstanding in 1984. Only construction works for a number of schemes were still in progress during 1984, but these are covered in Chapter V.

Feasibility Studies

Feasibility studies are usually undertaken by the Division of Planning. These studies, include topographical surveys, geological mapping, geotechnical investigations, hydrological studies, preliminary alternative designs of the proposed works, selection of suitable land for irrigation, cost estimates and economic analysis. Such studies initiated during 1983 and completed in 1984 were for the Vizakia dam and the Akaki-Malounda dam.

As mentioned before, in addition to the feasibility studies for the above dams the Design Division contributed substantially in the preliminary studies for the Solea Valley Project and the dams of the Krasokhoria Integrated Rural Development Project. These two Projects are covered in Chapter III.

Vizakia Dam

Technical details of this dam have been given in the 1983 Annual Report. The dam will be constructed in a small valley off the main river and will be filled with water from Kannavia river through a diversion pipeline.

After the selection of the areas to be irrigated, the capacity of the dam was increased to 940,000 m³ and the irrigation area to 1500 donums (200 hectares). The dam will irrigate areas of the villages of Vizakia, Nikitari and Potami. The total estimated cost will be £1,600,000 and the Internal Rate of Return of the scheme was calculated to 9.4%.

Akaki-Malounda Dam

Some technical details were given in the 1983 Annual Report. The dam site is located on the Akaki River about 0.5 km west of Malounda village. Rock outcrops over the site are dykes and sills of the Lower Pillow Lava group. The maximum reservoir capacity is limited to 2.0 million cubic meters by the topography and the geology of the site. This gives a dam height of 31.0 m above river bed. The most suitable dam type for the site, dictated by the topography, geology and availability of materials, is a zoned type embankment dam.

The catchment area at the dam site is about 85 km². The spillway design flood was estimated to 312m³/sec and the freeboard flood to 512 m³/sec. An open channel spillway is proposed and the spillway optimization carried out suggests that a spillway width of 40.0m is the most economical.

The total area to be irrigated from the dam is 2340 donums (310 hectares) and most of it lies in the vicinity of Akaki and Meniko villages, where land consolidation is envisaged. Water from the dam will be conveyed by gravity through a pipeline varying in diameter from 500 to 350 mm and 12.5 km long. Some smaller areas belonging to Malounda, Klirou and Ayios Ioannis villages will also be irrigated.

The total estimated cost of the scheme is £3,050,000 and the calculated Internal Rate of Return 11.8%.

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 Process Laboratory and
- The Technical Library and Technical Information Section

At the end of the year under review the staff of the Drawing and Records Branch numbered - i.e Technicians I, Technician II (Daily) and 2 hourly paid assistants of the Plan Reproduction Section. Throughout the year under review two Technicians I travelled every day to VPP sites; one to the VPP administration offices at Khirokitia and the other to the Kornos Treatment Plant site. Two Technicians II Daily, (not included above) were transferred to Limassol Regional Office of the Department in November and have been working at Kouris damsite.

The work carried out by the Drawing and Records Branch during 1984 is listed on Table V-1

TABLE V - 1

WORK CARRIED OUT BY THE DRAWING AND RECORDS BRANCH DURING 1984

Ref	Description	Time spent in hours	Man months	% of total
a	Existing dams(completion plans,sedimentation maps etc)	1259	8.1	3.5
b	Irrigation distribution systems for dams....	257	2.0	0.7
c	Routine irrigation schemes	663	4.3	1.8
d	Routine domestic water supply schemes	2640	17.0	7.3
e	Krasokhoria Project	622	4.0	1.7
f	Pitsilia Integrated Rural Development Project	1715	11.1	4.8
g	Vasilikos-Pendaskinos Project	5349	35.0	14.8
h	Southern Conveyor Project	3253	21.0	9.0
i	Khrysokhou Irrigation Project	1014	7.0	2.8
j	Solea Valley Project	190	1.2	0.5
k	Larnaca-Orini Project	235	2.0	0.6
l	Recharge works	-	-	-
m	Antiflood works	-	-	-
n	River training works	-	-	-
o	Watersheds surveys	-	-	-

TABLE V-1
WORK CARRIED OUT BY THE DRAWING AND RECORDS BRANCH DURING 1984

Ref	Description	Time spent in hours	Man months	% of total
p	Hydrological	838	5.4	2.2
q	Programmes and organisation	459	3.0	1.3
r	Agriculture show	1166	7.5	3.2
s	Productivity centre courses	109	1.0	0.3
t	Sewage disposal	720	5.0	2.0
u	Completion plans and reports	674	5.0	2.0
v	Reports	1122	7.2	3.1
w	Emergency schemes	237	2.0	0.7
x	Odd jobs-General	749	5.0	2.1
	(i) Library	1731	11.2	4.8
	(ii) Plan registry.....	624	4.0	1.7
y	Auxiliary services			
	(i) Plan reproduction.....	2209	14.2	6.1
	(ii) Drawing materials store	416	3.0	1.1
	(iii) Photographic section	1862	12.00	5.1
	Total for auxiliary services	6842	44.4	18.8
z	Leave etc			
	(i) Leave paid	4039	26.0	11.1
	(ii) Leave without pay.....	25	0.2	0.1
	(iii) Sick leave	1141	7.4	3.1
	(iv) Maternity leave	633	4.1	1.7
	(v) D.C (including site visits)...	302	2.0	0.8
	Total for leave etc	6140	39.7	16.8
	Grand total	36253	238.0	100.0

Drawing and Cartography Section

As can be seen on table V-1 Vasilikos-Pendaskinos Project has taken the largest single load of work. This is due to the fact that members of the Drawing Branch staff have been assigned to VPP sites, two on a fulltime basis and one part-time. Colour maps of the four major projects under construction - SCP PIRD, VPP and KIP - were produced by the Cartography Section during 1984. These were included in description leaflets for the projects and were available at the Cyprus AGRIFAIR 1984 as well as for all requesting information of these projects.

Plan Reproduction and Plan Registry Section

The production of plans for the Southern Conveyor Project contracts constituted the greatest work load for the 2 continuous process plan printing machines. Some 39,000 prints of all sizes and types were produced through 3000 orders. Plan registry work was shared by the Drawing Branch.

The Photographic Section and Photo Process Laboratory

Photographic coverage of construction works of the Department was carried out throughout 1984 in black and white, colour and colour slide still photography as well as colour 16 mm cine filming and video recording. Full coverage of VPP was undertaken by the Photographic Section as well as for PIRDP. Although the provision in the contracts of Evretou Dam and Kouris Dam obliges the respective contractors to carry out the photographic coverage, periodic visits were paid to these sites especially for video recording.

Two new generation fully automatic 35 mm cameras were purchased during 1984 so that they may be loaned to technical officers wanting to record aspects of their field work.

Photolithographic work continued also at the Department's Photo Process Laboratory for reductions enlargements and reproduction of drawings. All the photolithographic work for the maps of the major projects mentioned above was done in the Photo Process Lab. The Lands & Surveys Department through provided the films for the various base maps.

Technical Library and Technical Information Section

In 1984 £805 was spent on the purchase of 14 technical books and subscription to 16 periodicals.

The Library continued to issue monthly notes on material received and of articles of special interest in periodicals.

In 1984 the Library has succeeded to secure the following six valuable publications which were presented by the U S Department of the Interior Bureau of Reclamation on an exchange basis.

- Design of small dams. Washington 1977. Book No. A179.
- Earth manual. A water resources technical publication. Second edition 1980. Book No. A180.
- Concrete manual. Eight edition. Revised. Washington, 1981. Book No. A181.
- Ground water manual. First edition. Revised reprint. Washington 1981. Book No. A183.
- Water measurement manual. Second edition. Revised reprint. Washington 1981. Book No. A184.
- Hydropower at work. Washington 1981. Book No. A181.

Following are lists of books purchased, of periodical subscriptions and of WDD reports.

MATERIAL PURCHASED

a. B o o k s

I RICHTER-R S MITCHEL. Handbook of construction law and claims. USA, 1982.
Book No. A151. US\$ 49.95.

I RICHTER. International construction claims. Avoiding and resolving dispute.
USA, 1983. Book No. A152. US\$ 49.50.

J GRUBER. Econometric decision models. Germany, 1983. Book No. A162. DM61.40

ΣΥΝΔΕΣΜΟΣ ΠΟΛΙΤΙΚΩΝ ΜΗΧΑΝΙΚΩΝ ΚΑΙ ΑΡΧΙΤΕΚΤΟΝΩΝ. Μέτρα προστασίας από σεισμούς.
Λευκωσία, 1984. Αριθμός βιβλίου A163. ΛΚ£2.00.

M KAY. Sprinkler irrigation equipment and practice. London, 1983.
Book No. A185. Stg.£7.95.

J WATERHOUSE. Water engineering for agriculture. London, 1982. Book No. A186.
Stg.£19.95.

B WITHERS-S VIPOND. Irrigation: design and practice. London, 1983.
Book No. A184. Stg.£9.95.

T BAUMEISTER. Marks' standard handbook for mechanical engineers,
8th Ed.

BARNES, BLISS, GOULD & VALLENTINE. Water and wasterwater engineering systems.
Great Britain 1981. Book No. A205. DM54.40.

INDUSTRIAL FABRICS ASSOCIATION INTERNATIONAL. International conference on
geomebranes, June 20-24 1984 Denver, Colorado USA. Proceedings. Volume I & II
Book Nos A206, A207. US\$63.00.

P KALLIS. Civil and criminal cases. Index of subject matter, table of cases
reported. Nicosia, 1984. Book No. A236. £25.00.

UNESCO. Technical papers in hydrology. No. 23. Dispersion and self-purification
of pollutants in surface water systems. France, 1982. Book No. A235. £2.25

AWWA. AWWA seminar. Proceedings. Water rates. An equitability challenge.
Colorado, 1983. Book No. A257.

AWWA. Water rates AWWA No. M1. Colorado, 1983. Book No. A258.

b. S u b s c r i p t i o n t o P e r i o d i c a l s .

ASCE. Construction Engineering and Management US\$42.50.

ASCE. Geotechnical Engineering US\$73.00.

ASCE. Hydraulic Engineering US\$91.00.

ASCE. Irrigation and Drainage Engineering US\$39.00.

ASCE. Structural Engineering US\$117.50.

ASCE. Surveying Engineering US\$27.00.

ASCE. Water Resources Planning and Management. US\$35.00.

AWWA. Journal US\$75.00.

Employment Gazette Stg.£32.76.

Water and Waste Treatment Stg.£26.50.

Journal of the Irrigation Engineering and Rural Planning. US\$38.00

International Water Report. US\$37.00.

Journal of the Institution of Water Engineers and Scientists stg.£30.00.

Concrete Magazine US\$ 55.00.

ICE Proceedings Stg.£80.00

ICE Geotechnique Stg.£76.00

2. WDD REPORTS (27 No.)

WDD - THE WATER RESOURCES DIVISION. Hydrological year-book of Cyprus 1976-1977. Nicosia, December 1983. Book Nos A62, A63.

WDD - THE WATER RESOURCES DIVISION. Hydrological year-book of Cyprus 1977-1978. Nicosia, December 1983. Book Nos A64, A65.

WDD - THE WATER RESOURCES DIVISION. Hydrological year-book of Cyprus 1978-1979. Nicosia, December 1983. Book Nos A66, A67.

T E H SABBEN-CLARE. Vasilikos-Pendaskinos project. Progress report No. 11. Covering period from 1.7.83 to 31.12.83. Nicosia, February 1984. No. D/211. Book Nos A68, A69.

A GEORGHIADES - V PARTASSIDES. Schedules of rates and prices. Nicosia, February 1984. Report No. S/15. Book Nos A70, A71.

ΠΑΥΛΟΣ ΝΕΟΦΥΤΙΔΗΣ. Κανονισμοί ασφαλείας εργοταξίων. Λευκωσία, Μάρτης 1984. Αριθμός εκθέσεως Σ/16. Αριθμός βιβλίων Α90, Α91.

B M MILINUSIC. Paphos Irrigation Project. Project completion report. Nicosia, January 1983. Report No. C/144. Book Nos A98, A99.

M MICHAELIDOU - N STYLIANOU. Vizakia dam. Feasibility study. Nicosia, March 1984. Report No. D/143. Book Nos A153, A154.

M MICHAELIDOU. Nicosia septage treatment plant at Kochati. Design report. Nicosia, June 1984. Report No. D/145. Book Nos A164, A165.

K SPANOS. Khrysokhou irrigation project. Progress report No. 1. Covering the period up to 31.3.84. Nicosia, May 1984. Report No. D/301. Book Nos A166, A167.

D C KYPRIS. Elements of water supply engineering and water treatment. Nicosia, February 1980. Report No. H/50. Book Nos A168, A169.

P ST SKORDIS. The runoff and divertible quantities for the Vizakia proposed dam. Nicosia, November 1983. Report No. H/60. Book Nos A170, A171.

A PENGEROS. Melini borehole irrigation scheme. Mini feasibility study. Nicosia, June 1984. Report No. D/144. Book Nos A188, A189.

N MICHAEL. Vizakia dam irrigation scheme. Feasibility study. Nicosia, May 1984. Report No. D/146. Book Nos A190, A191.

C S KATSAVRAS. Pitsilia integrated rural development project Xyliatos dam. Completion report. Nicosia, July, 1984. Report No. C/149. Book Nos A210, A211.

Π. ΝΕΟΦΥΤΙΔΗΣ. Σχέδιον ενιαίας αγροτικής αναπτύξεως Πιτσιλίας. φάσμα πύλων. Περιοχή έργου-Δίκτυο διανομής. Λευκωσία, Αύγουστος 1984. Αρ. εκθέσεως C/148. Αρ. βιβλίων A237, A238.

PH. PHOTIOU. Arakapas dam. Improvement of Dhimma tis Koutsis irrigation scheme. Mini feasibility study. Nicosia, September 1984. Book Nos A255, A256.

T E H SABBEN CLARE Vasilikos-Pendaskinos project. Progress report No. 12. Covering period from 1.1.84 to 30.6.84. Nicosia, July, 1984. Report No. D/212. Book Nos A239, A240.

K SPANOS. Khrysokhou irrigation project. Progress report No. 2. Covering the period from 1.4.84 to 30.6.84, Nicosia, September 1984. Report No. D/302. Book Nos A241, A242.

PH PHOTIOU. Episkopi village. Phaneromeni irrigation scheme. Mini feasibility study. Nicosia, July 1984. Report No. D/148. Book Nos A268, A269.

CHR IOANNOU - S GIRAGOSIAN. Completion report on the irrigation projects in region 4, Solea Valley, financed by the Federal Republic of Germany. Nicosia, November 1984. Report No. C/150 Book Nos A272, A273.

VI-RURAL PROJECTS PLANNING DIVISION

by C. Andreou
Senior Water Engineer
Head of Division

Introduction

The Rural Projects Planning Division is dealing especially with rural domestic water supply and the planning and design of contributory irrigation schemes. Other activities of the Division is the rehabilitation of water supply and irrigation schemes, within the Pitsilie Integrated Rural Development Project, water supply schemes of touristic and livestock areas, encroachment in rivers and streams, quarrying in river beds, design of sewage systems for Refugee Housing Estates, the administration of capital aid from the Federal Republic of Germany, and the examination of applications for building permits and permits for the division of building plots.

By the end of 1984 the staff of the Division was consisting of the following:

- 1 Senior Water Engineer - Head of the Division
- 1 Executive Engineer Class I
- 1 Executive Engineer II
- 1 Senior Technical Superintendent
- 1 Technical Superintendent
- 3 Senior Technicians
- 2 Technicians I
- 1 Chief Foreman
- 1 Hourly paid Technician
- 1 Secretary - Typist

VILLAGE WATER SUPPLY SCHEMES

The general village water supply situation during 1984 is described in Tables VI - 1 and V - 2. There are no villages in Cyprus without piped water.

During 1984 only 57 out of a total number of 619 villages remained with public fountains i.e. 1.90% of the total village population.

Out of 562 villages with house to house supply systems 531 enjoyed a per capita daily rate of over 90 litres (20 gallons).

Water Supply Schemes Prepared During 1984

A total number of 83 schemes were prepared and submitted to the District Officers during 1984, at a total estimated cost of £2,628,240 as shown on Table VI - 3.

Another 45 schemes were in the course of preparation by the end of the year as per Table VI - 4.

Besides the above mentioned schemes a total number of 17 water supply schemes were prepared for the housing of displaced persons (Refugee self-housing and housing estates), at a total estimated cost of £158,500 as per Table VI - 3A, which were submitted to the Department of Town Planning and Housing.

In 1984, four schemes to supply water to Livestock areas were prepared at a total estimated cost of £34,000 as per table VI - 3B.

Domestic water supply schemes for touristic areas 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.

Brief description of Important Water supply Schemes prepared during 1984

Kalokhorio (Cvini) Additional supply from B H 113/13.
Total estimated cost £38,400.

Argates Industrial Zone: A scheme was prepared to supply with water Argates Industrial Zone from B H 65/83.
Total Estimated cost £81,000.

Astromeritis: Additional Supply from B H 121/83 and improvements to the existing house to house system.
Total Estimated cost £70,000.

Sha: Construction of a new storage tank and improvements to the existing house to house system. Total Estimated cost £35,800.

Peristerona: Additional Supply from B H 96/84.
Total Estimated cost £32,000.

Moutayaka Replacement of the existing main conveyor of Moutayaka Regional Water Supply Scheme at an estimated cost of £112,000.

Khalassa: Scheme for the supply of water to the new Khalassa village at an estimated cost of £146,300.

Moniatis-Saittas: Additional supply of water to the village at an estimated cost of £61,200.

Paralimni-Ayia Napa: A pumping scheme was prepared to supply additional water supply to the communities of Paralimni and Ayia Napa especially for touristic purposes, at a total estimated cost of £440,000.

Paralimni Water Supply: This scheme was prepared in order to improve the existing distribution system of the community at a total estimated cost of £440,000

IRRIGATION SCHEMES

The planning and design of irrigation schemes aims at increasing the irrigated area near the sources for self employed farming organizations such as Village Irrigation Associations or Divisions.

The main target is to increase permanent irrigation annually which can be implemented with the financial participation by the farmers.

As the main principles of this special programme is the quick and effective use of water at or near the source combined with intensive agriculture methods, design considerations are usually based on land and water use data furnished by the District Agricultural Offices. Project evaluation is undertaken by a Joint Inter-departmental Committee.

The advantages of the rural projects programme, the beginning of which dates back to the creation of the Department is "speed of reaction" in all phases of project development, "wide participation" of farming communities "greater flexibility" in budgetary procedure and "greater exploitation" of the existing agriculture and 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 night or seasonal storage, the exploitation of new boreholes and the artificial recharge of depleted aquifers.

A certain number of schemes have been designed and are now under construction with government contribution.

During 1984 a total number of 33 irrigation schemes was prepared and submitted to District Officers at a total estimated cost of £947,000 as per Table VI - 5.

Another 30 schemes were in the course of preparation or under investigation by the end of 1984 as per Table VI - 7.

Brief description of important irrigation schemes prepared during 1984

Kato Pyrgos: Pumping scheme from BH 50/81 and 193/83 to irrigate 345 donums at a total estimated cost of £105,000.

Lemythou: Pumping scheme from BH 134/78 to irrigate 50 donums deciduous fruit trees and 10 donums of various vegetables. Total estimated cost £41,000.

Perapedhi: Pumping scheme from BH 109/77 to irrigate 90 donums deciduous fruit trees and supplement the village water supply.

Yiolou: Pumping scheme from BH 90/80 and 66/80 to irrigate 187 donums at a total estimated cost of £96,700.

Salamiou: Pumping scheme from BH 97/79 to irrigate 210 donums at a total estimated cost of £62,000.

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 co-ordinates the activities of the District Agriculture Services, for the supply of agro-economic data in the preparatory stages of the projects. During 1984, 32 schemes have been considered by the Committee as per Table VI - 6.

Capital Aid from the Federal Republic of Germany

During 1984 a total sum of £40,504 was reimbursed from the loan of 18 Million D M for irrigation projects completed as detailed below:

Minor Projects (Over £15,000)

Total number of projects	2
Investment cost of projects	£ 45,680
Amount reimbursed in 1984	£ 40,504

River Training Schemes

During 1984 two river training schemes were prepared and submitted at a total estimated cost of £48,000 as per Table VI - 8

Encroachment in Rivers and Streams

Some 87 cases for land encroachment in rivers and streams were examined in 1984 and the Director of Lands and Surveys was advised accordingly.

Sewage Schemes

During the year under review 9 sewage schemes were designed and studied at an estimated cost of £573,250 (as per Table V - 9).

Building and Division of Building Plots Permits

During 1984 a total of 1409 cases were investigated and sent to the District Officers for further action.

TABLE VI - 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	-	-	-	619	
1969	14	360	57.32	78.60	268	42.68	21.40	-	-	-	619	
1970	32	392	62.42	83.23	236	37.58	16.77	-	-	-	619	
1971	16	408	64.95	85.42	220	35.05	14.58	-	-	-	619	
1972	29	437	69.60	88.70	191	30.40	11.30	-	-	-	619	
1973	67	504	81.40	95.10	115	18.60	4.90	-	-	-	619	
1974	22	526	85.00	97.20	93	15.00	2.80	-	-	-	619	
1975	6	532	85.94	97.55	87	14.06	2.45	-	-	-	619	
1976	11	543	87.72	97.60	76	12.28	2.40	-	-	-	619	
1977	8	551	89.02	98.04	68	10.98	1.96	-	-	-	619	
1978	6	557	89.98	98.20	62	10.02	1.80	-	-	-	619	
1979	2	559	90.30	98.27	60	9.70	1.73	-	-	-	619	
1980	1	560	90.47	98.04	59	9.53	1.96	-	-	-	619	
1981	1	561	90.63	98.06	58	9.37	1.94	-	-	-	619	
1982	-	561	90.63	98.06	58	9.37	1.94	-	-	-	619	
1983	-	561	90.63	98.06	58	9.37	1.94	-	-	-	619	
1984	1	562	90.79	98.10	57	9.21	1.90	-	-	-	619	

TABLE VI-2

WATER SUPPLY SITUATION AT THE END OF 1984

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District	Satisfactory piped supply supply rate: 90 litres/head/day & over										Unsatisfactory piped supply supply rate below 90 litres/head/day								Total No of Villages	Total population 1969
	Villages with house to house supply					Villages with fountains					Villages with house to house supply				Villages with public fountains					
	No	%	pop.	%	No	%	pop	%	No	%	pop	%	No	%	pop	%	No	%			pop	%
Nicosia ...	145	85.80	116576	93.79	10	5.92	1230	0.99	9	5.32	5791	4.66	5	2.96	699	0.56	169	124296		
Kyrenia ...	39	82.98	30786	93.50	2	4.26	59	0.18	1	2.13	540	1.64	5	10.63	1542	4.68	47	32927		
Famagusta ...	82	83.68	82644	92.12	3	3.06	444	0.50	6	6.12	5695	6.34	7	7.14	934	1.04	98	89717		
Limassol ...	104	91.23	72527	97.87	3	2.63	40	0.15	4	3.51	1417	1.91	3	2.63	124	0.17	114	74108		
Paphos ...	106	80.30	47603	92.08	12	9.09	2036	3.94	10	7.58	1611	3.19	4	3.03	445	0.86	132	51695		
Larnaca ...	55	93.22	39813	98.22	2	3.40	156	0.38	1	1.69	425	1.05	1	1.69	140	0.35	59	40534		
TOTAL ...	531	85.78	389949	94.36	32	5.17	3965	0.96	31	5.01	154793	3.74	25	4.04	3884	0.94	619	413277		

TABLE VI - 3

VILLAGE WATER SUPPLY SCHEMES
PREPARED IN 1984 AND SUBMITTED TO
DISTRICT OFFICERS

Nicosia District

Ser. No.	Village	Nature of Scheme	Est. Cost £
1	Argates	New storage tank and extensions	9 000
2	Peristerona . . .	Installation of gate valves	2 000
3	Kakopctria	Installation of gate valves	1 150
4	Xeri	Add supply from B H 41154	9 000
5	Alambra	Extensions	6 000
6	Laxia	Relaying of pipes (S E K F P)	1 300
7	Chakistra	Replacement of pipes	6.600
8	Palekchori (M)	Extensions	4,000
9	Kalokhorio (O)	Add supply from B H 113/83	38 400
10	Lakatamia	W S to "Astir" Developments	9,200
11	Argates Indust. zone . . .	Supply from B H 65/83	81,000
12	Lakatamia	Removing of pipes	1 000
13	Astromeritis . . .	Add supply from B H 121/83	70 000
14	Kambia	" " " B H 168/83	27 000
15	Laxia	Replacement of pipelines	5 400
16	Sha	New st tank and improvements	35 800
17	Lazania	Removing of pipeline	900
18	Orounda	" " "	900
19	Sha	W S to Gover. plots	4 800
20	Malounda	Extensions	1 680
21	Arkhangelos Michael (Mon)	Add supply from Analiondas B/H	15 000
22	Mammari	W S to Government plots	5 000
23	Kokkini Trimi- thia	W S to Government plots	1 500
24	Alambra	Extensions	13 600
25	Lakatamia	Laying of pipes	1 500
26	Lefkara Pano . . .	Extensions	1 300
27	Nisou-Pera- Khorio	Improvements to the site. House to house scheme	70 000
28	Episkopio	Supply from B H 62/73	2 100
29	Laxia	Laying of pipes	1 600
30	Ay. Varvera	Installation of automatic control system	720

Ser. No	Village	Nature of scheme	Est. Cost £
31	Peristerona	Add. supply from B H 96/84	32 000
32	Mergi	" " " B H 108/84	29 000
33	Methiatis camp	W S to Camp	2 600
34	Phlasou	New pipeline from sheleshis spring	8 500
35	Sha -Komos	New booster pump	4 500
36	Astromeritis	Supply from B H 22/82/83	31 000
37	Dhali	Extensions	7 400
38	Palekhori (O)	Improvements	2 000
39	Pano & Kato Pyrgos	Replacement of Conveyor pipeline	145 000
TOTAL			£689 450 =====
<u>FAMAGUSTA DISTRICT</u>			
Village Water supply schemes prepared and submitted to D.O. in 1984 in 1984			
1	Ayia Napa	Extensions	9 600
2	Paralimni	Replacements	4 300
3	Paralimni	New Distribution system	440 000
4	Ayia Napa	Extensions	18 000
5	Ayia Napa	Water supply to Police Station	3 700
	Dherinia	Extensions	4 800
7	Paralimni- Protaras	Extensions	22 000
8	Paralimni- Ayia Napa	Pumping scheme from Phrenaros reservoir of Famagusta Water Supply Scheme	440 000
TOTAL			£942 400 =====
<u>LARNACA DISTRICT</u>			
Village Water supply schemes prepared in 1984 and submitted to District Officer			
1	Xylophaghou	Improvements	63 000
2	Anaphotia	Government Building sites	5 200
3	Voroklini	New Distribution system	34 000
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Ser. No.	Village	Nature of Scheme	Est. Cost £
4	Tersephanou	New storage tank	23 000
5	Pyrga	Additional supply	30 000
6	Kornos	Improvements	23 000
7	Khirokitia	New Distribution System	40 000
8	Tersephanou	" " "	50 000
9	Mazotos	" " "	50 000
10	Kophinou	Supplementary supply	16 000
11	Aradhippou	" " " for camp	26 000
12	Larnaca	Construction of new storage for camp	17 700
13	Zyyi-Mari	New scheme from Khirokitia storage tank	145 000
14	Ormidhia	Extensions	1 020
15	Kophinou-Central slaughter house	New W S scheme	63 500
16	Pervolia	New storage tank	14 600
17	Kiti	New conveyor pipeline	14 000
18	Ormidhia	Extensions	6 720
19	Pervolia	New Distribution system	18 000
20	Zyyi	Extensions	6 000
			£646 740

LIMASSOL DISTRICT

	Village Water	Supply schemes prepared in 1984 and submitted to D.O.	
1	Moutayiaka	Replacement of Moutayiaka regional W S scheme main conveyor	112 000
2	Kilani	New storage tank	7 800
3	Kandou	Supply of water to cemetery	600
4	Asgata	" " " to camp	6 400
5	Khalassa	Water supply to livestock area	20 000
6	Kividhes	" " to community building sites	9 000
7	Ayia Phyla	New storage tank and distribution pipelines for military camp	23 000
8	Evdhimou	New distribution system	17 000
9	Khalassa	Supply of water to the new Khalassa village from Kephlovrysos spring	138 700
10	Phasoula	New storage tank	1 750
11	Moniatis-Saittas	W S scheme from Kaminoudhia spring	61 200
12	Perapedhi	Additional supply from BH 109/77	11 000
TOTAL			£388 450

PAPHOS DISTRICT

Village Water Supply Schemes prepared in 1984 and submitted to District Officer

Ser. No.	Village	Nature of Scheme	Est. Cost £
1	Mesa Khorio	Improvements	15 800
2	Xeropiya Regional scheme	Replacement of conveyor pipeline	47 600
3	Yeroskipou Tourist area	New storage tank and conveyor pipeline	73 800
4	Khlorakas	New Distribution system	180 000
5	Ay. Marina Nea Dhimmata	Replacement of conveyor pipeline	16 000
6	Kissonerga Tourist area	New storage tank and conveyor pipeline	68 000
TOTAL			£401 200
			=====

Summary of Table VI - 3

<u>District</u>	<u>No. of Schemes</u>	<u>Est. Cost £</u>
Nicosia	39	689 450
Famagusta	7	646 740
Larnaca	20	502 400
Limassol	11	388 450
Paphos	6	401 200
TOTAL	83	£2 628 240
	=====	=====

TABLE VI - 3A

WATER SUPPLY SCHEMES OF REFUGEE HOUSING OR SELFHOUSING
ESTATES PREPARED AND SUBMITTED IN 1984

Ser. No	Village	Nature of scheme	Est. cost £
<u>LIMASSOL DISTRICT</u>			
1	K. Polemidhia	Self housing - Area D	10 200
2	Moutayiaka	Self housing - Area D	8 000
3	Episkopi	Self housing - Area D	4 400
4	Moutayiaka	Self housing - Area E	55 300
5	K. Polemidhia	Self housing - Area E	8 400
6	" "	Government housing-Extensions	13 550
TOTAL			<u>£99 850</u> =====
<u>LARNACA DISTRICT</u>			
1	Zyyi	New building sites	3 000
2	Kellia	New building sites	1 000
3	Chromolaxia	New building sites	2 500
4	Xylophaghrou	New building sites	2 700
5	Kiti	New building sites	700
6	Kivisil.	Supplementary supply	2 200
			<u>£12 100</u> =====
<u>FAMAGUSTA DISTRICT</u>			
1	Vrysoulles	New building sites	4 000
2	Akhna forest	New building sites	32 000
3	Sotira	New building sites	2 500
			<u>£38 600</u> =====

PAPHOS DISTRICT

Timi	Distribution pipelines	3.950
Lemba	New storage tank and distribution pipelines	4 000
		<hr/>
		£7.950
		<hr/> <hr/>

Summary of Table VI - 3A

<u>District</u>	<u>No of Schemes</u>	<u>Est. cost</u> £
Nicosia	-	-
Limassol	6	99 850
Larnaca	6	12 100
Famagusta	3	38 600
Paphos	2	7 950
	<hr/>	<hr/>
	17	£158 500
	<hr/> <hr/>	<hr/> <hr/>

TABLE VI - 3B

WATER SUPPLY SCHEMES TO LIVESTOCK AREAS

<u>Village</u>	<u>Nature of scheme</u>	<u>Est. cost</u> <u>£</u>
<u>LIMASSOL DISTRICT</u>		
Khalassa	Supply from Kephalovrysos spring	7 600
<u>LARNACA DISTRICT</u>		
Aradhippou	Supplementary supply	16 000
<u>FAMAGUSTA DISTRICT</u>		
Akhna	Extensions	4 300
<u>PAPHOS DISTRICT</u>		
Asproyia	Distribution system	6 100
TOTAL		<u>£34 000</u> =====

Summary of Table VI - 3B

<u>District</u>	<u>No. of schemes</u>	<u>Est. cost</u> <u>£</u>
Nicosia	-	-
Limassol	1	7 600
Larnaca	1	16 000
Famagusta	1	4 300
Paphos	1	6 100
TOTAL	<u>4</u> =====	<u>£34 000</u> =====

TABLE VI-4
VILLAGE WATER SUPPLY SCHEMES PENDING DURING 1984

NICOSIA DISTRICT

<u>Ser. No</u>	<u>Village</u>	<u>Nature of scheme</u>
1	Mitsero	New house to house scheme
2	Paleometokho	Improvements to the exist house to house scheme
3	Xeri	Improvements to the exist house to house scheme
4	Lakatamia	Add. supply from new B H
5	Xeri livestock area	Supply from B H
6.	Ay Marina (Xyfiatos)	Add. supply from B H 131/84
7	Yeri	Improvements to the exist house to house scheme
8	Kalokhorio (Klirou)	Improvements to the exist house to house scheme
9	Gourri	Replacement of pipeline
10	Sarandi	Improvements
11	Lakatamia	"
12	Akaki	Improvements to the exist house to house scheme
13	Livadhia (Pitsilia)	Installation of Water meters
14	Klirou	Add. supply from B H and improvements
15	Kalopenayiotis etc.	Add. supply from "Pikromiloudhi C" spr.

LIMASSOL DISTRICT

1	Silikou-Ayios Yeoryios	Additional supply
2	Kellaki	" "
3	Akrounda	New storage tank
4	Prastio (Kellaki)	New supply
5	Vasa (Kellaki)	Additional supply
6	Mathikoloni	New storage tank
7	Kalokhorio	Additional supply
8	Pyrgos	" "
9	Moni	" "
10	Kolossi	New distr. system

PAPHOS DISTRICT

1	Akoursos	Additional Supply
2	Pomos	Improvements
3	Kannaviou	Additional Supply
4	Akamas-Coral Bay Tourist Area	New pumping scheme for Ayios Yeorghios area
5	Anarita	Improvements.
6	Paphos Town	"

LARNACA DISTRICT

1	Pano Lefkara	New Distribution system
2	Alaminos	" " "
3	Ayios Theodoros	" " "
4	Kalokhorio.	" " "
5	Kiti	" " "
6	Xylotymbou	" " "
7	Ormidhia	" " "
8	Athienou	Additional supply
9	Meneou-Perivolia- Kiti Tourist Areas	New Government scheme to supply tourist areas with water

FAMAGUSTA DISTRICT

1	Dherinia	New Distribution System
2	Avgorou	" " "
3	Liopetri	" " "
4	Ayia Napa	Extensions to Tourist area
5	Sotira	New scheme for " "

TABLE VI-4A

WATER SUPPLY TO LIVESTOCK AREAS FEEDING DURING 1984

Nicosia District	-	Tseri
Larnaca "	-	-
Famagusta "	-	Avgorou
Limassol "	-	-
Paphos "	-	Khrysokhou
		Timi
		Argaka
		Kouklia

TABLE VI - 5

IRRIGATION SCHEMES PREPARED IN 1984 AND SUBMITTED TO DISTRICT OFFICERS

Ser. No	Village	Division or Association	Locality	Nature of proposed work	Est. cost £	Village Cont. %	Donums Per. Seas
<u>NICOSIA DISTRICT</u>							
1	Potami	Division	Potamos	Pumping scheme from BH97/80 and Distr. pipes	44 000	1/3	- 150
2	Palekhorí	Association	P. Aulaki-Maroullena	Distribution pipes	14 000	42%	16 4
3	Palekhorí	Association	Maroullena	"	15 200	44%	25 -
4	Pharmakas	Association	Dhexameni tou Kaminíou	"	2 300		20 -
5	Yerakies	Division	Yerakies	"	12 500	1/3	25 -
6	Kakopetria	Division	Kakopetria	"	8 300	1/3	235 25
7	Kato Pyrgos	Division	Katouris	Improvements	5 400	1/3	1600 -
8	Kato Pyrgos	Division	Platis	Pumping scheme from BH50/81 and 193/83	105 000	1/3	265 80
9	Pedagogical Academy N/sia	-	-	Pumping scheme from chain of wells	23 500		
TOTAL					£230 200		
<u>LARNACA DISTRICT</u>							
1	Kellia	Division	-	New Irrigation Division	50 000		
2	Ay Vavatsini	Division	-	Installation of Water meters	4 000		
3	Odhou	Division	-	Supplementary supply	2 500		
					£56 500		

Ser. No.	Village	Division or Association	Locality	Nature of proposed work	Est. cost £	Village Cont. %	Donums Per. Seas
<u>LIMASSOL DISTRICT</u>							
1	Lemythou	Div.	--	Pumping scheme from BH134/78	41 000	1/3	50 10
2	Phini	"	Mylos	Distribution pipelines	5 200	1/3	355 --
3	Perapedhi	"	--	Pumping scheme from BH109/77	49 200	1/3	90 --
4	Saittas-Moniatis	"	--	Diversión weir and main conveyer	16 300	1/3	230 --
5	Yerasa	"	--	Pumping scheme from BH106/82 (Preliminary scheme)	28 500	1/3	-- --
6	Prodhromos	"	Hardji-Fraktis	Supply of additional quantity of water to Prodhromos reservoir	44 000	1/3	170 --
7	Ay ^o Theodoros	"	Ay ^o Yeorgios	Distribution pipes	6 000	1/3	9 28
8	" "	"	Fintoukia	" "	8 300	1/3	28
9	Pelendria	Ass	Kato Psilon-Vrissy tou Arkhangelou	" "	2 600		32
10	Ay ^o Ioannis	Div.	Teratsia	" "	17 800	1/3	34
11	" "	"	Peroyia	" "	9 700	1/3	13
12	Sykopetra	"	Agridhia-Konomidhes	" "	4 500	1/3	7
13	Alekhtora	"	--	Improvements	17.000		
TOTAL					£250 100		

Ser. No.	Village	Division or Association	Locality	Nature of proposed work	Est. cost £	Village Cont. %	Donums Per. Seas
<u>PAPHOS DISTRICT</u>							
1	Souskiou	Division	B H 96/62	Pumping scheme	42 300		12 200
2	Yioliou	Division	B H 90/80 & 66/80	"	96 700	1/3	137 50
3	Yioliou	Division	B H 96/80	"	36 200	1/3	32 33
4	Kritou Terra	Division	Kephalovrysos	St. Tank & distribution pipelines	17 000	1/3	200 175
5	Kelokedhara	Division	Ziripillis	Distribution pipelines	5 500	1/3	46 -
6	Salamiou	Division	B H 97/79	Pumping scheme	62 000	1/3	158 52
7	P. Akourdhalia	Division	B H 93/76	"	30 000	1/3	90 100
8	Kholetria	Division	B H 27/69	"	63 000	1/3	84 86
9	Khoulou	Division	B H 74/81	"	40 000	1/3	90 20
10	Nikoklia	Division	B H 64/83	"	41 000	1/3	153 37
TOTAL					£433 700		

Summary of Table VI - 5

District	No. of Schemes	Est. cost £
Nicosia	8	230 200
Larnaca	3	56 500
Limassol	13	250 100
Paphos	10	433 700
TOTAL		£970 500

TABLE VI - 6SMALL IRRIGATION SCHEMES APPROVED BY THE
INTERDEPARTMENTAL COMMITTEE IN 1984

Ser. No	Village		Locality
1	Kaminaria	ID	Ay. Vasilios
2	Pelendri	IA	K. Psilon-Vrysi tou Arkhangelou
3	Ay. Ioannis	ID	Teratsia
4	Kakopetria	ID	Kakopetrias
5	Khoulou	ID	Kartsvines
6	Ay. Ioannis	ID	Peroyia
7	Palekhorri	IA	Pano Aulaki Maroullena
8	Pharmakas	ID	Dhexameni tou Kaminicou
9	Ay. Theodoros	ID	Ayios Yeorgios
10	Ayios Theodoros	ID	Fountoukia
11	Yerakies	ID	Yerakion
12	Kaminaria	ID	Ayios Vasilios
13	Nikoklia	ID	Nikoklias
14	Kholetria	ID	Kholetrias
15	Sykopetra	ID	Agridhia-Konomides
16	Perapedhi	ID	Perapedhi
17	Kellia	BH	4OT/79
18	Potami	ID	Potamos
19	Phini	ID	Mylos
20	Ay. Dhimitrios	ID	Kaminia-Krio Nero
21	Kritou Terra	ID	Kefalovryson
22	Saittas-Moniatis	ID	Saitta Moniati
23	K. Pyrgos	ID	Platys
24	Lemythou	ID	Lemythou
25	P. Akourdhalia	ID	Villourka
26	Yiolou	ID	Nipios
27	Yiolou	ID	Ay. Yeoryios
28	Salamiou	ID	Salamiou

SCHEMES NOT APPROVED

1	Agros	ID	Lambadha
2	Agros	ID	Kato Lambadha
3	Agros	IA	Dihalorotsos-Akros
4	Louvaras	IA	Kato Perivolia Maskalos

TABLE VI - 7

IRRIGATION SCHEMES IN THE COURSE OF PREPARATION, UNDER INVESTIGATION OR PENDING DURING 1984

<u>Ser. No</u>	<u>Village and Nature of Proposed work</u>		
<u>NICOSIA DISTRICT</u>			
1	Kato Moni	IA	Vayiannis Lining of canals
2	Kalopanayiotis	ID	Pano Troullinos Pumping scheme
3	Akaki	IA	Riatikon " "
4	Klirou	IA	Laoura " "
5	Kannavia	ID	Koumna Distribution pipe
6	Kambia	ID	Kambia Pumping scheme
7	Pharmakas	IA	Koskinas Distribution pipe & W.T.
8	Kato Moni	ID	Pumping scheme
<u>LIMASSOL DISTRICT</u>			
1	Pelendri	IA	Dhimma tou Khoriou Distribution pipe
2	Pelendri	ID	Potamoulia " "
3	Pelendri	ID	Kolokasi " "
4	Agros	ID	Kokkinoi " "
5	Agros	ID	Pano Taliou " "
6	Louvaras	IA	P. Pervolia-Koutroutsou-Paskalis " "
7	Ayios Konstantinos	ID	Vavatsinia " "
8	Kaminaria		Pumping scheme
9	Sanidha		" "
10.	Trimiklini		New scheme
11	Vasa (Kill)		Pumping scheme
12	Kapilio		New scheme
<u>PAPHOS DISTRICT</u>			
1	Inia		Construction of pond & distribution system
2	Pendalia		Pumping scheme from B H 67/83
3	Miliou	" "	" " 99/82
4	Mamonia	" "	" " 61/51 & 133/83
5	Phasoula	" "	" " 236/62 & 166/83
6	Stavrokono	" "	" " 59/73
7	Marathounda		Improvements
8	Kholëtria		Pumping scheme from B H 18/69
9	Theletra		Construction of St. Tank
10	Pano Arodhes		Improvements

TABLE VI - 8
RIVER TRAINING SCHEMES

Ser. No	Village	Nature of scheme	Est.cost £
<u>PAPHOS DISTRICT</u>			
1	Mamonia	Removal of aggregate and embankment	18 000
2	Nata	"	30 000
TOTAL			<u>£48 000</u> =====

TABLE VI - 9
SEWAGE SCHEMES PREPARED IN 1984

Ser. No	Description	Est.cost £
<u>NICOSIA DISTRICT</u>		
1.	Kakopetria (sewage scheme-Drg No L/SD/6)	145 000
2	" (effluent pipeline to Tembria Pond-Drg No. L/SD/9)	70 000
3	Perakhorio (sewage scheme, phase 1-Drg No.R/SD/3)	66 000
4	Perakhorio (Nisou)(effluent pipeline to Nicosia septage treatment plant at Kochati-Drg No R/SD/9)	65 000
5	Perakhorio (Nisou) (effluent pipeline to Nicosia septage treatment plant at Ay.Sozomenos Drg No R/SD/11)	83 500
6.	Nicosia (septage treatment plant at Kochati-Drg No R/SD/51)	92 500
7	Ayios Pavlos (N) (connection of drainage system to sewage system to facilitate pumping-Drg No A/SD/9)	3 250
TOTAL		<u>£525 250</u>
<u>PAPHOS DISTRICT</u>		
1	Kholetria (sewage scheme-phase 1-Drg No N/SD/1)	39 500
2	Mouttallos (sewage scheme-Drg No I/SD/10)	8 500
TOTAL		<u>48 000</u>
GRAND TOTAL		<u>£573 250</u> =====

VII 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, by direct labour. The Division has also an important role to play when projects are constructed by Contract.

The Division is sub-divided into three main branches:

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

During 1984 the Division consisted of the following staff:

1	Senior Water Engineer - Head of the Division
1	Executive Engineer, Class I - Assistant Head of the Division
3	Executive Engineers, Class II
1	Senior Technical Superintendent
2	Technical Superintendents
8	Senior Technicians
4	Technicians I
3	Technicians II
3	Chief Foremen
13	Assistant Chief Foremen
37	Monthly paid Foremen
26	Weekly paid Foremen
102	Total staff

In addition to the above technical staff the Department engaged 581 regular employees of various trades, mostly skilled, and a daily average of 242 casual labour, mostly unskilled, for the execution of the schemes approved for construction during 1984.

The Division has continued during 1984 the collection of data regarding actual rates of construction, standards of materials and equipment for the revision of the manual "Schedule of Rates and Prices" which was published in January 1984, and was distributed to all Divisions and Technical Officers of the Department.

Again in 1984, the commencement of the construction of the new schemes especially the contributory ones, started late in the year due to the delay in the completion of the administrative formalities and the allocation of the funds. This delay in the allocation of funds during the first six months of the year causes considerable problems in the construction programme and especially in the manpower distribution. As it can be observed from the statement of monthly expenditure for the year 1984, shown elsewhere in this report, the expenditure on the Development Budget for the first six months of the year was only approximately 33 %, in comparison with the second half of the year, which was approximately 66 %.

It is believed that special attention should be given on this problem by all appropriate authorities, such as the Planning Bureau, the Ministry of Interior, the District Officers and the Loan Commissioners, so that the allocation of funds is distributed smoothly all through the year. By achieving this the capability and output of the Construction Division will be increased considerably.

CONSTRUCTION PROGRAMME AND PROGRESS

The Planning Branch of the Division prepared a construction programme for all the water projects which were approved for execution during 1984. These projects were included in the Development Budget of our Department, or in the budget of other Ministries or Departments. Over and above, the Division had to deal with all non-budgeted water projects for private developers or for villages. In general the Division had to deal with the constructional

activities relating to all water projects scheduled for construction during 1984, except some specific major projects where the role of the Division is limited due to financing procedures, etc.

All these water projects undertaken for construction during 1984, may be classified into five main groups as follows:

- All projects new and carry over, approved in our Department's Development Budget,
- The Pitsilia Integrated Rural Development Project, approved in the budget of the Ministry of Agriculture and Natural Resources,
- All water supply and sewage schemes for the housing of the Refugees, approved in the budget of the Department of Planning and Housing,
- All other projects, covering a wide range of types, i.e water supply schemes for livestock areas, industrial areas, Turkish Cypriot villages, relocation of pipes, etc, approved in the budgets of a number of Ministries, or Departments, and
- All types of non-budgeted projects, i.e improvements to existing water supply and irrigation schemes, laying of distribution mains for land development, etc, carried out from funds deposited in full by villages or private land developers.

In total during 1984 the Department had to deal with the construction of 776 projects of an estimated value of £21,002,367. The Division had to deal direct with the vast majority of these schemes. The overall expenditure incurred on all these projects during the year reached the amount of £ 18,905,999, against £ 12,654,747 for 1983, which is another record figure in our Department's life.

Table VII-1 below gives an outline of the volume of work executed by the Department in 1984. Detailed lists showing all the projects undertaken for construction, and more information are given in tables that follow, further on in this report.

TABLE VII-1
SCHEMES UNDERTAKEN FOR CONSTRUCTION DURING 1984

Ser No	Description	No. of schemes	Amount allocated £	Expenditure incurred £
1	Rural domestic water supply schemes	62	1 323 667	857 594
2	Minor irrigation schemes	44	782 103	512 361
3	Other major irrigation works	10	431 443	363 909
4	Town water supply schemes	25	265 991	172 765
5	Vasilikos-Pendaskinos Project ...	2	9 290 444	9 047 305
6	Southern Conveyor Project	1	2 861 221	2 659 686
7	Khrysokhou Irrigation Project ...	1	3 252 000	3 150 594
8	Paphos Irrigation Project	1	346 608	287 233
9	Pitsilia Integrated Rural Development Project	86	938 426	697 716
10	Refugee housing and self-housing schemes	50	226 096	140 509
11	Schemes undertaken for construction for other Government Departments	67	722 780	526 826
12	Schemes undertaken for construction for villages (non-budgeted) from deposits	97	105 011	84 607
13	Schemes undertaken for construction for private developers (non-budgeted) from deposits	330	476 577	404 894
	Total	776	£21 022 367	£18 905 999

PLANNING BRANCH

Again during 1984, it has not been possible to staff this branch properly so as to respond to its expanded role since its creation in 1979. Though it is accepted that the whole of the Department is suffering from acute shortage of technical staff, yet it is believed that every effort should be made in the direction of properly staffing this branch which is playing a significant role in the Division, and its activities and responsibilities should be expanded so as to be in a position to watch more closely the programme of construction.

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

- The programming and cost control of all schemes approved for construction
- The preparation of a construction programme for all schemes approved for construction, either in our Department's budget or in the budget of any other Department, in consultation with all supervising Technical Officers and the responsibility to watch its implementation. This construction programme is distributed to all Ministries and Departments concerned and to all the Technical Officers in charge of the supervision of construction.
- The preparation of a monthly progress report showing all budgeted schemes, and the progress and expenditure incurred each month. This report too is distributed to all Ministries and Departments as well as Technical Officers of the Department concerned.
- The assessment of our Department's requirements in materials and equipment, such as pipes and fittings, pumping units, etc, and their order through the Government Central Stores Department in time so that the schemes approved for construction are executed smoothly and uninterruptedly.
- The checking of the estimates of the schemes designed by other Divisions of the Department, so as to conform with the current rates and to ensure their execution within the estimated cost.
- The collection of data regarding actual rates of construction standards of materials and equipment and their appraisal and utilization for the up-to-date information of the "Schedules of Rates and Prices" manual, which is being reprinted each year and distributed to all concerned Technical Officer

- The distribution of resources, such as labour force, plant and materials to the various schemes under construction.
- The invitation of tenders direct for the supply of such materials that are not available at the Central Stores, i.e building materials, and for the hiring of machinery from the private sector when such machinery is not available at the E.M.S.
- The acquisition of immovable property which is affected by the construction of the schemes
- The supply of services towards the installation of electricity supply, telephone etc, at the site of the various works.

CONTROL BRANCH

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

A very important objective of this branch is to ensure that the schemes undertaken for construction are completed within the estimated amount. As most of the budgeted schemes are contributory (village water supplies, minor irrigation works etc) several problems arise if a project is put in hand and the approved funds are not sufficient for its completion. In such cases, the scheme has to be revised prior to the commencement of the work, so that both the Government and the beneficiaries approve the revised scheme and the extra amount needed.

The technical staff of this branch work in close co-operation with the supervising technical staff for the construction of a scheme, and solve all problems that might arise before or during the execution of a project.

- All projects other than Nicosia District, are constructed direct by the three Regional Offices of the Department, i.e Larnaca-Famagusta, Limassol and Paphos, in close association

with a Senior Officer of the Construction Division who acts as the co-ordinator between the Regional Offices and the Headquarters in Nicosia. In addition, the Head of the Division and other Senior Officers carry out periodic visits to the Regional Offices and to the sites of the works under construction.

The Division of Construction is always kept informed on the progress of the schemes in the Districts through the Technical Co-ordinator, and monthly progress reports which are utilized for the preparation of the general monthly progress report which covers all the budget schemes under construction.

LABOUR FORCE

For the construction of a project the Division engages gangs usually consisting of monthly, or weekly (hourly) paid foremen, 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 including the workshops, during 1984, for the construction of all the projects was 824. Out of this figure 581 were regular and 242 were casual covering a variety of trades i.e. builders, carpenters, pipelayers etc.

The total expenditure incurred during 1984 on wages alone on schemes constructed by direct labour by the department reached the amount of £ 2,276,572. Out of this amount £ 1,867,813 represented the wages of the regular staff, and £ 408,759 represented the wages of casual staff.

Table VII-2 shows in detail the monthly average labour force engaged direct by the Division during 1984.

TABLE VII-2

LABOUR FORCE FOR 1984

Month	Skilled	Unskilled	REgular	Casual	Total
January	568	292	565	295	860
February	587	244	561	270	831
March	600	224	557	267	824
April	602	201	544	228	772
May	622	199	596	225	821
June	618	201	589	230	819
July	622	200	588	234	822
August	620	192	588	224	812
September	620	199	589	230	819
October	627	201	598	230	828
November	623	216	595	244	839
December	631	210	603	238	841
Daily average No.	611	214	581	242	824
Daily average %	74	26	71	29	100

PIPES AND PIPE FITTINGS

The vast majority of pipes and pipe-fittings of all types used for construction of the schemes approved for 1984, were purchased through the Government Central Stores Department where a reasonable stock of fast moving materials is always kept on a permanent basis for requisitioning by all Government Departments.

In exceptional cases where our requirements could not be met through the Government Central Stores due to the execution of emergency schemes where a special type of pipes was used, such as PVC pipes or Ductile Iron Pipes, then these pipes were purchased direct by our Department through the usual procedure of tenders through the Tender Branch of our Division.

The yearly requirements of our Department in pipes and pipe fittings of all types, are assessed by the Planning Branch of the Division of Construction as soon as the Development Budget is approved by the Ministerial Council and an order is put through the Government Central Stores early before the commencement of the projects.

During 1984 a length of 363,867 running meters of pipes of various types and diameters were laid all over the island for all projects executed by our Division at an expenditure of £ 2,137,747.

Table VII-3 below shows in detail all types, lengths and value of pipes laid during 1984.

TABLE VII-3

PIPES LAID DURING 1984

I GALVANIZED STEEL PIPES

Dia inches	length m	Value £
1/2	7 340	4 266
3/4	1 134	656
1	3 696	2 177
1 1/4	7 626	7 468
1 1/2	6 888	7 154
2	24 054	42 101
2 1/2	14 050	24 816
3	21 020	48 515
4	30 548	100 798
Total	116 356	£ 237 951

II STEEL PIPES (COATED-PLAIN ENDED OR VICTAULIC)

Dia mm	length m	value £
150	6 466	33 958
200	2 824	20 325
250	1 360	13 036
300	4 678	59 717
350	1 024	15 421
400	16	210
470	250	4 105
550	64	1 024
850	32	892
900	24	670
Total	16 738	£ 149 358

III ASBESTOS CEMENT PRESSURE PIPES - CLASS 15

Dia mm	Length m	Value £
75	1 904	1 143
80	3 052	6 104
100	40 747	137 239
125	1 263	4 869
150	23 924	79 148
200	15 760	88 074
250	2 750	21 045
300	1 230	11 351
350	1 378	18 012
400	1 467	24 959
450	1 050	23 508
500	1 689	43 749
Total	96 214	£ 459 201

IV ASBESTOS CEMENT PRESSURE PIPES - CLASS 20

Dia mm	Length m	Value £
80	3 360	8 400
100	14 498	38 439
125	186	730
150	14 068	63 567
200	4 707	32 974
250	6 917	57 552
300	36	313
350	871	16 155
400	1 410	32 554
500	886	26 626
Total	46 939	£ 277 310

V ASBESTOS CEMENT PRESSURE PIPES - CLASS 25

Dia mm	Length m	Value £
500	672	£ 25 349

VI PVC / POLYTHENE PIPES - 6 atm AND 10 atm)

Dia mm	Length m	Value £
12.50	14 459	1 721
18.75	3 670	599
25	12 205	3 144
37.50	77	13
50	1 092	638
62.50	34 860	13 106
75	516	345
100	972	978
125	150	287
150	1 037	2 177
200	98	378
Total	69 136	£ 23 386

VII DUCTILE IRON PIPES

Dia mm	Length m	Value £
150	72	413
200	12	87
250	36	367
500	12	339
600	7 740	289 624
700	998	47 568
800	2 282	137 622
900	6 660	489 172
Total	17 812	£ 965 192

SUMMARY OF ALL TYPES OF PIPES LAID DURING 1984

Ser No.	Type	Length m	Value £
I	Galvanized steel pipes	116 356	237 951
II	Steel pipes (Coated) P.E	16 738	149 358
III	Asbestos cement pressure pipes - class 15	96 214	459 201
IV	Asbestos cement pressure pipes - class 20	46 939	277 310
V	Asbestos cement pressure pipes - class 25	672	25 349
VI	PVC/polythene pipes	69 136	23 386
VII	Ductile iron pipes	17 812	965 192
Total		363,867	£ 2 137 747

CONSTRUCTION PLANT

For the execution of the schemes approved for construction in the 1984 Development Budget, and all other schemes of various types undertaken for construction during the year, the Division had to apply primarily to the Department of Electrical and Mechanical Services (EMS) for any type of machinery considered necessary for the execution of the works.

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

During 1984 our Division had to hire machinery both from the EMS and from the private sector. In total during 1984 an amount of £ 568,766 was paid for the hiring of all types of machinery considered necessary for the execution of the works, undertaken for construction direct by the Division. The hiring of land-rovers, or saloon cars for the transportation of the foremen and their staff to the site of the works constitutes quite a large percentage out of this amount, reaching the sum of £ 103,458.

Table VII-4 shows in detail all machinery hired for the execution of the works during 1984, including the hiring of land-rovers.

TABLE VII-4
MACHINERY HIRED DURING 1984

Ser No.	Description	Quantity	Unit	value £
1	Diggers	44 033	W/hrs	188 843
2	Concrete mixers	1 054	W/hrs	3 267
3	Electrowelding machines ..	4 506½	W/hrs	4 700
4	Elevators	agreed	--	641
5	Compressors	3 603½	W/hrs	6 204
6	Water pumps	48	W/days	393
7	Cutting machines	85	W/days	630
8	Cranes	3 682	W/hrs	29 870
9	Bulldozers	2 826	W/hrs	37 048
10	Dumpers	28	W/days	168
11	Tiper lorries	24 547	W/hrs	77 829

TABLE VII-4

MACHINERY HIRED DURING 1984 (Cont.)

Ser No.	Description	Quantity	Unit	Value £
12	Buses	3 410	W/hrs	12 501
13	Land-rovers	9 756	W/days	103 458
14	Low Loader	agreed	--	375
15	Vibrating roller	176	W/hrs	880
16	Driller	agreed	--	274
17	Saloon cars	1 256	W/days	6 024
18	Water carriers	26	W/days	233
19	Excavations	117 358	m ³	85 121
20	Soil compactor	427	W/hrs	2 882
21	Hiring of various types of machinery	145	W/hrs	7 425
Total				£ 568 766

BUILDING AND OTHER MATERIALS

All materials which are used for the construction of the schemes are usually requisitioned through the usual way from the Government Central Stores. However, materials that are not available at the GCS are purchased locally from the private sector through public tenders.

During 1984 a quantity of 727.16 tons of mild steel at a value of £ 116,480 was purchased from the GCS, 2,598 water meters of various diameters and at a value of £ 23,730 were also purchased from the GCS. All our needs in cement, reaching the quantity of 3,141 tons, at a value of £ 84,972 were purchased direct from the Vasiliko Cement Factory through a general tender for all Government needs.

All other building materials used during 1984, i.e aggregate, sea sand, etc were purchased locally from the private sector through public tenders.

In total, during 1984, the Division purchased building materials and water meters of a value of £ 341,366.

Table VII-5 shows in detail all building and other materials used by the Division of Construction during 1984, for the execution of the schemes.

TABLE VII-5

MATERIALS PURCHASED AND WATER METERS INSTALLED

I BUILDING AND OTHER MATERIALS USED DURING 1984

Ser No.	Description	Quantity	value £
1	Cement	3141 tons	84 972
2	Mild steel	727.16 tons	116 480
3	Aggregate	17 696 m ³	29 490
4	Sea sand	5 630 m ³	21 834
5	Sand-soil	35 334 m ³	39 181
6	Shingle	7 238 m ³	21 385
7	Havara	483 m ³	537
8	Stone sand	1 040 m ³	3 757
	Total		<u>£ 317 636</u>

II WATER METERS INSTALLED DURING 1984

Ser No.	Dia inches	Number	Value £
1	1/2	2 209	5 923
2	1 1/4	16	135
3	1 1/2	44	549
4	2	62	2 253
5	2 1/2	49	2 092
6	3	48	2 040
7	4	142	8 180
8	6	22	1 608
9	8	4	487
10	10	1	184
11	12	1	279
	Total	<u>2 598</u>	<u>23 730</u>

RURAL DOMESTIC WATER SUPPLY SCHEMES

The construction programme for 1984 included 62 rural water supply schemes of an estimated cost of £ 1,323,666. The expenditure incurred on all these schemes during the year reached the amount of £ 857,594.

These schemes were split in the five free Districts of the island as shown on the summary below.

A list showing in detail all 62 rural domestic water supply schemes which were approved for construction during 1984 is given on Table VII-6.

SUMMARY OF RURAL DOMESTIC WATER SUPPLY SCHEMES UNDERTAKEN
FOR CONSTRUCTION DURING 1984

District	No. of schemes	Amount allocated for 1984 £	Expenditure incurred in 1984 £
Nicosia	19	420 965	296 492
Larnaca	7	175 676	126 077
Famagusta	7	248 762	149 780
Limassol	16	284 882	204 783
Paphos	13	193 381	80 462
Totals	62	<u>£ 1 323 666</u>	<u>£ 857 594</u>

TABLE VII-6
RURAL DOMESTIC WATER SUPPLY SCHEMES - EXPENDITURE 1984

Ser No.	Scheme	Amount Allocated		Govt £	Village £	Total £	Expenditure		Remarks
		Govt £	Village £				Govt £	Village £		Total £
NICOSIA DISTRICT									
1	Anayia - Improvements to distribution system	900	900	1 800	900	1 800	900	1 800	Completed
2	Analiondas - Supplementary supply from new borehole	34 500	11 500	46 000	--	--	--	--	Work will commence early in 1985
3	Astromeritis - Improvements to distribution system	7 563	19 937	27 500	6 800	24 729	17 929	24 729	Completed
4	Ayia Varvara - improvements to distribution systems and pumping unit	2 045	2 045	4 090	1 795	3 591	1 796	3 591	Completed
5	Ayios Theodoros - supplementary supply from new borehole	17 242	8 621	25 863	16 680	25 020	8 340	25 020	Completed
6	Ayios Yeorgios (Kafkalou) supplementary water supply ...	4 915	--	4 915	4 915	4 915	--	4 915	Completed
7	Dhali - Supplementary water supply and improvements to existing system	94 265	75 765	170 030	74 060	148 122	74 062	148 122	Work in progress
8	Kapedhes - supplementary supply from new borehole	14 666	7 334	22 000	--	--	--	--	Work will commence in 1985
9	Klirou - supplementary water supply from new borehole	5 275	5 275	10 550	3 719	7 438	3 719	7 438	Completed
10	Kokkini Trimithia - supplementary water supply from new borehole	4 048	4 048	8 096	18	35	17	35	Completed

TABLE VII-6
RURAL DOMESTIC WATER SUPPLY SCHEMES - EXPENDITURE 1984 (Cont)

Ser No.	Scheme	Amount Allocated		Govt £	Expenditure		Remarks
		Govt £	Village £		Govt £	Village £	
11	Koutraphas - new main conveyer pipeline	49	24	73	47	23	70 Completed
12	Lakatamia Pano and Kato supplementary supply from B/Hs 41/75 and 135/65 and two storage tanks (500 m ³)	18 550	9 275	27 825	12 045	6 022	18 067 Completed
13	Laxia - improvements to distribution system	10 000	10 021	20 021	10 000	10 021	20 021 Completed
14	Linou - New main conveyer pipeline	2 589	2 589	5 178	1 353	1 353	2 706 Completed
15	Malounda - extension of distribution system	2 337	779	3 116	980	326	1 306 Completed
16	Malounda - new storage tank and supply to ELDYK camp	6 000	--	6 000	5 526	--	5 526 Completed
17	Meniko - supplementary water supply from new B/H	16 574	5 525	22 099	13 327	4 442	17 769 Completed
18	Paleometokho - supplementary water supply from new B/H	7 526	7 876	15 402	7 355	7 876	15 231 Completed
19	Politiko - supplementary supply from B/H 48/79	204	204	408	73	73	146 Completed
Total for Nicosia District ..		£249 248	£171 718	£420 966	£159 593	£136 899	£296 492

TABLE VII-6

RURAL DOMESTIC WATER SUPPLY SCHEMES - EXPENDITURE 1984 (Cont)

Ser No.	Scheme	Amount Allocated		Expenditure		Remarks		
		Govt £	Village £	Govt £	Total £			
LARNACA DISTRICT								
1	Anglisidhes - supplementary supply	7 459	--	7 459	24	--	24	Scheme abandoned
2	Aradhippou - new distribution system	58 877	58 877	117 754	52 116	52 117	104 233	Completed
3	Athienou - supplementary water supply from new B/H 110/82	10 000	10 000	20 000	--	--	--	Output of B/H diminished New B/H to be drilled soon
4	Ayios Minas Monastery - new water supply scheme and irrigation system	1 830	1 830	3 660	1 182	1 182	2 364	Completed
5	Kalokhorio - supplementary water supply from B/H 79/83	18 803	--	18 803	14 820	--	14 820	Completed
6	Mazotos - new storage tank	2 500	2 500	5 000	2 318	2 318	4 636	Completed
7	Xylymbou - supplementary water supply from new B/H	1 500	1 500	3 000	--	--	--	Scheme to be revised output of B/H diminished
Total for Larnaca District		£100 969	£74 707	£175 676	£70 460	£55 617	£126 077	

TABLE VII-6

RURAL DOMESTIC WATER SUPPLY SCHEMES - EXPENDITURE 1984 (Cont)

Ser No.	Scheme	Amount Allocated		Expenditure		Remarks	
		Govt £	Village £	Govt £	Village £		Total £
FAMAGUSTA DISTRICT							
1	Ayia Napa - new distribution system	3 125	3 125	893	893	1 786 Completed	
2	Ayia Napa - extension to distribution system	7 000	--	6 699	--	6 699 Completed	
3	Ayia Napa - improvement of water supply from 'Kastalia' to 'Nisi Beach'	18 000	--	12 050	--	12 050 Work in progress	
4	Dherinia - improvements to existing water supply system	20 000	10 000	10 216	5 108	15 324 Work in progress	
5	Paralimni - Protaras - main conveyor pipeline to Protaras tourist area	100 512	--	62 378	--	62 378 Work in progress	
6	Paralimni - Ayia Napa installation of new pumping units and main conveyor pipelines	68 000	--	32 949	--	32 949 Work in progress	
7	Paralimni - improvements to distribution system	9 500	9 500	9 297	9 297	18 594 Completed	
Total for Famagusta District		£226 137	£22 625	£248 762	£134 482	£15 298	£149 780

RURAL DOMESTIC WATER SUPPLY SCHEMES - EXPENDITURE 1984 (Cont.)

Ser No.	Scheme	Amount Allocated		Govt £	Expenditure		Remarks
		Govt £	Village £		Govt £	Village £		Total £
LIMASSOL DISTRICT							
1	Apsiou - supplementary supply from Ieromonachos spring	2 400	2 400	2 400	2 400	4 800	Completed
2	Asomatos - supplementary water supply combined schemes with Trakhoni	8 500	8 500	8 500	--	--	Administrative formalities not completed promptly
3	Asgata - supplementary supply from B/H 60/80	10 178	10 178	8 158	8 158	16 316	Completed
4	Ayios Athanasios - improvements of existing system (Phases B + C)	18 166	18 166	14 562	14 562	29 124	Work in progress
5	Ayios Tykhonas - new reservoir Erimi - improvements of existing system	60	60	60	60	120	Completed
6	Kellaki - extension of distribution system to new area	15 000	15 000	8 609	8 609	17 218	Work in progress
7	Klonari - supply from Kellaki village	8 000	8 000	--	--	--	Rejected
8	Kividhes Pano - supplementary supply from Platania and Vrisi springs	7 000	--	6 905	--	6 905	Completed
9	Omodhos - supplementary supply from B/H 92/77	21 150	21 150	21 136	21 136	42 272	Completed
10		7 844	7 844	4 953	4 953	9 906	Pending installation of a chlorinator

TABLE VII-6

RURAL DOMESTIC WATER SUPPLY SCHEMES - EXPENDITURE 1984 (Cont)

Ser No.	Scheme	Amount Allocated		Expenditure		Remarks
		Govt £	Village Total £	Govt £	Village Total £	
11	Paramythia - Palodhia - Spitali supplementary supply	22 301	22 301	18 480	18 480	Pending the payment for the cost of B/H
12	Pyrgos - improvements of existing distribution system	6 266	2 266	5 057	5 057	Completed
13	Polemichia Kato - improvement of existing system (Phase A + B)	13 419	13 419	11 875	11 875	Work in progress
14	Trakhoni - supplementary supply	642	--	394	--	Completed
15	Trimiklini - supplementary supply from Arkolahania spring	3 988	3 988	3 187	3 187	Completed
16	Troodhitissa Monastery - supplementary supply from B/H	1 348	1 348	265	265	of a chlorinator
Total for Limassol District		£146 262	£138 620	£106 041	£98 742	£204 783
PAPHOS DISTRICT						
1	Argaka - supplementary supply and new storage tank	1 657	1 657	1 648	1 648	Completed
2	Akoursos - improvement of spring	400	--	--	--	Pending land acquisition
3	Arkhimandrita Pano - replacement of main conveyor from spring	1 579	1 579	401	401	Completed

TABLE VII-6

RURAL DOMESTIC WATER SUPPLY SCHEMES - EXPENDITURE 1984 (Cont)

Ser No.	Scheme	Amount Allocated		Govt £	Expenditure		Remarks
		Govt £	Village £		Govt £	Village £		Total £
4	Arodhes Pano - supplementary supply	2 887	--	2 887	--	--	Funds not made available
5	Emba - improvements to distribution system	7 912	7 912	15 824	1 625	1 624	3 249 Completed
6	Kallepia - Letimbou - Krítou Marottou	6 667	3 333	10 000	--	--	Funds not made available in time
7	Khoulou - supplementary water supply from B/H 19/81	6 700	6 700	13 400	4 420	2 756	7 176 Completed
8	Kholetria - improvement of pumping scheme	7 000	--	7 000	2 177	--	2 177 Pending supply of electricity
9	Panayia - new main conveyor pipeline from Kholetria spring	2 450	2 450	4 900	1 327	1 328	2 655 Work in progress
10	Peyia - supplementary water supply from B/H 49/82	34 300	34 300	68 600	25 088	22 580	47 668 Work in progress
11	Tala - supplementary supply from new borehole	4 173	4 173	8 346	1 604	1 605	3 209 Completed
12	Tsadha - Kili - supplementary supply from B/H 13/78	7 176	7 176	14 352	1 111	1 111	2 222 Completed
13	Yeroskipou - Improvements to distribution system	25 200	16 000	41 200	2 734	5 274	8 008 In progress
Total for Paphos District		£108 101	£85 280	£193 381	£42 135	£38 327	£80 462

MINOR IRRIGATION SCHEMES

The construction programme for 1984 included 44 minor irrigation schemes of an estimated value of £782,103. The overall expenditure incurred during the year for all these schemes reached the amount of £512,361.

These 44 minor irrigation schemes were split in the four free districts of the island and cover a wide field of constructional activities, such as the lining of channels, pumping and piped distribution networks, etc.

A list showing in detail all 44 minor irrigation schemes which were approved for construction during 1984 is given on Table VII-7.

SUMMARY OF THE MINOR IRRIGATION SCHEMES UNDERTAKEN FOR CONSTRUCTION DURING 1984

District	No. of schemes	Amount allocated for 1984 £	Expenditure incurred during 1984 £
Nicosia	24	398 680	306 406
Larnaca	3	6 039	776
Limassol	5	46 256	17 395
Paphos	12	331 128	187 784
Totals	44	<u>£782 103</u>	<u>£512 361</u>

TABLE VII-7

MINOR IRRIGATION SCHEMES - EXPENDITURE 1984

Ser No.	Scheme	Amount Allocated		Govt £	Village £	Total £	Expenditure		Remarks	
		Govt £	Village £				Govt £	Village £		Total £
NICOSIA DISTRICT										
1	Akaki - lining of R.C.C. channels	9 100	--	9 100	--	--	--	--		
2	Argates 'Kounapis' - improvements to existing chain of wells	9 500	7 500	17 000	5 821	3 821	9 642	Work in progress		
3	Astromeritis - R.C.C. channels	5 567	5 761	11 328	5 567	5 761	11 328	Completed		
4	Ayios Epiphaniios 'Maroullena' - weir and pumping scheme from river, and piped distribution system	4 547	2 273	6 820	2 059	1 029	3 088	Completed		
5	Ayios Ioannis (Malounda) lining of channels	9 935	4 967	14 902	9 740	4 870	14 610	Completed		
6	Ayii Trimithias - R.C.C. channels	1 073	357	1 430	919	306	1 225	Completed		
7	Dhenia - pumping scheme and lining of channels	3 467	--	3 467	--	--	--	Pending approval of scheme and allocation of funds		
8	Galata -- Sina Oros - R.C.C. channels and distribution	438	219	657	403	201	604	Completed		
9	KaloKhorio Klirou - lining of channels	20 656	10 333	30 999	16 837	8 418	25 255	Work in progress		

TABLE VII-7

MINOR IRRIGATION SCHEMES - EXPENDITURE 1984 (Cont)

Ser No.	Scheme	Amount Allocated		Expenditure		Remarks		
		Govt £	Village £	Govt £	Village £		Total £	
10	Kambos 'Potamos Kaloyirou' Pumping irrigation scheme	418	140	558	--	--	Completed. Balance for minor repairs	
11	Kochati - R.C. channels lining	12 567	6 283	18 850	12 512	6 256	18 768	Completed
12	Koutraphas Kato Mounes and Kalianitika' - R.C.C. channels	10 192	5 096	15 288	10 185	5 092	15 277	Completed
13	Kourdhali - distribution system	4 333	--	4 333	--	--	--	Pending allocation of funds
14	Linou 'Linopsas' - R.C.C. channels	29 497	14 748	44 245	29 432	14 716	44 148	Completed
15	Meniko - R.C.C. channels	9 333	4 667	14 000	8 364	4 182	12 546	Completed
16	Nikitari - pumping from B/H	49 166	24 534	73 700	35 200	17 600	52 800	Work in progress
17	Orounda - R.C.C. channels	34 000	16 048	50 048	31 931	15 966	47 897	Completed
18	Orounda 'Nero tou Filippou' - pumping from borehole	6 834	4 086	10 920	1 529	915	2 444	Work in progress
19	Orounda 'Maoutsos' - pumping from borehole	3 139	2 261	5 400	1 637	1 179	2 816	Work in progress
20	Pera - Politiko - lining of channels	10 000	5 000	15 000	7 582	3 791	11 373	Completed
21	Phlasou - Evrykhou - R.C.C. channels	4 333	2 167	6 500	4 211	2 105	6 316	Completed
22	Potami 'Stavrodromi' - pumping from borehole	485	--	485	245	--	245	Completed

TABLE VII-7

MINOR IRRIGATION SCHEMES - EXPENDITURE 1984 (Cont)

Ser No.	Scheme	Amount Allocated		Expenditure		Remarks			
		Govt £	Village £	Govt £	Village £		Total £		
23	Potami 'Potamos' pumping from borehole	20 000	10 000	30 000	8 460	4 231	12 691	Work in progress	
24	Tembria - R.C.C. channels	9 100	4 550	13 650	8 889	4 444	13 333	Completed	
	Total for Nicosia District	£267 690	£130 990	£398 680	£201 523	£104 883	£306 406		
LARNACA DISTRICT									
1	Maroni - improvements	1 334	--	1 334	--	--	--	Funds not made available	
2	Psematismenos 'Drakonties' - pipe distribution system	2 630	1 315	3 945	10	6	16	Completed	
3	Skarinou - re-alignment of pipes	760	--	760	760	--	760	Completed	
	Total for Larnaca District	£4 724	£1 315	£6 039	£770	£6	£776		
LIMASSOL DISTRICT									
1	Apsiou - improvement of existing system	3 551	1 775	5 326	1 898	949	2 847	Work in progress	
2	Ayios Mamas 'Vatsellas' - pumping scheme from B/H 53/77 and distribution system ...	16 000	8 000	24 000	--	--	--	Work will commence early in 1985	
3	Kilani - improvements of existing system	8 33	4 266	12 799	7 303	3 652	10 955	Completed	

TABLE VII-7

MINOR IRRIGATION SCHEMES - EXPENDITURE 1984 (Cont)

Ser No.	Scheme	Amount Allocated		Govt £	Village £	Total £	Expenditure		Remarks
		Govt £	Village £				Govt £	Village £		Total £
4	Kouka - Distribution system	800	400	1 200	741	370	1 111	Completed	
5	Trimiklini - main conveyor pipe to replace R.C. channel	1 954	977	2 931	1 655	827	2 482	Completed	
	Total for Limassol District	£30 838	£15 418	£46 256	£11 597	£5 798	£17 395		
PAPHOS DISTRICT									
1	Kato Akourdhalia - weir, conveyor pipeline, storage tank	11 020	5 510	16 530	400	200	600	Work in progress	
2	Kelokedhara 'Psathaes' - pumping scheme, storage tank and distribution	24 844	12 422	37 266	12 122	6 061	18 183	Work in progress	
3	Kelokedhara 'Ziripillis' - replacement of existing R.C. channel with A.C. pipes and distribution system	19 126	9 563	28 689	15 910	7 955	23 865	Pending supply of electricity	
4	Kholi - storage tank	145	73	218	22	11	3	Completed	
5	Kritou Terra 'Kephalovrysos' storage tank and distribution	5 000	--	5 000	--	--	--	Additional funds required to put the work in hand. Scheme to start early 1985	

TABLE VII-7

MINOR IRRIGATION SCHEMES - EXPENDITURE 1984 (Cont)

Ser No.	Scheme	Amount Allocated		Expenditure		Remarks		
		Govt £	Village £	Govt £	Village £		Total £	
6	Miliou 'Liskiari' - weir, storage tank and distribution	41 113	20 557	61 670	10 448	5 224	15 672	Work in progress
7	Miliou 'Kolokouris' - construction of storage tank	4 000	2 000	6 000	--	--	--	Work to start early in 1985 combined with a new scheme
8	Nata - pumping scheme, storage tank and distribution	34 603	22 301	56 904	22 979	11 490	34 469	Work in progress
9	Nea Dhimmata - new distribution system	8 600	4 300	12 900	4 598	2 299	6 897	Work in progress
10	Nikoklia - pumping scheme, storage tank and distribution system	33 679	20 174	53 853	30 164	15 082	45 246	Work in progress
11	Skoulli 'Ayios Adronikos' pumping scheme	782	391	1 173	782	391	1 173	Completed
12	Trakhyedhoula - pumping scheme, storage tank and distribution system	33 950	16 975	50 925	27 764	13 882	41 646	Work in progress
Total for Paphos District		£216 862	£114 266	£331 128	£125 189	£62 595	£187 784	

**OTHER MAJOR IRRIGATION WORKS
(SUPPLEMENTARY WORKS)**

The construction programme for 1984 included 10 other Major Irrigation Works of an estimated cost of £431,443. The overall expenditure incurred on these ten schemes during the year reached the amount of £363,909.

This category of projects constitutes mostly of new distribution systems, or extensions and maintenance to existing Major Irrigation Projects.

Out of this category of schemes the Khirokitia Pond features first in construction expenditure reaching the amount of £113,511. Other important projects are the Akrotiri extensions to the distribution networks with an expenditure of £79,920, the construction of the Ezzo Galata Pond with an expenditure of £78,270, and the distribution system from the Khirokitia Pond with an expenditure of £68,387.

A list showing in detail all 10 other Major Irrigation Works which were approved for construction during 1984 is given on Table VII-8.

TABLE VII-8

OTHER MAJOR IRRIGATION WORKS - EXPENDITURE 1984

Ser No.	Scheme	Amount Allocated		Govt £	Village £	Total £	Expenditure		Remarks
		Govt £	Village £				Govt £	Village £		Total £
1	Akrotiri - extension of distribution system	80 000	--	80 000	79 920	--	79 920	Completed	
2	Argaka - Makounda - installation of pumping units on three existing boreholes	20 000	--	20 000	14 530	--	14 530	Work in progress	
3	Esso Galata - construction of pond	66 667	33 333	100 000	52 180	26 090	78 270	Work in progress	
4	Khirokitia pond	79 889	39 945	119 834	75 674	37 837	113 511	Work in progress	
5	Khirokitia Irrigation Scheme - distribution system from pond	60 000	30 000	90 000	45 591	22 796	68 387	Work in progress	
6	Pissouri - Alekhtora - installation of water meters	1 500	--	1 500	1 407	--	1 407	Completed	
7	Pissouri - extension of distribution system	4 044	2 022	6 066	221	110	331	Completed	
8	Palekhori 'Skliuros' - piped distribution system	8 072	2 691	10 763	4 978	1 660	6 638	Work in progress	
9	Trakhoni - Ypsonas - extension of distribution system	1 280	--	1 280	--	--	--	For minor improvements to be executed early in 1984	
10	Yermasoyia - Polemidhia - relocation of distribution system	2 000	--	2 000	915	--	915	Work in progress	
	Total	£323 452	£107 991	£431 443	£275 416	£88 493	£363 909		

TOWN WATER SUPPLY SCHEMES

The 1984 Development Budget had a provision for two main categories of schemes regarding Town Water Supplies:

- (a) Improvement of water supply sources, treatment plants, pumping units and main conveyor pipelines, and
- (b) New schemes for Town Water Supplies.

During the year an amount of £ 265,991 was allocated for both categories of Town Water Supply Schemes, and eventually 25 schemes were undertaken for construction by our Division. The total expenditure incurred on all these 25 schemes during 1984 reached the amount of £ 172,765.

Most of the 25 schemes undertaken for construction during 1984 were put in hand in 1983 and were carried over for completion in 1984. A number of these schemes were emergency ones for augmenting of the water suppliers of Nicosia and Larnaca towns and other villages situated along the route of central WS System main conveyor pipelines, which faced acute shortage of domestic water supply.

A list showing in detail all 25 schemes for the Town Water Supplies which were undertaken for construction during 1984 is given on Table VII-9.

TABLE VII-9

TOWN WATER SUPPLY SCHEMES

Ser No.	Scheme	Expenditure incurred during 1984 £
1	Kokkini-Trimithia pipeline	1 013
2	Paphos Lower Villages	12 198
3	Kouris Delta	8 864
4	Maintenance and operation (General)	9 258
5	Steel Formwork	13 143
6	Nicosia Emergency Scheme	7 937
7	Removal of Yermasoyia pipeline near Vasilikos Pumping Station	1 300
8	Kakora djia B/H 132/83	9 453
9	Anglisides B/H 141/83	20 908
10	Alethriko	666
11	Skarinou	760
12	Yermasoyia B/H	2 319

TABLE VII-9

TOWN WATER SUPPLY SCHEMES (Cont)

Ser No.	Scheme	Expenditure incurred during 1984 £
13	Testing of B/H of Kornos	1 111
14	Recharge works at Kourris Delta	3 465
15	Kourris - Yermasoyia Pumping. Emergency pumping scheme from B/H No. 6	10 502
16	Pumping unit and connection B/H 153/83	1 733
17	Episkopi	10 985
18	Episkopi	861
19	Deepening of wells	24
20	Kattoudhia B/H 94/80.....	8 657
21	Pyrga B/H 28/84	9 110
22	Klavdhia	1 244
23	Yermasoyia - Vasilikos Pipeline	20 702
24	Purchase of water meters	3 582
25	Compensations	12 970
	Total	<u>£172 765</u>

MAJOR IRRIGATION WORKS

VASILIKOS PENDASKINOS PROJECT

Introduction

The Vasilikos Pendaskinos Scheme consists of the two rockfill dams of Kalavastos and Dhypotamos, the Maroni Diversion, the main conveyor of 10 km long, the Pumping Station at Tokhni and Treatment Plant at Kornos and the networks at Maroni and Pendaskinos.

The whole project is expected to cost around 29 million pounds.

The following schemes of Vasilikos Pendaskinos Project have been constructed by forced account by the Construction Division.

KALAVASOS-KHIROKITIA PIPELINE

The scheme provides the transport of water from the Kalavastos dam to Maroni area for irrigation and to Khirokitia treatment plant which in turn serves with drinkable water the Larnaca and Nicosia districts.

The scheme mainly consists of the following features:

- Pipelines
 - (i) 6.517 km of 900 mm ductile iron pipes
 - (ii) 1.55 km of 800 mm ductile iron pipes
 - (iii) 0.43 km of 700 mm ductile iron pipes
 - (iv) 7.6 km of 600 mm ductile iron pipes
 - (v) 0.66 km of 550 mm steel pipes
 - (vi) 0.75 km of 300 mm steel pipes

- Break pressure tank (Kalavassos area)

- Balancing reservoir (capacity 9,000 m³)

The construction of the above project has been undertaken by the construction Division of ^{the} Water Development Department for the amount of £2,838,666 (for materials £1,636,105 and for construction £1,202,561) with completion target the end of June 1985.

The project started at the end of 1983 and up to the end of 1984 was substantially ready for operation.

TOKHNI PUMPING STATION -

The pumping station is sited adjacent to the Nicosia - Limassol old road and branch road to Tokhni. Water from Kalavassos reservoir is flowing up to Tokhni pumping station by gravity and then is pumped to the balancing reservoir. The building construction has been undertaken by the Construction Division of the Department for the amount of £ 152 032 (consultants cost estimate £ 252,000) with the target to allow the mechanical contractor to start installation end of October 1984.

By the end of the year the whole building was ready except the joinery works, which were undertaken by the Departments Workshop. The works associated with the pumps and electrical installation and the reinstatement around the building are in progress.

The expenditure at the end of the year was £ 113,669.

MARONI NETWORK

This project includes the following parts:

- a) The construction of an open concrete storage reservoir of a capacity of about 3,500 m³.
- b) The installation of the distribution system south of the Maroni village with total irrigable land of about 1,800 donums.
- c) The construction of Vasilikos/Maroni Connection, a conveyor pipeline of about 6,000 meters of A.C pipes 600 mm to 350 mm dia.

Parts (a) and (b) estimated at £ 666,000 and part (c) estimated at £ 385,000. The construction works of the whole project has been undertaken directly by the Division of Construction of our Department.

Works on parts (a) and (b) commenced on 29th October 1984 and by the end of the year, the expenditure incurred was £280,000. Out of this amount £ 225,000 were paid for A.c pipes, valves, meters, air valves, C.I fittings, etc, and £ 55,000 on the construction i.e wages, excavation for the foundations of the storage reservoir, trenching, laying etc.

Part (c) the Vasilikos/Maroni connection is scheduled to commence in February 1985.

The whole project is expected to be completed by September 1985.

SOUTHERN CONVEYOR PROJECT

The purpose of the Southern Conveyor Project is the development of the water resources of the South East coastal region from Limassol to Kokkinokhoria and to satisfy the water demand up to the year 2010.

The Project consists of the Kouris Rockfill Dam of capacity 115 million cu.m, the main conveyor of 110 km, the Akhna Earthfill Dam, a number of Pumping Stations and the Kokkinokhoria distribution network.

During the year 1984 a small part of the Southern Conveyor Project as discribed below has been constructed by forced account by the Construction Division.

Main Conveyor

Parts of the Main Conveyor were constructed by the Water Development Department prior to the Limassol highway (by-pass) construction. Those parts were divided in two main sections; (1) The EAC section (2) Limassol by-pass.

EAC Section (L=145 m, d=1400 mm D.I.)

This part of the main conveyor runs along the south side of the Limassol by-pass. Work started at the end of November 1983 and was completed end of April 1984.

1453 meters of ductile iron Pipes have been laid and tested according to the drawings and specifications. The part which will be under the foundabout has been encased in concrete. Six containment R.C. channels were constructed for the EAC pylons. Also cathodic protection has been installed for that section. The total expenditure for the above is £94,093.

Limassol By-pass Section

Under the Limassol by-pass section the following pipes have been laid:

Location	Diameter mm	Length m	Length m
Paphos roundabout	1 400	205.00	
Berengaria	1 400	90.40	
Ayios Panteleimon	1 400	187.25	
Mesayitonia	1 400	114.80	
Mesayitonia	800		112.00
Phasoula road	800		77.00
Ayios Athanasios	1 400	82.00	
Ayios Athanasios	800		84.25
Connections to Limassol Treatment plant	800		147.75
Yermasoyia roundabout ..	1 400	<u>196.56</u>	<u> </u>
Total		876.01	421.00

All the pipes have been encased in concrete. The construction period was three months from 2nd April up to the end of June. Total expenditure £105,386.

KHRYSOKHOU IRRIGATION PROJECT

The Khryosokhou Irrigation Project is described elsewhere in this report by the Project Manager.

The role of the Construction Division in this respect was mainly restricted during the current year in the preparation and invitation of tenders for the various aspects of this project, such as supply of pipes and fittings, civil contracts etc.

In addition, the Head of the Construction Division was officially appointed as the Engineering Adviser to the Project Manager of Khryosokhou Irrigation Project, from 1st November 1984, being a World Bank requirement. His involvement was mainly on Evretou dam, being under construction at the time by contract.

PAPHOS IRRIGATION PROJECT

This project was completed long before 1984 while the extension of the hydroelectrical scheme whose commissioning went into early 1989 but there are still outstanding claims on Asprokremmos Dam Contract which are now in the process of Arbitration and which is believed to continue into 1986 as well.

The Construction Division, apart from its Head of Division who is participating in the Claims Committee for this project had no role to play during the year 1984, although a lot of work was done by forced account in the past.

A report on operation and maintenance of this project appears elsewhere in this report, by others.

TABLE VII-10

PAPHOS IRRIGATION PROJECT

Ser No.	Description	Amount allocated in 1984 £	Expenditure incurred in 1984 £
1	WDD works (extension and improvements to distr. networks eastern)		5 737
2	Connection of irrigation network area with Akhelia Government Chiftliks		3 904
3	Anarita extension	100 000	77 617
4	Completion of irrigation network Western area	33 000	15 892
5	Paphos town water supply		690
6	Asphalting of Asprokremos dam crest road	10 940	9 768
7	Asprokremos dam power station ...	12 135	914
8	Land acquisition	153 105	131 583
9	Staff training	4 765	4 655
10	Installation of irrigation network Western area	32 663	32 663
11	Removal of spoil material Western area		2 975
12	Vehicles operation		494
13	Hiring charge of vehicles		331
14	Consulting Engineers		10
	Total	£346 608	£287 233

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 inhabitants. In the area of the project which forms the eastern part of Troodos mountain range a rugged topography prevails and the terrain is dissected by numerous streams and small deep valleys. Most of the Pitsilia area is on diabase rocks with gabbros which offer themselves for conversion into agricultural land (pillow lavas).

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

The project aims at improving the standard of living of the people of Pitsilia region, by developing the productive resources of the area and improving the social services, such as health and education. Pitsilia Integrated Rural Development Project is a multipurpose interdisciplinary project the main component of which is surface and ground water development.

The project was inaugurated in 1978 and was scheduled to be completed over a period of five years, i.e. by the end of 1982, but eventually it was decided to extend the period of implementation to six years, so as to catch up with certain minor delays over the design and construction of a few schemes, but mainly in order to expand its targets, especially in the field of water development, with the construction of all the feasible schemes acceptable by the farmers concerned. The majority of the Pitsilia schemes was completed during the first six months of 1984.

The total investment on this project will exceed the amount of about £ 10.5 million out of which an amount of £ 7.26 million will be used for the development of the region's water resources so as to irrigate 11,000 donums of land (the initial target was 8,600 donums) through the following schemes.

* The construction of a rockfill type of dam at Xyliatos with a capacity of 1.25 million cubic meters of water to irrigate 2,300 donums.

* The construction of an arch dam at Ayii Vavatsinias with a capacity of 53,500 cubic meters.

* The construction of 19 PVC lined earth ponds (4 of them combined with boreholes) with a total capacity of £ 1,872,000 cubic meters for the irrigation of 4,000 donums of land.

* The development of 28 boreholes with a combined yield of approximately 1.5 million cubic meters per year for the irrigation of 3,220 donums of land.

* The rehabilitation of existing minor irrigation schemes (more than 50) for the irrigation of 1,500 donums of land.

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

Development and utilization of surface water resources have increased by about 4 million cubic meters to a total of 15 million cubic metres following project implementation (14 MCM for irrigation and 1 MCM for water supply).

The irrigated area of the Pitsilia region has been increased from 1470 ha to about 3,000 ha by the implementation of the PIRDP.

By the end of 1984 the total expenditure incurred in the sector of water development reached the amount of £7,216,126 as follows:

1978	.....	£	49 407
1979	.....	£	471 542
1980	.....	£	881 326
1981	.....	£	1 577 069
1982	.....	£	1 759 881
1983	.....	£	1 824 185
1984	.....	£	697 716
Total	.. .. .	£	7 261 126

The first six months of 1984 have been a period of intensive activity in the sector of water development in the Pitsilia area. This sector of development has absorbed the vast majority of funds allocated for the Pitsilia Integrated Rural Development Project, which is financed by the International Bank for Reconstruction and Development (IBRD).

During the year the activities were continued on the construction of ponds, distribution systems, borehole schemes, rehabilitation schemes and domestic water supply schemes.

In addition construction works on the Xyliatos dam distribution system were completed. These will cover an area of 2,300 donums.

It is now evident that the original target in the sector of water development as laid down at the commencement of the project will be overwhelmingly covered.

The construction programme for 1984 included 86 water development schemes including completion of P.V.C. membrane lined earth ponds distribution networks, borehole, rehabilitation and water supply schemes.

For all these schemes an amount of £ 938,426 was allocated through the budget during 1984, and by the end of the year the expenditure incurred on all these schemes reached the amount of £697,716.

The PVC lined earth ponds are mainly off stream man made reservoirs which are fed with water (essentially in gravity) from diversion weirs (constructed on nearby stream) through diversion pipelines laid for this purpose. The ponds are filled during the winter and early spring months, so that water can be used for irrigation during the dry summer period.

For more details on the Pitsilia Water Development schemes please refer to Table VII-11.

TABLE VII-11
PITSILIA INTEGRATED RURAL DEVELOPMENT PROJECT
SCHEMES UNDERTAKEN FOR CONSTRUCTION IN 1984

Ser No.	Description	Amount allocated in 1984 £	Expenditure incurred in 1984 £	Remarks
A. PONDS AND DISTRIBUTION SYSTEMS				
1	Agrichia pond	7 490	4 299	Completed
2	Agrichia distribution system .	2 013	286	"

TABLE VII-11

PITSILIA INTEGRATED RURAL DEVELOPMENT PROJECT

SCHEMES UNDERTAKEN FOR CONSTRUCTION IN 1984 (Cont.)

Ser No.	Description	Amount allocated in 1984 £	Expenditure incurred in 1984 £	Remarks
3	Arakapas pond No. 1	2 078	196	Completed
4	Arakapas distribution system	1 036		"
5	Arakapas pond No. 2	64 137	44 293	"
6	Arakapas distribution No.2	16 321	11 019	"
7	Akapnou-Efthagonia pond ..	8 264	2 419	"
8	Akapnou-Efthagonia distribution system	916	---	"
9	Ayii Vavatsinias pond No.2	31 544	29 272	"
10	Ayii Vavatsinias distribution system	3 732	780	"
11	Ayii Vavatsinias pond No.1	10 591	7 868	"
12	Dhierona pond	58 280	48 502	"
13	Dhierona distribution system	8 317	6 755	"
14	Ephtagonia pond No. 1	2 005	---	"
15	Ephtagonia pond No. 2)			"
16	Ephtagonia pond No. 3)	22 615	13 044	"
17	Ephtagonia pond No. 2+3)			"
18	Ephtagonia pond No. 2+3	5 698	1 750	"
19	Khandria pond	6 405	3 997	"
20	Khandria distribution system	92	---	"
21	Kato Mylos	7 038	2 539	"
22	Kato Mylos distribution system	1 185	---	"
23	Kyperounda pond No. 2 ...	20 142	7 989	"
24	Kyperounda distribution system No. 2	27 755	21 971	"
25	Lagoudhera pond	5 862	2 093	"
26	Lagoudhera distribution system	9 822	6 712	"
27	Melini pond	1 116	196	"
28	Ora pond	8 895	7 306	"

TABLE VII-11

PITSILIA INTEGRATED RURAL DEVELOPMENT PROJECT

SCHEMES UNDERTAKEN FOR CONSTRUCTION IN 1984 (Cont.)

Ser No.	Description	Amount allocated in 1984 £	Expenditure incurred in 1984 £	Remarks
29	Ora distribution and B/H 27/81 and 66/81	16 321	8 888	Completed
30	Pelendria pond	4 218	871	"
31	Pharmakas pond 1 & 2	56 265	44 322	"
32	Pharmakas distribution system	6 413	5 572	"
	Total	£416 566	£282 939	
33	B. XYLIATOS DAM			
	i Phase A	8 329	8 196	Completed
	ii Phase B	31 924	28 633	"
	iii Purchase of filters	31 817	31 147	"
	iv Guard house	8 868	8 868	"
	v Acquisition	4 473	2 685	"
	Total	£85 411	£79 529	
	C. BOREHOLE SCHEMES			
34	Agros B/H 63/76	1 974	1 574	Completed
35	Agros B/H 21/82	37 284	28 786	"
36	Alona B/H 46/80	21 545	13 378	"
37	Arakapas B/H 106/76 and 107/76	678	---	Pending land acquisition
38	Arakapas B/H 124/76	446	---	Pending land acquisition
39	Askas	24 985	23 167	Completed
40	Ayios Konstantinos B/H 123/76 and 8/81	13 461	4 994	"
41	Ayii Vavatsinias B/H 35/81	20 614	17 286	"
42	Dhymes B/H 81/80	21 857	16 613	"
43	Dhierona B/H 14/82	38 191	35 223	"
44	Kato Amiantos B/H 31/76	36 559	36 251	"
45	Kalokhorio B/H 69/83	12 390	---	"
46	Louvaras B/H 32/77 and 16/81	6 185	3 390	"

TABLE VII-11

PITSILIA INTEGRATED RURAL DEVELOPMENT PROJECT
SCHEMES UNDERTAKEN FOR CONSTRUCTION IN 1984 (Cont.)

Ser No.	Description	Amount allocated in 1984 £	Expenditure incurred in 1984 £	Remarks
47	Lagoudhera B/H 53/80	15 587	12 037	Completed
48	Sykopetra B/H 48/82	22 266	22 074	"
49	Zoopiyi B/H 9/81	19 197	12 044	"
	Total	<u>£293 219</u>	<u>£226 817</u>	

D. VILLAGE WATER SUPPLY SCHEMES

50	Agros B/H 63/76	280	185	Completed
51	Arakapas	1 698	138	"
52	Ayios Pavlos	1 398	1 340	"
53	Ayios Ioannis Agrou oper. exp.	2 197	2 160	"
54	Ayios Ioannis Agrou B/H 65/76	1 500	318	"
55	Dhierona B/H 14/82	4 700	4 012	"
56	Gourri	600	400	"
57	Gourri B/H 99/83	22 444	15 619	"
58	Louvaras B/H 32/77 and 16/81	4 788	2 335	"
59	Palekhoris B/H 71/79	879	587	"
60	Pelendria B/H 17/76 (old)	812	541	"
61	Pelendria B/H 69/81 and Farm	1 550	573	"
62	Palekhoris B/H 81/79 (M)	1 438	1 149	"
63	Phterikoudhi	293	---	"
64	Phikardhou.....	8 500	5 937	"
65	Reductio of village contribution from $\frac{1}{2}$ to $\frac{1}{3}$	37 308	37 308	"
	Total	<u>£90 385</u>	<u>£72 602</u>	

E. IRRIGATION SCHEMES

66	Agros 'Kaoukkaris'	2 004	1 272	Completed
67	Agros 'Vrisi ton Trouartzion'	941	687	"
68	Agros 'Sykambron'	1 261	1 126	"
69	Agridhia 'Konisero'	1 027	312	"
70	Agridhia 'Kato Enetikos'..	429	30	"
71	Ayios Theodoros 'Maroudhes'	3 809	3 770	"
72	Ayios Theodoros 'Kavatzia'	2 782	2 293	"
73	Ayios Pavlos 'Dhimma tou Khoriou and Dhoma'	4 228	4 205	"

TABLE VII-11

PITSILIA INTEGRATED RURAL DEVELOPMENT PROJECT
SCHEMES UNDERTAKEN FOR CONSTRUCTION IN 1984

Ser No.	Description	Amount allocated in 1984 £	Expenditure incurred in 1984 £	Remarks
74	Ayii Vavatsinias 'Diploma'	2 460	1 291	Completed
75	Dhieronas 'Mylos'	1 042	69	"
76	Dhymes 'Kambos-Kardama'	1 119	955	"
77	Pelendria 'Kato Phylagra'	11 385	2 690	Completed Pending the installation of a new turbine
78	Pelendria B/H 53/76	3 542	2 243	Completed
79	Saranti 'Agrosykia'	332	128	"
80	Spilia 'Verouti-Stavartaro'	13 060	10 576	"
	Total	<u>£49 421</u>	<u>£32 647</u>	

F. OTHER WORKS

81	Melini test pumping	553	342	"
82	Test pumping	2 871	2 840	"
	Total	<u>£3 424</u>	<u>£3182</u>	

SUMMARY OF ALL PITSILIA INTEGRATED RURAL DEVELOPMENT SCHEMES
UNDERTAKEN FOR CONSTRUCTION DURING 1984

Ser No.	Description	Amount allocated in 1984 £	Expenditure incurred in 1984 £	Number of schemes
1	Ponds and distribution systems	416 566	282 939	32
2	Xyliatos Dam	85 411	79 529	5
3	Borehole schemes	293 219	226 817	16
4	Village water supply schemes	90 385	72 602	16
5	Irrigation schemes	49 421	32 647	15
6	Other works	3 424	3 182	2
	Grand Total	<u>£938 426</u>	<u>£697 716</u>	<u>86</u>

TABLE VII-12

W D D PITSLIA INTEGRATED RURAL DEVELOPMENT PROJECT - PONDIS AND THEIR DISTRIBUTION SYSTEMS

Ser No	Scheme	Capacity (cub.metres)	Irrigated area (hectares)	Completed in	Expenditure ₯	Design	Construction by	Supervision of Construction
1	Xylitios* (Dam)	1 250 000	-	1982	1 187 428		General Construction Co	
2	" Distribution System	-	308,31	1984	654 000		Water Development Dept.	
3	Ephthegonia No.1	92 000	-	1980	83 722		Iacovou Bros	
4	" Distribution System	-	20.11	1981	24 509		Water Development Dept.	
5	Khandria	70 000	-	1980	105 940		CYBARCO	
6	" Distribution System	-	18.77	1982	26 906		Water Development Dept.	
7	Mellini	58 000	-	1980	67 815		Iacovou Bros	
8	" Distribution System	-	14.08	1980	15 390		Water Development Dept.	
9	Peledria & B II No 53/76	123 000	-	1980	132 266		FYSCO Contracting	
10	" Distribution System	-	71.98	1981	73 550		Water Development Dept.	
11	Ayili Vavatsinias	53 500	-	1981	82 252		Water Development Dept.	
12	a) Arch dam	55 000	-	1981	72 330		Iacovou Bros	
13	b) Pond No 1	-	24.13	1981	28 333		Water Development Dept.	
14	" Distribution System	104 000	-	1981	125 000		Phoenix Constructions	
15	Kato Mylos & B II No 66/76	-	40.21	1982	71 313		Water Development Dept.	
16	" Distribution System	127 000	-	1981	162 271		Hadjikonstandis-Pisentszides & Charalambous Co.	
17	Ephthegonia No 3	65 000	-	1981	97 686		Iacovou Bros	
18	" Distribution System	-	35.52	1982	66 302		Water Development Dept.	
19	Akapnou-Ephthegonia	132 000	-	1981	177 390		Iacovou Bros	
20	" Distribution System	-	24.80	1982	39 084		Water Development Dept.	
21	Arakapas No 1	191 000	-	1982	177 975		Iacovou Bros	
22	" Distribution System	-	36.19	1982	49 964		Water Development Dept.	
23	Agridhia	59 000	-	1983	89 510		Iacovou Bros	
24	" Distribution System	-	12.33	1983	27 787		Water Development Dept.	
25	Kyperounda No 2	270 000	-	1983	315 314		Iacovou Bros	
26	" Distribution System	-	71.05	1983	193 565		Water Development Dept.	
27	Lagouthera	71 500	-	1983	140 870		Phoenix Constructions-KYKON	
28	" Distribution System	-	17.43	1984	14 500		Water Development Dept.	
29	Ora & B II Nos 27/01 & 66/01	60 000	-	1983	104 522		Phoenix Constructions	
30	" /Distribution System	-	18.10	1983	68 340		Water Development Dept.	
31	Ayili Vavatsinias No 2	43 500	-	1984	97 810		Chr Charalambous	
32	" Distribution System	-	7.37	1983	15 710		Water Development Dept.	
33	Pharmakas No 1	21 000	-	1984	224 210		Iacovou Bros	
34	" Distribution System	59 000	-	1983	25 214		Water Development Dept.	
35	Pharmakas No 2	-	16.76	1984	155 598		Char Apostolides	
36	" Distribution System	119 000	-	1983	45 900		Water Development Dept.	
37	Arakapas No 2	-	25.47	1983	216 200		Char Apostolides	
38	" Distribution System	159 000	-	1984	95 500		Water Development Dept.	
39	Dhlerona	-	40.21	1983	-			
40	" Distribution System	-	-	-	-			
T O T A L		3 182 500	802.82		6 5 359 976			

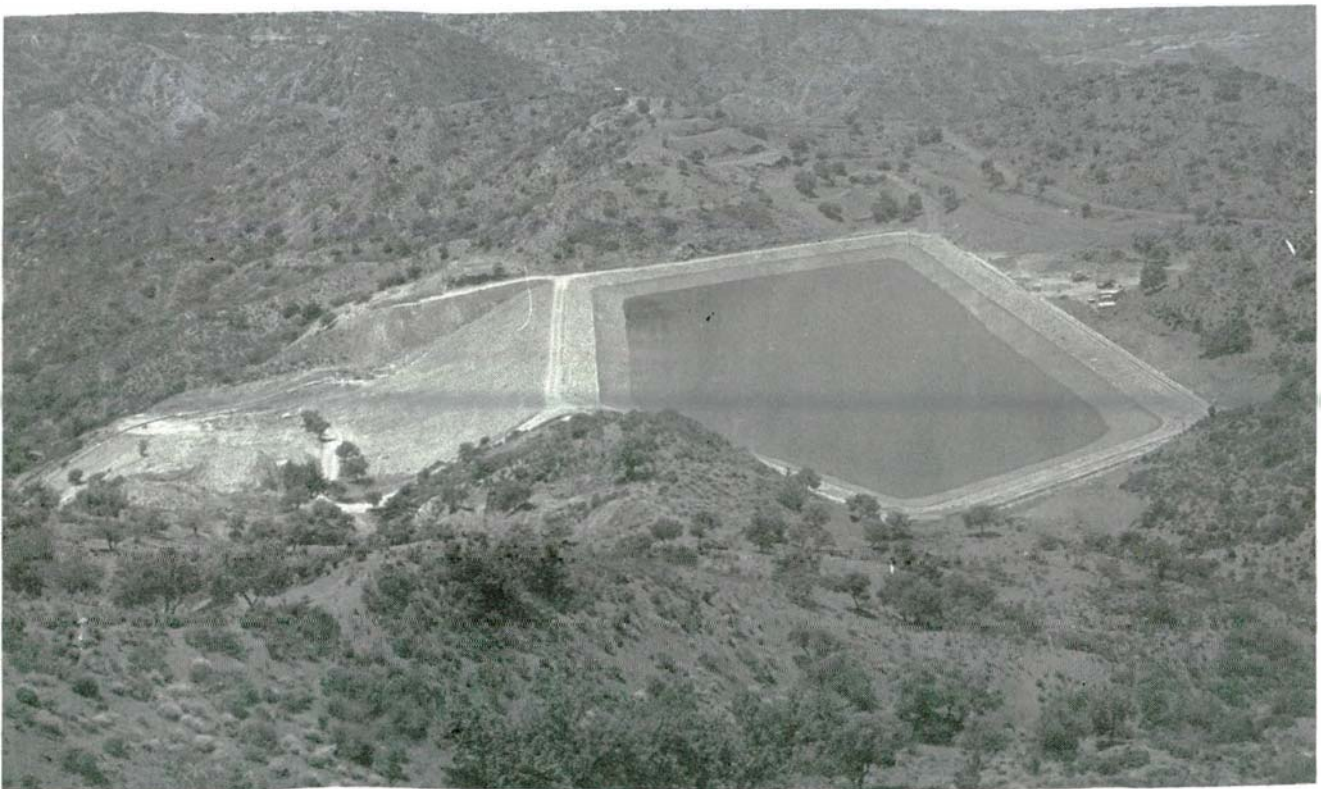
* Villages benefiting from Xylitios Dam are Ayia Marina with 20% of the irrigated area, Khandria 25%, Xylitios 20%, Kyperounda 9%, Lagouthera 5% and various other villages 13%

WATER DEVELOPMENT DEPARTMENT

WATER DEVELOPMENT DEPARTMENT



Pitsilia Integrated Rural Development Project. Diversion weir serving Dhierona and Arakapas No. 2 Ponds. WDD Photo E15-8 (20.2.84).



Pitsilia Integrated Rural Development Project. Dhierona Pond—Capacity 159,000 m³. WDD Photo E38-12 (16.5.84)

TABLE VII-13

W D D PITSILIA INTEGRATED RURAL DEVELOPMENT PROJECT - BOREHOLE IRRIGATION SCHEMES

Ser No	Scheme	B H Nos	Irrigated area (hectares)	Completed in	Expenditure £	Design and Construction
1	Kalokhorio	11/77& 54/76	55.63	1981	56 618	WATER DEVELOPMENT DEPARTMENT
2	Potamitissa	67/76& 69/79B	29.49	1981	47 755	
3	Arakapas (Skoli).....	106/76&107/76	24.13	1981	69 790	
4	Ayios Theodoros.....	105/76	12.60	1981	26 988	
5	Arakapas (Angoulos)...	124/76	12.73	1982	43 795	
6	Polystipos	21/77	9.38	1982	36 520	
7	Ayios Konstantinos....	123/76& 8/81	40.21	1983	123 200	
8	Kato Amiandos.....	31/76	70.64	1983	207 481	
9	Louvaras.....	32/76& 16/81	37.53	1983	91 150	
10	Zoopiya	9/81	13.00	1983	46 450	
11	Agros *.....	63/76	47.59	1983	103 332	
12	Dhymes	81/80	23.59	1984	74 200	
13	Sykopetra.....	48/82	13.94	1984	46 560	
14	Agros	21/82	23.46	1984	73 500	
15	Askas	98/80	19.44	1984	75 000	
16	Alona	46/80	12.73	1984	44 862	
17	Lagoudhera.....	53/80	5.76	1984	29 587	
18	Dhierona.....	14/82	12.73	1984	50 000	
19	Ayii Vavatsinias.....	35/81	14.34	1984	45 450	
20	Phterikoudhi	9/82	-	-	-	
	TOTAL		478.92		51 292 238	

* Together with Agros Dam

LARNACA ORINI PROJECT

KHIROKITIA POND

Construction works for Khirokitia pond commenced early in May 1983. The contract was awarded to Iacovou Brothers Ltd and the contract period is twelve months. Supervision was undertaken by the Construction Division of the Water Development Department.

The pond and all auxilliary structures were substantially completed in June 1984. Works for the laying of the distribution network commenced in May 1984 and was completed in February 1985. Fencing of the pond is scheduled in 1985.

The pond constructed has a capacity of 205,000 m³. It is an earth pond lined with 0.5 mm thick PVC membrane, similar to the ones constructed for the Pitsilia Project. Water was diverted into the pond (in December 1984) by gravity through a 200 mm asphalt coated steel pipe utilizing water from the nearby Ayios Minas river. The length of the diversion pipeline is approximately 2.5 km. The whole scheme is combined with the development of a nearby borehole No. 136/78. All the water utilized will be used for irrigation.

The Contractor, Iacovou Brothers Ltd submitted a number of claims (associated with the construction of Khirokitia pond) based mainly (i) on two variation orders issued introducing zoning to the embankment and (ii) on the fine nature of the excavated material. These claims are under the Technical Committee's consideration and it is hoped that they will be settled with the contractor early in 1985.

REFUGEE HOUSING AND SELF-HOUSING SCHEMES

During 1984 the Division of Construction had to attend to 50 schemes of various categories for the housing of refugees.

As it has been stated before the Division always dealt with prompt action, giving first priority to the construction of schemes relating to the housing of refugees, since the Turkish invasion of Cyprus in 1974. During the period of 10 years, since the Turkish invasion of Cyprus, an enormous achievement has been accomplished in this urgent and human task, and the vast volume of work in this sector has already been covered.

It should be noted that in addition to the usual water supply schemes for Housing-Estates and Self-housing schemes, the Division has undertaken the construction of a number of Sewage schemes for the Housing Estates. The construction of sewage schemes was inaugurated in 1981, but since then this field has been extended and the introduction of Sewage Treatment Plants has been considered both essential for health purpose and for the better management of waste water purposes. The treated effluent resulting from these Treatment Plants is planned to be used for the enrichment of underground water aquifers for irrigation purposes, or for watering grass for athletic stadiums.

Out of the 50 schemes undertaken for construction during 1984, 25 schemes were related to Housing Estates and 25 schemes to self housing.

The amount allocated for these 50 schemes which/undertaken were for construction during 1984 was £226,096 and the expenditure incurred reached the amount of £140,509.

A list showing in detail all 50 schemes relating to the housing of refugees during 1984, is given on Table VII-14.

TABLE VII-14
REFUGEE HOUSING AND SELF HOUSING SCHEMES
UNDERTAKEN FOR CONSTRUCTION IN 1984

Ser No.	Description	Amount allocated in 1984 £	Expenditure incurred in 1984 £
A. HOUSING ESTATES			
SEWAGE DISPOSAL AND WATER SUPPLY SCHEMES			
<u>i Sewage Systems</u>			
1	Apostolos Loucas (Nicosia)	14 497	14 473
2	Ayios Pavlos (Nicosia)	3 000	2 685
3	Ayios Pavlos (Nicosia)	1 176	1 102
4	Kamares (Larnaca)	4 628	1 089
5	Kophinou (Larnaca)	12 867	7 561
6	Mouttalos (Paphos)	8 500	4 223
7	Zenon (Larnaca)	27 900	20 689
	Total	<u>£72 568</u>	<u>£51 822</u>
<u>ii Water Supplies</u>			
1	Anthoupolis (Nicosia)	316	358
2	Arkangelos I (Nicosia)	1 679	7
3	Arkangelos (Nicosia)	180	2
4	Aspres (Nicosia)	1 457	630
5	Ayios Yeorgios (Nicosia)	350	350
6	Ayios Eleftherios (Nicosia) ...	1 339	539
7	Ayios Pavlos (Nicosia)	2 076	---
8	Chrysospiliotissa (Nicosia) ...	1 357	52
9	Kamares (Larnaca)	15 772	15 406
10	Kokkines (Nicosia)	12 163	---
11	Makarinos III (Larnaca)	4 000	3 332
12	Makarinos III (Limassol)	950	729

TABLE VII- 14

REFUGEE HOUSING AND SELF HOUSING SCHEMES
 UNDERTAKEN FOR CONSTRUCTION IN 1984 (Cont)

Ser No.	Description	Amount allocated in 1984 £	Expenditure incurred in 1984 £
13	Omonia (Limassol	15 790	15 427
14	Strovolos II (Nicosia)	2 308	2 271
15	Strovolos III (Nicosia)	725	636
16	Timi (Paphos)	3 950	3 654
17	Zenon (Larnaca)	8 672	374
18	Zyyi (Larnaca)	1 800	1 534
	Total	<u>£74 884</u>	<u>£45 301</u>

B. WATER SUPPLY FOR SELF-HOUSING SCHEMES

i Nicosia District

1	Agrokipia	163	71
2	Kokkini Trimithia	337	125
3	Livadhia	2 449	159
4	Peristerona Z	188	60
5	Tseri C	93	81
6	Tseri Z	1 900	1 689
7	Tseri H	496	124
8	Yeri C	623	239
9	Yeri D	1 565	975
	Total	<u>£7 814</u>	<u>£3 523</u>

ii Famagusta District

1	Akhna B	3 470	377
2	Akhna C	19 285	10 028
	Total	<u>£22 755</u>	<u>£10 405</u>

iii Limassol District

1	Evðhimou B	6 400	4 600
2	Episkopi D	4 400	--
3	Kato Polemidhia C	4 000	--
4	Kato POlemidhia E	2 000	--

TABLE VII-14
 REFUGEE HOUSING AND SELF HOUSING SCHEMES
 UNDERTAKEN FOR CONSTRUCTION IN 1984 (Cont)

Ser No.	Description	Amount allocated in 1984 £	Expenditure incurred in 1984 £
5	Kolossi D	881	350
6	Pano Polemidhia C	415	384
7	Trachoni C	2 491	2 391
8	Trachoni D	2 463	1 054
9	Installation of water meters ...	220	121
	Total	<u>£23 270</u>	<u>£8 900</u>
<u>iv Larnaca District</u>			
1	Dhromolaxia	2 500	20
2	Kiti A	1 000	507
3	Oroklini	305	216
4	Zyyi A	3 000	1 815
	Total	<u>£6 805</u>	<u>£2 558</u>
<u>v Paphos District</u>			
1	Lemba	18 000	18 000
	Total	<u>£18 000</u>	<u>£18 000</u>

SUMMARY OF ALL DISTRICTS

Ser No.	Description	Number of schemes	Amount allocated in 1984 £	Expenditure incurred in 1984 £
<u>A. Housing Estates</u>				
i	Sewage Systems	7	72 568	51 822
ii	Water Supplies	18	74 884	45 301
<u>B. Water Supply for Self-housing Schemes</u>				
i	Nicosia District	9	7 814	3 523
ii	Famagusta District	2	22 755	10 405
iii	Limassol District	9	23 270	8 900
iv	Larnaca District	4	6 805	2 558
v	Paphos District	1	18 000	18 000
	Total	<u>50</u>	<u>£226 096</u>	<u>£140 509</u>

SCHEMES UNDERTAKEN FOR CONSTRUCTION FOR OTHER GOVERNMENT DEPARTMENTS

As usual, the Division of Construction had also during 1984, to respond to requests of other Government Departments for the construction of a considerable number of schemes which were approved and included in their own individual budgets.

These schemes cover a wide field of water works, such as water supplies to livestock ^{areas,} village water supply schemes, irrigation schemes, relocation of pipelines which are affected by the Construction of new roads, improvement of water supply and irrigation schemes for Turkish villages etc.

During 1984, the Division had to deal with the construction of 67 such schemes of various types all over the island of an estimated cost of £722,780. The overall expenditure incurred on all these schemes during the year reached the amount of £526,826.

As it can be observed from the expenditure incurred, and the number of these schemes it is obvious that this category of works represents a considerable percentage of the Division's activities, especially if we consider the urgent demand for the early execution of the works such as the relocation of pipelines which affect the construction of new roads. As all these projects are not known before hand, at the time of the preparation of the year construction programme, sometimes we have to interrupt other programmed works so as to respond to the construction of these schemes.

A list showing in detail all 67 schemes which were undertaken for construction during 1984, on behalf of other Government Departments is given on Table VII-18.

TABLE VII-15

SCHEMES UNDERTAKEN FOR CONSTRUCTION FOR OTHER
GOVERNMENT DEPARTMENTS DURING 1984

Ser No.	Description	Amount allocated in 1984 £	Expenditure incurred in 1984 £
Nicosia District			
1	Athalassa livestock water supply	700	422
2	Athalassa Mental Health Services Sewage Scheme	25 000	20 488
3	Astromeritis Irrigation	14 875	13 593
4	Atlas Pantou Water Supply	220	220
5	Ayios Yeoryios Irrigation	17 950	8 734
6	Anayia Water Supply	22 000	10 944
7	Argates Industrial Area Water Supply	50 000	39 727
8	Astromeritis Water Supply	4 960	4 100
9	Apliki Irrigation	100	100
10	Ayios Ioannis (Malounda) (ΕΛ.ΔΥ.Κ.) Water Supply	7 500	6 898
11	Chief Fire Office Irrigation ...	3 740	2 907
12	Kokkini-Trimithia Water Supply..	2 000	1 403
13	Kakopetria Sewage	20 000	10 823
14	Kambos-Kykkos road - relocation of pipes	5 000	3 738
15	Lymbia-Sha-Kornos Irrigation	2 000	2 000
16	Mavres Sykies Irrigation	325	296
17	Makarinos Hospital Water Supply	360	91
18	Mathiatis National Guard Water Supply	7 400	5 510
19	Mammari National Guard Water Supply	3 876	86
20	Ministry of Interior Irrigation	1 000	753
21	Nicosia - Limassol road - relocation of pipes	20 047	28 717
22	Nicosia - Limassol road (Governor's Beach) Irrigation	1 300	1 270

TABLE VII-15

SCHEMES UNDERTAKEN FOR CONSTRUCTION FOR OTHER
GOVERNMENT DEPARTMENTS DURING 1984 (Cont.)

Ser No.	Description	Amount allocated in 1984 £	Expenditure incurred in 1984 £
23	Peristerona Water Supply	5 500	4 580
24	Strovolos Avenue - relocation of pipes	9 000	9 000
25	Xyliatos Irrigation	183	161
26	Yeri livestock Water Supply	700	210
	Total	<u>£225 736</u>	<u>£176 771</u>
Larnaca and Famagusta Districts			
27	Anaphotia Water Supply	4 900	3 236
28	Aradhippou Water Supply	7 000	6 675
29	Anglisidhes Water Supply	300	242
30	Ayios Minas (Mon.) Water Supply	700	520
31	Ayii Vavatsinias Irrigation	285	285
32	Ayia Anna Water Supply	1 500	986
33	Dhromolaxia Water Supply	3 400	2 365
34	Kalokhorio livestock Water Supply	8 000	3 955
35	Kalokhorio - Pharmakas road - relocation of pipes	20 000	17 543
36	Kophinou Water Supply	51 000	34 651
37	Klavdhia livestock Water Supply	1 000	567
38	Livadhia Water Supply	4 000	4 000
39	Liopetri - Sotira - Paralimni road - relocation of pipes	32 100	25 773
40	Mosphiloti Water Supply	3 000	2 343
41	Meneou	600	406
42	Pyrga Water Supply	100	61
43	Psevdhas Water Supply	4 974	4 740
44	Tersephanou Water Supply	5 500	3 090
45	Troulli - Kelia - relocation of pipes	2 000	878
	Total	<u>£150 359</u>	<u>£112 316</u>

TABLE VII-15

SCHEMES UNDERTAKEN FOR CONSTRUCTION FOR OTHER
GOVERNMENT DEPARTMENTS DURING 1984 (Cont)

Ser No.	Description	Amount allocated in 1984 £	Expenditure incurred in 1984 £
Limassol District			
46	Asgata - water supply to the National Guard Camp	6 400	5 571
47	Ayia Phyla - Palodhia road - relocation of pipes	5 800	5 327
48	Evdhimou Irrigation	350	214
49	Evdhimou - improvements of existing system	4 500	4 414
50	Erimi - Mandria road - relocation of pipes	3 233	379
51	Kato Mylos (Vatera) Irrigation	5 500	4 580
52	Kato Amiantos - Saittas - relocation	1 200	690
53	Limassol By-Pass - relocation of pipes	170 554	94 394
54	Pano Polemidhia - improvements of existing system	11 498	11 160
55	Pelendri (Ammos) Irrigation	200	200
56	Pareklisia road - relocation of pipes	9000	7 264
57	Ypsonas - Erimi new road - relocation of pipes	18 000	14 226
58	Zakaki Irrigation	540	540
	Total	£236 775	£148 959
Paphos District			
59	Ayia Marina Khrysokhou - removal of pipes	15 750	14 655
60	Installation of Fire-Hydrants ..	1 000	632
61	Kathikas - Arodhes - removal of pipes	10 100	10 000
62	Kholetria Sewage	5 000	4 665
63	Lemonari - Polemi	13 960	13 960
64	Panayia - Khrysorroiyatissa - removal of pipes	2 500	2 068

TABLE VII- 15

SCHEMES UNDERTAKEN FOR CONSTRUCTION FOR OTHER
GOVERNMENT DEPARTMENTS DURING 1984 (Cont)

Ser No.	Description	Amount allocated in 1984 £	Expenditure incurred in 1984 £
65	Peyia Improvement board water supply	20 000	2 000
66	Polis Khrysokhou - Xeros - removal of pipes	33 600	32 910
67	Polis - Prodhromi - removal of pipes	8 000	7 890
	Total	<u>£109 910</u>	<u>£88 780</u>
	Grand Total	<u>£722 780</u> =====	<u>£526 826</u> =====

SCHEMES UNDERTAKEN FOR CONSTRUCTION FOR VILLAGES FROM DEPOSITS

During 1984 the Division of Construction had to respond to the request of the District Officers and Village Water Commissions, or Village Irrigation Committees for the execution of 97 schemes of various types.

These 97 schemes covered a wide field of constructional activities, such as:

- Maintenance and repairs to pumping units used for water supply or irrigation purposes.
- Extensions, improvements or maintenance of existing water supply or irrigation distribution systems etc.

It has almost become the practice that all villages request the services of our Division and our Department's Workshops for the execution of such works, because they do not have the means to carry out the works by themselves, but mostly and most important because they are confident that the work will be executed by experienced personnel and most efficiently and at the same time the work will conform to the standard of their existing schemes.

The cost of all these works, in these cases is not shared between the Government and the villages, but is borne entirely by the villages alone.

During 1984 an amount of £105,011 was deposited for the execution of 97 schemes, and by the end of the year the

total expenditure incurred reached the amount of £84,607.

SCHEMES UNDERTAKEN FOR PRIVATE DEVELOPERS

During 1984 the Division of Construction had to respond to the request of private developers for the construction of 330 schemes relating to water works, mainly distribution systems for land development.

These 330 schemes which were executed for private developers were split all over the island and relate mostly to the laying of distribution pipes for the parcellation of land into building sites, pumping tests, hiring of moulds, etc.

For all these 330 schemes an amount of £476,577 was deposited with the Department during 1984, and during the year the expenditure incurred on all schemes reached the amount of £404,894. This expenditure includes 20 % Departmental charges which is added on the cost of construction. This practice is a Ministerial Council's decision and is followed by all Government Departments for many years, even before the independence of Cyprus. These charges aim at recovering the actual cost of the work which does not include services rendered by monthly paid Technical Officers, Government stationary, import duties etc.

The practice followed until lately was that any work which is interrelated to existing town or village water supply scheme should be constructed by the Division of Construction direct, so that the standard of the work is maintained at the same level as the existing ones and the interests of the towns or villages are safeguarded.

It should be noted that lately there is an increasing demand by private developers to execute by themselves or through private contractors works or schemes interrelated to existing communal water supply schemes, and a considerable number of works have been constructed direct by them. It is believed that many problems will arise in the near future if this trend is continued, especially in the quality of the work executed by private contractors.

This presents also many problems in supervising the works as very often the Division of Construction is not informed in time to inspect the works before they are covered up although at the end of the job final approval is sought. Eventually this may lead to bad workmanship in the expense of existing communal water supply schemes.

VII/1 VASILIKOS-PENDASKINOS PROJECT

by

D M Patsalides EEI

Dy Project Manager (Eng.)

General

During 1984, construction work was in progress on eight civil engineering Contracts of the Vasilikos-Pendaskinos Project and completion certificates for parts of the works have been issued on three of them.

Much of the mechanical equipment has been manufactured and delivered to Cyprus and the erection of this equipment at the treatment plant and the pumping stations, was imminent at the end of 84 or beginning of 85.

The most creditable achievement of the project was the completion of Kalavastos and Dhyptomamos Dams to impounding level by the end of 84. Kalavastos dam was completed to impounding level about eight weeks ahead of the accelerated completion date and the embankment was wholly completed by the end of 84.

The Construction Division of the Department, proceeded at a very fast rate with the laying of the Kalavastos-Khirokitia pipeline and by the end of the year, it was well on the way to completion.

The project continued to proceed very well during the year and the expenditure incurred was £8,985,461 making the total expenditure figure since the beginning of the project implementation £14,917,601.

More details about each individual project are given in the following section which deals with the progress of the works.

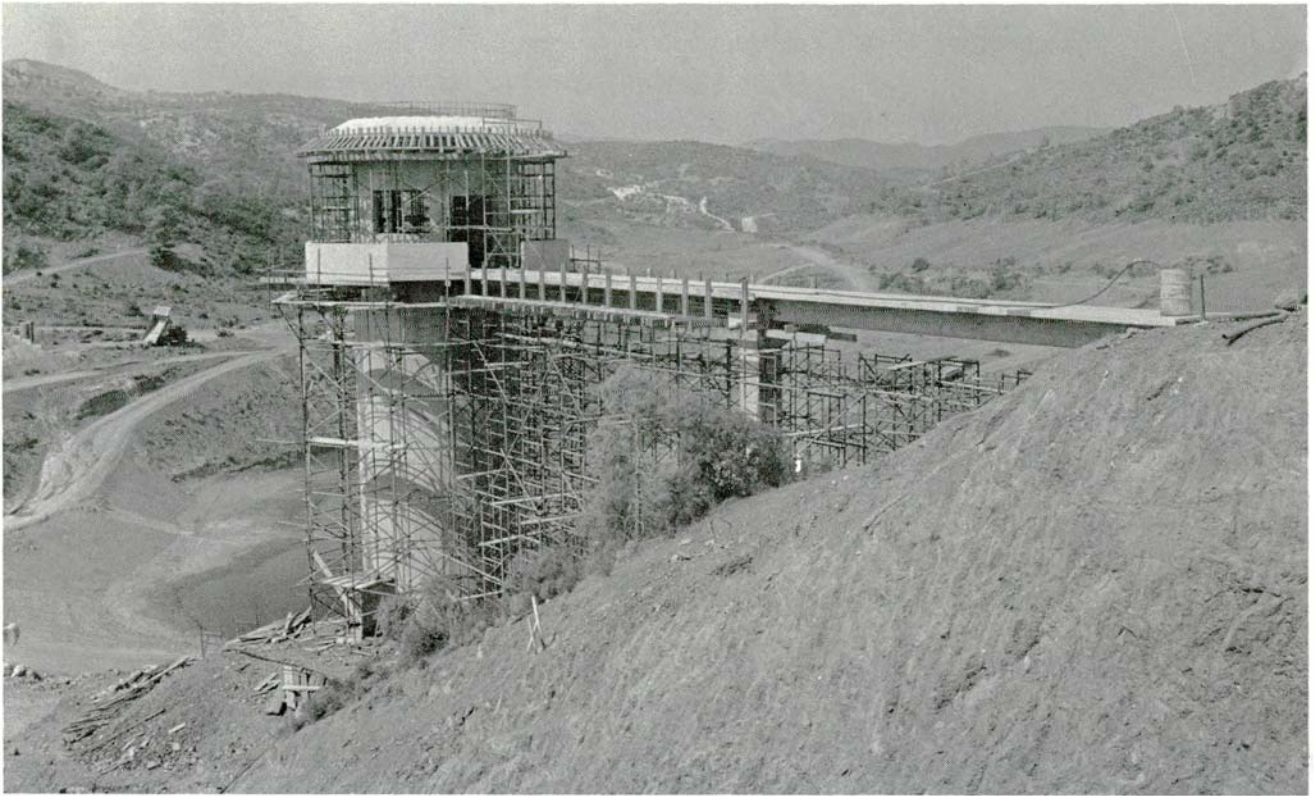
PROGRESS OF WORKS AND CONTRACTS

KALAVASOS DAM - Contract No. 1

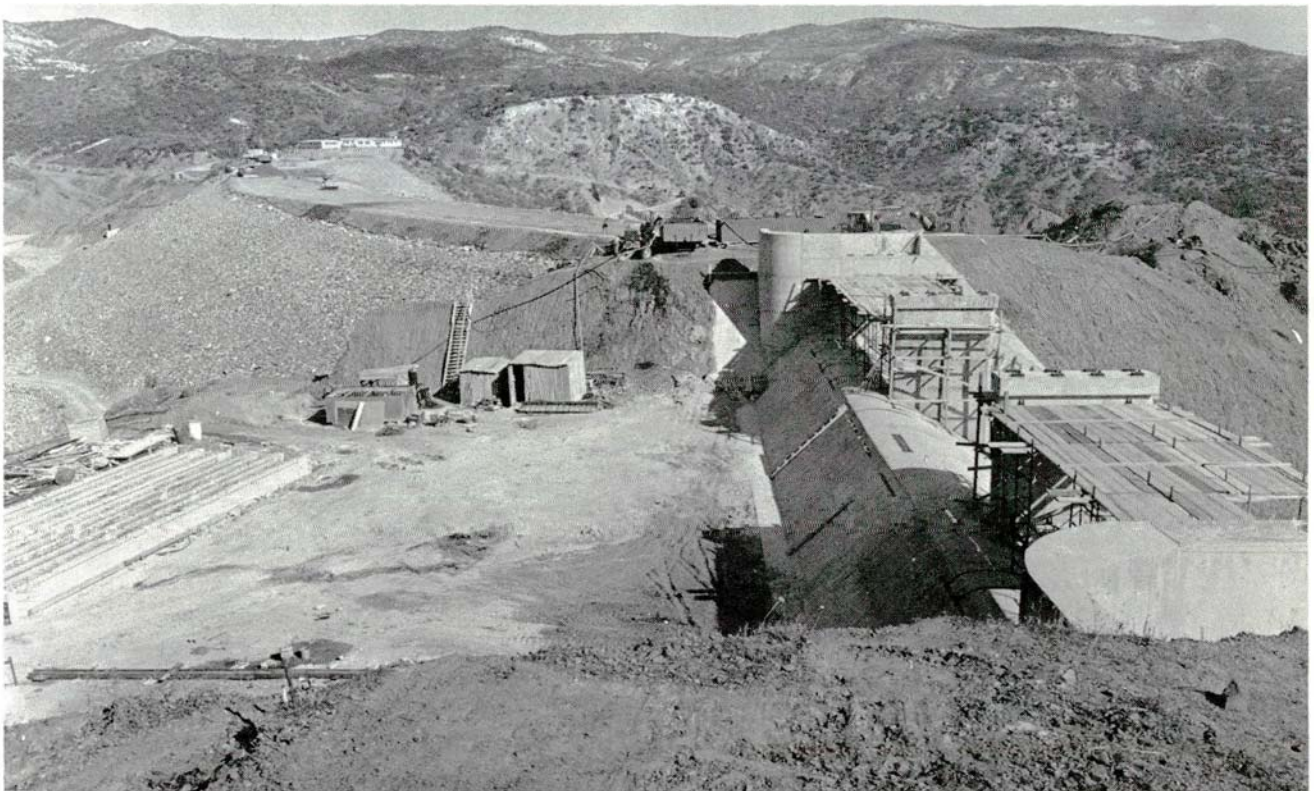
Contractor: Joint Venture of J & P and Medcon Ltd of Cyprus.

Very good progress has been achieved on the construction of Kalavastos dam during the year and the earthworks in particular have proceeded at a greatly accelerated pace using two shifts up to the 1st of December 1984 and an increased number of machinery.

A Certificate of completion to impounding level was issued by the Engineer on the 2nd of November 1984. The Contractor was paid the agreed additional sum of £120,000 for achieving early completion successfully.



Dhyptomamos Dam. Valve shaft and access bridge. WDD Photo E61-10 (2.10.84)



Kalavassos Dam. Progress of work on spillway and embankment. WDD Photo E76-4 (5.12.84)

The programme for completion of the draw-off works was also accelerated to match the good progress on the embankment. All the pipework was installed and tested and the intermediate flooring has been placed in the valve shaft. The valve house has been partly completed and the valve shaft bridge was prepared for casting in situ.

The spillway was virtually complete by the end of the year except for the bridge piers and the bridge deck across the crest and the downstream control weir.

By the end of 1984 the expenditure on the dam reached the figure of £2,896,678 while the total amount spent during 1983 and 1984 was £5,230,864.

DHYPOTAMOS DAM - Contract No. 2

Contractor: Joint Venture of Shephard Hill of U.K. and
G.P. Zachariades Ltd of Cyprus.

This dam has also progressed very well during the year and the rate of clay and rock placing kept the embanking exactly at the contractor's accelerated target programme and achieved completion to impounding level on the predicted date of 21st December 1984.

The spillway was also completed, including the foot bridge over the weir. the plunge pool was also completed but the gully regrading has not yet started.

All the pipes and valves for the valve shaft and the upstream tunnel have been installed and tested. The valve shaft bridge piers were also completed and the in-situ bridge beams have been cast to carry the footway to the shaft.

By the end of the year the expenditure on the dam reached the figure of £1,283,514 while the total amount spent since the commencement of the works was £3,693,039.

MARONI RIVER DIVERSION - Contract No. 3

Contractor: G.P. Zachariades Ltd. of Cyprus.

The tenders on this contract were returned on the 21st of February 1984 and the tender submitted by G.P. Zachariades Ltd was the lowest by a good margin. The contract was signed on the 18th of April 1984 and the works started on the 2nd of May 1984.

The progress on this Contract was slow but steady. The excavations for the weir at the Maroni river have been completed and the base concrete has been placed. Part of the weir structure and the channel walls have been concreted.

The upstream and the downstream ends of the tunnel were driven at a rate of about 10 m per week each by a sub-contractor.

Thyssens of Germany delivered all the pipes for this Contract in mid August 1984 and the specials in December 1984. The pipeline was successfully laid and tested along most of the Pendaskinos valley before the river started flowing.

By the end of the year the expenditure on this Contract reached the figure of £712,882.

MECHANICAL AND ELECTRICAL PLANT FOR THE PUMPING STATIONS - Contract 4A

Contractor: Weir Pumps Ltd of U.K.

Most of the equipment supplied under this Contract have been delivered to the sites of Kornos and Tokhni Pumping Stations.

The manufacture of the electrical panels was completed and these items were finally inspected at manufacturer's works (CYEMS) in Cyprus and stored at Khirokitia until they are required for erection.

The amount of £328,632 has been spent during the year for the supply of the Mechanical and Electrical Plant.

TOKHNI PUMPING STATION - Contract No. 4B

The construction of Tokhni Pumping station was undertaken by the Construction Division of the Water Development Department.

The work has proceeded very well in accordance with the construction programme.

The building was ready for pump installation by the end of November 1984. The structure was virtually completed.

Drainage manholes were completed around the building and the area largely backfilled. Site fencing, grading and access facilities have been started.

During the year an amount of £123,653 was spent on Civil Works.

MECHANICAL AND ELECTRICAL PLANT FOR KORNOS TREATMENT WORKS - Contract 5A

Contractor: Degremont Laing Ltd of U.K.

Most of the equipment has been delivered to the site. A proportion of the materials delivered to the site was damaged in transit and required replacing. All these have been reordered and are expected to be delivered early in 1985.

The manufacture of the electrical control panels has started at the CYEMS factory in Cyprus.

Arrangements were made for the erection of plant to start early in January 1985.

By the end of the year the expenditure on the supply of the plant reached the figure of £217,964 while the total amount spent during 1983 and 1984 was £353,628.

KORNOS TREATMENT WORKS - Contract 5B

Contractor: Ch. Apostolides & Co. Ltd of Cyprus.

Although the excavation work proceeded quite rapidly there was considerable delay before structural concrete work was started.

The first stage of completion of the filters was achieved on the 9th of December 1984 and were handed over but it seemed that the clarifiers would not be completed on time.

Concrete works have continued in all parts of the works. The sludge area and raw water reservoir were well advanced. The pumping station gave cause for real concern as it had to be completed for plant erection by mid February 1985 and was still behind the programme. The programme for completion of all the remaining structures was at the end of the year extremely tight.

During 1984 an amount of £360,848 was spent on Kornos Treatment works raising the total amount spent since the beginning of the Contract to £589,681..

TELEMETRY - Contract 6

A list of 19 prequalified contractors has been approved and draft tender documents have been submitted by the Consultants to the Department for review. When these documents were finalised they were sent out to the prequalified tenderers.

Tenders were expected on the 22nd of January 1985.



Kalavassos-Khirokitia Pipeline. Installation of 900 mm dia pipeline.
WDD Photo E57-9 (5.9.84).



Tokhni Pumping Station with the four floor level pump plinths ready for pump and motor installation. WDD Photo E75-11 (5.12.84).

KALAVASOS-KHIROKITIA PIPELINE - Contract No. 7

The laying of the Kalavastos Khirokitia Pipeline was undertaken by the Construction Division of the Water Development Department.

The 600 mm diameter pipeline has been completed and tested from Tokhni Pumping Station to the Balancing Tank and the pipework was finished up to the Khirokitia Treatment Works.

The 900 mm diameter pipeline was now almost completed as a result of some very quick pipelaying along the river and up to Kalavastos dam.

The Balancing Tank and ancillary works are now complete ready to be put into operation. The concrete quality and finish of these works are excellent.

By the end of the year, the expenditure on the Kalavastos Khirokitia pipeline reached the figure of £1,921,860 while the total amount spent during 1983 and 1984 was £1,950,909.

VASILIKOS-IRRIGATION NETWORK - Contract No. 8

The network design has been completed.

The Government procured all the required Asbestos Cement (A.C) pipes from the "Cyprus Pipes Industries" at negotiated rates. All other materials like fittings, valves, meters, hydrants etc. have been procured by International Competitive Bidding.

Work is programmed to start in February 1985 on the Vasilikos/ Maroni Connection to enable water from Kalavastos dam to reach the Maroni Irrigation Area before the irrigation season of 1985.

PENDASKINOS IRRIGATION NETWORK - Contract No. 9

The network design has been completed and the supply contracts let, except for the gravel filters. Construction work started at the beginning of October 1984 by the Construction Division of the Water Development Department. The main activity has been the laying of the 63 m.m. diameter UPVC tertiary pipelines between the hydrant positions and the plot feeders.

Construction work at the site of the break pressure tank has started as well.

MARONI IRRIGATION NETWORK - Contract No. 10

The network design has been completed and all the supply contracts have been let except for the gravel filters.

The Construction Division of the Water Development Department started the pipelaying operations at the beginning of October of 1984 and the construction of a balancing reservoir.

The pipelaying has proceeded ahead of programme and with unit costs below estimate.

Up to end of 1984 £276,015 have been spent on the supply of materials and network installation.

TABLE VII/1 - 1

VASILIKOS PENDASKINOS PROJECT

Item No.	Description	Expenditure in 1984 £	Expenditure up to 1984 £
i Nicosia Water Supply 1st Phase			
1	Acquisition of land	35 909	35 909
2	Contract No. 39/78/38 (civil works)	24 765	996 479
3	Consultant fees (Lemon & Blizard)...	1 170	68 914
4	Other expenditure	-	1 830 976
	Total	<u>£61 844</u>	<u>£2 932 278</u>
ii Agricultural Development			
31	MARONI IRRIGATION AREA Contract 10		
31A	Pipe network - installation	24 843	27 307
31B	Storage reservoir	8 098	8 098
31C	Supply of pipes and fittings	185 999	185 999
31D	Supply of valves, meters, hydrants filters etc	57 075	57 075
31E	Development of boreholes and pipelines	---	---
31F	Electricity supply to boreholes .	---	---
	Total Maroni Irrigation Area	<u>£276 015</u>	<u>£278 479</u>
32	KHIROKITIA PROJECT HEADQUARTERS ...	£3 760	£65 870
33	AGRICULTURAL RESEARCH AND ARI BUILDING	£17 210	£57 395
34	PURCHASE OF VEHICLES AND MACHINERY	---	£89 059
35	CONSULTANTS FEES AND PANEL OF EXPERTS		
35A	Design and supervision fees	173 433	614 409
35B	Panel of Experts fees	13 374	21 034
	Total Consultants Fees	<u>£186 807</u>	<u>£635 443</u>
36	HYDRAULIC MODEL TESTING	---	£39 930
37	TOPOGRAPHY AND INVESTIGATIONS BY WDD	£26 310	£118 769
38	ADMINISTRATION/TRANSPORT/SUPERVISION		
38A	Kalavastos Dam	111 914	166 209
38B	Dhyptomamos Dam	73 683	135 750
38C	Kornos Treatment Works	44 286	46 941

TABLE VII /1-1
VASILIKOS PENDASKINOS PROJECT (Cont)

Item No.	Description	Expenditure in 1984 £	Expenditure up to 1984 £
38D	Maroni River Diversion	19 743	19 932
38E	Kalavastos-Khirokitia pipeline	16 006	16 006
38F	Tokhni Pumping Station	505	505
38G	Telemetry	---	---
38H	Maroni Irrigation Area	5 664	5 664
38J	Pendaskinos Irrigation Area	426	426
38K	Vasilikos Irrigation Area ..	---	---
38S	Sundries (Including 39 Dy PM allowance)	8 980	18 966
38+39	Total of Administration/ Supervision/Transport	£281 207	£410 399
40	LAND CONSOLIDATION	£16 689	£68 817
41	KALAVASOS DAM		
41A	Construction - Contract	2 882 892	5 196 928
41A	Electricity supply	11 041	11 041
41A	Inspection of hydraulic equipment by consultant	---	---
41B	Supply of materials	---	---
41C	Upstream gauging weir and diversion of services	2 745	10 228
42C	Supply of soils equipment ...	---	12 667
	Total Kalavastos Dam	£2 896 678	£5 230 864
42	DHYPOTAMOS DAM - Contract 2		
42A	Construction - Contract	1 268 600	3 075 968
42A	Electricity supply	5 354	5 354
42A	Inspection of hydraulic equipment by consultant	---	---
42C	Supply of soils equipment ...	---	12 666
42B	Supply of materials for Lefkara Diversion	219	330 246
	LEFKARA DIVERSION & AYIOS THEODHOROS DIVERSION		
42(1.1)*	Permanent access road	38	52 699
42(1.2)	Pipeline construction - Lefkara line	143	131 546
42(1.3)	Removal of pipelines on original route - 3055 m	39	8 159

TABLE VII /1-1

VASILIKOS PENDASKINOS PROJECT (Cont.)

Item No.	Description	Expenditure in 1984 £	Expenditure up to 1984 £
42(1.4)	Break pressure tank by-pass	---	---
42(3.4)	Connections of Maroni/Pendaskinos pipelines	1 645	59 204
42(5)	Ayios Theodoros diversion pipeline	---	9 721
42(6)*	Miscellaneous pipeline connections and chambers	7 476	7 476
	Total Dhyptomamos Dam	£1 283 514	£3 693 039
43	MARONI RIVER DIVERSION - Contract 3		
43A	Construction - Contract	706 629	706 629
43B	Grouting work by WDD	6 253	6 253
	Total Maroni River Diversion	£712 882	£712 882
44*	KALAVASOS-KHIROKITIA PIPELINE - Contract 7		
44.1	Balancing reservoir	288 427	313 984
44.2	Pipeline balancing reservoir to Khirokitia T.W	57 588	59 628
44.3	Pipeline Kalavastos Dam to balancing reservoir	364 830	366 282
44.4	Break Pressure tank	38 334	38 334
44.5	Supply of pipes and fittings Contract 7A	1 122 159	1 122 159
44.6	Supply of valves and meters Contract 7B	---	4 777
	Electricity supply	---	4 777
	Total Kalavastos-Khirokitia Pipeline	£1 921 860	£1 950 909
45*	PENDASKINOS IRRIGATION - Contract 9		
45A	Pipe network - installation	45 899	45 899
45B	Break pressure tank	---	---
45C	Supply of pipes and fittings	207 649	207 649
45D	Supply of valves, meters, hydrants filters	31 905	31 905
45E	Skarinou irrigation scheme from B/H 64/73		
	Total Pendaskinos Irrigation	£285 453	£285 453

TABLE VII /1-1

VASILIKOS PENDASKINOS PROJECT (Cont.)

Item No.	Description	Expenditure in 1984 £	Expenditure up to 1984 £
46*	VASILIKOS IRRIGATION - Contract 8		
46A	Pipe network - installation		---
46B	Supply of pipes and fittings	---	---
46C	Supply of valves, meters, hydrants fittings	---	---
46D	Pipe network - installation Mari area connection	---	---
47	PUMPING STATIONS Elect. and Mech. Plant Contr. 4A		
47A	Supply and erection of plant	325 466	341 215
47A	Inspections by the consultant	3 166	3 166
	Total Pumping Stations Plant	£328 632	£344 381
48	KORNOS TREATMENT WORKS CIVIL WORKS- Contract 5B		
48A	Construction	360 848	589 681
	Electricity supply	---	---
	Total Kornos Civil Works	£360 848	£589 681
49	KORNOS T.W. Elect. and Mech. Plant - Contract 5A		
49A	Supply and erection of plant	217 406	353 070
	Inspections by consultant	558	558
	Total Kornos T.W. Plant	£217 964	£353 628
50*	TOKHNI PUMPING STATION CIVIL WORKS - Contract 4B		
50A	Construction	123 653	126 689
	Electricity supply	---	---
	Total Tokhni Pumping Station	£123 653	£126 689
51	ACQUISITION OF LAND	£45 979	£47 497
52	TELEMETRY - Contract 6		
52A	Supply and installation of equipment	---	---
52B*	Cabling work by WDD	---	---
	CONTINGENCIES		6 443 139
	TOTAL EXPENDITURE (ii)	£8 985 461	£15 099 184
	Grand Total (i) & (ii)	£9 047 305	£18 031 462

VII/2 KHRYSOKHOU IRRIGATION PROJECT

by
K S Spanos EEI
Project Manager

General

Following the signature of the loan agreement 2279 CY for US\$16 million in May 1983 between the World Bank and the Government of Cyprus, Phase I of the Project has entered the construction phase as from January 1984 with commencement of works on Evretou dam construction, Contract No^{KC1} of contract price of £ 8,366,588.

Implementation of the remaining parts of Phase I of the Project was planned to be achieved through 2 other major construction Contracts i.e. KC2 - Installation of Irrigation Networks and construction of Farm Roads and KC3 - Installation of Main Conveyor and construction of Ponds.

The purchase of necessary Pipes, fittings, valves, hydrants and water meters above components of the Project will be done directly by WDD through 5 separate supply tenders.

Preparation of tender documents for the Contracts KC2, KC3 and the 5 supply Contracts was undertaken by W.D.D. and by the end of the year 1984 were generally completed in draft form. The estimated cost of these parts of the Project is £ 4.3 million as shown in detail on table. Their execution is planned during the years 1985 - 1988.

In addition to the above schemes the design of a Pumping Station below Evretou dam with a distribution network to irrigate an area of about 150 ha along the river valley upstream of the dam reservoir was also undertaken by the Department. Its execution through direct labour force is planned to start in 1987 after completion of land consolidation in these areas by Land Consolidation Authority.

Project expenditure by the end of the year 1984 reached the amount of £ 3,975,549 of which £ 3,150,567 were spent during the year. The total cost of the Project is estimated at £ 21 million including the investment of £ 3,115 to be made by the farmers for the installation of on farm equipment.

Organization and Management

The whole structure on which the project organization and management is based is shown on the accompanying chart.

The 1st meeting of the Project Policy and Coordination Committee and the Project Advisory Committee took place on the 10th and 4th September 1984 respectively.

The Project Management Staff consisted of the following at the end of the year 1984.

- 1 Executive Engineer I, as Project Manager
- 1 Clerk/Typist (hourly) as from Nov. 84
- 1 Clerk/Accounts " as from July 84

Despite a lot of efforts by the Department it has not been possible to fill the post of the Administrative Officer and Accounting Officer for the Project.

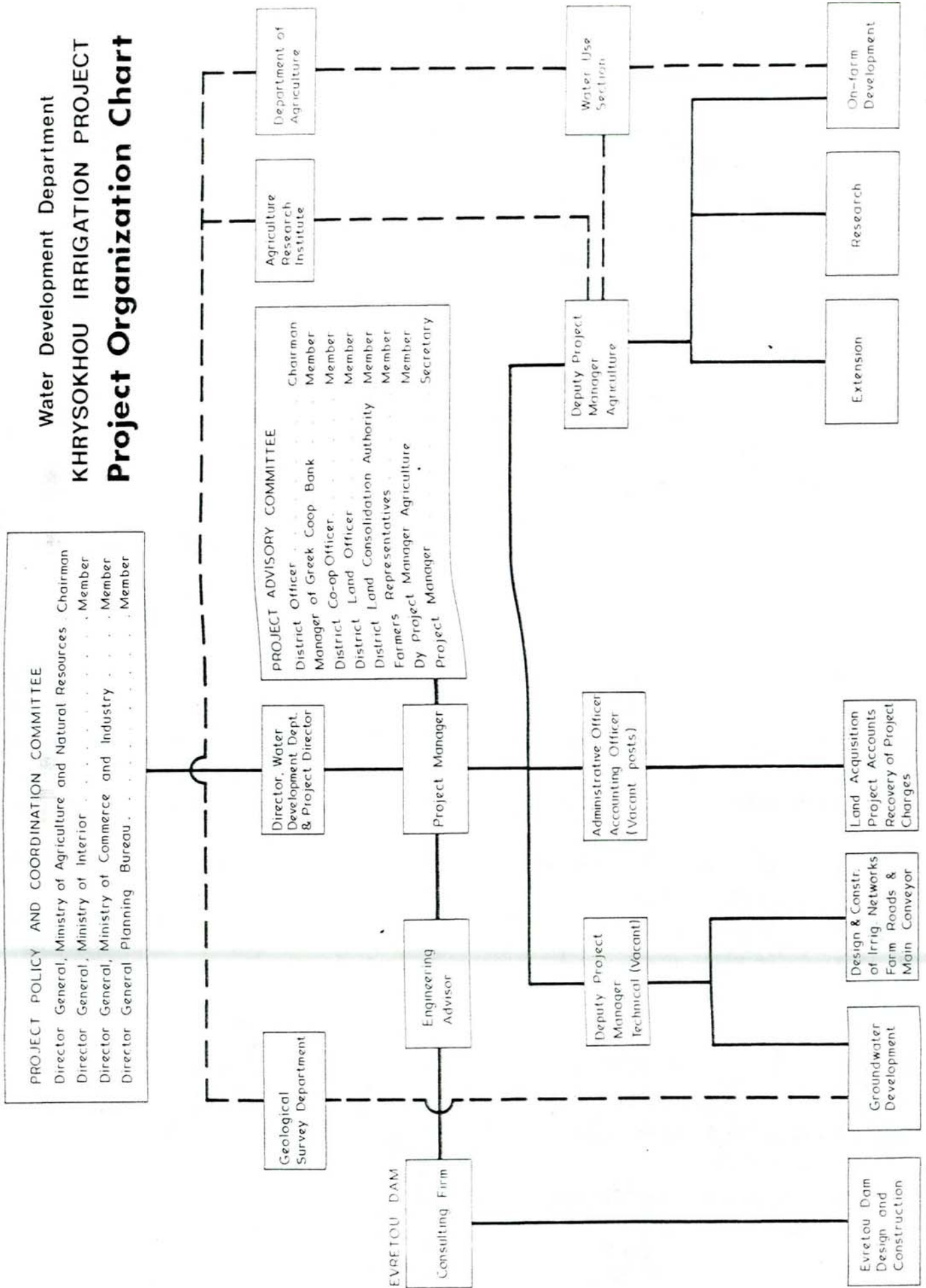
Due to some serious disputes between the Government and the Trade Unions it has not been possible to recruit any new Technical staff either for the Project. Urgent requirements in respect to supervision of Evretou dam construction works had to be met by making temporary transfers from existing staff of the Department. In fact the Deputy Project Manager as well had to join as from June 84 the staff at Evretou as the Engineer responsible for the design work and supervision of all structures and roadworks.

The total number of Staff assigned for the supervision of Evretou Dam were as follows in December 1984:

- a) From Sir William Halcrow & Partners
 - 1 Civil Engineer as Resident Engineer.

- b) From WDD
 - 4 Executive Engineers Class I
 - 1 Executive Engineer Class II
 - 1 Technician Class I
 - 9 Technicians Class II
 - 1 Clerk/Typist

Water Development Department KHRYSO KHOU IRRIGATION PROJECT Project Organization Chart



In addition to the above a considerable number of hourly paid staff on regular or temporary basis had to be transferred also to the site in order to assist in the supervision of the works.

As regards preparation of detailed designs and tender documents for the other components of the Project a team has been set up at the Project Offices at Skoulli consisting of 2 Executive Engineers class II, one Technician II (topographer) and one Technician II (draftswoman). Their work was checked also by the Design Division of WDD Head Offices before presented to the Technical Committee for final approval.

PROGRESS REPORT

1. Evretou Dam. Construction. Contract No. 1

Contractor: Shephard Hill - Zachariades Joint Venture

Evretou Dam is the most major element of the Project. It is ^a rockfill dam 70m high of maximum Storage capacity of 25 MCM. The dam was designed by Sir William Halcrow and Partners in association with A. Prastitis. Tenders were invited in summer 1983 & following the award of the above Contract to Shephard Hill - G P Zachariades Joint Venture the Contract Agreement was signed on the 5th January 1984 for the sum of £ 8,366,588. On the 18th January 84 the Contractor was given Instructions to Commence the Works which had to be completed within 1150 days or by April 1987.

The progress achieved by the Contractor during the year 1984 has been quite satisfactory and according to the construction progress chart on page ... the overall amount of work completed by 31 December 84 was about 32% of all Contract works. Diversion works were completed by end of October 84 and the first river flows were recorded through the diversion tunnel early November. Detailed progress of works on each section of the dam was as follows:

Temporary Works

These works comprised the erection of ^{the} Resident Engineer's site Offices, the site laboratory, the Contractor's site offices, workshop, batching plant, stores and other temporary facilities. Completion of ^{the} above works was achieved during the months from February to May 1984.

Tunnel Downstream Portal

The excavation of the d/s portal started towards the end of January 1984 but after reaching level 112 m the excavator had to be moved to the top of the hill to cut back the upper part of the excavated face above 178.5 m el which was considered to be potentially dangerous. This work involved the formation of two new berms running across the face and back into the adjacent spillway excavation.

Finally all excavations of total volume of $56,000\text{m}^3$ were completed by the middle of April '84. The portal face surrounding the tunnel was shotcreted as a protective measure and by the end of April the Contractor was able to commence tunnel excavation from this face.

Tunnel U/S Portal

Excavation of the hillside above the upstream portal proceeded in February with one or two backactors cutting slopes, forming the berms and generally casting the excavated material down the hillside. The two uppermost berms at 198m and 179.5m levels respectively were first formed and by the end^{of} February the Contractor has reached the Winch House access track level (171.5 m). During March the Contractor continued excavation below 171 and for the screen ramp with a backacter plus a D8 dozing and ripping. Due to poor material encountered however, a revised arrangement of slopes was issued by the R.E. to the Contractor on 27th March. This revised excavation plan necessitated the Contractor's having to work down once more from the 171m bench level cutting back more material into the hillside.

As the excavation has continued on this portal the excavation lines had to be modified further due to the large extent of poor quality of the hillside material above the portal. Work started on the new arrangement on 12 April and continued steadily, generally utilizing one backactor and one bulldozer. By the end of June the level of excavation reached the tunnel invert. The total volume of material removed to complete fully U/S portal excavation was increased to about $89,000\text{ m}^3$.

A berm was introduced above the tunnel portal at 120.5 m.el. as a portective measure for the blocks loose zone that was encountered above this level running diagonally along the portal face. With the revision of the excavation plans it has become necessary to modify the design of the intake structure as well. Following the decision to drop the idea of having a retractable screen for the irrigation inlet it was no longer considered necessary to have the inlet structure right next to the tunnel entry so it was decided to move it about 40m towards the middle of the river valley so that it would be less vulnerable against any future fall of materials from the portal face. The new inlet structure will be connected with the valve chamber at the entry of the tunnel with pipe culvert for the irrigation and the bottom outlet pipelines. The new design was prepared by the Consultants.

Installation of the rock anchors to stabilize the portal face above the valve chamber was no longer considered necessary mainly because of not finding any large size rocks which could be anchored to more solid rock underneath. The only protective measure applied over the portal was 25 mm shotcrete on the portal face surrounding the tunnel for its protection during tunnel excavation. The Contractor was finally ready to start tunnel excavation from upstream at the end of June 1984.

Tunnel

Tunnel excavation has started from the downstream and towards the end of April and good progress was achieved in very good ground conditions from a geological point of view. By the end of June the face had progressed 124 meters out of the total length of 224 meters, with the Contractor completing two blasts a day of 1.8 m length each. Shotcreting of the crown of the tunnel, together with installation of rockbolts ^{done} was following the excavation as a protective measure. On 28 June a start was also made on the tunnel excavation from upstream using a pneumatic rock breaker.

The work was fully completed on 10 August without any major difficulty. Concreting of the floor slab of the tunnel was started during the month of July from its downstream section which was then followed with concreting of its vertical walls. Concrete lining over the crown of the tunnel was started in August with the use of mobile steel arch shutter and a concrete pump.

Concreting of the tunnel lining was fully completed by the end of October 1984. Drilling and injection for cavity grouting in the tunnel using a 2:1 water cement mix (by weight) started on 7 November from the upstream end of the tunnel and was completed during December. The total grout take over the 222m of tunnel was 17 tonnes, an average per metre of tunnel of 77 kg. During the same month drilling started for consolidation grouting.

The first river flow through the tunnel occurred on 4th November and apart from some short periods during November there has since been flow through the tunnel almost continuously making working conditions at times difficult for the cavity and consolidation grouting operations.

Right and Left Abutment Excavation

Excavation for the right abutment key trench started towards the end of February with the use of a pneumatic rock breaker and a D8 bulldozer with ripper. Due to the hardness of the rock, however, its progress rate was very slow and a second pneumatic breaker was brought to site in an effort to improve progress. Finally core trench excavation and cleaning of the rock for clay core placement was completed by the end June whilst excavation of the right abutment flanks continued intermittently mostly with blasting and trimming at a slow rate. By the end of the year 1986 preparation of the right abutment was generally completed except the less accessible zones adjacent to the core trench which will have to be carried out progressively ahead of embankment filling.

Excavation at the foot of the left abutment to expose rock and allow preparation for the excavation of the core trench across the valley floor was completed in June. Work on the excavation of the left abutment core trench and foundation areas was continued during July and August starting from the upper side but due to poor quality material encountered in the core trench above level 145 m revised cross sections had to be issued to the Contractor. During September excavation continued to the revised cross-section and finally the core trench profile was achieved in acceptable quality of rock. Due to the presence however of some jointing and light weathering it was decided to introduce a concrete grout cap of minimum thickness of 375 mm over the core trench except for a short section at its toe.

Cofferdam

Excavation for the cofferdam commenced in August and completed the following month with the excavation of about 52,000 m³ of material. Placing of earthfill commenced on 19 September and was fully completed by mid November without encountering any serious problem. The total volume of fill materials placed on the cofferdam was about 76,000 cub. meters.

Diaphragm Wall

Preparatory works for/^{the} construction of the Diaphragm wall which is to be undertaken by the subcontractor specialists Colcrete/Soletanch were completed in June. Trial mixes for the plastic concrete were carried^{out} on site on the proposed mixes. The plant for excavating the diaphragm wall has started excavation on 28 June on panel No. 11. Excavation and placing of plastic concrete of 80cm thickness was done in panels of 6m length in alternate fashion. The total number of 16 panels were completed by the end of August. All the panels were keyed into the subjacent rock for at least 1m deep.

In order to achieve a clean contact of concrete with the base rock and with the concrete in the adjacent panel great care was taken to clean the supporting bentonite slurry from contamination before concreting each panel. The only difficulty was encountered in panel No. 3 where a 10m deep vertical cliff was found. The vertical face was carefully cleared before concreting⁵⁰ as to avoid leaving any gravel pockets between the rock and the concrete. The greatest depth of 37.5 m was reached in panels No. 5 and 6. A total of approximately 1670m³ of plastic concrete was poured. Permeability tests carried out on concrete samples indicated coefficient of permeabilities of the order of 10^{-8} m/s.

Alluvial Grouting

Alluvial grouting to be carried out included the blanket grouting to a depth of 5.00 m below core foundation upstream (6 rows of grout holes) and downstream (14 rows) of the diaphragm wall and two rows of deep alluvial grouting immediately downstream of the wall. The treatment was to be done by injection of bentonite - cement and chemical grout. This work was undertaken by the Sub Contractor Colcrete/Soletanch who started drilling and installation of tubes - a - manchette in August. Following the Panel of Experts visit in October 1984 and their recommendations with regard to alluvial grouting the following modifications to the work were agreed by the Engineer and the Water Development Department.

(i) all blanket grouting have been limited to 4.2 metres depth below core foundation level. The pattern of grout holes remained the same i.e. 14 rows downstream and rows upstream of diaphragm wall in an equilateral pattern with holes at 1.4 metres centres. Target permeabilities remained also as specified at 10^{-6} m/s but procedures have been derived to limit the amount of chemical grouting.

(ii) the deep alluvial grouting adjacent to the diaphragm wall has been discontinued. This measure has no effect on the stability of the dam, but it was agreed that in the absence of deep alluvium a downstream fine filter blanket should be provided on the alluvium downstream of the core.

Following the completion of bentonite-cement and chemical treatment, and bentonite-cement only during October in small parts of the downstream blanket near the left abutment, permeability tests were carried out in order to establish the effectiveness of the treatment carried out. The first results indicated that only limited chemical grout was required in order to achieve the target permeabilities. By the end of December downstream alluvial grouting was nearing completion. In most areas no or very limited chemical injections were required to produce the target permeabilities. Grouting with bentonite-cement in the upstream blanket area was in progress and about 50% complete by the end of December.

At panel 3 of the diaphragm wall, in view of the lack of a key into the near vertical cliff, zones of deep alluvial grouting to rockhead have been introduced on both sides of the wall with target permeability of 10^{-6} m/sec. Bentonite cement injection has been carried out between 19 m and 32.5 m depth and most of the sleeves injected took the maximum of 750 l. Further bentonite cement injection in this area is still required which will then be followed by chemical treatment.

Up to the end of December about 510 tonnes of cement and 252 tonnes of chemical have been injected in the alluvium at an average rate of injection of 0.243 ton/hr. This is about 5 times less than what has been anticipated at design stage.

As a result of the low rates of injection alluvial grouting works, although scheduled to be completed by mid-December, they are now expected to continue up to the end of February 1985. Remaining work comprises 50% of upstream bentonite-cement injection and chemical treatment whenever required in most of the upstream area.

Rock Grouting

Rock grouting for the curtain in the valley floor section, which was started early in September was completed by mid-November. This section of the curtain comprises two rows of holes, one through the diaphragm wall (row R1) with 1.5 m hole spacing, and the other (row R2) set some 2 m downstream with staggered holes at 1.2 m centres.

The first R2 primary hole takes had indicated generally tight conditions below a depth of 30-40 metres into bedrock, and instructions had been issued for curtailment of the depth of remaining primary and secondary holes. In total, 6167 metres were grouted with the moderately low average take of 37 kg/m. All final water tests showed zero Lugeon except one of 0.4 Lugeon.

During December a start was made on rock grouting along the extremity of the left wing of the cut off curtain to the west of the Spillway. Grouting started to the single-line pattern "B" with primary holes at 3.0 metres centres using descending stages. The first results showed very high takes mainly due to rock fractures.

At the right abutment preparation of the mobile drilling and grouting platform was almost complete by the end of December.



Evretou dam. Diaphragm wall excavation. WDD Photo E50-7. (27.7.84)

Intake Structure and Valve Chamber

Excavation for the base of the intake structure in the river bed was carried out in August and right after its base slab was concreted. Concreting of the remaining structure which was done in several stages was continued throughout the remaining part of the year and was finally completed by the end of December.

The twin pipe culvert (900 mm and 1200 mm dia) of about 40 m long connecting the intake structure with the valve chamber was also constructed during the same period.

The Valve Chamber base slab was casted in September and the remaining parts of the structure were concreted by the end of December. A temporary funnelled opening in the roof of the Valve Chamber has been provided to pass the diversion flows in case that water level behind cofferdam exceeds the elevation of 120.50m. Installation of the screen guide steelwork and stoplogs will be installed on the vertical openings of the intake structure later on as soon as they will be supplied by their manufacturers. Installation of the stoplogs will allow storage of water behind cofferdam up to level of 120.5 m which will be used by the Contractor during placing of embankment fill.

Spillway

A start was made in July on the excavation for the lower chute section below level 162.5m which was finally completed (excluding the flip bucket) by the end of August. Excavation of the upper spillway section commenced in August and continued up to November. Excavations have exposed satisfactory rock for founding the spillway structure but extensive cleaning of the foundation surface was necessary before concreting. A drainage system was also installed beneath spillway chute using a free draining no-fines concrete round the underdrains.

Due to overexcavation in the bottom of the chute trench infill concrete and additional rock anchors were considered necessary in order to resolve the problem. Four bays of infill concrete were placed by the end of December between chainage 62.80 and 81.80m and drainage between ch. 62.80 and 92.80m.

Materials

Delivery of the very fine filter material from a new borrow area in Argaka-Magounda inland terraced area commenced in October. The material is being stockpiled on two areas, one on the top of the U/S spoil ti heap and the other behind the Contractor's site camp.

About 5000 m³ were delivered to site by the end of December.

Production of fine filter and drainage blanket material continued from the river alluvium near Prodhromi and Khrysokhou areas. On 5 November production of filters from Prodhromi area was stopped by the Contractor due to high fines content in order to investigate ways of dealing with this problem.

Low concrete strengths were experienced towards the end of November, and the Contractor increased the cement content of mixes in order to achieve the specified strengths.

Nominated Sub contracts

Tenders were invited from specialist subcontractors for the supply and supervision of the water control equipment (Valves and water meters), Ductile iron pipes and fittings and dam instrumentation. In October the Main Tender Board has awarded the above subcontracts to the following 3 Sub Contractors

No 1a - Water Control Equipment to Caramondani Bros. Ltd at the price of £77,664

No 1b - Ductile Iron Pipes and Fittings to Pont-A-Mousson SA at the
price of £95,739

No 1c - Instrumentation Equipment to Soil Instruments Ltd at the
price of £45,073

Financial Information

During the year 1984 10 Monthly Payment Certificates have been issued by the Resident Engineer and by the end of the year the Contractor received total payments of £ 3,790,585 including the advance payment. This represents about 40% of the total cost of the work which is estimated at £ 9.3 million.

2. Installation of Irrigation Networks and Construction of Farm Roads. Contract KC2

The design of the irrigation networks and farm road networks and preparation of the necessary tender documents was undertaken by the Project staff. This work was completed by the end the year and all documents were ready for final printing in early 1985. Tenders from prequalified contractors were scheduled to be invited in April 1985.

The above contract will include (i) the installation of pipe distribution network consisting of about 35 km of AC pipes and 115 km UPVC pipes with all necessary hydraulic equipment (valves, hydrants, water meters etc.) and (ii) the construction of about 75 km of farm access roads in the project area. The value of these works is estimated at the order of £ 2 million.

The supply of all necessary pipes and hydraulic equipment for the irrigation networks will be done directly by the Project through 3 separate supply contracts as follows:

- KS 1 : Supply of AC pipes, UPVC pipes and fittings
- KS 2 : Supply of Valves
- KS 3 : Supply of Hydrants

Preparation of tender documents for above supply contracts was almost completed by the end of the year 1984 and tenders are scheduled to be invited early in 1985.

3. Installation of Main Conveyor and construction of Ponds :- Contract No. KC 3

Preparation of the design drawings and tender documents for ^{the} above contract was also undertaken by the Project Staff and substantially completed by the end of the year. The Main Conveyor of maximum diameter of 900 mm D.I. pipe starts from Evretou Dam and extends just after Khrysokhou Village and is about 8 km long. Furthermore the possibility of extending the Conveyor up to the Argaka - Magounda river in order to allow diversion of the river flow into Evretou Dam during winter and the release of irrigation supplies to the Argaka - Magounda irrigated areas during summer was under consideration by the Project.

The supply of all necessary Ductile Iron Pipes and fittings and Valves for the Main Conveyor will be done directly by the Project through 2 separate supply contracts KS4 (DI pipes and fittings) and KS5 (valves and metres)

Preparation of tender documents for these supply contracts was well advanced by the end of the year 1984 and are scheduled to be fully completed in 1985.

FINANCIAL INFORMATION

A total amount of £2,400,000 has been allocated as daggered provision in the 1984 Development Estimates for the Khrysokhou Irrigation Project. This however had to be supplemented with an additional provision of £852,000 as the actual expenditure during the year reached the total of £3,150,567.

The total expenditure for both years 1983 and 1984 reached the amount of £3,975.549. Details of expenditure incurred during 1984 are shown on the table of page 203 of this report.

TABLE VII /2-1

KHRYSOKHOU IRRIGATION PROJECT

Ser No.	Description	Amount allocation in 1984 £	Expenditure incurred in 1984 £
1	Evretou dam (G. P. Zachariades & Shephard Hil)	2 990 589	2 949 130
2	Compensations (removal of Mazarakis Bros)	5 500	5 500
3	Erection of measuring weir at Stavros tis Psokas river	8 000	6 935
4	Removal of electricity poles	10 897	10 897
5	Acquisition of land	5 500	3 911
6	Supply of Ductile Iron pipes from Paphos Irrigation Project	13 650	9 041
7	Air photo mapping	5 856	5 747
8	Office equipment	1 095	355
9	Consulting Engineers (Sir W. Halcrow & Partners)	67 987	66 639
10	Panel of Experts	6 840	6 553
11	Purchase of vehicles	7 500	6 400
12	Investigation and laboratory testings		11 827
13	Survey works		7 479
14	Typist - Draughtsman		4 898
15	Soil and concrete laboratory		6 841
16	Grouting works		7 947
17	Office expenses	79 500	3 656
18	Drivers wages		1 571
19	Operation vehicle		2 712
20	Hiring charge of vehicle		4 307
21	Subsistance		5 193
22	Advertisements		918
23	Overtime		22 137
	Total	£3 202 914	£3 150 594

Khrysokhou Irrigation Project - Phase I
Project Costs and Revised Estimates

TABLE VII /2-2

Item	Total Expenditure up to 31/2/84	Revised Estimate of total Cost	Estimates in Appraisal Report 1983
		CY £ 1000	
1. Evretou Dam	3,749	8,400	7,855
2. Upper Khrysokhou Diversion	-	-	500
3. Main Conveyor and Branches	-	1,400	1,699
4. Irrigation Networks	-	2,900	2,227
5. Groundwater Development	-	253	253
6. On-Farm Works	-	3,115	3,115
7. Land Aquisition	10	350	170
8. Project Management	40	500	944
Evretou Dam Supervision	177	575	585
Sub Total		17,493	17,347
Physical Cont.		600	1,537
Price Cont.		2,300	3,135
Total Cost	3,976	20,393	22,019

VII/3 SOUTHERN CONVEYOR PROJECT

By
Chr Ioannou HI

GENERAL

Objective

The purpose of the Southern Conveyor Project (SCP) for Water Resources Development is to collect and store surplus water from the south Catchments of the island and convey this water eastwards, to areas of demand for both domestic water supply and irrigation.

The main SCP objectives at full development of the Project would be:

- (a) To secure a safe domestic water supply until at least the year 2010 to the four major population areas of Cyprus (Nicosia, Limassol, Larnaca and Famagusta).
- (b) To provide irrigation water in order to maintain present agricultural production in Kokkinokhoria and to expand irrigated agriculture in four other areas along the southern coast of the island.

Phasing of the Project

It has been decided to implement the project in two phases because of its large size and the high financial implications.

Phase I of the Project

Phase I includes the Kouris Dam, the ^{main} conveyor, the Kokkinokhoria Irrigation network & the extension of Khirokitia Treatment Works.

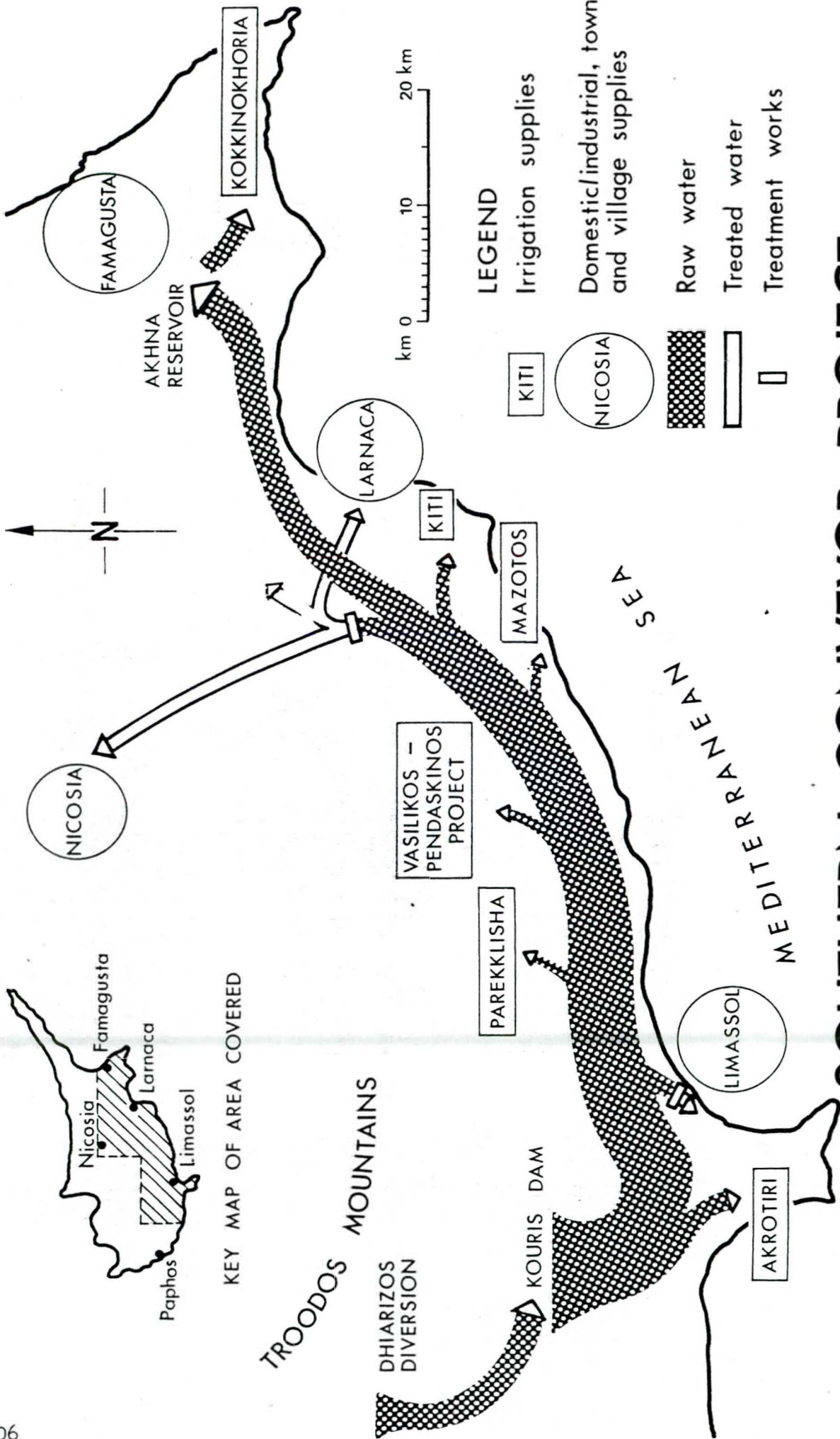
All other works would be postponed to Phase II.

Phase I project components and contracts

The Phase I project components have been divided ^{into} the following civil and supply contracts.

(a) Civil Contracts

- | | |
|--|-----------------|
| - Kouris Dam - | Contract No. C1 |
| - Main Conveyor (Kouris to Mari) | Contract No. C2 |
| - Main Conveyor (Mari to Akhna Dam) - | Contract No. C3 |
| - Akhna Dam - | Contract No. C4 |
| - Kokkinokhoria Main Distribution Network - | Contract No. C5 |
| - Kokkinokhoria Pumping Stations - | Contract No. C6 |
| - Kokkinokhoria secondary Distribution Network - | Contract No. C7 |



SOUTHERN CONVEYOR PROJECT

Diagrammatic Representation of Water Distribution

1st and 2nd Phase

(b) Supply Contracts

- Pipes and Fittings for the Main Conveyor (Limassol Bypass and EAC section) Contract No. S1(a)
- Pipes and fittings for the Main Conveyor and connection to Vasilikos - Pendaskinos Project (VPP) Contract No. S1(b)
- Valves for the Main Conveyor and connection to VPP Contract No. S2
- Pumping Plant and Ancillary Equipment for Kokkinokhoria Irrigation Network .. Contract No. S3
- Pipes and Fittings for Kokkinokhoria Irrigation Network Contract No. S4
- Valves for Kokkinokhoria Irrigation Network Contract No. S5
- Hydrants for Kokkinokhoria Irrigation Network Contract No. S6
- Flow meters for the Main Conveyor Contract No. S7
- Telemetry Contract No. S8

STAFF

Management Team

- Mr. K.C. Hassabis, Assistant Director WDD has been appointed Project Director and Acting Project Manager of the Main Conveyor and Irrigation Networks.
- Dr. C.A. Christodoulou, Principal Water Engineer WDD has been appointed Project Director and Acting Project Manager for Kouris dam.
- The senior members of the implementation team of the Conveyor Project have already been designated.

Supervisory Staff

The appropriate supervisory staff consisting of engineers, technicians (surveyors, laboratory technicians etc) have been transferred from the Headquarters and the Vasilikos - Pendaskinos Project, to Kouris Dam. An expatriate Resident Engineer for Kouris Dam has also been appointed. Similarly provisions have been made for the supervisory staff of the main conveyor, but transfers have not been made yet since the construction work has not started.

CONSULTING ENGINEERS

Kouris Dam

SOGREAH, Consulting Engineers in association with HYDROCONSULT have been appointed as the Consulting Engineers. The relevant agreement was signed on May 11, 1981. The Consulting Engineers prepared the detailed designs of the Kouris Dam and all other documents as specified in the agreement and have appointed the Resident Engineer (RE) for the supervision of the construction works, who assumed his duties in September 1984. During the execution of the works at the Kouris Damsite certain modifications/redesigns of the original plans proved necessary. For this purpose the presence of the designer of the Dam Mr A Yziquel on the site for a 9-month period became essential. This was proposed by the Department's Technical Committee to the main Tender Board and the latter approved it. Mr Yziquel assumed his duties in November 1984.

Main Conveyor and Irrigation Networks

Sir William Halcrow and Partners of UK designers of the Main Conveyor and Irrigation Networks have been appointed as consulting Engineers for the supervision of construction of the Main Conveyor and Irrigation Networks.

The relevant agreement 'Addendum to Original Consultancy Agreement' was signed in October 1984.

PANEL OF EXPERTS

The members of the panel for Kouris Dam are:

Prof. E. Nonveiller

Dr. J. Newbery

Mr. A. A. Abidi

During the reporting period, the Panel of Experts for Kouris Dam, met twice.

The first visit took place from the 2nd to 8th of June 1984 and the second between the 8th and the 13th of October 1984.

The Panel's findings and recommendations are given in the relevant reports which have been issued in June 1984 and October 1984.

FOREIGN FINANCIERS

- Phase I of the Southern Conveyor Project will be financed by three foreign financiers as follows:
 - (a) IBRD - International Bank for Reconstruction and Development
 - (b) KFAED - Kuwait Fund for Arab Economic Development
 - (c) EIB - European Investment Bank
- The relevant loans and items to be financed out of the proceeds of the loan are as follows:

Loan amount and items to be financed

Financier	Date of Agreement	Loan	Project items to be financed out of the proceeds of the loan
IBRD	April 1984	\$27,000,000	Kouris Dam, Akhna Dam Consultants Fees, office equipment, unallocated stores.
KFAED	December 1984	KD2,940,000	Supply of pipes and fittings for Kokkinokhoria irrigation network. Construction of Kokkinokhoria irrigation network. Construction of pumping stations for Kokkinokhoria irrigation network.
EIB	Agreement pending	ECU's30,200,000	Kouris Dam

PROGRESS ON PROJECT IMPLEMENTATION

KOURIS DAM - CONTRACT NO. C1

Tender procedures for the Kouris Dam, Contract No. C1, have been completed by mid 1984. Twenty (20) tenders have been received and opened publicly on the 27th of March 1984.

The successful tenderer was Impregilo S.p.A. (Italy). The letter of acceptance was issued on the 4th July, 1984.

Impregilo S.p.A. formed a joint venture with the Cyprus Firm Joannou and Paraskevaides, under the name "KOURIS DAM JOINT VENTURE" and the relevant agreement for the construction of the Kouris Dam was signed on the 6th of July, 1984 for the sum of £19,954,512.

Instructions to commence works was given to the Contractor on the 1st of September, 1984.

Immediately afterwards the Contractor started to mobilize and embarked on his works according to the submitted programme which was approved by the Resident Engineer. The progress by the end of the year was as follows:



Kouris Dam. Upstream portal of diversion tunnel being excavated by Alpine Miner AM75.
WDD Photo E72-7 (10.11.84)



Kouris Dam. Excavated part of the diversion tunnel. Upstream section.
WDD Photo E78-3. (17.12.84)

KOURIS DAM - CONTRACT NO. C1 (cont)

Temporary Works

The Resident Engineer's Offices as well as the site laboratory have been completed.

Crushing and Screening installations were well advanced, whilst the Batching Plant became operational.

Permanent Works

These works started with the Diversion Tunnel the excavation of which was about 50% completed by the end of 1984. Excavation of the tunnel was carried out using a tunnelling machine (Alpine Miner AM 75).

Works on the Intake Galleries and Chamber and Intake Shaft were also commenced.

Clearing of the site for the necessary excavations on the left abutment for Embankment foundation and Spillway proceeded according to the work programme submitted to the Resident Engineer.

MAIN CONVEYOR

Limassol Bypass and EAC Section

This part of the main conveyor was installed by Direct Labour in 1984 by the Construction Division of the Water Development Department.

The necessity for the installation of the EAC section of the conveyor at an early stage, was determined by the fact that the Electricity Authority of Cyprus (EAC) has to construct the footings of Electric Pylons over a certain section of the conveyor route.

A 1,300 mm Diameter Ductile Iron (D.I.) pipe, was installed at this section over a length of 1400 m.

The anticipated construction of the round-about of the Limassol Bypass, over another part of the conveyor route in the Limassol area, necessitated the installation of a length of 880 m of 1400 mm D.I. pipe and 420 m of 800 mm D.I. pipe.

Both sections of the conveyor in the Limassol area, were completed in 1984 with the following expenditure details.

- Supply of pipes and fittings Pont-a-Mousson of France	£ 575,000
- Civil works by Water Development Department	<u>£ 219,000</u>
Total Cost	£ 794,000

Extension of the Khirokitia Water Treatment Works

- Treatment Works were initially proposed to be constructed for the areas of Limassol, Larnaca/Nicosia and Famagusta (Ormidhia).
- It was however decided, on a cost comparison analysis, to omit the Ormidhia Treatment Works and extend the Khirokitia Treatment Works in order to meet the future water demand in Famagusta area.
- The extension of the Khirokitia Treatment Works will increase the treatment capacity from 20,300 m³/day to 31,800 m³/day.
- It is intended that the extension will be commissioned in August 1985 with the following expenditure details.

	Stg£	£
- Consulting Engineers Fees .....(26,150) (Howard Humphreys & Partners of UK)	1,200	Stg£26,150)
- Mechanical and Electrical Plant .....(88,421) (Degremont Laing Ltd of UK)	49,389	Stg£(88,421)
- Civil Works by Water Development Department	106,000	
Total Cost		<u>£ 156,589</u>

Progress on Civil Contracts

Construction of Main Conveyor (Kouris to Mari) - Contract No. C2

The prequalification procedure has been completed and the Tender Documents were prepared and will be made available for collection as from January 1985 by prequalified contractors.

Construction of Main Conveyor (Mari to Akhna) - Contract No. C3

The prequalification procedure has been completed and the Tender Documents were prepared and will be made available for collection as from January 1985 by prequalified contractors.

Akhna Dam - Contract No. C4

Interested contractors were invited in December 1984 to submit documents for prequalification purposes before February 16, 1985.

Kokkinokhoria Main Distribution Netowrk - Contract No. C5

The design for 5125 ha area was completed and draft Tender Documents have been prepared.

Kokkinokhoria Pumping Stations (Civil Works) Contract No. C6

Interested contractors were invited in December 1984 to submit documents for prequalification before the 16th February 1985.

Kokkinokhoria Secondary Distribution - Contract No. C7

The design has been completed and draft Tender Documents prepared.

Progress on Supply Contracts

Pipes and Fittings for the Main Conveyor - Contract No. S1(b)

Twenty-four tenders were received from fifteen tenderers on 27 October 1984, comprising four for Ductile Iron and twenty for Steel. Evaluation of tenders was then completed by the Consultants and this, together with the Department's recommendation for contract award and the Tender Board's endorsement of this recommendation, was forwarded to the Ministerial Committee for decision.

Valves for the Main Conveyor - Contract No. S2

Twenty-six tenders were received from twenty-two tenderers on 27 October 1984, which included eleven tenders for all the valve types required and fifteen for one or more of selected valve types.

Evaluation of tenders was then completed by the Consultants and this, together with the Department's recommendation for Contract award were forwarded to the Main Tender Board for consideration.

Pumping Plant and Ancillary Equipment for Kokkinokhoria Irrigation Network - contract No. S3

The draft tender documents were reviewed by the Technical Committee of the Department with result that CDP Pumps are being resized.

Valves for Kokkinokhoria Irrigation Network - Contract No. S5

Tender documents have been prepared and the invitation to tender was published. Documents will be available for collection as from January 1985.

Hydrants for Kokkinokhoria Irrigation Network - contract No. S6

Prepared draft tender document is awaiting review by the Department's Technical Committee.

TABLE VII/3-1

SOUTHERN CONVEYOR PROJECT		Amount allocated in 1984 £	Expenditure incurred in 1984 £
Ser. No.	Description		
Part A of the Project			
Kouris Dam			
1	Kouris Dam construction		2 153 665
2	Kouris Dam supervision of construction		11 689
3	Administration		7 422
4	Surveys and investigations		47 579
5	Construction of two water flowgauges on Kouris and Zyghos river		
	a. Kouris river (near Monagri) ...		9 394
	b. Limnatis river (near Limnatis)		11 412
	c. Hydrological observation at Kouris and Limnatis rivers		2 127
6	Removal and relocation of CYTA, telecommunication network		20 400
7	Acquisition of land.		31 136
8	Removal and relocation of Alassa village		65 884
9	Panel of Experts consultancy services for Kouris dam		1 899
10	SOGREAH consultancy services for Kouris dam		15 656
	Total		<u>£2 378 263</u>
Part B of the Project			
Main Conveyor			
1	Supply of pipes and fittings for EAC and Limassol by-pass section		17 021
2	Laying of main conveyor at EAC section - constructional works		94 093
3	Laying of main conveyor at Limassol by-pass section - constructional works		105 386

TABLE VII/3-1

SOUTHERN CONVEYOR PROJECT (cont.)

Ser. No.	Description	Amount allocated in 1984 £	Expenditure incurred in 1984 £
4	Laying of main conveyor on two crossings of Limassol road (Ypsonas - Erimi)		6 000
5	Administration (Purchase of one heavy duty photo copier)		2 355
6	Sir William Halcrow & Partners consultancy services		49 008
	Total		<u>£273 863</u>
Part C of the Project			
Akhna Reservoir			
1	British Hydromechanics research association consultancy services for the Akhna dam hydraulic model testing		1 983
	Total		<u>£1 983</u>
Part G of the Project			
Institutional Restructuring			
Preparatory Engineering Work			
1	W G SCHULZ of California USA consultancy services for the preparation of a study for the establishment of a National Water Entity		5 577
	Total		<u>£5 577</u>
	Grand Total	<u>£2 861 221</u>	<u>£2 659 686</u>

VIII DIVISION OF OPERATION & MAINTENANCE TOWN WATER SUPPLY

By: Elias Kambourides
Executive Engineer I

Ag. Head of Division

Introduction

The main activities of this Division are the administration, operation and maintenance of Government Town Water Supply schemes and Rural Regional Water Supply schemes. Presently, the following Government schemes are in operation:

- All sources of supply and conveyance systems for the water supply of Nicosia town and suburbs.
- The (non potable) water supply system of Government residences and institutions in Nicosia.
- The Central Water Supply System consisting of:
 - (a) The Larnaca-Famagusta Water Supply Scheme which is the main source of water supply of the towns of Famagusta, Larnaca and of over 30 communities and refugee housing estates in the above two districts and
 - (b) The First Phase of the Nicosia Water Supply component of the Vasilikos Pendaskinos Project. This phase of the Project comprises Dhipotamos Pumping Station, Stavrovouni Balancing Reservoir and the pipeline from Dhipotamos Pumping Station to Nicosia. It was commissioned early in 1982 and now forms part of the Central Water Supply System supplying supplementary water to Nicosia and a number of villages en route.
- The Government Rural Water Supply Schemes namely:
 - (a) Paphos Lower Villages Regional Water Supply Scheme
 - (b) Arminou Regional Water Supply Scheme
 - (c) Timi Water Supply Scheme
 - (d) Ambelitis Water Supply Scheme

Another activity of this Division is its participation in the administration of the Nicosia, Limassol, Famagusta and Larnaca Water Boards. Senior officers of the Division attend water board meetings as representatives of the Director of the Department. In its capacity as a member of the Water Boards, this Department acts as their technical adviser and also undertakes the design and construction work for major developments in their distribution systems.

Water Supply Situation in General

The year 1984 was the third consecutive year of drought. The rainfall during the 1983/1984 winter season was unsatisfactory and affected adversely, both the volume of water impounded in the dams and the recharge of the aquifers. This resulted in the further reduction of the yield of sources.

In order to counter the effects of the drought the execution of emergency borehole schemes continued. During 1984 three new boreholes were connected to the conveyors of Nicosia-Larnaca-Famagusta Central Water Supply system. More details of the Emergency Schemes completed in 1984 are given elsewhere in this chapter.

The total quantity of water produced by/all boreholes of the 1982-1984 Emergency Schemes was 3.594 MCM. ^{in 1984}

Another 2.6 MCM of water was conveyed from Yermasoyia Dam to Khirokitia Treatment works through the Yermasoyia-Vasilikos Conveyor which was completed early in 1983.

With these quantities, the water supply of the three towns and the numerous communities connected to the system was maintained at satisfactory levels.

As a further measure to save potable water, the scheme implemented in 1982 for subsidizing the drilling of private boreholes for the irrigation of gardens and other secondary uses, was continued in 1984 and covered consumers in the Areas of Supply of Nicosia, Limassol and Larnaca Water Boards. The scheme provided for £50.- subsidy for new boreholes drilled within the Area of Supply of the three aforementioned Water Boards.

A total of 591 applications were received by the end of the year, of which 484 were approved and the subsidy was paid for 356 cases totalling £17800.-. More details are given in Table VIII - I.

TABLE VIII-I APPLICATIONS FOR DRILLING OF BOREHOLES

<u>Town</u>	<u>Year</u>	<u>Total number of application received</u>	<u>Total number of application approved</u>	<u>Total number of application subsidized</u>
Nicosia	1982	847	689	375
	1983	525	410	332
	1984	482	388	291
Limassol	1983	4	4	4
	1984	6	6	6
Larnaca	1983	167	144	82
	1984	103	90	59
TOTAL		£ 2124	£ 1731	£ 1 149

Nicosia Town: Water shortage was again this year the major problem of this Water Board, and restrictions on the supply were continued almost throughout the year. Nevertheless, the water supply situation, in comparison, with that of last year, has improved, due to the improvements to the distribution system which made possible the fair rationing of the water available.

Limassol Town: Despite the effects of the drought the town enjoyed again this year, a continuous supply throughout the year.

Larnaca Town: The water supply of the town is supplemented from the Central Water Supply System. Despite the increased quantities supplied to the Water Board from this System, the water demand could not be met and restrictions on the supply were imposed. The supply to the consumers was 10-12 hours every 48 hours.

Paphos Town: This town experienced a water shortage problem during the summer months and restrictions on the supply were imposed. Due to limited capacities of the existing conveyors, the town's water supply was supplemented from the Paphos Lower Villages Water Supply system with a quantity of 38498m³ of water. Table VIII-2 gives some useful statistical data on the water supply of the towns over the last thirteen years.

TABLE VII - 2 - URBAN WATER SUPPLY IN CYPRUS

Year	Nicosia			Limassol			Larnaca			Paphos		
	Consumers #		Input into Service Reservoir (at Outlets) m ³	Consumers		Input into Service Reservoir (at Outlets) m ³	Consumers		Input into Service Reservoir (at Outlets) m ³	Consumers		Input into Service Reservoir (at Outlets) m ³
	Number at end of year	Increase %		Number at end of year	Increase %		Number at end of year	Increase %		Number at end of year	Increase %	
1972	17601	-	7,564,804	17927	-	4,952,521	5812	-	1,659,680	-	-	-
1973	18989	7.9	7,460,286	19015	6.1	4,999,405	5950	2.4	1,313,750	-	-	-
1974	20796	9.5	7,550,913	19435	2.2	4,990,401	6065	1.9	1,528,990	-	-	669,19
1975	21978	5.7	7,532,363	19800	4.1	4,175,035	6023	0.7	1,819,820	2332	3.3	645,22
1976	23628	7.5	8,137,580	20305	2.6	5,181,567	7515	24.7	2,015,900	2500	7.2	777,80
1977	25646	8.5	8,551,570	20989	3.4	5,935,146	8133	8.3	2,315,590	2706	8.2	808,77
1978	27944	9.0	8,307,170	21908	4.4	6,342,758	9513	17.0	2,523,680	2939	8.6	889,66.
1979	30337	8.6	8,559,184	23840	8.8	6,560,782	10578	11.2	2,669,100	3851	31.0	973,36
1980	34181	12.7	9,152,909	26416	10.8	7,214,542	11776	11.3	2,593,540	4413	14.6	1,119,05
1981	35366	3.5	8,676,120	28392	7.5	7,411,301	13487	14.5	2,931,690	4921	11.5	1,200,59 +
1982	37518	6.1	9,001,875	30311	6.7	7,692,378	15047	11.6	2,770,700	5602	13.8	1,247,97 +
1983	39554	5.4	8,984,890	31885	5.2	7,711,306	16453	9.3	2,471,510	6155	9.9	1,293,88
1984	41297	4.4	9,450,492	34034	6.7	7,831,767	17150	4.2	2,900,270	6685	8.6	1,464,787

* Due to lack of information on the number of consumers in the turkish occupied sector the figures in these columns now refer to the Government controlled area only.
 + These figures cover the whole of Nicosia
 + These figures have been corrected by subtracting quantities supplied to Mandria village en route.

NICOSIA WATER SUPPLY

Institutional Arrangements

The water supply of Nicosia town and suburbs is faced jointly by three authorities:

- The Water Development Department which is responsible for all sources and conveyors upto the service reservoirs and sells the water in bulk to the Nicosia Water Board,
- The Nicosia Water Board which has the responsibility for the distribution of water to Nicosia town and suburbs, and
- The Nicosia Water Commission which has the responsibility for the distribution of water to the old town of Nicosia within the Walls. The commission operates its own sources which are the boreholes P1 and P2 and the Arab Ahmed chain of wells.

Several important sources and conveyance systems serving the town of Nicosia are located within the Turkish occupied area. These sources are the Morphou-Pendayia boreholes which make a very significant contribution to the total water requirements of the capital and the Dhikomo boreholes and Sykhari Adit. There is a common distribution system for the whole of the town which serves both the Greek and Turkish sectors. 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.

The Government provides spare parts or replaces pumping units installed on sources of the systems within the area under Turkish occupation and also provides the Turkish side repair materials for the pipelines conveying water to Nicosia in order to keep up a continuous supply to the town.

The contribution of the United Nations personnel, who liaise between the two sides, is much appreciated.

Demand Estimates

For many years now restrictions have had to be imposed on the hours of supply to the consumers of Nicosia. For this reason the unrestricted demand of the town is not known accurately. Nevertheless, it is estimated that this demand was of the order of 13.77 MCM per annum during 1984 which corresponds to an average daily demand throughout the year of

38,000m³. The seasonal variation in demand would push this figure to about 45,000m³ during the summer months with single day maximum peaks as high as 53,000m³. This assumes an average daily consumption of 700l/day per consumer meter.

Sources and production

The main water supply sources of Nicosia town and their production over the years 1979 to 1984 are given in Table VIII- 3.

TABLE VIII-3NICOSIA WATER SUPPLY
Yield of Sources in MCM per annum 1979-84

Source	Year					
	1979	1980	1981	1982	1983	1984
1. Morphou Bay Scheme	3.232	3.343	3.252	3.198	3.230	3.486
2. Dhikomo-Sykhari	1.007	0.960	0.501	0.198	0.112	NIL
3. Paliometokho, Kok/thia Dhenia, Airport	0.659	0.548	0.568	0.565	0.466	0.451
4. Tseri	1.028	0.940	0.891	0.812	0.788	0.763
5. Dhali	--	0.294	0.268	0.017	NIL	NIL
6. Peristerona-Akaki	0.211	1.195	1.316	1.040	0.936	0.906
7. Latsia, Athelassa, Makedonitissa	0.401	0.296	0.367	0.268	0.358	0.232
8. N/sia Water Commission Sources	0.633	0.768	0.689	0.521	0.453	0.390
9. Purchased from private vhs	2.013	1.528	1.866	2.101	1.669	1.277
10. Lefkara Dam (CWSS)	--	--	--	0.891	0.042	0.339
11. 1982/84 Emergency Schemes						
(a) Stevrovouni-Pyrga	--	--	--	0.277	0.862	1.364
(b) Dhenia	--	--	--	0.314	0.389	0.278
(c) Dhali-Kottoudhia	--	--	--	--	0.276	0.645
Totals	9.184	3.878	9.718	10.202	9.581	10.131

Thus the total quantity of water produced in 1984 was 10.131MCM of which 8.464MCM came from Government sources, 0.390MCM was the yield of the Nicosia Water Commission Sources and 1.277MCM was purchased from private sources.

Although the operation of the First Phase of the Vasilikos Pendaskinos Project conveying water from Lefkara dam to Nicosia and the 1982-1984 Emergency Schemes of Stavrovouni, Dhenia and Dhali-Kattoudhia added 2.626MCM to the existing sources of the Nicosia System, the total production compared to 1983, was only by 0.55MCM greater. There was a reduction in yield of the old sources of about 0.50MCM as a result of the drought. Most affected were the Dhali and Peristerona-Akaki Sources which are located in river aquifers and are dependent on direct recharge from river flows. The decrease in the annual production of Peristerona-Akaki Sources was 30,000m³ whilst Dhali and Dhikomo-Sykhari sources, produced no yield at all.

Restrictions on water Supply

Of the total 1984 production of 10.131 MCM only 9.495 MCM reached Nicosia. The remaining 0.636MCM was partly consumed en-route by various villages camps Refugee estate & industries connected to the system and partly unaccounted for.

Thus, compared to the estimated unrestricted demand of Nicosia of 13.77MCM there was a storage of 4.275MCM or 31% during the year, and restrictions on the hours of supply continued to be enforced throughout the year. The restrictions provided for a supply of 18 hours every 48 hours.

Despite the restrictions, the water supply was maintained at acceptable levels for the following reasons: (a) the commissioning in 1982, of the First Phase of the Vasilikos-Pendaskinos Project which made it possible to convey large quantities to Nicosia during days of increased demand or failure of other sources (b) the operation in 1982 of the new Lakatemia Service Reservoir of 40,000m³ capacity which doubled the storage available to meet short term peaks etc. (c) the operation of the 1982/1984 Emergency Schemes (d) the sensible use of water by consumers due to the increased rates imposed in 1984 and the campaign to save water, and finally, (e) the improvements to the distribution system and the subdivision of large areas of supply in Nicosia into smaller areas of more uniform elevation so that the restrictions could be imposed more effectively whilst at the same time ensuring that all consumers received their fair share of the quantities available.

Villages and Other Consumers served by the Nicosia water Supply System

Table VIII⁴ below gives the communities and other consumers served by the Nicosia Water Supply System and the quantities supplied to them over the years 1979-1984.

TABLE VIII⁴ NICOSIA WATER SUPPLY SYSTEM
Villages and other Consumers Served

Country Served	Consumption in MCM					
	1979	1980	1981	1982	1983	1984
K/thia	0.050	0.057	0.063	0.091	0.082	0.086
Mammari-Dhenia	0.046	0.064	0.040	--	--	--
Mosphiloti (26.8.82)	--	--	--	0.017	0.052	0.049
Psevdhas (14.9.82)	--	--	--	0.009	0.031	0.018
Pyrga (25.9.82)	--	--	--	0.006	0.021	0.024
Lymbia, Sha, Kornos regional W.S. scheme (1.11.82)	--	--	--	0.018	0.060	0.043
Alambra (22.11.82)	--	--	--	0.004	0.014	0.021
Dhali (15.10.83)	--	--	--	--	0.009	0.059
Various Camps Industries and miscellaneous consumers	0.024	0.034	0.041	0.049	0.083	0.100
Totals	0.120	0.155	0.144	0.194	0.352	0.400

Note: The dates given in parentheses are the dates when these villages were connected to the Dhyptomos-Nicosia Pipeline due to the serious water shortage experienced by these villages as a result of the 1981-82 drought.

1984 Emergency Schemes

The following is an outline of the various schemes carried out during 1984 in order to supplement the water supply sources of both Nicosia and of the Central Water Supply System as a whole. They are all presented under the Nicosia Water Supply section even though many of the schemes are not directly connected to the Nicosia system for two reasons:

- A unified and complete picture of the 1984 Emergency Schemes is presented and

- The implementation of schemes in the Larnaca Area has by substitution enabled the conveyance of more water to Nicosia from Lefkara Dam which would normally be allocated to Larnaca-Famagusta demand centres.

- Anglisides Scheme

This scheme utilizes borehole No.141/83. A 2250 long A.C.pipeline of 150 mm dia, connects directly this borehole to the Khirokitis Famagusta conveyor. The yield of the borehole is 50m³/hr.

- Dhali-Kattoudhia Scheme

The scheme utilizes borehole No.94/80. This borehole is situated near the existing boreholes of Dhali-Kattoudhia emergency scheme which was executed in 1983. Steel pipes of 150 mm dia. and 400 m in length, connect the borehole to the existing conveyor of Dhali-Kattoudhia Scheme. This yield of this borehole is 40m³/hr.

- Pyrga-Stavrovouni Scheme

This scheme utilizes one borehole in the Pyrga area with no. 28/84. Steel mains of 150 mm dia of total length 700 m convey the water first into a circular collecting tank and from there through centrifugal booster pumps the water is being pumped into a 10" dia main connected to the Dhyptomamos-Nicosia pipeline. The yield of these boreholes is 30m³/hr.

Prospects for the solution of the water shortage problem

The operation of the first phase of the Nicosia Water Supply component of the Vasilikos-Pendaskinos Project in 1982 and of the Yermasoyia-Vasilikos Project in 1983 proved invaluable short term contributions to the solution of the water shortage problems of the capital. However, due to the continuous increase in demand for water and the equally continuous reduction in the yield of the boreholes presently supplying Nicosia, the water shortage will persist until the Vasilikos-Pendaskinos Project 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.

Expenditure and Revenue

A statement showing expenditure for the operation and maintenance of sources and conveyors and revenue from the sale of water for the year 1984 is given in table VIII-5.

TABLE VIII-5

NICOSIA WATER SUPPLY

Expenditure and revenue account for 1984

Expenditure

Morphou Bay Scheme

	£
Maintenance expenses	343
Electricity	316948
Wages	16400
Miscellaneous expenses	5277
TOTAL	£338968

Tseri Scheme

Maintenance expenses	1214
Electricity & fuel	50433
Wages	15913
Miscellaneous expenses	4157
TOTAL	£71717

Peristerona - Akaki Scheme

Maintenance expenses	3312
Electricity & fuel	62938
Wages	11987
Miscellaneous expenses	2475
TOTAL	£80712

Kokkini Trimithia-Paliometokho Installations

Maintenance Expenses	5683
Electricity & fuel	67635
Wages	37634
Miscellaneous expenses	1912
TOTAL	£112864

Dhali-Latsia Installations

Maintenance expenses	86
Electricity	8336

Wages	2926
Miscellaneous expenses	760
	<u> </u>
TOTAL	£12108

Maintenance Expenses of Civil Engineering Works

Motor transport expenses	4889
Wages	16235

Purchase of materials & Equip.	6978
Miscellaneous expenses	3710
	<u> </u>
	£31812

<u>Purchase of Water from Private Sources</u>	£
	93983

Yeri-Dhali-Kattoudhia Emergency Scheme

Maintenance expenses	1604
Electricity and Fuel	23840
Wages	7175
Miscellaneous expenses	345
	<u> </u>
TOTAL	£32964

Pyrga Stavrovouni Emergency Scheme

Maintenance expenses	3867
Electricity and Fuel	65209
Wages	10032
Miscellaneous expenses	1166
	<u> </u>
TOTAL	£80274

Vasilikos-Pendaskinos Project - Phase I

Maintenance expenses	2549
Electricity	16415
Wages	2598
Miscellaneous expenses	4558
	<u> </u>
TOTAL	£26120
GRAND TOTAL	£ 847539

Revenue

Revenue generated

Value of water delivered to Nicosia Water Board in 1984	£ 1274775*
Value of water delivered directly to other consumers in 1984	58957
Total value of water delivered in 1984	<u>1333732</u>
Amount actually collected in 1984 in respect of water delivered in 1984	1186167
Amount outstanding on 31.12.84 for water delivered in 1984	147565
Amount outstanding by 31.12.83	543717
Less amount collected in 1984 in respect of water delivered before 31.12.83	<u>213310</u>
Amount outstanding on 31.12.84 for water delivered before 31.12.83	330407
Total amount outstanding by 31.12.84	488904
Total amount collected in 1984	1399477

This statement does not include for the amortization of the Government installations and equipment of the scheme. The amortization cost of these installations and equipment is estimated at £503950 annually as given in Table VIII-6. Without taking into account office overheads the deficit for the year 1984 amounts to £17757 if outstanding payments are not considered as revenue then the deficit rises to £165322.

* This figure is calculated at the actual rates at which the Water Board is charged. As from 1.3.82 these rates represent only about 75% of the actual cost of the water. The balance is a government grant to the Water Board on account of the quantity it supplies to the Turkish-occupied sector of Nicosia for which no payment is received by the Board.

Table VIII-6 NICOSIA WATER SUPPLY
Amortization Costs

Installations	Capital Costs £	Discount rate	Period (years)	Annual Amortization Cost £
Pre-1982 installations Vasilikos-Pendaskinos 1st Phase	1 748 300	8%	Varies	107 760
- Civil works	2 650 000	9%	40	246 344
- E & M plant	350 000	9%	15	43 420
1982 Emergency Schemes				
Dhenia	90 000	9%	5	23 138
Stavrovouni	78 000	9%	5	20 053
1983 Emergency Schemes (Pyrga-Stavrovouni- Yeri-Dhali-Kattoudhia)	75 100	9%	5	19 307
1984 Emergency Schemes (Pyrga-Dhali-Kattoudhia)	17 767	9%	5	4 567
TOTAL				£503 950

Water Supply to Government residences and institutions in Nicosia

In addition to the water supplied ^{for} domestic use by the Nicosia water Board, Government houses, offices and other institutions are supplied free of charge with water for irrigation and cleaning purposes by a separate water supply system. The sources of this system are four boreholes situated within the inhabited area of Nicosia. The total quantity of water produced from these sources during 1984 was 107,000m³ which met satisfactorily the demand. The total expenditure, (which is borne by Government) for the operation and maintenance of this system for 1984 was £11,020 as follows:

- Electricity	£1988
- Wages	£6850
- Maintenance expenses	£ 10
- Miscellaneous expenses	£2172
TOTAL	£11020

Note: Expenditure under the heading 'Wages' includes also the wages for the maintenance and repairs to large water meters which are carried out by the same gang operating this system.

CENTRAL WATER SUPPLY SYSTEM

The system

The Central Water Supply System (CWSS) is the former Famagusta Water Supply Scheme which has gradually been expanded and enlarged with the addition of new sources and the connection of new demand centres to a point where it serves the towns of Nicosia Larnaca and Famagusta and more than 35 communities in the respective districts.

The system provides both underground water being pumped from Vasilikos Subsurface Dam and several boreholes in the areas of Khirokitia, Alethriko, Skarinou, Anglisidhes and Klavdhia village and surface water from Lefkara Dam and Yermasoyia Dam. The surface water is being treated at the Khirokitia Water Treatment Works which has a capacity of 21800m^3 per day. Treated and borehole water is conveyed along a 70 km pipeline from Khirokitia up to Phrenaros reservoir South of Famagusta. Borehole sources and communities are connected at various points along the Famagusta Pipeline which in effect forms the backbone of the CWSS.

During 1984 the Khirokitia Water Treatment Works was in operation continuously because demand 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, 1984 was 405000m^3 representing 2.92% of the reservoir capacity and by the end of the year the total water storage was 394000m^3 representing 2.84% of the reservoir capacity.

The total inflow quantity during the year was 1852630m^3 and the total drawoff for domestic water supply was 1691633m^3 .

The water held in storage in the Yermasoyia dam reservoir on 1st January 1984 was 3578000m^3 representing 26.5% of the reservoir capacity and by the end of the year the total water storage was 3026000m^3 representing 22.4% of the reservoir capacity.

The total inflow quantity during the year was 7344974m^3 and the total drawoff including water for irrigation, Domestic Recharge and evaporation was 7337619m^3 .

The draw-off quantity for domestic purpose was 2601010 m³.

The total quantity of water pumped and/or treated from all sources of this scheme during 1984 was 6639000 m³ (including losses and quantities supplied to Akrounda-Phinikaria local irrigators) and the total consumption was 6510599 m³.

The total demand on the system during 1984 was 6.5 MCM comparing to 5.4 MCM during 1983.

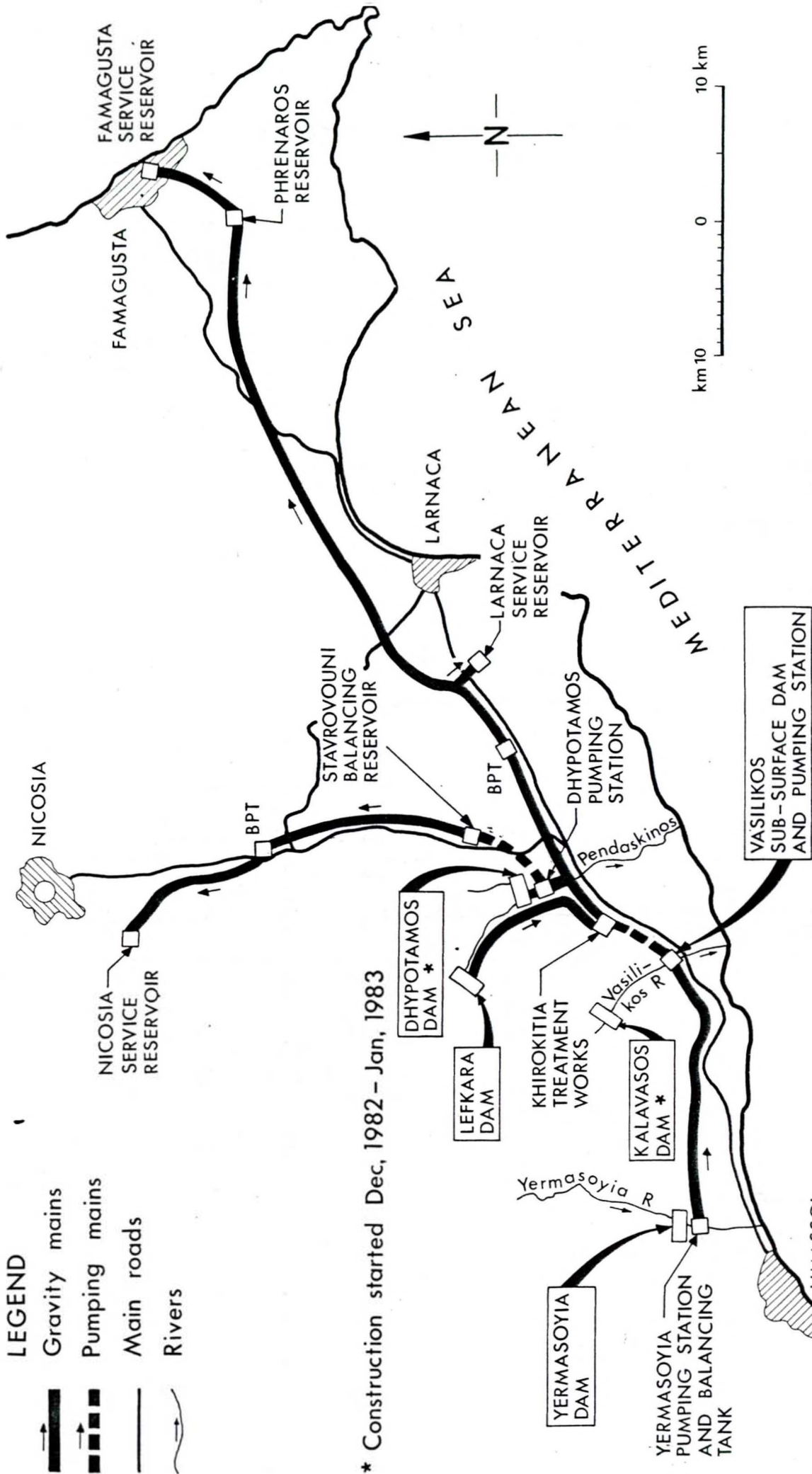
Sources and Production

The main sources of the Central Water Supply System and their production over the years 1979 to 1984 are given in table VIII-7.

TABLE VIII-7 CENTRAL WATER SUPPLY SYSTEM
Yield of Sources in MCM per annum 1979-1984

Source	Year					
	1979	1980	1981	1982	1983	1984
Khirokitia Treatment Works Drawing from Yermasoyia Dam	--	--	--	--	1.957	2.487
Drawing from Lefkara Dam	2.807	2.107	3.035	4.325	1.429	1.618
Drawing from Vasilikos Sub-surface Dam	--	--	--	--	0.001	0.745
Sub-Total	2.807	2.107	3.035	4.325	3.387	4.850
Vasilikos Sub-surface dam Boreholes	0.579	0.833	0.762	0.449	0.366	--
Panathismenos	0.179(1)	0.124(1)	0.101(1)	0.127(1)	0.116(1)	--
Khirokitia	0.320(2)	0.278(2)	0.243(2)	0.206(2)	0.168(2)	0.139(2)
Alethriko	0.190(1)	0.338(2)	0.158(2)	0.158(2)	0.093(2)	0.062(2)
Sub-total Vasilikos & old BH'S	1.268	1.573	1.505	0.940	0.743	0.201
Yermasoyia Dam (for Irrig.) 1982/83 Emergency Schemes	--	--	--	--	0.232	0.281
Tokhni	--	--	--	0.038(1)	--	--
Skorinou	--	--	--	0.190(2)	0.337(6)	0.345(4)
Menoyia	--	--	--	0.078(2)	0. -- ()	--
Alethriko	--	--	--	0.064(1)	0.159(1)	0.245(3)
Klavdhia	--	--	--	0.349(4)	0.507(5)	0.400(5)
Khirokitia	--	--	--	--	0.123(1)	0.095(1)
Anglisidhes	--	--	--	--	--	0.222(1)
Sub-total Emergency schemes	--	--	--	0.719	1.126	1.588
Totals	4.075	3.680	4.540	5.984	5.458	6.639

- LEGEND**
-  Gravity mains
 -  Pumping mains
 -  Main roads
 -  Rivers



* Construction started Dec, 1982 - Jan, 1983

CENTRAL WATER SUPPLY SYSTEM

Feeding Nicosia, Larnaca, Famagusta, several villages, refugee housing and tourist installations in N'isia, L'ca, and F'sta areas

Notes: Figures in parenthesis indicate the number of Boreholes
The quantities for the treatment works production are given net of treatment losses.

The total quantity of water produced shows an increase of 21.6% in 1984 over the corresponding 1983 figure. The water held in storage in the Lefkera Dam reservoir on 1st January 1984 was 405000m³ and on 31st December, 1984 was 394000m³.

The total inflow quantity during the year was 1852630 m³ and the total drawoff during the year for Domestic water supply was 1691633 m³.

In order to meet the demand on the System the Water Treatment Works at Khirokitia was in continuous operation since the groundwater available even during the winter period of low demand was not adequate to meet that demand.

Bulk Consumption

Table VIII-8 shows the bulk consumption of the various communities served by the CWSS over the years 1979-1984.

TABLE VIII-8 CENTRAL WATER SUPPLY SYSTEM
Bulk Consumption in MCM per annum 1979-1984

Community Served	Consumption from CWSS in MCM					
	1979	1980	1981	1982	1983	1984
Nicosia (via Dhyptomos)	--	--	0.014	0.891	0.042	0.339
Larnanca	1.292	0.796	1.182	1.446	2.111	2.467
Famagusta	0.973	1.017	1.058	1.060	0.985	0.986
Sub-total-Towns	2.265	1.813	2.254	3.397	3.138	3.792
Western Region Villages						
Pano Lefkara	0.036	0.033	0.025	0.044	0.042	0.052
Kato Lefkara	0.013	0.009	0.009	0.010	0.008	0.009
Kato Dhrys	0.008	0.010	0.009	0.008	0.008	0.007
Vavla	0.008	0.008	0.007	0.007	0.008	0.007
Alethriko	0.017	0.017	0.018	0.028	0.029	0.028
Mazotos	0.025	0.026	0.035	0.042	0.031	0.041
Kivisili	0.016	0.020	0.019	0.020	0.021	0.023
Tokhni	0.045	0.041	0.031	0.035	0.025	0.027
Menoyia	0.001	--	--	--	0.002	0.005
Khirokitia	0.013	0.019	0.024	0.033	0.024	0.027
Maroni		0.027	0.031	0.039	0.031	0.037
Zyyi	0.059	0.019	0.029	0.029	0.026	0.028
Psematismenos		0.010	0.012	0.013	0.011	0.013
Kophinou	--	--	--	--	--	0.001
Aplanda-Anaphotia	--	--	--	--	0.005	0.033
Meneou-Dhromolaxia-Tersephanou	--	--	--	--	0.107	0.239
Klavdhia	--	--	--	0.001	0.020	0.022
Kalokhorio	--	--	--	--	0.041	0.019
Sub-total western villages	0.241	0.239	0.249	0.309	0.439	0.618

VIII- 8(continued)

	Consumption from CVSS in MCM					
	1979	1980	1981	1982	1983	1984
Eastern Region Villages						
Aradippou	0.043	0.097	0.175	0.131	0.104	0.231
Xyloymbou	0.147	0.154	0.158	0.158	0.121	0.117
Dherynia	0.130	0.147	0.153	0.152	0.137	0.149
Avgorou	0.115	0.113	0.134	0.133	0.121	0.120
Phrenaros	0.008	0.015	0.051	0.053	0.014	0.036
Livadhia	0.071	0.085	0.104	0.134	0.127	0.128
Voroklini	0.054	0.059	0.062	0.065	0.064	0.070
Sotira	0.088	0.082	0.097	0.091	0.073	0.088
Paralimni	0.086	0.127	0.210	0.207	0.247	0.302
Ayia Napa	0.032	0.049	0.161	0.217	0.255	0.336
Kellia	0.012	0.018	0.015	0.024	0.025	0.025
Troulli	0.023	0.033	0.036	0.038	0.036	0.041
Aradhippou-Livestock	0.007	0.020	0.021	0.017	0.011	0.017
Anzio Camp	0.122	0.082	0.084	0.047	0.013	0.027
Akhna Forest	0.077	0.103	0.095	0.098	0.097	0.091
Displaced persons Service	0.027	--	--	--	--	--
Pyla	--	--	--	--	0.008	0.027
Subtotal Eastern Villages	1.042	1.184	1.556	1.565	1.453	1.805
Irrigators & minor consumers	0.052	0.047	0.055	0.076	0.305	0.294
Grand Total	3.600	3.283	4.114	5.347	5.335	6.509

Expenditure and Revenue

A statement showing expenditure and revenue of the Central Water Supply System for the year 1984 is shown in table VIII-9

Operation of the Vasilikos-Pendaskinos - First Phase supplying water to Nicosia is not included here as it is included in the accounts of the Nicosia System.

TABLE VIII- 9 NICOSIA-LARNACA-PAMAGUSTA
CENTRAL WATER SUPPLY SYSTEM

Expenditure and revenue accounts for 1984

Expenditure

Khirokitia and Lefkara Installations

	£
Electricity	6 920
Wages	45 210
Materials and others	27 431
Total	£ 79 561

Yermasoyia-Vasilikos pumping and maintenance expenses

Electricity	324 336
Wages	31 357
Materials and others	3 512
Total	£ 359 205

Pumping and maintenance expenses

Electricity	88 344
Wages	32 671
Materials and others	20 723
Total	£141 738

Khirokitia-Lefkara Regional Water Supply Scheme

Electricity	23 888
Maintenance	886
Total	£24 776

Maintenance expenses for Civil Engin. Works

Wages	5 910
Materials and others	1 744
Total	£7 654

GRAND TOTAL £ 612 934

Revenue

Revenue Generated in 1984

Value of water delivered to Larnaca Water Board in 1984	441 666
Value of water delivered to Pamagusta area occupied by Turks in 1984	176 549

Value of water delivered to Nicosia Water Board in 1984	£ 47 451
Value of water delivered to other consumers in 1984	437 181
Total value of water delivered in 1984	<u>£1102 847*</u>
Amount actually collected in 1984 in respect of water delivered in 1984	<u>490 267</u>
Amount outstanding on 31.12.84 for water delivered in 1984	612 580*
Amount outstanding by 31.12.83	945 915
Less amount collected in 1984 in respect of water delivered before 31.12.83	292 893
	<u>£653 022**</u>
Total amount outstanding by 31.12.84	<u>£1 265 602***</u> =====

Notes on expenditure and revenue account of the Central Water
Supply System for 1984

- (a) The Capital Cost of the CWSS installations up to the end of 1984 was £3018,026. Roughly the amortization of this capital investment at 9% for 40 years is £280,555 annually. The capital cost of the 1982/84 Emergency Schemes added to the system and commissioned in 1982/84 was £196,777. Amortized at 9% over 5 years only this adds a further annual cost of £50,590 bringing the total annual amortization of capital investment to £331,145. Thus without taking into account office overheads for the management of the scheme, the profit for the year 1984 amounts to £158,768. If outstanding payments are not considered as revenue then there is a deficit of £453,812.
- (b) Expenditure under heading "Khirokitia and Lefkara installations" refer to the following installations.

Khirokitia Treatment Works
Lefkara dam

The total quantity of water treated during the year reached 4850027 m³ and the unit running cost was 1.64 cents/m³.

- * Includes an amount of £176,549 representing the value of 986310 m³ of water supplied to Famagusta area occupied by Turks.
- ** Includes an amount of £607,770 representing the value of 3082419 m³ supplied to Famagusta area occupied by Turks during the years 1974-1983.
- *** Includes an amount of £784,320 representing the value of 10068729 m³ of water supplied to Famagusta area occupied by Turks during the years 1974-1984.

-) Expenditure under heading "Yermasoyia-Vasilikos pumping and maintenance expenses" refers to the running expenses of Yermasoyia Boosting Station, Vasilikos Boosting Station and Vasilikos Subsurface dam pumping scheme.
- (d) Expenditure under heading "Pumping and maintenance expenses" refers to the following installations:
- * Borehole No. 11/69, 4/69 in Khirokitia area
 - * Borehole No. 35/73, 45/73 in Alethriko area

1982/84 Emergency Scheme Installations

- * Borehole No. 114/80, 127/80, 112/80, 38/82, 16/79 in Klavdhia area.
- * Borehole No. 73/80, 15/83, 75/83 in Alethriko area.
- * Borehole No. 133/80, 80/83, 55/83, 63/83 in Skarinou area.
- * Borehole No. 45/61 in Khirokitia area.
- * Borehole No. 141/83 in Anglisidhes area.

The total quantity produced by these sources during 1984 was 1507986 m³.

The unit cost of pumping and maintenance was therefore 9.399 cents/m³.

- (e) Expenditure under heading "Khirokitia-Lefkara 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 75020 m³.

- (f) Expenditure under heading "Maintenance expenses for Civil Engineering Works" refers to maintenance expenses for Yermasoyia-Khirokitia main, Lefkara main Khirokitia-Phrenaros main.

Chemical Laboratory at Khirokitia Water Treatment Plant

The Khirokitia Water Treatment Plant was commissioned in 1974. For the period 1974-78 the operators at the plant carried out some simple chemical tests (analyses) of the water to check its chlorine content, turbidity, pH and conductivity.

In early 1978 the WDD set up a modern chemical laboratory at Khirokitia Water Treatment Plant which was to cater for the needs of the treatment plant and to a large extent of WDD in respect of Drinking Water Supplies.

The laboratory is presently staffed with two persons only, one chemist and one labourer who works as a laboratory assistant. The laboratory undertakes all the chemical analyses of drinking water and carries out chemical tests for water conductivity, pH total dissolved solids, total hardness, chlorides, sulphates,

carbonates, fluoride (F), Nitrite (NO₂), bicarbonates, nitrates, sodium, potassium, calcium and magnesium. All the bacteriological tests of raw and drinking water are presently being carried out by the State General Laboratory in Nicosia.

Samples of water from existing boreholes and reservoirs being used for urban water supply are collected monthly by the WDD district offices and are tested at the laboratory. Also samples of the water used for village water supply are tested annually.

In addition to the above analyses, the laboratory also carries out several chemical tests in connection with new projects undertaken by the WDD (Such as the Vasilikos-Pendaskinos Project, the Southern Conveyor Project etc.) and in cases where water from a new borehole will be used for drinking purposes.

During the year 1984, 2165 chemical analyses of drinking water, were carried out, at the laboratory of Khirokitia Water Treatment Plant. Details of the chemical analyses are shown in table VIII-10.

In addition to the chemical analyses mentioned above, samples of water from the Yermasoyia and Lefkara Dams were collected monthly, and jar tests for estimating coagulant dosing requirements were carried out.

TABLE No.VIII-10 Summary of chemical analyses carried out at the VDD Chemical Laboratory

Area* Month	Number of Samples analysed during 1984								TOTAL
	LARNACA	NICOSIA	LIMASSOL	PAPHOS	POLIS	KHIROKITIA			
January	32	49	35	44	8	7			175
February	19	19	13	--	3	27			81
March	18	38	15	--	--	25			96
April	169	3	7	--	--	30			209
May	36	28	7	--	--	77			148
June	28	123	7	--	--	56			214
July	14	58	39	--	30	55			196
August	11	22	47	--	--	38			118
September	59	12	24	59	--	24			178
October	25	4	168	65	--	37			299
November	118	8	110	22	--	27			285
December	70	--	87	--	--	9			166
	599	364	559	190	41	412			2165

* Area from which samples were taken.

FACTS ABOUT THE TOWN WATER BOARDS

Nicosia Water Board

Water shortage was again this year the basic problem of this Water Board, and restrictions on the supply were in force from 26.2.1984 to 9.11.1984.

Nevertheless due to the increased quantities of water delivered to this Water Board from the 1982/1984 Emergency Schemes and Khirokitia Treatment Works during the summer and other reasons explained elsewhere in this report, the water supply situation, in comparison with last year, has improved.

The Nicosia Water Board enforced new increased water rates as from 1.1.1984, to reflect its increased costs especially in the purchase of water in bulk from Government.

Water Supply Data

- Total quantity of water delivered to the service reservoirs or directly into the distribution system 9,495,274m³
- Total quantity of water consumed as registered by area meters (including Nicosia Water Commission) 9,450,498m³
- Total consumption during 1984 as registered by individual consumer meters in the Greek sector only 5,829,780m³
- Unaccounted for water 19.5%
- Maximum daily summer consumption 38,360m³
(Based on area meter readings and including Nicosia Water Commission. Registered on 31.7.84 for 18 hours of supply in every 48 hours).
- Total number of consumers on 31.12.83 39,554 No
(Greek sector only)
- Total number of consumers on 31.12.84 42,697 No
(In Greek sector only)
- Average number of consumers during 1984 41,125 No
(excluding consumers in the area under Turkish control)
- Average gross supply per connection 480 l/day

- Extension of distribution system 6665m
(100mm and 150mm dia. A.C.pipes)

- Total number of Fire Hydrants installed during 1984 15No.

From analysis of the information available it has been deducted that the consumption in the part of the Nicosia area of supply under Turkish control was 23.7% of the total consumption.

Limassol Water Board

The Water Board sources met satisfactorily the water demand and the town enjoyed a regular supply throughout the year 1984.

Underpressure supply was observed at the high parts of the town in the summer months which is attributed to the undercapacity of the existing distribution system. The improvement of the distribution system and service reservoirs were studied by Consulting Engineers and their report was submitted in 1981. The estimated cost of the improvement works proposed by their report is £2.34 million and envisages the construction of two new service reservoirs and the laying of a number of trunk mains within the distribution system for improving its conveyance capacity.

In May 1984 two new boreholes Nos.48/83 and 35/83 were connected direct to the distribution system and the total quantity produced was 940000m³.

Water Supply Data

- Total quantity of water produced from all sources during 1984.	8226848m ³
- Total quantity of water consumed during 1984 as registered by area meters	7831767m ³
- Total consumption during 1984 as registered by individual consumers meters	6041505m ³
- Unaccounted for water	26.56%
- Maximum daily summer consumption. (Registered by area meters on 15.6.1984)	32421
- Total number of consumers connected in 1984	2494No.
- Total number of consumers on 31.12.1983	31885No.
and on 31.12.1984	34034No.
- Average number of consumers during 1984	32960No.
- Average gross supply per consumer	684 l/day
- Extension of distribution system (100mm, 150mm, 200mm and 250mm A.C.pipes and 300mm ductile pipes)	13400m

- Total length of distribution system as at 31.12.1984 389,847m
- Total number of Fire Hydrants installed during 1984. 77 No.
- Total number of Fire Hydrants installed as at 31.12.1984 1357No.

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 1984 was 986,310m³.

Larnaca Water Board

The water supply of this town was supplemented throughout the year from the Central Water Supply System. The total quantity of water delivered to Larnaca Water Board from this system, during 1984 was 2,467,410m³. Because of the increased demand on the one hand and the reduced production of the water board sources, due to the dry year, on the other hand, the town faced a water shortage problem and restrictions on the supply had to be imposed in May. These restrictions, which provided for a supply every other day, stayed in force till the end of the year. As a relief measure this Water Board launched a water saving campaign, by publicity and the distribution of nylon bags to be placed by consumers in W.C. cisterns/bulk out water.

As a result of the increased rates introduced by this Department for the water delivered to Water Boards from the Government Water Supply Schemes, this Water Board increased its own water rates as from 1.1.1984.

Water Supply Data

- Total quantity of water supplied to service reservoirs during 1984 2,949,590m³
- Total quantity of water consumed as registered by area meters during 1984 2,900,270m³
- Total consumption as registered by individual consumer's meters in 1984. 2,422,383m³
- Unaccounted for water 17.87%

- Maximum daily summer consumption (Registered on 3.8.84) X	11,800m ³
- Total number of consumers as at 31.12.83	16,453No.
- Total number of consumers as at 31.12.84	17,150No.
- Total number of consumers connected in 1984	1,047No.
- Average number of consumers during 1984	1,680No.
- Average gross supply per connection	481 l/d
- Extension of distribution system during 1984 (100mm, 150mm and 200mm A.C.pipes)	6,531/m
- Fire Hydrants installed during 1984	39No.
- Total number of Fire Hydrants installed as at 31.12.84	753No.

Paphos Water Supply

The water supply of the town is administered by the Municipality. Although the capacity of the Municipality's sources could have met the demand, carrying capacity limitations of the pipeline feeding the town have necessitated the augmentation of the town's supply from the Paphos Lower Villages Government Water Supply Scheme by 38,498m³. Despite this augmentation, the demand during the summer months was greater and restrictions on the water supply had to be imposed. The restrictions provided for a supply every other day.

Parallel to the restrictions the Municipality launched also a water saving campaign by publicity and the distribution of literature, urging consumers to make frugal use of water.

Water Supply Data

- Total quantity of water produced during 1984	14,79,340m ³
- Total quantity of water supplied to service reservoirs during 1984	14,36,385m ³
- Total quantity of water consumed during 1984 (As registered by consumer meters)	1,094,876m ³
- Unaccounted for water	23.77%
- Average daily summer consumption (for July- August and Sept.)	39,32m ³
- Total number of consumers on 31.12.1983	6,155No.
and on 31.12.1984	6,685No.
- Average number of consumers during 1984	6,420No.

- Average gross supply per consumer	613 l/day
- Extension of distribution system (100 mm and 200 mm diam)	3521mm.
- Total length of the distribution system as at 31.12.1984	140,748m
- Number of Fire Hydrants installed during 1984	19No.
- Total number of Hydrants installed as at 31.12.1984	84No.

GOVERNMENT REGIONAL WATER SUPPLY SCHEMES

These schemes supply water to rural population on a regional basis. Water is supplied in bulk to the service reservoir of each community and the distribution is the responsibility of the village water supply committee. These schemes are composed of the sources, balancing tanks, conveyor pipelines and associated pumping installations and are wholly financed by Government. These schemes operate with automatic control equipment. Periodic supervision as well as maintenance work are carried out by the Regional Offices of the Department.

During 1984, the following regional water ^{supply} schemes were in operation.
Paphos Lower Villages

This scheme supplies water to 21 communities, to Mesoyi Industrial Estate, Anatoliko Industrial Estate, Paphos Airport and supplements the Paphos Town water supply.

The sources of this scheme are two boreholes Nos. 57/72 and 56/75 situated in ^{the} Xeropotamos river. The total quantity of water supplied from these sources during 1984 was 697206m³. The total expenditure for the operation and maintenance of the scheme was £51796 and the revenue generated was £38286. More details on expenditure and revenue are given on Table VIII-11 below:

Table VIII-11 PAPHOS LOWER VILLAGES W.S.

Expenditure and Revenue Account for 1984

Expenditure

Electricity cost	£	45609
Maintenance expenses		6187
	Total	£ 51796

Revenue

Amount collected for 1984		30683
Outstanding accounts for 1984		7603
	Total	£38286

Outstanding accounts by 31.12.1983	20 286
Less amount collected in 1984	10 824
Total amount outstanding by 31.12.1984	£17 158

This statement does not include for the amortization of the capital expenditure of the scheme. The amortization cost of the installation is estimated at £30823 p.a. Without taking into account administration expenses and other overheads, the total deficit for the year 1984 amounts to £44333.

Arminou Regional Scheme

This scheme supplies water to eight communities. The source of this scheme is Borehole No.56/72 in Dhiarizos river near Arminou village. The total quantity of water distributed to the eight villages in 1984 was 48909m³.

The total expenditure for the operation and maintenance of this scheme was £11209 while the revenue generated for the same year was £2384. More details on revenue and expenditure are given in table VIII-12.

TABLE VIII-12 ARMINOU REGIONAL SCHEME
Expenditure and Revenue account for 1984

Expenditure

	£
Electricity cost	5 900
Maintenance expenses	5 309
Total	£11 209

Revenue

Amount collected for the year 1984	1 132
Amount outstanding for 1984	1 252
Total	£2 384

Outstanding accounts by 31.12.83	3 684
Less amount collected in 1984	246
Total	£3 438

Total amount outstanding by 31.12.84 £4 690

This statement does not include for the amortization cost of the capital expenditure of the scheme. The amortization cost of the installations is estimated at £6895 p.a. The total deficit for the year, without taking into account administration expenses and other overheads, amount to £15720 p.a.

Timi Water Supply Scheme

This scheme supplies water to Timi village only. The source is boreholde No.2821, and the total quantity of water produced during 1984 was 33049m³.

The total expenditure for the operation and maintenance of the scheme was £1892 and the revenue generated was £661.- The water is sold to this community at the price of 2.0 cent per m³.

Ambelitis Water Supply Scheme

This scheme supplies water to Ambelitis village only. The source is Kephlovrysos spring near Vrecha village. The water is conveyed to the village by a booster pump installed near the spring. The total quantity of water pumped during 1984 was 42012m³ and the total expenditure for the operation and maintenance of the scheme was £3,303.-

Amathus Scheme

This scheme has been established under the Government Water Works Law to supply water to Amathus Tourist Development Area. The scheme is administered by a committee composed of the Director General of the Ministry of Interior as chairman and the Director Generals of the Ministries of Agriculture and Natural Resources, Finance, Communications and Works and Commerce and Industry, as members. The scheme is operated by the Limassol District Engineer of the Department in cooperation with the District Officer, Limassol.

The sources of this scheme are two boreholes (Hydr. Nos 946 and 993), situated in Yermasoyia River. The total quantity of water distributed during 1984 was 441,158m³. The total cost for the operation and maintenance of the scheme was £17,134 and the revenue generated for the same year was £188,052.-

More details on expenditure and revenue are given on Table VIII-13

TABLE VIII-13 AMATHUS WATER SUPPLY SCHEME

Expenditure and Revenue account for 1984

<u>Expenditure</u>	£
Electricity Cost	11750
Maintenance expenses	5384
Total	<u>17134</u>
 <u>Revenue</u>	
Sale of water	32901
Connection fees	155151
Total	<u>£188052</u>

Moutayiaka Regional Scheme

This scheme supplies water to 10 Communities of a total population of 12850 persons. The sources of this scheme are two boreholes Nos. 64/64 and 180/59 situated in Yermasoyia River. The operation and maintenance of the scheme is the responsibility of the District Officer, Limassol. The total quantity of water produced was 571240m³ and the total quantity distributed was 544590m³, as shown below:

No.	Villages	Consumption m ³
1	Ayia Phyla	224,550
2	Polemidhia National Guard Camp	20,170
3	Ayios Athanasios	129,430
4	Moutayiaka	59,088
5	Ayios Tykhonas	31,790
6	Parekklisha	41,606
7	Moni-Moni National Guard Camp	21,150
8	Monagroulli	12,600
9	Armenokhori	2,315
10	Phinikaria	1,891
	Total	544,590

The total expenditure for the operation and maintenance of the scheme was £58920 and the revenue generated was £60000.- More details on expenditure and revenue are given on Table VIII-4

TABLE VIII- 14 MOUTAYIAKA REGIONAL WATER SUPPLY SCHEME

Expenditure and Revenue account for 1984

Expenditure

Electricity cost	£	48038
Maintenance and operation		10882
Total		58920

Revenue

Amount collected in 1984	27916
Amount outstanding for 1984	32084
Total	60000

Amount outstanding by 31.12.1983	29013
Less amount collected in 1984 in respect of water delivered before 1984	22067
Total amount outstanding by 31.12.1984	£39030

Zakaki Water Supply Scheme

This scheme supplies water to Zakaki village with a total population of 3,000 persons. The source of the scheme is borehole Hydr. No.815 situated at the outskirts of the village. The operation and maintenance of the scheme is the responsibility of Limesol Municipality. The total quantity of water supplied from this source during 1984 was 152,337 c.m.

The total expenditure for the operation and maintenance of the scheme was £11,085 and the revenue generated was £11,825.

More details on expenditure and revenue are given below:

Table VIII - 15 ZAKAKI WATER SUPPLY SCHEME

Expenditure and Revenue account for 1984

<u>Expenditure</u>	£
Electricity Cost	4,769
Maintenance and Operation Cost	6,316
Total	11,085
 <u>Revenue</u>	
Sale of water	10,735
Connection fees	1,090
Total	11,825

Yermasoyia water supply scheme

This scheme supplies water to Yermasoyia village and Potamos tis Yermasoyias with a total population of 6,000 persons during winter and 12,000 persons during summer. This scheme supplies also a number of hotels and other touristic installations in the coastal area of Potamos tis Yermasoyia.

The operation and maintenance of this scheme is the responsibility of Yermasoyia Improvement Board.

The total quantity of water produced during 1984 was 816,500m³ and the total water consumption was 656,237m³.

The total expenditure for the operation and maintenance of this scheme was £39,346 while the revenue generated was £99,735.- More details on expenditure and revenue are given on table VII-16.

TABLE VIII-16 YERMA/ SOYIA WATER SUPPLY SCHEME

Expenditure and Revenue account for 1984

Expenditure

	£
Electricity Cost	25,283
Maintenance and Operation Cost	14,063
Total	<u>£39,346</u>

Revenue

Sale of water	68,416
Amount outstanding for 1984	8,000
Connection fees	<u>23,319</u>
Total	£ 99735

IX DIVISION OF OPERATION AND MAINTENANCE (IRRIGATION)

By

N Tsiourtis
Senior Water Engineer
Head of Division

Introduction

This Division includes the Branches dealing with:

- * The management, operation and maintenance of Government Waterworks.
- * The maintenance of contributory irrigation projects

During 1984 the Division consisted of the following staff:

- 1 Senior Water Engineer - Head
- 1 Topographer Irrigation Engineer, class I
- 1 Topographer Irrigation Engineer, class II
- 1 Technical superintendent
- 2 Senior Technicians
- 1 Technician I
- 1 Chief Foreman
- 1 Technician II
- 9 Total Staff

Definitions

Government Waterworks: These are the projects constructed under the Government Waterworks Law Cap. 341. These projects are listed in Tables IX-1 and IX-7.

Projects

Contributory Irrigation/ These are projects constructed under the Irrigation Division Law Cap. 342. A list of these projects is given in Tables IX-6 and IX-6a

MANAGEMENT AND OPERATION PROCEDURES

The management and operation of the various categories waterworks are carried out as follows:

1 Government Waterworks

The management and operation of these projects are carried out by:

- (a) Waterworks Committees established according to the provision of the relevant Law. The Waterworks Committees are usually composed of the following:

Chairman

District Officer of the district in which the projects are situated

Members

Director of the Water Development Department or his representative. Director of the Land and Surveys Department or his representative. Two or more members. elected by the farmers.

The Committee is responsible for the overall administration and management of the Government Waterworks Projects such as:

- * to make recommendations on the development, conservation, management and efficient use of the available water resources of the project.
- * to manage and operate the project with a view to:
 - improve the standard of agricultural practices
 - improve the methods of irrigation
 - increase the revenue from land and water utilization to the full economic value
 - to sell the water at the nominal rates approved by the Government and see that the fees and charges are collected (See Table IX-1).

(b) The Director of the Water Development Department who undertakes to operate, manage and maintain the Government waterworks. The only projects whose operation and maintenance are with the Director of the WDD is the Paphos Irrigation Project, and the Khrysokhou Valley Project.

The Committees and the Director of WDD have their own budgets, approved by the Minister of Finance and the Council of Ministers accordingly.

The water selling rates approved by the Council of Ministers are shown on Table IX-3.

2 Contributory Irrigation Projects (Major and Small)

The operation of the contributory projects is carried out by the Irrigation Division Committees. These committees are chaired by the District Officer and members to the committees are beneficiaries elected by the general assembly meetings of the Irrigation Division beneficiaries. The Water Development Department in such cases gives technical advice both to the District Officer and to the Committees.

The costs of the operation of these oprojects is born in total by the beneficiaries.

3 Government Recharge Waterworks

These are managed directly by the Water Development Department (See Table IX-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 Division. The procedure is as follows:

A Government Waterworks: The maintenance of these projects is carried out by the Water Development Department being the Government's Agency for waterworks and the costs are both in full by the Government. By the term maintenance we mean routine dam and pipeline maintenance, valves and watermeters repair or replacements, paintings of metal works or woodworks etc.

B Contributory Irrigation Projects: The maintenance of these projects is carried out by the Water Development Department but the costs are shared between the Government and the specific Irrigation Division usually at a ratio of 2 to 1. Some maintenance or repair works are carried out by the respective I D directly.

Water Development Data

Cyprus is an island and all available water resources are those that result from overall precipitation. The total precipitation in an average year is estimated at 4,600 MCM, where 1,270 MCM/annum are lost in the form of evaporation, 900 MCM/ a are lost in the form of evapotranspiration from cultivated crops, 1,480 MCM/a are lost in the form of evapotranspiration from forest pasture and grass and irrigated crops. The annual surface runoff is estimated at 600 MCM and the groundwater and springs another 350 MCM. As it is seen from the above only 950 MCM or 21% of the total precipitation are available for development both surface and groundwater. The groundwater resources being easier to develop are at present overpumped. The annual extraction from the boreholes is estimated at 370 MCM and the total springs yield is around 30 MCM. Out of these quantities 300 MCM are used for irrigation where the rest 100 MCM are used for domestic and industrial uses.

The surface water resources being much more expensive to ^{be} developed, remained undeveloped until the beginning of the 1960's. By the beginning of 1960 the total water storage capacity of dams all over the island amounted to 6.2 MCM commanding an area of 11,400 donums of irrigated land. Soon after this (after independence) the Government

of the Republic started a construction program to develop as much as possible more surface water resources. Many projects were constructed which increased the water storage capacity of dams, to 117.5 MCM, 99.5 MCM for irrigation or domestic water supply and the rest 18.0 MCM for recharge purposes where the commanded area has risen to 120,642 donums.

Details on the projects and the rate of storage development are given in Drg. No. AG/IR/36 "Cyprus Dam Projects and Regional Development" page 22 and "progress in Dam Construction" page 27

SUMMARY OF MANAGEMENT, OPERATION AND MAINTENANCE DATA

The overall average precipitation during the hydrological year under review was 451 mm or 85% of the 40 year average of the Government controlled area, where the total volume of water available in the dams and boreholes in the Government controlled area amounted to 48.840 MCM. From this quantity 26.915 MCM was used for irrigation, 4.29 MCM was used for domestic water supplies, 4.062 MCM was used for recharge 0.747 MCM seeped through or below the dams and another 4.463 MCM was lost as evaporation. The rest 8.224 MCM remained in the dams for over year storage or lost in the distribution system or as overflow. Projects in the Turkish occupied areas are not included here as we cannot collect the necessary information.

The total area commanded by the irrigation projects is estimated at 120,642 donums where an estimated area of 56,505 donums, has been irrigated, planted with citrus, bananas, deciduous, vegetables, potatoes etc.

Maintenance works totalling £171,106 were carried out on thirty^{-three} projects. These include routine maintenance on the dam structures and the distribution systems. For the Government irrigation^{works} a total of £157,859 were spent where for the recharge works an amount of £460 was spent. The rest £12,717 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 41.635 MCM.

From this total, a quantity of 30.898 MCM or 76.3% was utilized, 23.270 MCM for irrigation, 4.429 MCM for the domestic water supply^{and} 3.199 MCM for recharge purposes. The rest of the water remained in storage or lost in the form of overflow. In the same period 3.789 MCM was lost in the form of evaporation where another 0.747 MCM were lost as seepage or deep percolation (see Table IX-1).

The irrigation water was used to irrigate fully or partly 50,055 donums of land planted with citrus, bananas, vines, deciduous, vegetables, potatoes, cereals and olives (See Table IX-2).

The gross income from the sale of water amounted to £688,686 being the income from the sale of water at the rates shown on Table IX-3. The operational expenses amounted to £215,847 being the cost for the payment of the watermen, and the bill collectors etc., which amounted to 1.0 cent/MCM of water sold or 0.7 cent/MCM of water utilized. The maintenance expenses on government projects amounted to £157,849 i.e. 0.7 cent/MCM of water sold or 0.5 cent/MCM of water utilized. The power expenses amounted to £355,186 i.e. 1.7 cent/MCM of water sold or 1.1 cent/MCM of water utilized.

The total annual operation, maintenance and power expenses amounted to £728,892 which amounts to 3.4 cent/MCM of water sold or 2.4 cent/MCM of water utilized.

Evaporation losses from the reservoirs amounted to 3.789 MCM or 9.1% of the total storage capacity available. The seepage losses were estimated at 0.747 MCM or 1.8% of the total storage, mostly from the Polemidhia and Yermasoyia dams.

The overall water utilization and land utilization indexes are 74.2% and 65.2% respectively. Of the 23.270 MCM used for irrigation 21.210 MCM was sold at the nominal rates, (91.1%) where the rest 2.060 MCM, (8.9%) was given free of charge as water rights or overflows.

A summary of the above data in detail is given in Tables IX-1, IX-4, and IX-5 where more details are given for each project under separate headings.

Table IX-5 gives data on the operation and maintenance of the government irrigation projects for the last 10 years.

Table IX-8 gives data on the operation and maintenance for the last two years.

Contributory Irrigation Projects

In general there are 69 contributory irrigation projects with total capacity 9.351 MCM commanding an area of 43,832 donums. Nine projects of total capacity 5.296 MCM or 56.5% of the total capacity of contributory schemes, commanding an area of about 23,668 donums are situated in the Turkish occupied area and on which no data are collected. Forty one projects of total capacity 2,193 MCM, commanding an area of 7,459 donums, belong to the Pitsilia Project. During the year under review the total water collected from ^{all} the contributory schemes amounted to 4.167 MCM out of which 3.645 MCM were used for the irrigation of 6,450 donums where the rest were lost in the form of evaporation or remained in the dams/ponds for over year storage. See Tables IX-6 and IX-7, for details.

Recharge Works

On the island there are about 32 recharge works of total capacity 18.063 MCM. Out of these projects 19 of the total capacity 15.694 MCM or 86.9% of the total recharge capacity are situated in the Turkish occupied areas. On these, no government control is possible and no data on their use is available. For the projects in the Government controlled area no water was collected for the year under review. For information on individual projects in the Government control areas see Tables IX-7 and IX-11.

COST OF OPERATION ON SOME GOVERNMENT PROJECTS

The operational cost of a number of important projects are shown on Table IX-9 This Table shows the running costs (O+M and Power) and the unit cost of water.

TABLE IX-1 GOVERNMENT IRRIGATION PROJECTS - DATA FOR 1984

Ser. No.	Project	Capacity M ³ x10 ³	Area Commanded domms	Water Available for Utilization M ³ x10 ³	Water available from other resources M ³ x10 ³	Total water available M ³ x10 ³	Water used for irrigation M ³ x10 ³	Water used for D.W.S. M ³ x10 ³	Water used for recharge M ³ x10 ³	Total Quantity used M ³ x10 ³	Evaporation Losses M ³ x10 ³	Seepage Losses M ³ x10 ³	Area irrigated domms	Water Utilized Index %	Land Utilized Index %
1	Argaka	990	2 340	1 555	143	1 698	1 288	NIL	NIL	1 288	78	4	1 649	75.9	70.5
2	Ayia Marina	300	1 500	354	-	354	309	NIL	NIL	309	27	22	248	87.3	16.5
3	Kalopanayiotis	363	435	550	-	550	261	NIL	NIL	261	32	150	450	47.4	103.4
4	Kiti	1 610	6 200	NIL	NIL	NIL	NIL	NIL	NIL	NIL	NIL	NIL	NIL	NIL	NIL
5	Lefkara **	13 850	615	2 088	-	2 088	66	1 692	NIL	1 758	191	21	130	84.2	21.1
6	Pomos	860	2 850	1 040	109	1 149	888	NIL	NIL	888	68	107	942	77.3	33.0
7	Polemihia) 3 430)														
8	Yermasoyia) 13 500)		15 440	10 925	2 582	13 507	3 969	2 737	3 199	9 905	936	251	15 440	48.3	100.0
9	Athalassa	791	310	NIL	-	NIL	NIL	NIL	NIL	NIL	NIL	NIL	NIL	NIL	NIL
10	Paphos	53 180	38 355	26 414	5 994	32 408	14 473	NIL	NIL	14 473	2 353	52	25 119	76.1	65.5
11	Kha-Potami	- 1	4 235	1 202	-	1 202	1 202	NIL	NIL	1 202	-	-	4 235	100.0	100.0
12	Khrysokhou Valley	- 2	1 770	447	-	447	447	NIL	NIL	447	-	-	892	100.0	50.4
13	Ayios Theodoros (Larnaca)	- 2	460	56	-	56	56	NIL	NIL	56	-	-	250	100.0	54.3
14	Xyliatos	1 220	2 300	1 560	-	1 560	311	NIL	NIL	311	104	140	700	19.9	30.4
Total		90 094	76 810	46 191	8 828	55 019	23 270	4 290	3 199	30 898	3 789	747	50 055	74.2	65.2

* This is the water that possibly may be utilized: storage+overflow or seepage that may be utilized after deducting evaporation and seepage losses.

** Water allocated mainly for water supply.

- 1 Diversion on river
- 2 Groundwater scheme

TABLE IX-2 - CROPS AND AREAS IRRIGATED BY GOVERNMENT IRRIGATION PROJECTS

Ser. No.	Crop	Area in donums
1	Citrus	13 990
2	Bananas	3 596
3	Vines	11 233
4	Deciduous	871
5	Vegetables	6 214
6	Potatoes	2 968
7	Cereals	148
8	Olives	158
9	Ground-Nuts	4 454
10	Legumes	3 229
11	Tobacco.....	460
12	Avocatos.....	439
13	Onions	323
14	Melons	611
15	Alfa-Alfa	624
16	Other	737
	Total	<hr/> 50 055

TABLE IX-3 - GOVERNMENT IRRIGATION PROJECTS AND APPROVED WATER CHARGES IN CENT/M³

Ser. No.	Project	Overflow	Industrial	Flat Rate
1	Argaka	Free	-	2.5
2	Ayia Marina	-	-	2.5
3	Kalopanayiotis	-	-	3.0
4	Kiti	-	-	-
5	Lefkara	-	-	3.0
6	Pomos	0.5	-	2.5
7	Polemidhia	-	-	2.7, 3.0, 3.5
8	Yermasoyia	-	-	2.7, 3.0, 3.5
9	Athalassa	-	-	-
10	Paphos	-	10,13	2.5, 3.0, 3.5
11	Kha-Potami	-	-	Free
12	Khrysokhou Valley	-	-	3.5, 4.0
13	Ayios Theodoros	-	-	Free
14	Xyliatos	-	-	3.0

TABLE IX-4 DATA ON MANAGEMENT, OPERATION AND MAINTENANCE OF GOVERNMENT IRRIGATION PROJECTS

Ser. No.	Project	Dam reservoir capacity	Area command	Water available in storage	Water available from other resources	Total available water	Water used	Water used for irrigation	Gross income	Power	Expenditure		Total	Net Income	
											Operat.	Maint.			
1	Argaka	990	2 340	1 555	143	1 698	1 288	901	1 649	-	11 927	3 191	15 118	7 418	
2	Ayia Marina	300	1 500	354	-	354	309	309	248	-	4 068	1 296	5 364	2 356	
3	Kalopanayiotis	363	435	550	-	550	261	261	450	-	2 743	898	3 641	4 184	
4	Kiti	1 610	6 200	NIL	NIL	NIL	NIL	NIL	NIL	-	NIL	NIL	NIL	NIL	
5	Lefkara	13 850	615	2 088	-	2 088	1 758	66	130	*	1 955	1 955	1 955	28	
6	Pomos	860	2 850	1 040	109	1 149	888	888	942	-	13 344	3 214	16 558	3 870	
7	Polemihia	3 430)													
8	Yermascyia	13 500)	15 440	10 925	2 582	13 507	9 905	3 554	15 440	60 471	69 985	20 529	150 985	-47 115	
9	Athalassa	791	310	NIL	NIL	NIL	NIL	NIL	NIL	-	NIL	97	97	-97	
10	Paphos	53 180	38 355	26 414	5 994	32 408	14 473	14 473	25 119	283 628	101 308	121 896	506 832	-7 542	
11	Kha-Potami	- 1	4 235	1 202	-	1 202	1 202	NIL	4 235	-	-	790	790	-790	
12	Khrysokhou Valley	- 2	1 770	447	-	447	447	447	892	11 087	4 479	4 110	19 676	-4 022	
13	Ayios Theodoros (Larnaca)	- 2	460	56	-	56	56	NIL	250	-	**	-	7 772	1 608	
14	Xyliatos	1 220	2 300	1 560	-	1 560	311	311	700	-	4 977	2 795	7 772	-	
	Total	90 094	76 810	46 191	8 828	55 019	30 898	21 210	50 055	688 686	355 186	212 831	160 771	728 788	-40 102

* These costs are included in the Lefkara dam in the Report on D.W.S.

** All the expenses were undertaken by the irrigators

1 Diversion on river

2 Groundwater scheme

TABLE IX-5 DATA ON WATER USE FOR THE LAST 10 YEARS FOR THE GOVERNMENT PROJECTS

Ser. No.	Description	Unit	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984
1	Capacity	1000m ³	37 890	37 890	37 890	38 061	37 874	37 874	37 874	89 874	90 094	90 094
2	Water available	"	27 612	28 000	32 003	27 380	28 282	34 408	50 660	35 278	37 441	55 019
3	Water utilized for irrigation	"	7 776	8 388	9 704	9 457	10 847	27 109	19 634	20 858	21 814	23 270
4	Water used for DWS	"	1 000	1 365	2 058	2 856	2 936	2 210	3 356	4 793	3 831	4 429
5	Water used for recharge	"	NA	6 016	3 323	1 982	1 623	6 579	14 627	2 648	2 999	3 199
6	Total water used	"	8 776	15 769	15 085	14 295	15 426	23 609	37 617	28 299	28 644	30 898
7	Evaporation losses	"	2 854	2 570	2 662	2 683	2 409	2 587	2 618	2 646	3 218	3 789
8	Seepage losses	"	NA	428	359	3 367	1 024	5 087	5 424	973	873	747
9	Water sold	"	60 600	73 747	93 485	8 447	12 642	11 748	18 644	19 542	20 101	21 210
10	Gross income	£	5 522	6 624	7 999	101 367	128 281	169 418	253 307	433 214	520 441	688 686
11	Power cost	£	-	-	-	-	-	-	117 689	215 577	247 838	355 186
12	Operation cost	£	12 619	18 627	34 500	33 592	55 197	84 496	207 738	119 906	264 039	212 831
13	Maintenance cost	£	3 174	4 496	8 059	8 165	7 202	18 563	50 539	76 131	100 069	160 771
14	Total expenditure	£	15 793	23 123	42 559	41 757	62 399	103 059	258 277	411 614	611 946	728 788
15	Net income	£	44 808	50 264	50 926	59 610	65 882	68 159	-4 838	21 600	-91 505	-40 102
16	Area irrigated	Donums	12 458	17 376	15 459	14 905	20 084	27 109	37 340	39 509	45 678	50 055

TABLE IX-6 DATA ON CONTRIBUTORY IRRIGATION WORKS

Ser. No.	Project	Capacity M ³ /10 ³ h	Yield M ³ /h	Area commanded donums	Water available for utilization M ³ /10 ³	Water used for irrigation M ³ /10 ³	Water used for DWS M ³ /10 ³	Water used for recharge M ³ /10 ³	Total quantity used M ³ /10 ³	Evaporation Losses M ³ /10 ³	Seepage Losses M ³ /10 ³	Area irrigated donums
1	Akrounda	22	-	60	22	20	-	-	20	2	-	25
2*	Galini	22	-	1 300	-	-	-	-	-	-	-	-
3*	Geyneli	1 000	-	850	-	-	-	-	-	-	-	-
4*	Gypsos	113	-	638	-	-	-	-	-	-	-	64
5	Kalo Khorio (Klirou) ..	32	-	1 350	29	29	-	-	29	3	-	67
6	Kandou	38	-	563	33	30	-	-	30	3	-	-
7*	Kanli	1 100	-	4 000	-	-	-	-	-	-	-	-
8*	Lefka Marathasa	368	-	1 300	368	331	-	-	331	37	-	414
9*	Lefka Kafizes	113	-	770	113	102	-	-	102	11	-	128
10	Lymbia	220	-	940	117	117	-	-	117	55	-	55
11	Lythrodontas Upper. ..	32	-	115	16	14	-	-	14	2	-	31
12	Lythrodontas Lower ...	32	-	115	32	29	-	-	29	3	-	64
13*	Mia Milea	330	-	1 300	-	-	-	-	-	-	-	-
14*	Morphou	2 000	-	6 740	-	-	-	-	-	-	-	-
15*	Ovgos	250	-	6 370	-	-	-	-	-	-	-	-
16	Pakhyamos	43	-	400	33	30	-	-	30	3	-	67
17	Palekchori (Kambi)	620	-	1 000	620	558	-	-	558	62	-	698
18	Pera Pedhi	55	-	195	55	49	-	-	49	6	-	61
19	Petra Upper	10)	-	4 690	10	9	-	-	9	1	-	69
20	Petra Lower	25)	-	170	25	22	-	-	22	3	-	-
21	Prodromos	110	-	1 600	77	69	-	-	69	8	-	92
22	Pyrgos	283	-	1 600	283	255	-	-	255	28	-	283
23	Trimiklini	340	-	650	340	306	-	-	306	34	-	382
24	Kalavasos B/H	-	60	288	24	24	-	-	24	-	-	71
25	Skarinou B/H	-	48	153	32	32	-	-	32	-	-	130
26	***Kambos	-	70	270	11	11	-	-	11	-	17**	16
27	***Chakistra	-	70	330	39	39	-	-	39	-	23**	56
28	***Yerakies	-	70	216	13	13	-	-	13	-	3**	19
Total		7 158	318	36 373	2 295	2 089	-	-	2 089	261	44	2 792

* Project in Turkish occupied areas
 ** Losses in pumping main, regulating reservoirs and pipe system
 *** River Diversion with dual pumping stage scheme

TABLE IX-6a DATA ON CONTRIBUTORY IRRIGATION WORKS OF THE PITSILIA PROJECT

Ser. No.	Project	Capacity m ³ /10 ³	Annual Pumpage m ³ /10 ³	Area Commanded acres	Water available for utilization m ³ /10 ³	Water used for irrigation from canals m ³ /10 ³	Water used for irrigation from boreholes m ³ /10 ³	Water used for DWS m ³ /10 ³	Total quantity used m ³ /10 ³	Evaporation and Other losses m ³ /10 ³	Area irrigated acres
1	Agros Dam & R/H	72	70	354	90	27	63	-	90	3	204
2	Azapou-Ephtagoria Pond	132	-	185	100	83	-	-	83	2	134
3	Arakapas Dam	128	-	219	150	150	-	-	150	19	207
4	Arakapas I	192	-	285	92	30	-	-	30	30	51
5	Arakapas II	55	-	180	43	94	-	-	94	11	188
6	Ayii Vavatsinias (dam)	55	-	150	45	49	-	-	49	11	94
7	Ayii Vavatsinias (pond)	92	-	150	81	66	-	-	66	22	104
8	Ephtagoria I	127	-	175	21	21	-	-	21	6	33
9	Ephtagoria II	65	-	90	21	36	-	-	69	20	160
10	Ephtagoria III	104	62	300	117	82	33	-	82	13	140
11	Kato Mylos pond & B/H	70	-	140	82	34	-	-	34	10	80
12	Khandria	53	-	80	40	34	-	-	222	40	493
13	Kyperounda I	273	-	516	222	222	-	-	1	7	3
14	Kyperounda II	70	-	149	36	1	-	-	29	12	52
15	Lagoudera	59	-	110	32	29	-	-	9	11	21
16	Melini	59	-	92	28	9	-	-	108	19	251
17	Agriidhia	123	160	480	121	75	33	-	19	-	30
18	Pelendria pond & B/H	-	-	92	19	-	19	-	79	-	127
19	Arakapas B/H "Angoulos"	-	90	180	79	-	79	-	13	-	27
20	Arakapas B/Hs "Scoli"	-	15	63	13	-	13	-	54	-	135
21	Polystypos B/H	-	120	198	54	-	54	-	63	-	154
22	Potamitissa B/Hs	-	125	393	63	-	63	-	-	-	94
23	Kalon Khorion B/Hs	-	65	94	**	-	-	-	-	-	110
24	Ayios Theodoros B/Hs	62	42	135	63	63	-	-	63	8	-
	Cra Pond & B/Hs	-	-	-	-	-	NIL	-	-	-	-

TABLE IX-6a DATA ON CONTRIBUTORY IRRIGATION WORKS OF THE PITSILIA PROJECT

Ser. No.	Project	Capacity M ³ X10 ³	Annual Pumpage M ³ X10 ³	Area Commanded donums	Water available for utilization M ³ X10 ³	Water used for irrigation from dam M ³ X10 ³	Water used for irrigation from boreholes M ³ X10 ³	Water used for DWS M ³ X10 ³	Total quantity used M ³ X10 ³	Evaporation and other losses M ³ X10 ³	Area irrigated donums
25	Pharmakas I	21	-	135	13	1	-	-	1	4	14
26	Pharmakas II	61	-	190	21	5	-	-	5	4	12
27	Arakapas II	119	-	62	39	6	-	-	6	17	9
28	Ayii Vavatsinias II	44	-	300	3	NIL	-	-	NIL	2	NIL
29	Dhieron I	159	-	95	51	11	-	-	11	17	18
30	Dhieron B/H	-	54	90	2	-	2	-	2	-	3
31	Sykopetra B/H	-	45	300	-	-	-	-	-	-	-
32	Ayios Konstantinos B/Hs	-	116	265	32	-	32	-	32	-	60
33	Louvaras B/Hs	-	140	100	41	-	41	-	41	-	78
34	Ayii Vavatsinias B/H	-	50	160	-	-	-	-	-	-	-
35	Askas B/H	-	60	75	29	-	29	-	29	-	66
36	Alona B/H	-	50	45	1	-	1	-	1	-	2
37	Lagoudhera B/H	-	25	80	-	-	-	-	-	-	-
38	Agros B/H	-	82	198	-	-	-	-	-	-	-
39	Dhymes B/H	-	80	504	-	-	-	-	-	-	-
40	Kato Amiantos Scheme	-	56	100	-	-	-	-	-	-	504
41	Zoopiya B/H	-	49	-	-	-	-	-	-	-	-
Total		2 193	1 606	7 459	1 872	1 094	462	-	1 556	298	3 658

* Some quantity of the water from the borehole was given for DWS
 ** Water utilization from the river flow
 *** Borehole and River Diversion Combined Scheme

TABLE IX-7

RECHARGE WATERWORKS DATA

Ser. No.	Project	Capacity $m^3 \times 10^3$	Water available $m^3 \times 10^3$	Water used for recharge $m^3 \times 10^3$	Water lost in evaporation $m^3 \times 10^3$
1*	Kouklia	4 545	-	-	-
2*	Ayios Loucas	455	-	-	-
3	Sotira	77	64	58	6
4	Paralimni Panayia	45	5	4	1
5	Paralimni	115	115	104	11
6	Ayia Napa	55	39	35	4
7*	Famagusta Antiflood	50	-	-	-
8	Phrenaros	160	40	36	4
9	Dherinia	23	17	15	2
10	Avgorou	68	41	37	4
11*	Kondea	82	-	-	-
12	Xylophaghou	86	22	20	2
13*	Lysi	77	-	-	-
14*	Ayios Yeoryios (K)	68	-	-	-
15*	Ayios Epiktitos	34	-	-	-
16*	Akanthou	45	-	-	-
17	Akhna	40	30	27	3
18	Xylotymbou	50	50	45	5
19*	Syngrasis	1 115	-	-	-
20*	Ayios Yeoryios (F)	190	-	-	-
21*	Famagusta Recharge	165	-	-	-
22*	Ayios Nicolaos Fam.	1 365	-	-	-
23	Paralimni Lake	1 365	300	270	30
24*	Fresh Water Lake	4 545	-	-	-
25*	Makrasyka	195	-	-	-
26*	Akhna Mesania	90	90	81	9
27	Vrysoulles Fam.	140	-	-	-
28*	Morphou Recharge	130	-	-	-
29*	Morphou Protopapas	90	-	-	-
30	Ormidhia (Vathys)	100	100	90	10
31*	Masari	2 273	-	-	-
32	Liopetri	325	46	41	5
Total		18 063	959	863	96

* Projects in Turkish occupied area. Gate constantly open for recharge

TABLE IX-8 - DATA ON MANAGEMENT AND OPERATION OF GOVERNMENT IRRIGATION PROJECTS
FOR THE LAST TWO YEARS

Item No.	Data	Unit	1983	1984	% change on 1983
1	Capacity	1000 m ³	90 094	90 094	NIL
2	Water available	"	37 441	41 635	+ 11.2
3	Water utilized for irrigation	"	21 814	23 270	+ 6.7
4	Water utilized for DWS	"	3 831	4 429	+ 15.6
5	Water utilized for recharge	"	2 999	3 199	+ 6.7
6	Total water used	"	28 644	30 898	+ 7.9
7	Evaporation losses	"	3 218	3 789	+ 17.7
8	Seepage losses	"	873	747	- 14.4
9	Water sold	"	20 101	21 210	+ 5.5
10	Gross income	£	520 441	688 686	+ 32.3
11	Power cost	£	247 838	355 186	+ 43.3
12	Operation cost	£	264 039	212 831	- 19.4
13	Maintenance cost	£	100 069	160 771	+ 60.7
14	Total expenses	£	611 946	728 788	+ 19.1
15	Net income	£	-91 505	-40 102	-
16	Area irrigated	donums	45 678	50 055	+ 9.6
17	Area commanded	"	76 810	76 810	NIL

TABLE IX- 9 - GOVERNMENT IRRIGATION PROJECTS - COST OF WATER

Ser. No.	Project	Water sold	Total water utilized	Operation & Maintenance cost	Power cost	Total annual cost	Cost of water sold	Cost of water total utilized
		m ³	m ³	£	£	£	water	utilized
1	Argaka	901 424	1 287 827	15 118	-	15 118	1.7	1.2
2	Ayia Marina	308 820	308 820	5 364	-	5 364	1.7	1.7
3	Kalopanayiotis	260 840	260 840	3 641	-	3 641	1.4	1.4
4	Kiti	NIL	NIL	NIL	-	NIL	NIL	NIL
5	Pomos	888 500	888 500	16 662	-	16 662	1.9	1.9
6	Polemihia)							
7	Yermasoyia }	3 554 445	9 904 902	89 990	57 236	147 226	3.6	1.3
8	Paphos	14 472 741	14 472 741	223 204	283 628	506 832	3.5	3.5
9	Khrysokhou valley	446 897	446 897	8 589	11 087	19 676	4.4	4.4
10	Xyliatos	311 145	311 145	7 772	-	7 772	2.5	2.5
	Total	21 144 812	27 881 672	370 340	351 951	722 291	3.4	2.6

1 It does not include capital cost

TABLE IX - 10 - CONTRIBUTORY IRRIGATION WORKS - MAINTENANCE COST

Ser. No.	Project	Maintenance cost		
		Govt Contrib. £	I D Contrib. £	Total Cost £
1	Perapedhi (special case	8000	-	8000
2	Pakhyammos Dam (special case) ..	292	-	292
3	Petra Dam (specail case)	40	20	60
4	Pyrgos Dam	665	333	998
5	Kalokhorio Dam	107	53	160
6	Lythrodhonda Dams	40	20	60
7	Kambos)			
8	Chakistra)	1800	-	1800
9	Yerakies)			
	Total	10944	426	11370

CONTRIBUTORY IRRIGATION WORKS - MAINTENANCE DETAILS

1. Perapedhi Dam

Emergency desilting operation, repairing of grille and replacing of axle of penstock. Constructing of a permanent access road leading to the upstream tip of the reservoir. Maintaining and treating with Evode of all underwater metal structures. Operating of Government Borehole No. 190/82 to boost up irrigation during the desilting operation.

2. Pakhyammos Dam

Cleaning of embankment and painting of all metal structures.

3. Petra Dams

Maintaining of penstocks and gear boxes

4. Pyrgos Dam

Replacing and installing of a new axle and repairing of grille. Desilting of the area around penstock. Repairing of perforated outlet pipe and cleaning of perforations.

5. Kalokhorio Dam

Constructing and installing of a metal ladder.

6. Lythrodhondas Dams

Maintaining of penstocks and gearboxes.

7. Kambos, Chakistra, Yerakies

Repairs of electric circuits, pipings and machinery. Purchase of "Dry run auto device" pipe accessories

TABLE IX -10a - CONTRIBUTORY IRRIGATION WORKS OF THE PISTILIA PROJECT
MAINTENANCE COST

Ser. No.	Project	Maintenance cost		Total cost £
		Govt Contrib. £	I D Contrib. £	
1	Arakapas Dam	-	-	150
2	Khandria Pond	-	-	250
3	Pelendria Pond and Borehole	-	-	750
4	Kato Mylos Pond and Borehole	-	-	300
5	Kyperounda Pond II	-	-	690
6	Agridhia Pond	-	-	210
7	Ora Pond and Boreholes	-	-	50
8	Kyperounda I	-	-	300
9	Potamitissa Boreholes	-	-	102
10	Akapnou-Ephtagonia Pond	-	-	300
11	Melini Pond	-	-	25
12	Ayii Vavatsinias Pond I	-	-	90
	Total	-	-	3217

CONTRIBUTORY IRRIGATION WORKS OF THE PITSILIA PROJECT
MAINTENANCE DETAILS

1. Arakapas Dam
 Repairing of water meter and painting of metalworks.
2. Khandria Pond
 Cleaning of drainage ditch channels and repairing of main sluice valve.
3. Pelendria Pond and Borehole
 Repairing of the bank of the reservoir and main watermeter
4. Kato Mylos Pond and Borehole
 Repairing of pump, watermeter and the bank of the pond.
5. Kyperounda Pond II
 Repairing of the bank, the road and the diversion pipeline.

6. Agridhia Pond
Repairing of the bank of the pond and watermeter. Cleaning of drainage ditch channels.
7. Ora Pond and Boreholes
Repairing of main pipeline
8. Kyperounda Pond I
Repairing of the bank of the Pond
9. Potamitissa Borehole
Repairing of balancing tank and pump
10. Akapnou-Ephtagonia Pond
Repairing of main pipeline and watermeter
11. Melini Pond
Repairing of Flow Regulator
12. Ayii Vavatsinias Pond I
Repairing of watermeter

TABLE IX-II - RECHARGE WATERWORKS - MAINTENANCE COST

Ser. No.	Project	Maintenance Cost £
1	Yialia Recharge (Potamia Gabbion Weir)	460

RECHARGE WATERWORKS - MAINTENANCE DETAILS

1. Yialias Recharge
(Potamia Gabbion Weir)
Desilting and ripping of reservoir

DETAILS ON OPERATION OF GOVERNMENT IRRIGATION PROJECTS

ARGAKA PROJECT

The Argaka Irrigation Project consists of a dam reservoir of maximum capacity at spillway crest 0.990 MCM and a distribution system made of closed conduits commanding an area of 2,340 donums. Irrigation in the Project area started late in January and lasted until early in November, 1984. An area of 1,649 donums was irrigated by utilizing about 1.288 MCM of water.

The area irrigated was planted with citrus, bananas, vines, deciduous, vegetables, cereals and tobacco. Out of the 1.288 MCM of water utilized 901,424 m³ were sold to the farmers at the nominal rates and an amount of 386,403 m³ was taken from the overflow, free of charge. The gross income from the sale of water was £22,536. The expenditure of management was £11,927 where that of maintenance amounted to £3,191. Net income to the Project was £7,418.

Project Hydrology

The project hydrologic data, as recorded during the year, are tabulated on Table IX-12. The dam reservoir was filled to spillway crest on February 25th and overflow continued until May 17th 1984. The overspilled quantity could not be measured. The minimum level of water in storage ever reached was in October with total quantity in storage around 18,500 m³.

TABLE IX -12 - ARGAKA DAM-HYDROLOGY FOR 1984

Item No.	Description	Quantity m ³	% Storage capacity
1	Intitial amount in storage	136 020	13.7
2	Inflow-Seepage-Overflow	1 500 694	151.6
3	Total release	758 828	76.6
4	Leakages	3 663	0.4
5	Evaporation	78 494	7.9
6	Overflow	not measured	-
7	Final amount in storage	359 600	36.3
8	Minimum quantity in storage (Oct.)	18 500	1.9
9	Storage capacity	990 000	100.0

Water Utilization and Crops Irrigated

The project is built for irrigation purposes and as such, a quantity of 1,287,827 m³ of water was utilized for the irrigation of 1,649 donums of land planted with various crops as indicated in Table IX-14.

Table IX-13 shows the utilization of the project water and Table IX-14 shows the crops irrigated.

TABLE IX-13 - ARGAKA DAM - WATER UTILIZATION

Item No.	Description	Quantity m ³	% Storage capacity
1	Water used for irrigation from dam	1 145 231	115.7
2	Water used for irrigation from boreholes	142 596	14.4
3	Water used for recharge	NIL	NIL
4	Total water utilized	1 287 827	130.1

TABLE IX - 14 - ARGAKA DAM - CROPS IRRIGATED

Ser. No.	Crop	Area Donums
1	Citrus	704
2	Bananas	380
3	Vines	30
4	Deciduous	110
5	Vegetables	160
6	Tobacco	60
7	Cereals	120
8	Other	85
	Total	1649

Water Sale, Income, Operation and Maintenance Cost

The total quantity utilized for irrigation, water released from the dam reservoir, water pumped from the boreholes and water taken from overflow, amounted to 1,287,827 m³. Out of the 901,424 m³ was sold to the farmers at the nominal rates and the rest 386,403 m³ was given free of charge because it was taken from the overflow. From the sale of water a total of 22,536 was collected. For the operation of the project an amount of 11,927 was paid to the water men and bill collectors where for the maintenance of the project another 3,191 was spent. The maintenance works carried out during 1984 were the following; Cleaning of embankment from wild vegetation. Repairing of main ball valve. Replacing and repairing of sluice valves. Painting of all manhole covers and the metal structures. Maintaining of 16" dia sluice valves.

Net income for the benefit of the project is £7,418. All the data concerning water sale, operation and management costs are shown on Table IX-17.

TABLE IX-15

ARGAKA DAM - INCOME AND EXPENDITURE DATA

Item No.	Description	Quantity m ³	Amount £
1	Water sold at nominal rates	901 424	22 536
2	Water sold at reduced rates	Nil	Nil
3	Water given free of charge*	386 403	Nil
4	Total quantity utilized and gross income	1 287 827	22 536
5	Operation cost	-	11 927
6	Maintenance cost	-	3 191
7	Net income	-	7 418

* This quantity was taken from the overflow

Project performance for the last two years

Table IX-16 shows the performance of the project for the last two years. As shown there was a small increase in the total volume of water used for irrigation by 26.4% and the area irrigated was increased by 13.7%. The net income to the project was decreased by 22.4%.

TABLE IX-16 ARGAKA DAM - DATA ON PROJECT FOR THE LAST TWO YEARS

Item No.	Data	Unit	1983	1984	% Change on 1983
1	Capacity	1000 m ³	990	990	NIL
2	Water available in storage	"	1 235	1 555	+25.9
3	Water utilized for irrigation ..	"	1 019	1 288	+26.4
4	Water sold	"	893	902	+0.9
5	Water given free	"	136	386	+103.8
6	Water used for recharge	"	126	Nil	-
7	Gross income	£	18 810	22 536	+19.8
8.	Operation cost	£	7 696	11 927	+55.0
9	Maintenance cost	£	1 559	3 191	+104.7
10	Total expenses	£	9 255	15 118	+63.3
11	Net income	£	9 555	7 418	-22.4
12	Area irrigated	donums	1 450	1 649	+13.7

AYIA MARINA PROJECT

The Ayia Marina Irrigation Project consists of a dam reservoir of capacity at spillway crest of 0.300 MCM and a distribution system commanding an area of 1,500 donums. The distribution system consists of a main conduit at the terminal of which tertiary pipes branch-off to distribute water to each individual plot. Irrigation in the project area started early in January 1984 and continued throughout the year until late in October. An area of 248 donums was irrigated by utilizing about 0.309 MCM. The area irrigated was planted with, citrus, bananas, and vegetables. The water utilized was sold to farmers at the approved rates. The total gross income from the sale of water amounted to £7,720. The expenditure for the operation was £4,068 and that for maintenance £1,296. Net income to the project was £2,356.

Project Hydrology

The project hydrologic data as recorded during the year, are tabulated on Table IX -17. .

The dam was not filled up to the spillway crest. The maximum quantity stored was 281,000 m³ on the 4th of May 1984. Minimum quantity of water ever stored during the year under review, was 15,160 m³ and this occurred in November 1984.

TABLE IX-17 - AYIA MARINA DAM - HYDROLOGY FOR 1984

Item No.	Description	Quantity m ³	% Storage capacity
1	Initial amount in storage	54 830	18.3
2	Inflow - Seepage	348 372	116.1
3	Total release	308 820	102.9
4	Leakages	22 463	7.5
5	Evaporation	26 813	8.9
6	Overflow	Nil	Nil
7	Final amount in storage	45 380	15.1
8	Minimum quantity in storage (Nov.)	15 160	1.7
9	Storage capacity	300 000	100.0

Water Utilization and Crops Irrigated

During the year under review, a total quantity of 308,820 m³ of water was utilized for the irrigation of approximately 248 donums planted with various crops. Details about the water utilization and the crops irrigated and their extent are shown in Tables IX-18 and IX-19.

TABLE IX-18

AYIA MARINA DAM - WATER UTILIZATION

Item No.	Description	Quantity m ³	% Storage capacity
1	Water used for irrigation	308 820	102.9
2	Water used for recharge	NIL	NIL
3	Total water utilized	308 820	102.9

Water Sale, Income, Operation and Maintenance Costs

From the sale of 308,820 m³ of water, the gross income to the project, amounted to £7,720. Management and operation expenses being the wages of the water man and that of the dam attendant, amounted to £4,068. Maintenance cost of the dam and the distribution system was £1,296. The maintenance works carried out during 1984 were the following: Cleaning of embankment from wild vegetation. Painting of all metal structures. Painting of woodwork of the guarshouse and repairs to plumbing. Repairing of breakages of mains. Replacing and repairing of sluice valves. Constructing of one protective grille. Net income to the project was £2,356. Details regarding sale of water, income and costs are given on Table IX-20.

TABLE IX-19 - AYIA MARINA DAM - CROPS IRRIGATED

Ser. No	Crop	Area donums
1	Citrus	85
2	Bananas	80
3	Vegetables	65
4	Other	18
	Total	248

TABLE IX -20 - AYIA MARINA DAM - INCOME AND EXPENDITURE DATA

Item No.	Description	Quantity m ³	Amount £
1	Water sold at nominal rates	308 820	7 720
2	Water sold at reduced rates	NIL	NIL
3	Water given free of charge	NIL	NIL
4	Total quantity utilized and gross income	308 820	7 720
5	Operation cost	-	4 068
6	Maintenance cost	-	1 296
7	Net income	-	2 356

Project Operation Data for the last two years

Table IX-21 shows data on the operation of the project for the last two years. The water utilization shows an increase by 20.2% where the net income by 412.2%. The total expenditure showed an increase by 8.1%. The area under irrigation was decreased by 3.1%.

TABLE IX- 21

AYIA MARINA DAM-DATA ON PROJECT FOR THE LAST TWO YEARS

Item No	Data	unit	1983	1984	% Change on 1983
1	Capacity	1000 m ³	300	300	Nil
2	Water available in storage .	"	348	354	+1.7
3	Water utilized for irrigation	"	257	309	+20.2
4	Water sold	"	257	309	+20.2
5	Water given free	"	Nil	Nil	Nil
6	Water used for recharge	"	Nil	Nil	Nil
7	Gross income	£	5 423	7 720	+42.4
8	Operation cost	£	3 965	4 068	+ 2.6
9	Maintenance cost	£"	998	1 296	+29.9
10	Total expenses	£	4 963	5 364	+ 8.1
11	Net income	£	460	2 356	+412.2
12	Area irrigated	donums	256	248	-3.1

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 in May 1984 and continued throughout the year until the end of October 1984. During this period, a total quantity of 260,840 m³ of water was used for the irrigation of an area of approx. 450 donums planted mainly with deciduous, citrus and olive trees. The water was sold to the farmers at a fixed rate of 3.0 cent/m³. The gross income was £7,825. The operation expenses were £2,743 while the maintenance cost spent on routine works and emergency repairs, was £898. The project accounts presented a profit of £4,184.

Project Hydrology

The project hydrologic data, as recorded during the year under review, are tabulated in Table IX-22. The dam scouring gate was opened on the 9th of January and closed on the 24th of February. Overflow over the spillway crest occurred two times. The first occurred during the period 1st-9th January, 1984. The second lasted from 5th March to 21st May. The smallest quantity ever remained in the reservoir during the irrigation season, was 22,800 m³ and occurred in October, 1984.

TABLE IX-22

KALOPANAYIOTIS DAM
HYDROLOGY FOR 1984.

Item No	Description	Qty m ³	% Storage capacity
1	Initial amount in storage	363 000	100.0
2	Inflow - Seepage	345 714	95.2
3	Total release	260 840	71.9
4	Leakages	150 000*	41.3
5	Evaporation	32 031	8.8
6	Overflow	144 633	39.8
7	Final amount in storage	280 000	77.1
8	Minimum quantity in storage (Oct.)	22 800	6.3
9	Storage capacity	363 000	100.0

* Roughly estimated

TABLE IX- 23

KALOPANAYIOTIS DAM - WATER UTILIZATION

Item No	Description	Qty m ³	% Storage capacity
1	Water used for irrigation ...	260 840	71.9
2	Water allotted to Fishery Department and reutilized for irrigation	216 000	59.5
3	Total water utilized	260 840	71.9

Water Utilization

During the year under review, a total quantity of 260,840 m³ of water was utilized for the irrigation of 450 donums planted mainly with citrus, olives and deciduous. (See Table IX-23 for water utilization).

Water Sale, Income, Operation and Maintenance costs

For the sale of the water the gross income during the year under review, was £7,825. Operation expenses, including attendant and waterman wages and travelling costs, amounted to £2,743. Maintenance expenses were £898. The maintenance works carried out on the project were the following: Painting of all manhole covers and bridge. Treating of wood works of bridge with solignum. Repairs to 12" dia main and break pressure valves. Repairing of main irrigation meter of weir and rebuilding of concrete manhole of meter. Net income to the project was £4,184. Details on these are shown on Tables IX-25 and IX-26.

TABLE IX-24

KALOPANAYIOTIS DAM

GROPS IRRIGATED

Ser No	Crop	Area Donums
1	Citrus	150
2	Olive trees	4
3	Deciduous	296
	Total	<hr/> 450

TABLE IX-25

KALOPANAYIOTIS DAMINCOME AND EXPENDITURE DATA

Item No	Description	Qty m ³	Amount £
1	Water sold at nominal rates	260 840	7 825
2	Water sold at reduced rates	Nil	Nil
3	Water given free	216 000	-
4	Total quantity utilized and gross income	476 840	7 825
5	Operation cost	-	2 743
6	Maintenance cost	-	898
7	Net income	-	4 184

TABLE IX-26

KALOPANAYIOTIS DAM - DATA ON PROJECT FOR THE LAST TWO YEARS

Item No	Data	Unit	1983	1984	% Change on 1983
1	Capacity	1000 m ³	363	363	Nil
2	Water available in storage	"	449	550	+22.5
3	Water utilized for irrigation ...	"	236	261	+10.6
4	Water sold	"	236	261	+10.6
5	Water given free	"	-	216	Nil
6	Water used for recharge	"	Nil	Nil	Nil
7	Gross income	£	5 288	7 825	+48.0
8	Operation cost	£	3 044	2 743	- 9.9
9	Maintenance cost	£	839	898	+ 7.0
10	Total expenses	£	3 883	3 641	- 6.2
11	Net income	£	1 405	4 184	+197.8
12	Area irrigated	donums	435	450	+3.4

Project Operation Data for the last two years

Table IX-26 shows the operation data for the last two years. The amount of water utilized for irrigation, has increased by 10.6% and the area irrigated by 3.4%.

The operational costs were down by 9.9% whereas the maintenance costs were up by 7.0%. The net income showed a tremendous increase because the water rates were increased by 1 cent/m³ from the 9th of September 1983. The water utilization in the project area seems satisfactory although further increase of the quantity utilized is expected.

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. For the year under review the dam was dry.

LEFKARA DAM

The Lefkara dam project is a dual purpose project, mainly for the supply of Domestic Water to Famagusta town and partly for the irrigation for agricultural land downstream of the dam. The dam consists of (a) a dam reservoir whose capacity is 13.85 MCM, (b) a distribution system (piped) for the supply of irrigation water to an area of approximately 615 donums, (c) a feeder pipeline, (d) a domestic water treatment plant near Khirokitia and (f) a pipeline to Famagusta town.

As a result of the Turkish invasion and the occupation of the Famagusta town, the reserved water for Famagusta has been utilized to supply water to the Larnaca and Famagusta towns, other villages and refugee camps en route to Famagusta, whose population has been greatly increased or created accordingly from the refugees who were expelled from their villages and town by the occupation army.

This part of the report will deal only with the dam reservoir and water utilization for irrigation and water supply in general, where details, regarding domestic water supply will be given in the section dealing with domestic water supply.

From the sale of irrigation water, the income amounts to £1983. Maintenance works were carried out at a total cost of £1955.

Project Hydrology

The project hydrologic data as recorded during the year under review are tabulated in Table IX- 27.

The water in the dam reservoir did not reach spillway crest but it remained much lower, with maximum quantity in storage around 1,787,000 m³ or 12.9% of the total capacity, in May. The average inflow - Seepage to the dam reservoir during the year, was estimated at 1,892,768 m³. The minimum water level reached, occurred in November with minimum quantity in storage estimated at 286,000 m³.

TABLE IX-27

LEFKARA DAM - HYDROLOGY FOR 1984

Item No	Description	Qty m ³	% Storage capacity
1	Initial amount in storage	408 000	2.9
2	Inflow - Seepage	1 892 768	13.7
3	Total release	1 757 574	12.7
4	Leakages	21 332	0.2
5	Evaporation	190 986	1.4
6	Overflow	NIL	NIL
7	Final amount in storage	394 000	2.8
8	Minimum quantity in storage (Nov.)	286 000	0.6
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 of use is shown on Table IX-28.

Crops Irrigated

The distribution system of the Lefkara irrigation project is still under construction. However, there has been a relatively small agricultural activity in the area and during the year under review, a total of 130 donums of land has been irrigated by using 66,119 m³ of water. The area was planted with citrus, vegetables and olive trees as shown on Table IX-29.

TABLE IX-28

LEFKARA DAM - WATER UTILIZATION

Item No	Description	Qty m ³	% Storage capacity
1	Water used for domestic WS	1 691 455	12.2
2	Water used for irrigation	66 119	0.5
3	Total water utilized	1 757 574	12.7

TABLE IX-29

LEFKARA DAM - IRRIGATED CROPS

Ser No	Crop	Area Donums
1	Citrus	100
2	Vegetables	20
3	Olive trees ...	10
	Total	130

Water Sale, Income and Maintenance Costs

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 3 cent/m³ and the income from the sale of irrigation water amounted to £1983. The maintenance works were carried out at a cost of £1955. The following works were carried out: Painting of metal structures in both galleries. Repairs to electric circuit in galleries and installing of a fibre glass master switch box. Repairs to console in control room and hydraulic system pipings. Repairing of breakages of water supply main replacing of two 10" dia pipes of irrigation main and other repairs to same line. Repairing of main irrigation sluice valves of irrigation web.

Removal of avalanched rocks and soil from left abutment. Treating of woodwork of control room with linseed oil ^{and} painting of control room.

Project Operation Data for the Last Two Years

From the table it is shown that the quantity of water used for irrigation was increased by 24.5% and the domestic water supply by 14.3%.

TABLE IX- 30

LEFKARA DAM - PROJECTOPERATION DATA FOR THE LAST TWO YEARS

Ser No	Description	Unit	1983	1984	% Change on 1983
1	Capacity	1000 m ³	13 850	13 850	Nil
2	Water available	"	1 919	2 088	+ 8.8
3	Water utilized for irrigation .	"	53	66	+24.5
4	Water utilized for domestic WS	"	1 479	1 691	+14.3
5	Total water utilized	"	1 532	1 757	+14.7
6	Inflow - Seepage	"	1 058	1 893	+78.9
7	Area irrigated	donums	130	130	Nil

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 closed type distribution system commanding an area of 2,850 donums.

Irrigation in the project area started early in March 1984 and continued throughout the year until the end of October 1984.

An area of 942 donums of land planted with citrus, bananas and vegetables was irrigated by utilizing 888,500 m³ of water. From the total water utilized 690,500 m³ were taken directly from the dam reservoir, 89,200 m³ were taken from the overflow and the rest 108,800 m³ were pumped from the boreholes.

The total gross income from the sale of water amounted to £20,428. The expenditure for the maintenance was £3,214 whereas the operation and management costs were £13,344. Net income to the project for the year under review was £3,870.

Project Hydrology

The project hydrologic data as recorded during the year are tabulated in table IX-31

The reservoir was filled to spillway crest in spillway crest and overflow occurred during the period February the 13th-May 10th 1984. Minimum water level in the reservoir occurred in October with water in storage around 34,090 m³.

TABLE IX - 31

POMOS DAM - HYDROLOGY FOR 1984

Item No	Description	Qty m ³	% Storage capacity
1	Initial amount in storage	232 400	27.0
2	Inflow-Seepage-Overflow	983 426	114.4
3	Total release	690 500	80.3
4	Leakages	106 945	12.4
5	Evaporation	68 508	8.0
6	Overflow	not measured	-
7	Final amount in storage	145 700	16.9
8	Minimum quantity in storage (Oct.) ..	34 090	4.0
9	Storage capacity	860 000	100.00

Water Utilization and Crops Irrigated

The 888,500m³ of water were utilized for the irrigation of 942 donums within the project area. Details about the water utilized and the crops irrigated are shown on Tables IX-32 and IX-33.

TABLE IX- 32

POMOS DAM- WATER UTILIZATION

Item No	Description	Qty m ³
1	Water used for irrigation from dam ..	779 700
2	Water used for irrigation from boreholes	108 800
3	Water used for recharge	Nil
4	Total water utilized	888 500

TABLE IX- 33

POMOS DAM - CROPS IRRIGATED

Item No	Crop	Area donums
1	Citrus	544
2	Bananas	232
3	Deciduous	8
4	Vegetables	77

5	Cereals	28
6	Avocatos	14
7	Olive trees	24
7	Other	15
		942

Water Sale, Income, Operation and Maintenance Costs

The total quantity utilized for irrigation, water released from the dam reservoir, water pumped from the boreholes and water taken from the overflow amounted to 888,500 m³. Out of this 799,300 m³ were sold at the nominal rates and the rest 89,200 m³ were sold at reduced rates because that quantity was taken from the overflow.

From the sale of water (see details on Table IX-34) the total gross income amounted to £20,428 whereas the operation and management costs were £13,344. Maintenance works on the dam and distribution system were £3,214. Net income to the project for the year under review amounted to £3,870.

The maintenance works were the following:

Cleaning of embankment from wild vegetation. Repairing of windows and flooring of guard house. Painting of bridge and other metal structures. Treating of woodwork of bridge with solignum.

Repairing of joints of canals, Elevating of canals which subsided, Replacing and repairing of sluice valves.

TABLE IX-34.

POMOS DAM-INCOME AND EXPENDITURE DATA

Item No	Description	Qty m ³	Amount £
1	Water sold at nominal rates	799 300	19 982
2	Water sold at reduced rates	89 200*	446
3	Water given free of charge	Nil	Nil
4	Total quantity utilized and gross income	888 500	20 428
5	Operation cost	-	13 344
6	Maintenance cost	-	3 214
7	Net Income	-	3 870

* This quantity was taken from the overflow.

Project Performance Data for the Last Two Years

Table IX-35 shows data regarding hydrology, water utilization, water sales, gross income, operation, maintenance costs, net income and areas irrigated for the last two years.

The last column of the table shows the change in percentages of the quantities of 1984 over the previous year.

The quantity of water utilized for irrigation was increased by 3.0% and the gross income by 16.2%. The area irrigated was decreased by 7.2%.

The operational costs were increased by 12.9% while the maintenance costs were increased by 1.69%. Total expenses were up by 27.2%. Net income to the project was decreased by 15.3%.

TABLE IX-35

POMOS DAM-DATA ON PROJECT FOR THE LAST TWO YEARS

Item No	Data	Unit	1983	1984	% Change on 1983
1	Capacity	1000 m ³	860	860	Nil
2	Water available in Storage	"	1 140	1 040	-8.8
3	Water utilized for irrigation	"	862	888	+3.0
4	Water sold	"	862	888	+3.0
5	Water given free	"	Nil	Nil	Nil
6	Water used for recharge .	"	Nil	Nil	Nil
7	Gross income	£	17 584	20 428	+16.2
8	Operation cost	£	11 819	13 344	+12.9
9	Maintenance cost	£	1 195	3 214	+169.0
10	Total expenses	£	13 014	16 558	+27.2
11	Net income	£	4 570	3 870	-15.3
12	Area irrigated	donums	1 015	942	-7.2

YERMASOYIA-POLEMIDHIA PROJECT

The Yermasoyia-Polemidhia Irrigation Project consists of the Yermasoyia dam, the reservoir of which has a capacity of 13.5 MCM and the Polemidhia dam with reservoir capacity in the order of 3.43 MCM. The distribution system of the project consists of closed conduits now commanding an area of about 15,440 donums.

The water in the dam reservoir did not reach spillway crest but it remained much lower with maximum quantity in storage for Yermasoyia dam 8,149,000 m³ and for Polemidhia dam 995,000 m³.

For facing the drought of the year under review the boreholes of the "Kouris Delta Emergency Scheme" were set in operation in the period July–November 1984. The pumped water was diverted, into the distribution system of the Yermasoyia–Polemidhia project. During 1984 from July to November, a quantity of 2,582,095 m³ of water was pumped. A quantity of 1,906,095 m³ was used for irrigation of an area of the Yermasoyia–Polemidhia project, and the rest 676,000 m³ were used for recharge of the Yermasoyia aquifer.

A total quantity of 10,054,982 m³ was released from dams and pumped from the boreholes of the "Kouris Delta Emergency Scheme" (6,528,719 m³ from Yermasoyia, 944,168 m³ from Polemidhia and 2,582,095 m³ from boreholes). Out of 10,054,982 m³, 3,969,445 m³, were used for irrigation. 3,198,605 m³ for recharge and 2,736,852 m³ for Domestic Water Supply. The rest 150,080 m³ were lost in the pipe system.

Irrigation in the project area started early in January and continued throughout the year until/late in December 1984. The quantity of 3,969,445 m³ was used for irrigation of 15,440 donums (partial or full) in the Zakaki, Phasouri, Akrounda Phinikaria areas and Yermasoyia and Polemidhia Irrigation Divisions. Of the quantity used for irrigation a quantity of 415,000 m³ were given free of charge as water rights to the Yermasoyia and Polemidhia Irrigation Divisions (319,000 m³ for Yermasoyia ID and 96,000 m³ for Kato Polemidhia ID). The rest 3,554,445 m³ were sold at the nominal rates of 2.7, 3.0 and 3.5 cent/m³.

The quantity released for recharge (3,198,605 m³) was used for recharge of the Yermasoyia and Garyllis aquifers downstream the dam structures. These aquifers are pumped for the supply of water for domestic use for the Limassol town, the Moutayiaka Regional water supply scheme and for irrigation in the Zakaki area.

The total gross income from the sale of water amounted to £103,870. The operating costs including power expenses amounted to £130,456. The maintenance works carried out by the WDD were of the order of £20,529. Net income to the project was £47,115 loss. The above costs, include also the operation, power and maintenance expenses of the "Kouris Delta Emergency Scheme".

Project Hydrology

The project hydrologic data as recorded during the year under review are tabulated in the following tables. The data for each dam reservoir are given separately.

POLEMIDHIA DAM

The Inflow-Seepage to the Polemidhia dam during the year under review totalled 1,400,586 m³ representing 31.6% of the reservoir capacity. The reservoir did not fill to spillway crest but it remained much lower with maximum quantity in storage around 995,000 m³ on the 3rd May 1984. Leakages occurred through the dam and part of these were intercepted downstream for irrigation purposes. Releases from the dam reservoir were 944,168 m³.

TABLE IX- 36

POLEMIDHIA DAM-HYDROLOGY FOR 1984

Item No	Description	Qty m ³	% Storage capacity
1	Initial amount in storage	333 000	9.7
2	Inflow-Seepage	1 400 586	31.6
3	Total release	944 168	27.5
4	Leakages	241 021	7.0
5	Evaporation	126 647	3.7
6	Overflow	Nil	Nil
7	Final amount in storage	419 000	12.2
8	Minimum quantity in storage (Nov.)	172 000	5.0
9	Storage capacity	3 430 000	100.0

YERMASOYIA DAM

The Inflow-Seepage to the dam during the year under review was estimated at 6.800 MCM mostly occurring in the months of January to May and in December. The dam reservoir was not filled up the spillway crest but it remained much lower with maximum quantity in storage around 8.149 MCM on the 13th May 1984.

TABLE IX-37

YERMASOYIA DAM-HYDROLOGY FOR 1984

Item No	Description	Qty m ³	% Storage capacity
1	Initial amount in storage	3 578 000	26.5
2	Inflow-Seepage	6 799 613	50.4
3	Total release	6 528 719	48.4
4	Leakages	10 000*	0.1
5	Evaporation	808 903	6.0
6	Overflow	Nil	Nil
7	Final amount in storage	3 026 000	22.4
8	Minimum quantity in storage (Nov.)	2 357 000	17.4
9	Storage capacity	13 500 000	100.0

* Roughly estimated

Water Utilization from both Dams

Details regarding water utilization from both dams separately and in combine are shown on Tables IX-38, IX-39 and IX-41. In summary during the year under review a total quantity of 7,168,050 m³ of water was utilized for irrigation and recharge purposes. Out of this quantity 3,969,445 m³ were utilized for the irrigation (fully or in part) of 15,440 donums as indicated in Table IX-40. This quantity includes the releases for irrigation from both dams and the water pumped from the boreholes of the Kouris Delta Emergency Scheme. The rest 3,198,605 m³ was utilized to recharge the Garyllis and Yermasoyia aquifers.

TABLE IX-38

POLEMIDHIA DAM- WATER UTILIZATION

Item No	Description	Qty m ³	% Storage capacity
1	Water used for irrigation	944 168	27.5
2	Water used for recharge	Nil	Nil
3	Total water utilized	944 168	27.5

TABLE IX- 39

YERMASOYIA DAM-WATER UTILIZATION

Item No	Description	Qty m ³	% Storage capacity
1	Water used for irrigation	1 269 262	9.4
2	Water used for recharge	2 522 605	18.7
3	Water used for D W S	2 736 852	20.3
4	Total water utilized	6 528 719	48.4

TABLE IX-40

YERMASOYIA-POLEMIDHIA PROJECT - IRRIGATED CROPS

Ser No	Crop	Area donums
1	Citrus	7 256
2	Vines	3 856
3	Deciduous	130
4	Vegetables	4 178
5	Olive trees	20
Total		15 440

TABLE IX- 41

YERMASOYIA-POLEMIDHIA PROJECT
WATER UTILIZATION

Ser No	Description	Qty m ³
1	Water used for irrigation (Y & P & Kouris Delta boreholes)	3 969 445
2	Water used for recharge (Yermasoyia Dam & Kouris Delta boreholes)	3 198 605
3	Water used for DWS	2 736 852
4	Total water utilized	9 904 902
5	Total water released from Yermasoyia & Polemidhia dams and pumped from Kouris Delta boreholes	10 054 982
6	Water lost in the pipe system	150 080

From the sale of water the total gross income was £103,870. The operation cost including power cost totalled £130,456 where the maintenance costs spent on routine works was £20,529. Details regarding income and expenditure are shown on Table IX-42.

Water Sale, Income, Operation and Maintenance Costs and Details

Details about the quantity sold at the nominal rates, water given free of charge as water rights, are given in table IX-44. For the operation of the project an amount of 69,985 was spent. For the maintenance of both dams and the distribution system an amount of 20,529 was spent for the following works:

Repairs of breakages to pipes. Repairs of sluice valves and watermeters. Cleaning of manholes and painting of their metal covers.

For the Yermasoyia dam the following works were carried out. Repairs to guard house. Cleaning of embankment from wild vegetation. Maintenance of the mechanism of the gate in the gallery.

For the Polemichia dam the following works were carried out. Repairs to guard house. Painting of water level indicators. Maintenance of the mechanism of the gate in the gallery.

Project Operation Data for the last two Years

Table IX-43 gives details regarding the operation for the last two years. The last column shows the fluctuations of the various data of the Project Operation. For the year under review the boreholes of the "Kouris Delta Emergency Scheme" were put in operation so the expenses were tremendously increased. The quantity of water sold was decreased and the loss to the project increased.

TABLE IX-42

YERMASOYIA - POLEMIDHIA PROJECT

INCOME & EXPENDITURE DATA

Ser No	Description	Qty m ³	Amount £
1	Water sold at nominal rates	3 554 445	103 870
2	Water sold at reduced rates	Nil	Nil
3	Water given free of charge as water rights to:		
	- Yermasoyia Irrig. Division	319 000	Nil
	- Polemidhia Irrig. Division	96 000	Nil
4	Total quantity/income	3 969 445	103 870
5	Operation cost	-	69 985
6	Power cost	-	60 471
7	Maintenance cost (Yermasoyia & Polemidhia & Kouris Delta Boreholes)	-	20 529
8	Total cost	-	150 985
9	Net income	-	-47 115

TABLE IX-43

YERMASOYIA-POLEMIDHIA PROJECT - DATA ON PROJECT FOR THE LAST TWO YEARS

Ser No	Description	Unit	1983	1984	% Change on 1983
1	Capacity	1000 m ³	16 930	16 930	Nil
2	Water available (Y & P & KDES)	"	12 743	13 507	+6.0
3	Water utilized for irrigation	"	4 447	3 969	-10.7
4	Water sold	"	3 985	3 554	-10.8
5	Water given free	"	462	415	-10.2
6	Water used for recharge	"	2 9999	3 199	+ 6.7
7	Total quantity used	"	7 446	7 168	-3.7
8	Gross income	£	101 607	103 870	+1.4
9	Operation cost	£	69 041	69 985	+1.4
10	Power cost	£	35 139	60 471	+72.1
11	Maintenance cost	£	17 080	20 529	+20.2
12	Total expenditure	£	121 260	150 985	+24.5
13	Net income	£	-19 653	-47 115	-
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 they were completed by the end of 1983. The project consists of the Asprokremmos dam of maximum capacity at spillway crest of 51.00 MCM and a wellfield (24 nos boreholes) both sources of total annual safe yield of 32.00 MCM with a reliability of supply well above 92%. The project area is a coastal strip some 38 km long by 3 to 4 km wide with the town of Paphos at its centre. The total area commanded by the project is 35,000 donums. The distribution system is made of canals and pipes and it is the first project on the island to operate on the "on demand" mode. The water quantity used was taken from the Asprokremmos dam, the boreholes the diversion from the Dhiarizos and Ezouza rivers and the Mavrokolymbos dam which by now is included in the Paphos project.

Irrigation in the project area started in January 1984 and was completed late in December 1984. During this period a quantity of 14.442 MCM of water was utilized for the irrigation of 25,119 donums of land, planted with various crops. Another 30,601 M³ was given for industrial purposes. In brief the water was utilized as shown on Table IX-47. The crops irrigated were citrus, vegetables etc. as shown on Table IX-48.

The operation and maintenance of the project is the responsibility of the WDD. From the sale of water at the nominal rates the income for 1984 is around £499,290. The operation and maintenance expenses amounted to £223,204 and the power cost to £283,628. Total annual cost amounted to £506,832.

Project Hydrology & Water Resources

The water in the Asprokremmos dam did not reach spillway crest but it remained lower with maximum quantity in storage around 25,690 MCM on the 16th May 1984. The quantity of water of the order of 16,632,742 m³ was taken from the Asprokremmos dam, the boreholes and the river diversion and the Mavrokolymbos dam as shown on Table IX-44.

TABLE IX-47

PAPHOS PROJECT - WATER RESOURCES

Item No	Sources	Quantity m ³
1	Asprokremmos Dam	10 231 852
2	Boreholes in Dhiarizos & Ezouza rivers	2 882 739
3	Surface flow diversion from Dhiarizos & Ezouza rivers	3 111 151
4	Mavrokolybos Dam	407 000
	Total	16 632 742'

Hydrology of Dams

The hydrologic data for Asprokremmos dam and Mavrokolymbos dam as recorded during the year under review are tabulated on Tables IX-45 and IX-46 respectively.

TABLE IX-45

ASPROKREMMOS DAM - HYDROLOGY FOR 1984

Item No	Description	Qty m ³	% Storage capacity
1	Initial amount in storage	13 397 500	26.8
2	Inflow - Seepage	14 695 522	29.2
3	Total release	10 231 852	16.7
4	Leakages	52 143	0.1
5	Evaporation	2 274 850	4.1
6	Overflow	Nil	Nil
7	Final amount in storage	15 299 600	30.0
8	Minimum quantity in storage (Nov.)	14 270 000	28.0
9	Storage capacity.....	51 000 000	100.0
10	Water available	25 766 029	50.5

TABLE IX-46

MAVROKOLYMBOS DAM-HYDROLOGY FOR 1984

Item No	Description	Qty m ³	% Storage capacity
1	Initial amount in storage	225 000	10.3
2	Inflow - Seepage	501 891	23.0
3	Total release	406 900	18.7
4	Leakages	Nil	Nil
5	Evaporation	78 492	3.6
6	Overflow	Nil	Nil
7	Final amount in storage	250 000	11.5
8	Minimum quantity in storage (Nov.)	136 000	6.2
9	Storage capacity	2 180 000	100.0
10	Water available	648 399	29.7

Water Utilization and Crops Irrigated

From the water developed, about 2,160,001 m³ were lost in the canal system, 30,601 m³ were used by industries and the remaining 14,442,140 m³ were used for the irrigation of 25,119 donums planted with various crops as shown on Table IX-50 (See Table IX-47 for water utilization).

TABLE IX-47

PAPHOS IRRIGATION PROJECT-WATER UTILIZATION

Item No	Description	Qty m ³
1	Water used for irrigation	14 442 140
2	Water used by industries	30 601
3	Water used for recharge	Nil
4	Total water utilized	14 472 741
5	Total water lost	2 160 001
6	Total water delivered from headworks	16 632 742

TABLE IX-48

PAPHOS IRRIGATION PROJECT - CROPS IRRIGATED

Ser No	Crop	Area donums
1	Citrus	4 612
2	Bananas	2 904
3	Vines	3 072
4	Onions	323
5	Vegetables	1 404
6	Potatoes	2 718
7	Melons	611
8	Avocadoes	412
9	Alfa-alfa	624
10	Ground-nuts	4 454
11	Legumes	3 229
12	Deciduous	307
13	Other	449
Total		25 119

Water Sale, Income, Operation and Maintenance Costs

The project developed a quantity 16.633 MCM out of which 14.442 MCM were used for irrigation, and 0.030 MCM were used for industrial purposes, while the rest 2.160 MCM were lost. The irrigation water was sold at the nominal rates of 2.5, 3.5 and 4 cent/m³. The industrial water was sold at 10 and 13 cent/m³. From the sale of water the total income amounted to £499,290, whereas the operation, maintenance and power costs were £506,832. Details are shown on Table IX-49.

The maintenance works of the project were the following:

Cleaning of main canals. Repairing of breakages of distribution main Maintaining of pumps. Painting of metal structures and plumbing installations. Cleaning of pump houses and reservoirs. Repairs to hydrants, water meters, flow limit devices, pressure regulators and other accessories.

Asprokremmos dam maintenance

Painting of metal structures. Cleaning of all installations in the tower, the gallery and the power house . Installing of flanges on grout holes for future grouting. Removing of line sediment from drainage holes in the gallery. Maintaining of mechanical parts. Maintaining of operator's house.

Mavrokolymbos dam maintenance

Repair of access road. Cleaning of drainage ditch channels. Cleaning of embankment from wild vegetation. Painting of all metal : structures. Maintaining of penstock and drive winch. Installing of notice boards . repairing of the cracks in the guard house and painting of it's interior.

TABLE IX-49

PAPHOS IRRIGATION PROJECT-INCOME AND EXPENDITURE DATA

Item No	Description	Qty m ³	Amount £
1	Water delivered from Headworks	16 632 742	-
2	Water sold for irrigation	14 442 140	495 507
3	Water sold for industrial use...	30 601	3 783
4	Total water sold	14 472 741	499 290
5	Operation and Maintenance cost	-	223 204
6	Pumping cost	-	283 628
7	Total annual cost	-	506 832
8	Net Income	-	-7 542

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 IX-50 gives details regarding the operation and maintenance for the last two years. The last column shows the percentage variation of these data with respect to 1983 figures.

TABLE IX-50

PAPHOS PROJECT - DATA ON OPERATION FOR THE LAST TWO YEARS

Item No	Description	Unit	1983	1984	% Change on 1983
1	Yield	1000 m ³	32 000	32 000	Nil
2	Water available*	"	19 821	32 408	+63.5
3	Water utilized	"	13 064	14 473	+10.8
4	Water sold for irrigation	"	12 792	14 442	+12.9
5	Water sold for industrial use	"	272	31	-88.6
6	Total water sold	"	13 064	14 473	+10.8
7	Gross income	£	314 000	499 290	+59.00
8	Operation and Maintenance Cost	£	170 465	223 204	+30.9
9	Power cost	£	202 310	283 628	+40.2
10	Total cost	£	372 775	506 832	+36.0
11	Net income	£	-58 775	-5 221	-
12	Area Irrigated	donums	18 432	25 119	+36.3

* This the water available in the dams and the quantity taken from the boreholes and the river diversion.

From the above Table it is seen that the project water utilization has increased tremendously. However the cost/income ratio is 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. During the year under review the dam was dry, so no irrigation took place. For the maintenance of the project an amount of £97 was spent for

the constructing and installing of a gate.

KHAPOTAMI PROJECT

The Kha-Potami irrigation project consists of a diversion weir and a diversion pipeline capable of diverting a flow of 500 cubic meters/hour when the Kha-Potami river is flowing in the months January-June. The project is supplying water in bulk during the winter, spring and early summer months, to the Pissouri and Alektora Irrigation Divisions. The area commanded by both irrigation divisions is around 4,235 donums, 3,000 donums in the Pissouri Irrigation Division and 1,235 donums in the Alektora Irrigation Division. In both cases the area to be irrigated is planted totally with vines.

Based on the existing water resources for each of the two irrigation divisions and having in mind the area served by each irrigation division, water is allocated as follows:

- * If the works divert only 225 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:-
 - a. 225 m³/hr to Pissouri Irrigation Division
 - b. 100 m³/hr to Alektora Irrigation Division.
 - c. The remaining flow will be divided between the two irrigation divisions at a ratio of 3:1 (3 parts to the Pissouri irrigation division and 1 part to the Alektora irrigation division).

During the year under review the diversion of water started early in January 1984 and was completed in June 1984 when the river flow diminished. In this period a total of 1,202,460 m³ of water was utilized for the supplementary irrigation of 4,235 donums of land planted with vines.

For the maintenance of the project an amount of £790 was spent for the following works:-

Cleaning of weir painting of grilles and all other metal structures, repairing of breakages of main line and installing of a ball valve.

KHRYSOKHOU VALLEY PROJECT

The Khrysokhou valley project consist of five boreholes equipped with electro-submersible pumps, four balancing reservoirs and a distribution system made of pipes commanding an area of 1,770 donums. The project is situated in the Paphos District Polis region in the Khrysokhou river valley.

Irrigation in the project area started in January and continued throughout the year until November 1984. During this period a total quantity of 446,897 m³ of water was utilized by the farmers. From January 1st to October 31st the water was sold at 3.5 cent/m³ and from Nov. 1st to December 31st at 4.0 cent/m³. The income amounted to £15,654. The operation and maintenance expenses including pumping cost amounted to £19,676. 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 £4,022 was observed.

Out of the 1,770 donums commanded by the distribution system only an area of 892 donums was irrigated as shown on Table IX-51.

The maintenance works carried out on the project were the following: Replacing of accessories of water meters due to wear from high sand content in the water. Repairing of conveyors and distribution main. Repairing of farm outlet water meters. Replacing of 20 No. 3" dia sluice valves. Repairs to electric installation. Purchase and installation of two transformers. Removal of two electrosubmersible pumps and replacing of one. Cleaning of reservoirs from accumulated sand.

TABLE IX-51

KHRYSOKHOU VALLEY PROJECT - CROPS AND AREA IRRIGATED

Ser No	Crop	Area Donums
1	Citrus	189
2	Vines	40
3	Deciduous	20
4	Avocatos	13
5	Vegetables	60
6	Tobacco	400
7	Other	170
	Total	892

AYIOS THEODOROS 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. This scheme was turned over to the irrigators for the operation and maintenance. This was done because of the small size of the scheme and the limited quantities of water pumped.

In the year review the scheme was in operation from July to November 1984 during which period a total quantity of 55,618 m³ was pumped and used for irrigation. All the expenses for the operation and maintenance of the scheme were undertaken by the irrigators. The area irrigated was around 250 donums planted mainly with citrus.

XYLIATOS PROJECT

The Xyliatos irrigation project consists of a dam reservoir of maximum capacity at spillway crest 1,220,000 m³ of water and a closed type distribution system commanding an area of 2,300 donums. Irrigation in the project area started early in March 1984 and continued throughout the year until late in October 1984. During this period a total quantity of 311,145 m³ of water was used for the irrigation of an area of 700 donums planted with olive trees, citrus vegetables and potatoes. The water was sold to the Farmers at a fixed charge of 3 cent/m³ and the gross income was £9,380. The operation expenses were £4,977 while the maintenance expenses were £2,795. The net income to the project for the year under review was £1,608.

Project Hydrology

The project hydrologic data as recorded during the year under review, are tabulated in table IX-52. Overflow over the spillway crest occurred during the period 14th January to 13th May 1984. The minimum quantity of water ever stored in the reservoir during the irrigation period, was 721,000 m³ and occurred in November 1984.

TABLE IX-52

XYLIATOS DAM - HYDROLOGY FOR 1984

Item No	Description	Qty m ³	% Storage capacity
1	Initial amount in storage ...	1 198 300	98.2
2	Inflow - Seepage	1 926 060	157.9
3	Total release for Irrigation .	410 937	33.7
4	Leakages	140 055	11.5
5	Evaporation	103 969	8.5
6	Overflow	1 320 103	108.2
7	Final amount in sotrage	1 147 000	94.0
8	Minimum quantity in storage (Nov.)	721 000	59.0
9	Storage capacity	1 220 000	100.0

TABLE IX- 53

XYLIATOS DAM - WATER UTILIZATION

Item No	Description	Qty m ³	% Storage capacity
1	Water used for irrigation	311 145	25.5
2	Water used for recharge	Nil	Nil
3	Total water utilized	311 145	25.5

Water Utilization and Crops Irrigated

During the year under review a quantity of 311 145 m³ of water was utilized for the irrigation of 700 donums of land planted mainly with olive trees, citrus, vegetables and potatoes.

TABLE IX-54

XYLIATOS DAM - INCOME AND EXPENDITURE DATA

Item No	Description	Qty m ³	Amount £
1	Water sold at nominal rates	311 145	9 380
2	Water sold at reduced rates	Nil	-
3	Water given free	Nil	-
4	Total quantity utilized and gross income	311 145	9 380

Item No	Description	Qty m ³	Amount £
5	Operation cost	-	4 977
6	Maintenance cost	-	2 795
7	Net income	-	-1 608

Water Sale, Income, Operation and Maintenance and Details

From the sale of water, the gross income during the year review, was £9,380. Operation expenses, including attendant wages and travelling costs, amounted to £4,987. The maintenance expenses were £2,795 and the net income to the project was £1,608. The following maintenance works were carried out for the year under review: Repairs and Installation of float valves. Repairs to breakages of the pipe system. Installation of pipelines for the over flowing of the break pressure tank.

TABLE IX -55

XYLIATOS DAM - DATA ON PROJECT FOR THE LAST TWO YEARS

Item No	Data	Unit	1983	1984	% Change on 1983
1	Capacity	1000 m ³	1 220	1 220	Nil
2	Water available in storage	"	1 922	1 560	-0.2
3	Water utilized for irrigation	"	50	311	+522.0
4	Water sold	"	50	311	+522.0
5	Water given free	"	Nil	Nil	Nil
6	Water used for recharge	"	Nil	Nil	Nil
7	Gross income	£	1 488	9 380	+530.0
8	Operation cost	£	2 379	4 977	+109.2
9	Maintenance cost	£	1 601	2 795	+74.6
10	Total expenses	£	3 980	7 772	+95.3
11	Net income	£	-2 492	1 608	-
12	Area irrigated	donums	80	700	+775.0

Project Operation Data for the last two years

Table IX-55 shows the operation data for ^{the} last two years. It can be seen that the area irrigated was increased significantly and that resulted to the increase in the water utilization. The total expenses were up by 95.3% and the net income was tremendously increased.

X LARNACA - FAMAGUSTA REGIONAL OFFICE

by

T N Hamatsos
Executive Engineer I
Regional Engineer

General

By the end of the year the staff of the Regional Office was composed of the following officers :

- 1 Executive Engineer 1 - Head
- 1 Senior Technician
- 5 Technicians I
- 1 Assistant Chief Foreman
- 11 Regular Employees
- 1 Secretary Typist

For the execution of the construction works 7 foremen and 50 workers were engaged.

The activities of this office cover the Districts of Larnaca and Famagusta. Its functions are divided into four main categories as follows:

- Water Resources and Hydrology : Surface and groundwater measurements and studies.
- Investigations and Design : Design of water supplies and irrigation schemes.
- Construction of water supply and irrigation schemes
- Operation and Maintenance of existing irrigation and water supply schemes.

HYDROLOGY AND WATER RESOURCES

Stream Gauging

During the year 3 permanent gauging observation stations (one monthly at Liopetri Dam and two weekly at Paralimni Lake) equipped with automatic water level recorders were in operation and weekly or monthly visits were paid for observation and maintenance.

Ground Water Hydrology

The ground water conditions of the two Districts Famagusta and Larnaca were observed by means of 493 wells/boreholes.

2

The water level (i.e. the distance from established bench marks on the top of the observation wells/boreholes to the ground water level) of 365 of them were taken twice this year i.e. in March before the irrigation period and in November after the irrigation period.

The water level of 64 of these observation boreholes was taken every month and another 10 of them was taken every two months.

The water level of 54 boreholes used for village water supplies were also taken once during the whole year.

Chemical Analyses

A total number of 618 samples were taken from Government and Communal or private boreholes/wells or springs and were sent to the Government or Departmental Laboratories for Chemical Analysis.

Also a number of 240 samples taken from wells and boreholes were analyzed in the Regional Office for Chloride content.

Boreholes Test Pumping

During the year the test pumping of 8 boreholes/wells for domestic water supply or private use were carried out:

Plotting of Boreholes

During the year the plotting of wells/boreholes in Famagusta Larnaca Hydrological Area continued and the total number of wells/boreholes plotted were 947.

Questioning

The annual questionnaire was carried out in the area where the plotting was completed. A total number of 3888 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 samples were sent to the Government Laboratory for chemical analysis):

Quarries

A total number of 11 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 Project

During the year the two Officers dealing partly in different studies concerning the Southern Conveyor continued.

The ground water level of 98 wells/boreholes was taken in South-Eastern Mesaoria and another 47 in the Area of Kiti.

In addition the water levels were measured by 4 automatic recorders situated at Kiti, Xylophagh^{ou}, Liopetri and Phrenaros and were visited once a month.

Wells sinking permits

A total number of 1505 applications for sinking, covering permits and the change of conditions of permits of wells/boreholes were examined in the two Districts, and were presented to the General Advisory Committee for wells/boreholes of the Ministry of Agriculture and Natural Resources. Some 1180 applications are of cases lying in the conservation areas and another 325 in the non-conservation areas.

Apart from the above applications 694 cases dealing with well/boreholes were also examined direct from the District Office of the WDD Larnaca/Famagusta and were submitted to the District Officers of the two Districts. The above applications concerned cases for the renewal of leased agreements of wells/boreholes drilled on Government or Forest Land, or cases of cleaning or deepening of existing wells/boreholes.

From the above 378 cases were approved, 13 were not and 303 were returned to the District Officers for further examination.

Water Supply (Special Measures) Law 32/64

The control of the aquifers of Ormidhia and Xylophagh^{ou} under the Special Measures (Water Supply (Special Measures) Law 32/64) was continued and the District Officer in concurrence with the Water Development Department and the Agricultural Department investigated a total number of 848 boreholes (Legal or/and illegal).

In Ormidhia and Xylophagh^{ou} area, permits for 284 boreholes have been granted modifying the extraction of water and the area to be irrigated. Also 181 permits were renewed.

INVESTIGATIONS AND DESIGN

Investigations

During 1984 the following investigations were carried out :

LARNACA DISTRICT

Ormidhia : Investigations for the construction of Recharge Works and for improvement of part of the village water supply network, for the division of plots.

Kornos : Improvement of part of the village water supply network for the solution of water supply problems.

Kellia : Relocation of part of the village water supply network and for water supply to new refugee self housing plots.

Troulli ; Relocation of part of the village water supply network.

Kophinou : Connection of the village water supply to Khirokitia Famagusta pipeline, for the solution of the village and stock farming area water supply problems. For water supply of Nicosia-Limassol-Larnaca slaughter house from BH 178/83.

Zyyi-Mari : Improvement of the villages water supply from Khirokitia Treatment Plant.

Zyyi : Water Supply to new refugee self housing plots and for the solution of water supply problems. Improvement of parts of the village water supply network.

Zyyi-Tokhni ; Solution of problems of Zyyi-Tokhni Irrigation Division.

Mari: Solution of Irrigation Division problems

Aradhippou ; Improvement of the village and stock farming area water supply from a new borehole, and for the extension of the village water supply network. Solution of water supply problems.

Zenon-Kamares II : Investigations for conveying water from the biological station to the proposed area of the Agricultural Research Institute.

Tersephanou : Improvement of the village water supply network and for the solution of water supply problems.

Xylophaghou; Improvement of the village water supply and investigations for the solution of water supply problems. Investigations for water supply permits to new division of plots.

Pervolia : Construction of a new storage tank for the village water supply and for improvement of the village water supply network.

Investigations for the solution of water supply problems.

Kiti : Improvement of the distribution pipeline of the village water supply and for improvement of the refugee self housing water supply. Relocation of RCC irrigation channel of Kiti Dam Government Work and for the solution of water supply problems. Investigations for the water supply to new division of plots for refugee self housing and for improvement of the village water supply network.

Ayii Vanatsinias : Improvement of water supply of Kephelovrysos Irrigation Association and for installation of water meters in the irrigation plots of the association. Solution of irrigation problems.

Pano Lefkara ; Improvement of the village water supply network and for construction of a new storage tank for the purposes of the proposed tourist kiosk.

Pyrga : Improvement of the village water supply from a new borehole.

Kalavastos : Solution of water supply problems

Skarinou : Replacement of a pipeline through new division of plots and for the solution of water supply problems of the village.

Melini : Solution of water supply and Irrigation Division problems.

Mazotos : Improvement of the village water supply network.

Oroklini : Solution of water supply problems.

Alethriko : Creation of an Irrigation Division and for the solution of water supply problems.

Odhou : Improvement of Irrigation Division Odhou B and for the solution of Irrigation Division problems.

Khirokitia : Improvement of the village water supply network and for the solution of problems of the Irrigation Division. Improvement of the spring Ay. Spyredhon of the village water supply and for the solution of water supply problems.

Ora : For founding of a new Irrigation Division.

Kalo Khorio : Solution of water supply problems, and for improvement of the village water supply network.

Ayios Theodoros : Solution of water supply problems and for improvement of the distribution pipeline of the village water supply. Relocation of the distribution pipeline of Ag. Theodoros and Alaminos water supply.

Athienou : Improvement of a Government borehole for the live stock of the village and for water supply permits for new division of plots.

Anglisidhes : Solution of water supply problems

Layia : Relocation of part of the village water supply network.

Livadhia : Relocation of part of the village water supply network and for water supply to new division of plots for refugee self housing.

Sakotades : Investigations for the water supply of the live stock area of the village.

Mospiloti : Improvement of the old well of the village water supply and for the solution of water supply problems. Relocation of part of the village water supply network which passes through private plots.

Psematismenos : For the solution of Irrigation Division problems.

Dhromo-axia : Installation of water meters to T/C houses of the village and for water supply of new division of plots for refugee self housing, for the solution of water supply problems.

Alaminos : Improvement of the village water supply network and replacement of the central sluice valves of the village water supply.

Psevthas : Investigation of a case of building a house near the river.

Meneou : Solution of water supply problems

Sophtheadhes : Improvement of the live stock water supply

KatoDhrys : Investigation for a case of fencing of private plots near the river.

Pyla : Solution of water supply problems

Larnaca Salt Lake : Investigations for conveying water from the sea.

Larnaca Army Camp (Georghiou Lazarou) : Investigations for the construction of a new tower tank.

Larnaca (Hala Sultan Tekke) : Solution of irrigation problems of the gardens at the Archaeological Monument.

Kivisil : Improvement of a Government Borehole for live stock of the village.

Maroni : Investigations for water supply to new division of plots.

For all the villages in the Larnaca District, investigations were carried out for new sources of water supply in order to cope with the lack of rain.

FAMAGUSTA DISTRICT

Paralimni : Investigations for the expansion of the village tourist area water supply network and for relocation of part of the village water supply network. Investigations for water supply to new division of plots.

Sotira : Solution of stock farming area water supply problems.

Dherinia : Improvement of part of the village water supply network and for the solution of water supply problems.

AkhYritou (Vrysoulles) : Solution of Water Supply problems of Vrysoulles area and of the live stock area.

Ayia Napa : Investigation for the water supply of the proposed Police Station of the village and for the solution of water supply problems.

Phrenaros : Investigations for rental of state land for irrigation purposes.

TABLE X-1

DESIGNS SUBMITTED TO THE DIRECTOR FOR APPROVAL

Seq. No.	Village and Scheme	Est. cost £
<u>VILLAGE WATER SUPPLY</u>		
<u>IARNACA DISTRICT</u>		
1	<u>Kornos</u> : Improvement of existing house to house scheme water supply	23,000
2	<u>P. Lefkara</u> : Improvement of existing house to house scheme water supply.....	166,000
3	<u>Lefkara Dam</u> : Construction of a new storage tank for water supply of the proposed tourist kiosk.....	5,000
4	<u>Tersephanou</u> : Improvement of existing house to house scheme water supply.....	50,000
5	<u>Tersephanou</u> : Water Supply of village division of plots Phase A (No.5).....	3,500
6	<u>Pervolia</u> : Construction of a new storage tank.....	14,000
7	<u>Pervolia</u> : Improvement of existing house to house scheme water supply.....	18,000
8	<u>Kiti</u> : Placing of a new main distribution pipeline	14,000
9	<u>Kiti</u> : Improvement of refugee self housing estate water supply Phase A.....	1,000
10	<u>Kiti</u> : Refugee self housing estate house to house scheme Phase D.....	700
11	<u>Zyvi-Mari</u> : Improvement of the village water supply.....	145,000
12	<u>Zyvi</u> : Refugee self housing house to house scheme Phase A.....	3,000
13	<u>Zyvi</u> : Improvement of part of the village water supply scheme.....	6,000
14	<u>Kophinou</u> : Improvement of the village water supply from Khirokitia-Famagusta pipeline..	13,000

Ser. No.	Village and Scheme	Est. Cost £
15	<u>Kophinou</u> : Water supply of Kophinou Slaughter House for Nicosia-Larnaca-Limassol from BH 178/83	34,800
16	<u>Aradhippou</u> : Supplementary water supply from BH 143/83	26,000
17	<u>Kellia</u> : Water supply to T/C plots for Refugees	1,000
18	<u>Mazotos</u> : Improvement of the village water supply network	50,000
19	<u>Dhromolaxia</u> : Refugee self housing estate house to house scheme water supply Phase I	2,500
20	<u>Xylophaghou</u> : Refugee self housing estate house to house scheme Phase F	2,700
21	<u>Livadhia</u> : Refugee Self Housing Estate house to house scheme Phase G	2,100
22	<u>Ormidhia</u> : Improvement of part of the village water supply network Scheme A	1,020
	Scheme B	6,720
23	<u>Pyrga</u> : Supplementary water supply of the village	28,000
24	<u>Xylophaghou</u> : Supplementary water supply of of the village	11,000
25	<u>Larnaca Army Camp (Georghiou Lazarou)</u> : - Construction of a new tower tank	17,700

FAMAGUSTA DISTRICT

1	<u>Paralimni (Protaras Tourist Area)</u> : Expansion of tourist area water supply network scheme Phase B	100,000
2	<u>Vrysoulles (Ay. Yeorgios Self Housing Estate)</u> : House to house scheme water supply Phase E	4,000
3	<u>Dherinia</u> : Improvement of part of the existing house to house water supply scheme ..	4,800

Ser. No.	Village and Scheme	Est. Cost £
4	<u>Dhasos Akhnas</u> : Self housing estate house to house scheme water supply Phase B	32,000
5	<u>Ayia Napa</u> : Water supply of the proposed Police Station of the village	3,600

B STOCK FARMING AREAS WATER SUPPLY.

LARNACA DISTRICT

1	<u>Aradhippou</u> : Supplementary water supply of the stock farming area from BH 143/83	16,000
2	<u>Sophtadhes</u> : Water supply of live stock of the village	1,500

FAMAGUSTA DISTRICT

1	<u>Dhasos Akhnas Stock Farming Area</u> : Extension of the distribution network water supply scheme	4,300
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C IRRIGATION WORKS

LARNACA DISTRICT

1	<u>Odhor</u> : Improvement of Irrigation Division Odhor B	2,500
2	<u>Ayii Tavatsinias (Kefalovrysos Association)</u> : Installation of water meters	4,000

D VARIOUS MINOR SCHEMES

LARNACA DISTRICT

1.	<u>Ayios Theodoros</u> : Relocation of part of the water supply distribution pipeline of Ayios Theodoros-Alaminos complex	360
2	<u>Kiti-Mereou-Dhromolaxia-Pervolia-Tersephanou</u> Improvement of the villages water supply (installation of a new valve ball to the central water tank)	150

Ser. No.	Village and Scheme	Est. Cost. £
3	<u>Ormidhia</u> : Improvement of the village water supply (placing central sluice valves)	350
4	<u>Kornos</u> : Improvement of the village water supply (placing central sluice valves)	180
5	<u>Pyrga</u> : Repair of pipeline of the village water supply network	100
6	<u>Kellia-Troulli</u> : Relocation of pipelines of the villages water supply	2,000
7	<u>Livadhia</u> : Improvement of the village water supply (placing central sluice valves)	200
8	<u>Maroni</u> : Water supply of new division of plots	1,800
9	<u>Layia</u> : Relocation of pipeline of the village water supply	130
10	<u>Alaminos</u> : Improvement of the village water supply (placing central sluice valves)	120
11	<u>Psevðhas</u> : Improvement of the village water supply (placing of sluice valves)	60
12	<u>Dhromelaxia</u> : Improvement of the village water supply (installation of water meters) to T/C houses	200
13	<u>Khirokitia</u> : Improvement of the village water supply spring Ayios Spiridon.....	400
14	<u>Aradhippon</u> : Improvement of the village water supply.	
	a) Placing central water meters	450
	b) Water supply to isolated houses	13,200
	c) Water supply to isolated houses	2,180
15	<u>Kophinou</u> : Improvement of the refugee estates sewage scheme	400

FAMAGUSTA DISTRICT

Ser. No.	Village and Scheme	Est. Cost £
1	<u>Paralimni</u> : Relocation of pipelines of the village water supply	4,300
2	<u>Dherinia</u> : Improvement of the village water supply scheme (installation of central water meters)	750

CONSTRUCTION

During 1984 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 Regugee housing estates. For all construction works details see table under CONSTRUCTION DIVISION.

XI LIMASSOL REGIONAL OFFICE

by
N E Neocleous
Executive Engineer II
Regional Engineer

General

Limassol Regional Office is responsible for the activities of the Department within the District of Limassol. The office is divided into four main sections as follows:

Water Resources

Investigation and Design

Construction

Operation and Maintenance

The Regional Office is manned by 49 staff as follows:

- Executive Engineer II 1
- Technicians. I 13
- Assist Chief Foremen 3
- Hourly Technicians 11
- Accounting Officer 1
- Clerk II 2
- Foremen 18

For the execution of the construction works about 200 skilled and unskilled workers were engaged.

WATER RESOURCES

Hydrological measurements were carried out in the prescribed areas which are under the Special Measures or Conservation Law as listed under WATER RESOURCES DIVISION.

Surface Water Hydrology

Rivers

The flow of the rivers is gauged by means of automatic water level recorders and the results are calibrated by means of current meter measurements.

Nine gauging stations equipped with automatic water level recorders are established on main rivers of Limassol District.

At the end of the year two new Flow Gauging Stations were constructed and equipped with automatic water level recorder, one on Kouris river and one on Zyghos river, to replace the two existing Stations which will be cover by the water of Kouris Dam. The purpose of these flow gauging stations is the recording of the inflow to Kouris Dam, from the above rivers.

- The total discharges calculated for each river are given in the Hydrological Year Book of the Department.

✓ - Kouris river, at Khalassa gauging station had a continuous flow throughout the year.

- Current meter measurements were taken at weekly intervals except at times of flood, when additional measurements were taken (total measurements 291) and at the same time 7 water samples were taken for suspended sediment analysis. Another 96 water samples were taken from Kouris, Kryos and Zyghos rivers for suspended solids analysis.

Springs and Streams

The discharge of 43 springs and streams were measured at monthly intervals for the benefit of village water supplies, Limassol water supply, the design of minor irrigation and water supply schemes and hydrological observations.

✓ A total of 478 springs 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 5 streams and the water level of 17 boreholes were measured, within the framework of Pitsilia Project. A total of 88 stream measurements and 204 water level measurements were taken.

Groundwater Hydrology

Hydrological investigations and measurements were carried out in the Special Measures Law area of Akrotiri and the water conservation areas of Yermasoyia, Mori-Pyrgos, Paramali-Evahimou, Pissouri-Evdhimou, Parekklisha and the rest of Limassol District.

Special Measures Law - Akrotiri Phassouri Area

✓ Hydrological observation and control is exercised by means of 195 wells/boreholes strategically situated in the area.

Water level measurements are taken twice a year from the above wells/boreholes except from 148 wells/boreholes where water levels are observed monthly, so that the behaviour of the water table in the aquifer, is observed more closely. A contour map showing the water situation in the aquifer, is drawn monthly.

Sea water intrusion in the aquifer is observed and studied by means of 67 wells/boreholes at Zakaki-Asomatos area and 23 wells/boreholes at Akrotiri area, water samples from which area taken 3-4 times a year. In addition the salinity of the water of 25 wells/boreholes in Episkopi-Akrotiri area was observed once a week during the months, July-September.

Water pumped from the aquifer for irrigation, domestic and industrial purpose is noted monthly for each individual licenced well, by means of water meter, (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 the above area, from Yermasoyia and Polemiðhia Dams, through the distribution system, of the Dams and from Kouris river, through the irrigation intakes, up to the end of May 1984.

Water extracted from Akrotiri Aquifer.

<u>Purpose:</u>	M C M
Irrigation	12.53
Domestic	3.15
Industrial	0.91
Total	<u>16.59</u>
Water supplied from Dams	0.47
Total supplied for irrigation from the aquifer and from the Dams	13.00

Water Conservation Areas

The water situation within the Water Conservation Areas is 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 the questioning.

The Aquifer of Yermasoyia river is observed more closely, by means of 38 wells/boreholes, the water level of which is measured once every week. During 1984, a quantity of 2.7 M.C.M. was released for recharge, in the aquifer, from Yermasoyia Dam.

Salinity is also observed taking water samples for analysis, twice a year, from a number of wells/boreholes.

The number of observation wells/boreholes in the Hydrological Areas, which are under control, is 272.

Well Sinking Permits

Applications for well sinking permits and applications to transfer water to other plots, engine installations or Adjustment of pumping permits were investigated: some 475 cases were investigated and permits were finally granted by the D.O. for 385 of them.

Limassol Water Supply

Water supply to Limassol, for domestic purpose from the springs and boreholes is gauged monthly. A Total quantity of 8.18 MCM. was supplied, 1.42 MCM from springs and 6.76 MCM from boreholes.

Village Water Supply

The water supply of 106 villages was measured during the period

September-November, when springs and boreholes are at their minimum output or maximum draw down, respectively.

Water samples were taken from each of the above sources, for chemical analysis.

Metereological Observations

Daily records were kept for rainfall (Max. 47.5 mm on 1.11.1984) water evaporation (Max. 11.9 mm on 13.6.1984) temperature (Max. 39.1 C on 19.7.1984), wind velocity and sun reflection, at Yermasoyia Dam.

Records were also kept for rainfall (Max 32.2 mm on 16.11.1984) and water evaporation (Max average 23.0 for 2 days period, 18.7.1984-19.7.1984) at Polemidhia Dam.

Quarry and Gravel Pits Permits

19 applications for quarries and gravel pits licences, were examined and submitted to the Senior Mines Officer.

Dams and Reservoirs

In the District of Limassol there are 19 Dams and Reservoirs. Maximum water stored during 1984 and other data are recorded under OPERATION AND MAINTENANCE DIVISION.

INVESTIGATION & 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, 31 cases were examined studied, and the relevant designs were prepared for the total cost of £361,720 as follows:

TABLE XI - 1

IRRIGATION SCHEMES PREPARED IN 1984

Ser. No.	Village & Description	Est. cost £
1	<u>Kaminaria</u> . Utilization of B/H 117/78 for the improvement of new area	55 500
2	<u>Kellaki</u> . Improvement of "Pothies" proposed irrigation Division	12 600
3	<u>Agrós</u> . Improvement of "Mylos-Lambada" irrigation Division	14 400
4	<u>Agros</u> . Improvement of "Kato Lambada" proposed irrigation Division	5 200
5	<u>Parekklissha</u> Removing of pipelines on the new road of Pareklissha village	9 000

6	<u>P. Platres</u> . Improvement of channel of plot 118 Sh/Pl 477/11E ₁ E of "Pano Platres" Irrigation Division	50
	(a) temporary solution	1 000
	(b) permanent solution	
7	<u>Ay. Ioannis</u> . Improvement of "Teratsia" Irrigation Division	17 800
8	<u>Agros</u> . Improvement of "Dichalorotsos-Akros" Irrigation Association	14 800
9	<u>Limassol</u> . Removing of pipelines near Limassol - Yermasoyia seashore	6 000
10	<u>Pelendri</u> . Improvement of "Potamoulia" Irrigation Division	3 950
11	<u>Episkopi</u> . Utilization of B/Hs Hyar. Nos 1532 & 1381 for the proposed "Phaneromeni" Irrigation Division	76 000
12	<u>Pelendri</u> . Improvement of "Kato Psilon-Vrysi tou Archangelou" Irrigation Association	2 600
13	<u>Dhymes</u> . Substitution of channel by pipelines of "Kardama" Irrigation Division (a) solution	1 100
	(b) solution	1 270
14	<u>Kalo Khorio</u> Improvement of "Kalokhorio" Irrigation division	14 000
15	<u>Louvaras</u> . Improvement of "Koutroutsou" locality of "Pano Pervolia-Koutroutsou-Paskalis" Irrigation Association	3 850
16	<u>Saittas-Karvounas</u> . Removing of pipelines on the new road of Saittas-Karvounas	7 450
	(a) temporary solution	21 300
	(b) permanent solution	
17	<u>Agros</u> . Re-evaluation of "Kokkinoyi-Perambeli" Irrigation Division	2 800
18	<u>Agros</u> . Improvement of "Pano Taliou" Irrigation Division	2 300
19	<u>Yerasa</u> . Utilization of B/H 106/82 for the Improvement of "Yerasa" Irrigation Division	28 500
20	<u>Ayios Ioannis (Agros)</u> . Re-evaluation of "Peroyia" Irrigation Division	9 700
21	<u>Ypsonas</u> . Installation of sluice valve on plot 684/271 Sh/Pl 53/63 from Yermasoyia Polemidhia project	2 280
22	<u>Akrounda</u> . Removing of pipeline from plot 57 Sh/pl 54/11E ₂	1 700
23	<u>Mallia-Arsos</u> . Removing of pipelines on the new road Mallia-Arsos-Ayios Nicolaos	1 600
24	<u>Erimi</u> . Improvement of main channel "Erimi" of Asomatos, Trachoni, Zakaki, Tserkez Tsiflik Irrigation Division	41 500
25	<u>Pareklissha</u> Removing of pipelines on the new road of the village	1 300

26-		
31	Six cases in six villages of total cost	2 170
	Total	<u>£361 720</u>

In addition to the above 76 cases (applications) were examined studied and the relevant technical advice was given to the people concerned.

Water Supply Branch

For the development of water supply systems of Limassol District, 89 cases were examined studied, and the relevant designs were prepared for the total cost of £1,623,817 as follows.

TABLE XI - 2

DOMESTIC WATER SUPPLY SCHEMES PREPARED IN 1984

Ser. No.	Village & Description	Est. cost £
1	<u>Ayios Yeorghios (Sylikou) & Sylikou.</u> Utilization of B/H 24/83 for the improvement of water supply as follows: (a) Utilization of B/H 24/83 (b) Improvement of Sylikou Water Supply system (c) Improvement of Ay. Yeorghios water supply system	27 000 16 700 31 400
2	<u>Ephtagonia</u> Supplementary supply at plot 124/2 Sh/Pl 487/38	2 550
3	<u>Souni Zanaia</u> Utilization of B/H 93/82 for the improvement of water supply	151 000
4	<u>Amathus.</u> Supplementary supply at plots 246/1/1/1/7 and 246/1/1/2 Sh/Pl 54/45	1 500
5	<u>Ypsonas.</u> Re-evaluation for the land division (File No. D222/78	1 600
6	<u>Akrounda.</u> Supplementary supply at plots 97/2/1, 97/1/1, 95/1/1 Sh/Pl 54/11E ₂ & 19E ₁ , 54/12W ₂	3 150
7	<u>Moniatis.</u> Design to construct new storage tank in high position	16 570
8	<u>Korphi.</u> Supplementary supply for the land division (file No. B431/80	36 200
9	<u>Amathus.</u> Supplementary supply at plots 186/1/1/1, 186/1/2 Sh/Pl 54/47	2 700
10	<u>Asgata.</u> Supplementary supply for Asgata Soldgers Camp	6 400
11	<u>Ypsonas.</u> Supplementary supply for the land division (file No. D45/79)	2 100
12	<u>Yermasoyia.</u> Supplementary supply at plot 82/1 Sh/Pl 54/52	3 200
13	<u>Yermasoyia.</u> Supplementary supply at plot 293/2 Sh/Pl 54/51	1 350
		319

14	<u>Episkopi</u> . Re-evaluation for the land division (File No. D688/79)	3 600
15	<u>Kolossi</u> . Re-evaluation for the land division (File No. D250/82)	7 900
16	<u>Amathus</u> . Supplementaty supply at plot 99/2 Sh/Pl 54/47	1 900 4 400
17	<u>Episkopi</u> . Refugee self-housing scheme phase "D"	20 000
18	<u>Alassa</u> . Stock farm water supply	
19	<u>Kato Polemidhia</u> . Refugee self-housing scheme phase "E"	8 400
20	<u>Mouttayaika</u> . Refugee self-housing scheme phase "D" & "E"	63 300
21	<u>Moniatis</u> . Re-evaluation of land division (File No. D579/80)	1 800
22	<u>Kolossi</u> . Re-evaluation of land division (File No. D222/82)	6 000
23	<u>Pissouri</u> . Substitution of pipeline at "Limnes" locality	7 600
24	<u>Kato Polemidhia</u> . "Makarios III" Government Housing Estate (Temporary and permanent new scheme)	13 550
25	<u>Ay. Ioannis (Agros)</u> . Design to construct shed and other protection meters for the B/H of water supply	1 500
26	<u>Kolossi</u> . Re-evaluation of land division (File No. D293/79)	10 100
27	<u>Episkopi</u> . Re-evaluation of land division (file No. D688/79)	2 680
28	<u>Pano Kyviches</u> . Re-evaluation of new land division (36 plots)	5 400
29	<u>Amathus</u> . Supplementary supply at plots 527, 522/1 Sh/Pl 54/42 & 52	2 200
30	<u>Yermasovia</u> . Supplementary supply at plot 192 Sh/Pl 54/52	1 440
31	<u>P. Platres</u> . Re-evaluation of land division (File No. D71/82)	1 100
32	<u>Polemidhia</u> . Design to construct a storage tank of 135 m3 for the soldiers camp	7 250
33	<u>Paramytha</u> . Re-evaluation of land division (File No. D41/79)	2 600
34	<u>Amathus</u> . Supplementary supply of a house (File No. B304/84)	7 300
35	<u>Phasoula</u> . Improvement of "Angoulia" spring	1 750
36	<u>Ypsonas</u> . Evaluation for land division (File No. D130/84)	1 900
37	<u>Moniatis</u> . Evaluation for land division (File No. D686/78)	68 000

38	<u>Yermasoyia</u> . Supplementary supply of land division (File No. D183/83)	1 370
39	<u>Amathus</u> . Supplementary supply at plot 90/3/1 Sh/Pl 54/47	3 000
40	<u>Khalassa</u> . Temporary scheme for supplementary of New Khalassa from private B/H	7 500
41	<u>Ay. Athanasios</u> . Re-evaluation of land division (File No. D97/83)	1 000
42	<u>Polemidhia</u> . Supplementary supply of teachers houses near Polemidhia camp	1 600
43	<u>Evdhemou</u> . Substitution of water supply distribution system	17 000
44	<u>Khalassa</u> . Permanent supplementary of New Alassa and Stock farm (a) Main pipeline from "Kephalovrysos" spring to the proposed storage tank	109 000
	(b) Supplementary of Alassa (New site)	29 700
	(c) Supplementary of stock farm	7 600
45	<u>Amathus</u> . Supplementary supply at plots 254/2 & 3/1 Sh/Pl 54/46	1 600
46	<u>Khalassa</u> . Relocation of pipes of "Kephalovrysos" and "Krya Pygadhia" springs outside of Kouris Dam reservoir	563 000
47	<u>Ypsonas</u> . Re-evaluation for land division (File No. D425/80)	5 600
48	<u>Ayia Phyla</u> . Design to construct storage tank and improvement of distribution systems at Polemidhia Ayia Phyla Soldiers camp	23 000
49	<u>Yermasoyia</u> . Re-evaluation for land division (File No. 39/79)	2 000
50	<u>Amathus</u> . Supplementary supply at plots 234/2, 232/2 Sh/Pl 54/45	2 500
51	<u>Yermasoyia</u> . Supplementary supply at plot 193/1 Sh/Pl 54/52	1 560
52	<u>Yermasoyia</u> . Supplementary supply of land division	127 800
53	<u>Yermasoyia</u> . Supplementary supply at plot 98/1/1, 110/172 Sh/Pl 54/52	1 550
54	<u>Ypsonas</u> . Re-evaluation for land division (File No. D372/81)	1 000
55	<u>Yermasoyia</u> . Utilization of B/H 25/81 for the improvement of water supply	78 500
56	<u>Limassol</u> . "Ayios Spyridon" Government Housing Estate	56 500
57	<u>Kato Polemidhia</u> . Refugee Self-housing scheme phase "D"	10 200
58- 89	Thirty two cases in 32 villages of total cost . .	16 147
	Total	<u>£1 623 817</u>

In addition to the above 92 cases (applications) were examined studied, and the relevant technical advice was given to the people concerned.

CONSTRUCTION

Irrigation and Water Supply Schemes

Several schemes were constructed by the Limassol Regional Office for major and minor irrigation schemes village water supply, water supply for refugee housing estates. These are listed under chapter VII Construction Division.

Materials and Machinery

By the end of the year 1984 the following materials and machinery for water supply and irrigation schemes have been used.

TABLE XI - 3

MACHINERY USED BY LIMASSOL REGIONAL OFFICE

Machinery Employed . . .	Unit	Quantity	Value £
Tiger lorries	-	agreed	3 433
Tiger lorries	W/hours	487	1 519
Buses	W/days	70	579
Electrowelding machines	W/hours	1 496	1 730
Caterpillars	W/hours	339	4 035
Caterpillars	agreed	-	440
Cutting machines	W/hours	455	-
Saloon cars	W/days	249	1 173
Land rovers	W/days	3 504	34 076
Diggers	W/hours	10 046	37 152.75
Compressors	W/hours	2 554	4 090.25
Concrete mixers	W/days	185	740
Braker	agreed	-	300
Crane	W/days	39	234
Total			<u>89 502</u>

TABLE XI - 4

MATERIALS USED BY LIMASSOL REGIONAL OFFICE

Materials used	Unit	Quantity	Value £
Galvanized steel pipes . . .	m	51 654	104 389
Steel pipes (coated or uncoated)	m	1 996	13 977
Ductile iron pipes	m	188	8 564
Asbestos cement pressure pipes - class 15	m	14 160	34 870
Asbestos cement pressure pipes - class 20	m	12 450	67 069
P.V.C. polythere pipes . . .	m	22,681	5 965
Cement	tones	250	6 548
Sand	m ³	473.69	2 302
Aggregates	m ³	740	3 502
Mild steel	tones	22	3 416
Sand for pipe bedding . . .	m ³	4 722	8 112

TABLE MATERIALS USED BY LIMASSOL REGIONAL OFFICE (Cont.)

Materials used	Unit	Quantity	Value £
Ready mixed concrete	m ³	266	3 876
Fittings	No	25 435	61 007
Sluice valves	No	3 621	19 811
Water meters	No	404	4 658
Shingle	No ^S	149	566
Total			<u>£348 632</u>

OPERATION AND MAINTENANCE

The Limassol Regional Office was responsible for the operation and maintenance of all projects in the District of Limassol.

Yermasoyia-Polemidhia Project

Pissouri-Alectora Irrigation Schemes

For repairing and maintenance of water meters and valves and general maintenance and painting of metal structures, etc. a sum of £16 607 was spent on Yermasoyia-Polemidhia Dams and Distribution network and £790 on Pissouri-Alectora Irrigation Schemes.

Amathus Water Supply

The scheme operates with automatic control equipment. The operation and maintenance are carried out by the Regional Office of the Department in co-operation with Limassol District Officer.

For supervision, repairs and maintenance of water meters and valves and general maintenance and painting of metal structures etc. Expenditure: £1 829.

Village water supply schemes

For repairs and maintenance of several water supply systems the sum of £7 954 was spent.

MEETINGS

During the year under review, the regional Engineer attended several meetings as the representative of the Director of the Department.

XIII PAPHOS REGIONAL OFFICE

by

A Lambrou

Executive Engineer I

Regional Engineer

General

In 1984 the staff of the Paphos District Office was composed of the following:

- 1 Executive Engineer I- Head
- 10 Technicians I
- 3 Technicians II Monthly
- 7 Technicians II Daily
- 1 Assistant Chief Foreman
- 7 Foremen Monthly
- 4 Foremen Weekly
- 1 Officer Clerk
- 9 Clerical and accounting staff
- 1 Telephone Operator
- 3 Technicians II Hourly
- 1 Messenger

Surface Hydrology

During the year 10 permanent stream gauging stations equipped with automatic water level recorders were in operation and weekly visits were made for observation, maintenance and calibration purposes by the use of current meter.

A total number of 665 current meter and seven volumetric measurements were taken during the year for calibration purposes. Also samples for suspended sediment load and boron analysis were taken regularly.

Springs

During the year 38 springs were under observation and a total number of 640 spring discharges were gauged, 48 by current meter and 592 volumetrically.

Water Supply

The water supply of 132 villages was gauged during the months of September and October and samples for Ionic and Nitrates analysis were taken.

Rainfall observing stations

Five rainfall observing stations equipped with automatic rain gauge 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 127 wells/BHs.

The distance from established benchmarks on top of every observation well/BH to the ground water level was measured twice a year at the end of the wet season (March) when it is expected to be at highest level and at the dry season (November-December) when it is expected to be at the lowest level.

In addition monthly or weekly measurements of the ground water level were taken from 119 wells/BHs during the year for special studies.

During the year a total number of 1999 water level measurements were taken from wells/BHs under observation as follows:

1643	water level from S.W Paphos Hydrological Area
359	" " " Polis Project Area

Analysis

A total number of 323 samples for analysis were taken from wells/BHs, springs and streams, 28 of which were submitted to the Government analyst for Boron & Ionic B.O.D, 149 to Khirkitia analyst for Nitrates & Ionic, 18 to the Departmental laboratory for suspended sediment and 127, were analysed in the Paphos District Office for Chloride content.

Questioning

The annual questioning was carried out in South Western Paphos Hydrological area on 2650 owners of wells during summer for determining the ground water extracted, area irrigated and Kind of crops planted.

Well sinking permits

A total number of 128 applications for sinking and covering permits of wells/BHs were examined and submitted to the District Officer Paphos.

These applications were finally examined and approved by the Advisory Committee of the Ministry of Agriculture and Natural Resources and 110 were approved 41 of which were in special measures law areas, 55 in water conservation areas (WCA) and 14 in non WCA.

Encroachments in Rivers and streams

Thirty three cases for land encroachments in rivers and streams were examined and the Director of Lands and Surveys Department was advised accordingly.

Quarries and gravel pits permits

Fifty seven applications for quarries and gravel pits permits were examined.

The Hydrological section undertook to supervise implementation of the special conditions laid by the Department to the Contractors exploiting the gravel and sand of the river beds.

Plotting

During 1984, six new wells/BHs were plotted on LRO plans at Koyklia and Peyia Villages.

Pumping tests

During the year 12 pumping tests, seven of which for Tourist and five for Agriculture development were carried out and relevant reports were submitted to the Director of the Department.

Construction:

The construction programme of the Paphos Regional Office for 1984 included 26 Water Supply and Irrigation Schemes of a total cost of £413,887. Also another £83,207. were spent for several other works, mainly coming from Public Works Department and the District Officer Paphos.

Design Section

The main task of this Section is to solve all water supply and irrigation problems in Paphos District.

IRRIGATION SCHEMES

The planning and design of irrigation schemes were in progress during 1984 and a total number of 6 new Projects were prepared. These schemes were submitted to the Director for approval and submission to the interdepartmental Committee for Evaluation. The table below shows separately the extend of land and the Cost of each Irrigation Scheme.

TABLE XII-1
IRRIGATION SCHEMES PREPARED IN 1984

<u>Serial No.</u>	<u>Village and description</u>	<u>Land Irrigated</u>	<u>Estimated cost £</u>
1.	Kili Irrigation B/H 88/83	103	48,100
2.	Arminou (from the river)	50	13,000
3.	Nikoklia B/H 64/83	190	41,000
4.	Phasoula from B/H 166/83 & B/H 236/62	850	114,250
5.	Mamonia B/H 61/52 & 133/83	310	104,100
6.	Pendalia B/H 67/83	178	60,000
		Total amount	380,450

Village Water Supply Schemes

The design of new Water Supply Schemes for Paphos District continued during 1984 and a total number of 3 Schemes were prepared and submitted to the Director for approval.

TABLE XII-2
DOMESTIC WATER SUPPLY SCHEMES PREPARED IN 1984

1. Khloraka W. Supply (house to house scheme)	£ 180,000
2. Khloraka touristic area	£ 84,000
3. Khlorakas-new main conveyor and storage tank	£ 180,000
4. Kissonerga touristic zone	£ 68,000
	<u>£ 512,000</u>
	Total

Also designed and prepared drawings for livestock areas and for river training Works, as follow:

1. Livestock area Timi for	£ 8,000
2. Livestock area Anarita for	£16,400
3. River training Works.	<u>£37,600</u>
Total amount	£62,000 =====

Also 190 applications were investigated by this Section during the year.

OPERATION AND MAINTENANCE

During 1984 the Paphos Regional Office dealt with the operation and maintenance of the several water works in Paphos i.e. Paphos Dams, Khrysokhou valley irrigation Scheme and the various Government Water Supply Schemes.

Regarding the Government Water Supply Schemes a detail report covering both the expenditure and the revenue generated has been submitted to the Director.

Also 287 applications regarding E.A.C and CYTA way leaves were examined during 1984.

Committee Meetings

During the year under review the District Engineer attended several meetings as the representative of the Director or as member of several local committies.