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WATER SUPPLY AND IRRIGATION DEPARTMENT

ANNUAL REPORT FOR 1950

BY

I. L. WARD, B.E., M.I.C.E., M. INST. W.E.

Water Engineer

NICOSIA

PRINTED AT THE CYPRUS GOVERNMENT PRINTING OFFICE

1951

[4/51—250—1300/51.]

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Annual Report of the Water Supply and Irrigation Department for the Year 1950.

All Government water supply work in Cyprus is in the hands of the Water Supply and Irrigation Department whose activities cover the whole range of water supply including the search for new sources, irrigation, and the provision of water for domestic purposes. On the irrigation side, the Department's duties are confined to the engineering problems of the supply of water. The agricultural problems involved in its economic use are dealt with by the Department of Agriculture.

2. In 1950 more water development works have been carried out than in any previous year. New irrigation works continue at the pace set by the post-war development plan ; village water supplies, no longer delayed by a pipe shortage, have exceeded last year's record by 60% ; and the drilling of boreholes has proceeded 20% faster than the 1949 record. These results have been accomplished without a corresponding increase in staff and in spite of diversions to repair the 1949 flood damage and to plan town water supply schemes for Limassol, Famagusta and Nicosia. During the year water development works of one sort or another have been carried out in 225 of the island's 627 villages and investigations for new works have been made in many others.

3. The work of the irrigation branch of the Water Supply and Irrigation Department deals chiefly with the following :—

(*a*) Gravity irrigation schemes developing small springs by excavation at source, by lining channels in masonry to prevent loss of water, and by constructing masonry tanks for night storage.

(*b*) Gravity irrigation schemes involving the diversion of seasonal or perennial flow from rivers and watercourses by means of weirs and channels.

(*c*) Pumped irrigation from boreholes and open wells—a means of utilizing the natural underground water resources.

(*d*) Gravity irrigation from infiltration galleries constructed in slow yielding aquifers, in fissured rock or in river gravels—a means of tapping natural underground reservoirs without the expense of pumping.

(*e*) Water conservation in artificial reservoirs for periods of a few days to several months.

The above types of schemes fall into two major categories, viz. gravity irrigation works and pumped irrigation works. In the former, the water flows by gravity without mechanical assistance but in the latter the water is raised from boreholes and wells by some form of machinery.

4. The rate of progress in irrigation since the commencement of the Ten-Year Programme of Development in 1946 is shown in the following table :—

	Gravity Irrigation		Mechanical Irrigation (i.e. Pumped).	Total.
	Perennial.	Seasonal.		
	Donums	Donums	Donums	Donums
1946 Census	59,409 or say 59,500	284,977 or say 285,000	53,131 or say 53,000	397,517 or say 397,000
Estimated at end of 1949 (see W.S.I.D. Annual Report, 1949)	67,500	310,000	62,500	440,000
New Irrigation, 1950 (approximately) ..	2,500	3,000	5,000	10,500
Estimated totals at end of 1950 (approx.) ..	70,000	313,000	67,500	450,500
Percentage increase since 1946 census and commencement of Ten-Year Programme of Develpt.	17.5%	10%	27%	13.5%

5. In the domestic water section most attention is given to village supplies and the work comprises the development of water sources, the laying of main pipe lines to villages and the installation of piped distribution systems including storage tanks and public " fountains ". A " fountain " is a combined public standpipe, trough and drainage soak-pit. Usually no house connections are included. The sources may be springs, infiltration galleries, boreholes, or wells and the water is sometimes partly for domestic use and partly for irrigation. Town water supplies are not controlled by the Water Supply and Irrigation Department but the responsible authorities (usually Municipal Councils) frequently seek the help of the Department. This is rarely refused and in 1950 has been considerable.

6. The number of villages in Cyprus with piped domestic water supplies was estimated to be 346 in the census of 1946. Since then 150 schemes have been completed but many only improve or replace old installations and it is now estimated that the total number of villages with piped water is 385 or 61% of the 627 villages named in the census. Of these 234 may be considered to be in satisfactory condition while 151 need fundamental repairs or total replacement. The villages still without piped supplies are on the whole situated far from reliable sources and the cost and difficulty of providing them with piped water will usually be greater than it has been in past schemes. Of the four large towns in Cyprus only one, Larnaca, may be said to have a satisfactory water supply. For the other three, Nicosia, Famagusta and Limassol, new schemes have been prepared by the Water Supply and Irrigation Department.

7. GRAVITY IRRIGATION : There has been no change of policy during the year and the Department has continued to concentrate on carrying out many small gravity irrigation schemes rather than a few large ones. These small schemes have become very popular, particularly in the hills, and a steady flow of proposals for new works is coming in. The proposals usually originate from the landowners themselves who in the first instance put forward ideas which are frequently sound in principle and require little modification by the Department's officers except in technical detail. All construction work is carried out by the Water Department. Management and maintenance of the works upon completion passes over to the beneficiaries. The total number of gravity irrigation schemes completed during the year is 69 commanding 5,424 donums of new irrigation of which 2,294 can be irrigated perennially. These figures are exclusive of flood damage repairs.

8. The typical hill scheme consisting of perennial water source, masonry or concrete lined channels, and frequently a masonry irrigation tank may be said to have reached the stage of mass production. In the Pitsillia where this type of scheme is perhaps the most popular, most villages have had a number carried out by the Water Department. During the year 56 schemes of this type have been completed commanding 1,342 donums of new perennial irrigation. A further 17 are in hand at the end of the year and many more are planned. Among those planned are several large projects which include the lining of a number of miles of existing earth channels to prevent waste of water and to make possible its utilization on land that is now dry. Three of these are Prodhromos (£7,130), Pedhoulas (£11,026), Korakou and Tembria (£12,860).

9. Projects utilizing the steady winter and spring flow and sometimes the diminished summer flow of the larger rivers are also in demand and this year 15 projects of this type commanding 13,634 donums have either been completed or are in progress. Among these may be mentioned the works at Kochati, Limnitis, Geunyeli and the three former Paphos chiftliks of Kouklia, Akhelia and Potima. Descriptions of these, except Kochati, are given in Appendix 1. Kochati was described in the 1949 Annual Report.

10. No major water-storage schemes have been carried out in 1950 but a number of improvements and extensions have been made to earlier works and a small dam was built at Marathounda. The Lythrodhonda dam has been heightened

by two feet, masonry spillways have replaced the earth spillway at Kanli Keuy and desilting gates have been fixed on the Lythrodhonda, Galini, Lymbia and Akrounda dams to minimise the accumulation of silt in the reservoirs and consequent loss of storage capacity. Detailed designs have been prepared for a new 60-foot high dam at Lefka and investigations have been made for other new dams at Petra and Lythrodhonda.

11. Flood irrigation, by which sudden floods of short duration are utilized to irrigate winter and spring crops, mainly cereals, is practised chiefly in the Mesaoria and also in other places throughout the island. In 1950 no large schemes have been undertaken but a number of minor ones including improvements to existing works have been carried out in various places, chiefly in the Eastern Mesaoria.

12. The record floods of December, 1949, described in the Water Supply and Irrigation Department's annual report for 1949, caused more damage to irrigation than was at first realised. The most notable damage was the breaching in some 20 places of the 50 year old Kouklia embankment which controls the flood flow from the largest catchment in Cyprus, the combined Pedieos and Yialias basin. The work of reforming the embankment, including the movement and consolidation of some 50,000 cubic yards of earth, was completed before the normal rainy season and is described in Appendix 1. In addition to the December floods a second extraordinary flood occurred in the early summer in a different part of the island, the Marathassa Valley. In this case a " cloud burst " on 21st June, 1950, in the hills above Kalopanayiotis caused severe soil erosion and damage to the main road and to irrigation and water supply works. At the nearest rainfall station, Pedhoulas, two miles from the " cloud burst " 3.11 of rain fell in about 3½ hours. At the centre, of course, the intensity must have been very much greater. In 1950 a total of 31 flood damage repair schemes was completed and the expenditure was £48,360 of which £45,742 was for damage caused in December, 1949, and £2,618 for that of June, 1950.

13. A comprehensive report on the subject of accumulation of silt in reservoirs, which is also a study of the rates of soil erosion in Cyprus, has been prepared by Dr. Burdon, Assistant Water Engineer. The report shows that the irrigation reservoirs on the periphery of the Troodos range, if not provided with desilting gates, will all become full of silt in periods ranging from 7 to 70 years from the date of construction. Kouklia Reservoir, on the plain, would take 275 years to fill with silt and Syngrasis, were it still kept as a reservoir of its original capacity, 1,300 years. The report also gives estimates of the rate of soil erosion in reservoir catchments. It is hoped to publish the full report in 1951. In the meantime Dr. Burdon gives a summary of his findings in Appendix 5 of this Annual Report.

14. Regular measurements of discharge of forest streams have been taken to show the extent of diurnal variations. It has been found this year that the maximum flow of the Pyrgos stream at night was sometimes as much as eight times the day flow. In the adjacent Limnitis valley a maximum day discharge of 2.4 times the minimum was measured. No irrigation is practised above the points of measurement and the chief cause of the diurnal variation is therefore thought to be transpiration by the trees and plants growing in the stream beds. Measurements of forest springs at their sources have shown no such diurnal variation.

15. The Kouklia Reservoir (Eastern Mesaoria Irrigation Works) was this year out of action owing to the damage caused by the floods of December, 1949, and so no revenue was obtained for the sale of irrigation water. Land leased for cultivation at Kouklia, Akhyritou, Syngrasis and Vatili amounted to 2,707 donums. Grazing licences were issued for 5,902 sheep and goats. Revenue amounted to £2,343 as against expenditure on normal maintenance of £1,559 and on staff of £2,654.

16. The transfer of the control of the Eastern Mesaoria Works to a special committee was postponed pending the completion of repairs to flood damage. It is now proposed that the works should be run by the Commissioner, Famagusta, in consultation with a committee comprised of the Director of Agriculture, the Accountant-General, and the Water Engineer ; no handing over date has yet been fixed.

17. DOMESTIC WATER SUPPLY : For ten years, from the beginning of the war until 1949, the domestic water section of the Department has been severely handicapped through lack of pipes. At the end of 1949 the position suddenly changed and since the beginning of 1950 all materials needed for village schemes have been available. All orders for pipes placed before 1950 have now been fulfilled.

18. The changed circumstances have enabled the Department to perform a record year's work on village water supplies. A total number of 52 schemes was completed during the year and on the 31st December, a further 38 were still in hand. Investigations for new schemes have been keeping pace with construction, and at the end of the year 87 are ready to be carried out as staff becomes available and as financial and other formalities are settled.

19. While the chief problem of carrying out so many village water supply works is one of organizing a limited staff to its highest efficiency there are also technical difficulties. For example in 1950 the following have occurred in village domestic water schemes : at Anoyira a tunnel in rock 1,700 feet long ; at Asomatos a tunnel 2,200 feet long ; at Pyrgos a 3-inch pipe line 9 miles long through precipitous forest country ; at Pissouri a 3-inch pipe line 7 miles long also through precipitous country ; at Kantara a 300,000 gallon covered reservoir of masonry and reinforced concrete. Descriptions of several schemes are given in greater detail in Appendix 2.

20. There are two projected village water supply schemes of more than ordinary importance and both deserve mention although they are still in the planning stage.

(*a*) In the Paphos district it is proposed to utilize the water of a large forest spring, the Appidhes, for a combined project to serve a large number of waterless or almost waterless villages. Provisionally ten villages are included, viz. Pano Panayia, Asproyia, Kritou Marottou, Simou, Stroumbi, Tsadha, Lemona, Phalia, Ayia Marina and Amargeti. The total length of pipe line, excluding distribution pipes, will be about 46 miles. The population of the 10 villages, by the 1946 census, was 4,714. A preliminary estimate indicates that the cost will approximate £60,000 or £12.7 per head. The latter is high but is perhaps justifiable because of the scarcity of water in the area.

(*b*) No village water supply problem in Cyprus deserves greater attention than that of the dry villages of the Eastern Mesaoria. There are six villages in the plain without water in summer or with only brackish water. They are Mora, Marathovouno, Mousoulita, Angastina, Yenagra and Pyrga. Their total population in 1946 was 4,567. Two tentative schemes have been studied as alternatives. The first plans to utilize the water now wasted at Kythrea from leaky channels. A volume equivalent to 3% of the flow of the Kythrea spring would provide domestic water for the dry villages of the plain ; it is expected that more than this quantity could be saved by lining some of the Kythrea channels. The total cost would amount to about £7 per head of the population served. For the moment the scheme has been shelved for administrative reasons. The alternative plan is to provide water from boreholes near Kokkini Trimithia. The capital expenditure in this case, including the capitalized cost of pumping charges, would be about £15 per person. A third possibility, not yet explored, is to obtain water from boreholes in the Kyrenia hills between Kythrea and Trypimeni.

21. In 1950 at the request of the respective Municipal Councils the Water Supply and Irrigation Department has spent considerable effort in preparing and checking projects for new town water supplies for Limassol, Famagusta, Nicosia and Ktima.

22. For Limassol a completely new scheme was prepared and tenders have been called for the supply of pipes and other materials. Construction is expected to commence towards the end of 1951. The cost of the scheme was estimated at the beginning of 1950 to be £252,000 but prices have now risen and the cost is likely to approach £300,000. Details of the Limassol scheme are given in Appendix 3.

23. The first stage of a scheme for Famagusta was prepared by the Water Supply and Irrigation Department early in the year and tenders for the supply of pipes and machinery were called by the Municipal Council in November. The estimated cost was £38,000 but owing to rising prices the actual cost is likely to be higher. A description is given in Appendix 4.

24. The Nicosia Water Supply scheme has received more attention in 1950 and some minor alterations have been made. In 1949 when it was prepared the estimated cost was £250,000. A description is given in Appendix 3 of the 1949 annual report of the Water Supply and Irrigation Department. Tenders for the supply of materials have not yet been called but a site for a reservoir has been secured on the Strovolos bye-pass.

25. The Ktima Municipal Council has accepted a tender for the supply of pipes for the first stage of a town water supply and it is expected that construction will begin in 1951 under the supervision of the Water Supply and Irrigation Department. The proposed project provides for the replacement of the present system of distribution pipes with new ones but it does not include any extensions to the system or any additional water. These must come later. The cost was estimated at £14,700 before the recent rise in prices.

26. DRILLING FOR WATER: More boreholes have been drilled in 1950 than in any previous year and the area of land irrigated from pumped underground water is increasing rapidly. Applications for boreholes under the subsidised drilling scheme continue steadily and with the present high rate of drilling the Department can attend to them promptly; there is now no long waiting list. As in 1949, eleven drilling rigs have been in operation throughout the year. Of these five have been on loan from the Army while the remaining six are Government property. Three of the latter are upwards of 25 years old and are consequently expensive to run.

NUMBER OF BOREHOLES DRILLED, 1943-1950.

	1943	1944	1945	1946	1947	1948	1949	1950
For private individuals and companies ..	25	34	56	61	35	92	135	132
For Government	20	23	16	3	17	25	46	32
For War Dept.	10	4	—	19	15	—	—	27
Totals ..	55	61	72	83	67	117	181	191
Aggregate footage drilled ..	7,964	9,115	12,785	11,686	12,171	21,397	33,610	40,751

27. Boreholes have been drilled for a number of purposes with varying degrees of success as shown in the following table. A "successful" borehole is one that yields more than 1,000 gallons per hour on test.

BOREHOLES DRILLED IN 1950.

Purpose	No.	Footage Drilled	Percentage Successful	Total Tested yield gals. per day
Irrigation	117	25,264	73·5	10,364,000
Domestic Water	8	1,482	37·5	184,000
Observation of Ground Water Level	9	1,843	100.0	780,000
Prospecting for water ..	23	4,888	39·1	791,000
War Department	27	5,251	92.6	3,221,000
Mining Companies ..	7	2,023	—	—
Total New Boreholes ..	191	40,751	71·7	15,340,000

An additional 290 feet of drilling has been carried out in cleaning and deepening old boreholes.

Prospecting boreholes are usually drilled in places where the chances of success are too slight to tempt farmers to apply for subsidised boreholes. The domestic water boreholes have been sunk mostly for villages remote from flowing water in the hope of saving the cost of long pipe lines for village supplies. The 10,364,000 gallons per day produced from irrigation boreholes is sufficient to irrigate 5,000 donums in summer or 15,000 in winter with steady pumping at half the test rate.

28. Since the commencement of the Ten-Year Development Programme in 1946, the total tested output of new irrigation boreholes has amounted to some 35 million gallons per day. If steadily pumped at half the tested rate, these new boreholes will yield sufficient water to irrigate 17,500 donums in summer and 52,500 donums in winter. Not all these boreholes have yet come into regular production but it is estimated that the area of land irrigated by mechanical means (chiefly by pumping from boreholes and wells) has increased by about 14,500 donums in the past four years, i.e. by about 27%.

29. As in 1949, most of the successful boreholes have been drilled in the Pliocene deposits which cover one-third of the island. In the Western Mesaoria, 21 successful boreholes have produced a tested yield of 3.3 million gallons per day equivalent to an average yield of 6,500 gallons per hour. In addition nine observation boreholes have been drilled in that area to observe fluctuations of the ground water level and to give timely notice of any tendency towards overpumping of ground water. No signs of such overpumping have yet been observed in the Western Mesaoria. Around Nicosia and in the Pliocene beds to the south-east, only 8 out of 17 boreholes proved successful and the water has sometimes been of poor chemical composition.

30. The most interesting area developed this year lies in the triangle Kalopsidha-Pergamos-Xylophagou where 58 out of 65 boreholes were successful yielding a total of 7 million gallons per day on test. Of this number 27 were drilled for the War Department and yielded 3.2 million gallons per day. At Kalopsidha all the water is found in the Pliocene but around Xylophagou, most of the 22 successful irrigation boreholes have struck water in a Middle Miocene reef-limestone and in its associated limestone agglomerates. The outcrop of these rocks is restricted and there is a danger that heavy pumping may deplete the reserves of water. At Ayia Napa boreholes drilled in the same reef-limestone have met saline water, probably indicating contamination from the sea.

31. In Limassol and Ktima 33 boreholes have again demonstrated that in those areas underground water is strictly confined to the Pliocene coastal plain. Of 16 holes in the volcanic and hypabyssal rocks throughout Cyprus only two were

successful, showing that drilling in those rocks is usually unadvisable. In the alluvium filled valleys of the Tylliria 5 boreholes were all successful, one being truly artesian with a free flow of 1,600 gallons per hour. On the Kyrenia coast 8 boreholes were drilled but only three, all in the Pliocene, were successful. In the Trikomo area 6 holes produced poor quality water from the sandy Miocene. Two boreholes in the Hilarion limestone were successful but costly to drill.

32. MISCELLANEOUS: Miscellaneous activities in the Department occupy a considerable proportion of the time of technical staff. In Nicosia three water supply systems, viz. the Government House—English School, the Government Offices and Hospital, and the supply to the Prison and the houses of Government officers, are all managed by the Department. Chlorinating apparatus to sterilize the water in all three systems has this year been installed and is now working satisfactorily. Personnel of the Department exercise technical control over the water supply works of the Nicosia Water Administration, which provides water chiefly to the part of Nicosia within the old city walls. The maintenance of the Larnaca town water supply is supervised by staff of the Department, and this summer some major repairs were carried out to the ancient supply tunnel in which a collapse after the winter floods threatened to cut off all water from the town. A number of miscellaneous works including pumping tests of boreholes and wells have been carried out for the Army, Village Water Commissions and private persons. Regular measurements of spring discharges are being carried out in many places throughout Cyprus for record purposes.

33. LEGISLATION: In 1950 no notable water legislation has been introduced but a new law and an amendment are under study. A bill to provide for the control and management of water supplies in municipal and other areas and for the establishment of Water Boards is being prepared. This law will give powers to the Governor in Council to establish Water Boards comprised partly of Government and partly of non-Government members. It is likely to be used for establishing and operating new water supplies in the chief towns. An amendment to the Wells Law, 1945, is under consideration; it is thought that a revision is necessary to provide for the better protection of existing sources of underground water from interference by new wells and boreholes.

34. FINANCIAL: The following is a summarized statement of the expenditure of the Water Supply and Irrigation Department in 1950:—

	Government		Village or Private Contributions	Totals
	Colonial Development and Welfare Grants	Cyprus Funds		
	£	£	£	£
Gravity Irrigation Schemes	38,342	40,758	23,520	102,620
Flood Damage repairs ..	—	43,425	4,935	48,360
Village Water Supplies ..	26,059	27,189	53,122	106,370
Subsidised Drilling ..	707	7,697	3,615	12,019
Prospecting for water ..	—	6,393	—	6,393
Miscellaneous works upon repayment	—	—	4,143	4,143
Departmental and Maintenance charges ..	—	27,257	—	27,257
	£65,108	£152,719	£89,335	£307,162

35. Included in the above are Personal Emoluments from all votes (£19,146), Payment of labour (£119,014), Travelling and Subsistence charges (£2,101), Improvement to Irrigation in the Paphos Chiftliks (£16,344), Flood Damage Repairs to the Eastern Mesaoria Irrigation Works (£18,399) and the total cost of drilling including deepening and cleaning a number of old wells (£18,886).

36. The average cost of a new borehole has been £94 and the average cost per foot of drilling about £0.440. A subsidised borehole has on the average cost £90, a borehole drilled upon full repayment £53, and a prospecting borehole £191. A reason for the low cost of boreholes drilled upon repayment is that recipients, including the army, frequently provide their own transport. Prospecting boreholes cost more because they are usually drilled in remote places.

37. Village contributions towards the cost of gravity irrigation works vary from one-fifth to one-third according to the type of work, the lower fraction being for flood-irrigation schemes and the latter for perennial irrigation. Payment by the villagers is made in cash, in free labour (capitalized in the above statements) or by Government loans at low rates of interest. Village domestic water schemes are paid for half by Government and half by the village, the village contribution being either in cash or by Government loan. Boreholes under the Subsidized Drilling Scheme are carried out for private irrigators at a fixed price to them of £32. 10*s*. per borehole and the balance which, in 1950, has on the average amounted to £57. 10*s*. excluding depreciation of plant, is paid by Government. Private individuals requiring boreholes for purposes other than irrigation are charged the actual cost in full. The Army, Municipal Corporations, Companies, etc., also pay the cost in full.

38. Staff and Labour: No appreciable increase in staff has occurred during the year but the labour force has been increased on the average by 42% to cope with the increased volume of work. Since 25th September the Assistant Water Engineer, Dr. Burdon, has been on loan to the Geological Survey for half his time; in return the Survey is paying the salary of the Assistant Engineer, Mr. Ford, who is wholly attached to the Water Department. The Cypriot staff at the end of the year comprised the following :—

Superintendent of Waterworks	1
Senior Inspector of Water Supplies	1
Inspectors of Water Supplies	5
Temporary Inspector of Water Supplies	1
Technical Assistants	7
Temporary Technical Assistant	1
Foremen	77
Clerical and Miscellaneous	24

39. During the year two Technical Assistants have been promoted to the grade of Inspector of Water Supplies and one temporary Technical Assistant has left the Department. The number of foremen has increased from 70 to 77 and clerical staff from 20 to 24. The increased output of the Department without a corresponding increase in staff has been made possible only by the enthusiasm of officers and their willingness to work long hours.

40. The average number of labourers employed was 1,142 of whom 12% were "skilled". This compares with an average 805 in 1949 of whom 12% were skilled. The approximate monthly averages are as shown :—

January	880	April	1000	July	1250	October	1350
February	950	May	1070	August	1350	November	1400
March	1000	June	1150	September	1300	December	1000

41. As in other Government Departments a 44-hour week is observed. From Monday to Friday the working day is 8 hours but on Saturday 4 hours only. The 4 hours on Saturday is considered as a full day and wages are paid for 8 hours. In drilling for water a bonus system is used whereby a drilling crew, if it exceeds a certain prescribed monthly output, receives an addition to its normal weekly wages.

42. DEMAND FOR SCHEMES: Keen interest in all kinds of water supply work continues. In 1950 a substantial effort has been made to cope with the demand for village water supplies but there is still a long waiting list of applications which can only be attended to as staff become available. The large town water supply schemes of Limassol, Famagusta and Nicosia together with a smaller one for Ktima are needed urgently and their execution in the next few years will add to the difficulties of finding officers to supervise large numbers of village schemes. Requests for irrigation works in 1950 have on the whole been met although not without difficulty because of the necessity to attend to repairs of the 1949 flood damage. The demand for boreholes has been fully satisfied and it is unlikely that the need for such a high rate of drilling will continue. In general it may be said that the demand for irrigation works is being satisfied but the rate at which domestic water problems can be attended to is limited by the availability of suitable technical staff.

I. L. WARD,
Water Engineer.

January, 1951.

APPENDIX 1.

DESCRIPTIONS OF CERTAIN IRRIGATION SCHEMES.

(*A*) *Repairs to the Kouklia Embankment.*—The Kouklia reservoir embankment was built 50 years ago to store the surplus waters of the Pedias and Yialias rivers for irrigation. It also protects from flooding the low lands between Kouklia and the sea. The embankment is 5½ miles long and its top level near the spillway was originally probably about 24 feet in height above the invert of the low level outlet. In the course of years the top of the bank has weathered until at the time of the flood of December, 1949, it was on the average only about 22.5 feet above the outlet invert. The present masonry spillway, built in 1930, is 17.2 feet above the invert.

The embankment has been damaged on a number of occasions but never so badly as in 1949, when it was breached in about 20 places. The chief damage occurred in three different sections (*a*) at the north end near the railway—this was relatively unimportant—(*b*) in the centre where a length of about 2,000 feet contained some 15 breaches caused chiefly by the force of the Pedieos (Kopris) river, and (*c*) below the main Kouklia reservoir where the embankment is highest.

After the damage had been carefully examined and levels taken along the whole length of the embankment the following repair and preventive measures were decided upon : (*a*) all breaches to be filled after removing the soft silty mud that had been deposited in each, (*b*) the crest of the embankment to be restored to a uniform level a few inches below the original, (*c*) a new apron to be built on the masonry spillway together with a foot bridge over the crest to enable inspection of the embankment to be made during floods, (*d*) the earth spillway, which is supplementary to the masonry spillway and at the same level, to be increased in width from 100 feet to 200 feet, (*e*) a 1,500 foot breaching section to be formed in the centre section of the embankment to act as a safety valve for Pedieos floods. This section to be re-formed between masonry abutments and built 2 feet lower than the remainder of the bank so that in the event of another big flood, damage by the Pedieos would, as far as possible, be confined to this section.

Some delay occurred in the early stages of the work owing to the difficulty of obtaining sufficient mechanical plant but eventually the following were all operating together :—

2 T2 Traxcavators with 4 lorries (Contractors).
1 D6 Tractor and Scraper (Department of Agriculture).
1 D4 Tractor and Scraper (Contractors).
4 TD6 Tractors and Rollers (tractors from Contractors) (and rollers from P.W.D.)

In September, October and November work was carried out day and night to finish before the rainy season. Electric lighting was installed to enable this to be done.

A difficulty was met in filling the main breach. The soft mud that had accumulated in it during the flood was found to be unexpectedly deep and to establish a firm foundation for the new filling it was necessary to excavate down to 15 feet below ground surface. The excavation had then to be filled with firm clay. The quantity of filling below ground level at this point is much more than in the embankment above ground.

A total of about 50,000 cubic yards of earth was excavated, moved and consolidated. Consolidation was effected by rolling with both plain and sheepsfoot rollers and by ramming. Where the earth was dry it was watered. A mechanical rammer was used in some places, particularly where cracks had occurred in the old embankment. The degree of consolidation was tested by regular weighings of compacted earth samples, checked occasionally for dry density.

The work was successfully completed before the normal rainy season at a cost of about £15,000.

(*B*) *Geunyeli.*—The Almyros river has a high flood discharge in winter and low normal flow which usually persists into the early summer. The Geunyeli irrigation works are for the purpose of utilizing this water for winter and spring crops.

The extremely friable nature of the Kythrea beds, through which the channels pass, have caused high construction costs. Channels in this unstable side-long ground cannot be expected to stand the test of time unless they are built on good foundations excavated well into the solid ground.

A low weir was built across the river at the head of a ravine about half a mile long at a distance of nearly a mile from the cultivable lands. To reach these lands a masonry-lined channel 2 feet 6 inches by 2 feet 6 inches was built through the ravine and across difficult lands outside it. Included on this length are three aqueducts 75, 75 and 120 feet long respectively and 7, 13 and 14 feet high. The channel finally emerges through a stone-lined tunnel 350 feet long built to avoid unstable side-long ground. Downstream of the tunnel all work is straightforward but there are two more noteworthy items. An 8-inch pipe syphon is built to convey water from the left bank to the right and some 1,260 feet of lined and partly covered channels are yet to be constructed to take the water through Geunyeli village beside the Nicosia-Kyrenia main road.

Work was commenced in March, 1950, and at the end of the year was well advanced. The cost is likely to be about £12,000 and the area irrigated in winter and spring possibly 2,000 donums.

(*C*) *Yerasa.*—This is one of the bigger hill schemes. It consists of the following :—a small weir in a precipitous valley, 150 feet of channelling leading to a settling tank, a 4-inch pipe line 6,500 feet long leading to the beginning of the cultivable land, a 34,700 gallon masonry storage tank set on high grounds above the village, and finally some 2,000 feet of masonry channels plus 1,200 feet of 4-inch pipes and earth channels leading the water on to the land.

The water available is sufficient to irrigate 90 donums throughout the year plus an additional 100 donums in winter and spring. Before the construction of the works only 10 donums under summer crops was irrigated. The villagers are already making use of the water that has reached the tank even before the distribution channels are finished. They are also terracing some of the steeper parts of the hillsides.

The works were started in April, 1950, and are nearing completion at the end of the year. The cost will be about £4,160.

(*D*) *Alona.*—This is an example of a tunnelling scheme in the hills where a tunnel excavated for the purpose of tapping underground water is also used as an irrigation storage tank.

A number of old wells on a sloping hillside indicated the presence of water seepages and the villagers, aware of this fact, asked for an irrigation scheme to be prepared. This was done and in due course works commenced on a tunnel 700 feet long connecting 13 wells of which 11 were new and 2 old. The tunnel was mostly through solid igneous rock requiring the use of compressed air drills. Some 200 feet was in softer material that required lining in masonry. The well shafts were lined some in masonry and some in precast unreinforced concrete, the former being of large size to facilitate removal of spoil, and the latter for ventilation only. At the outlet of the tunnel a concrete diaphragm wall will be built and fitted with a sluice valve so that water can be drawn off as required or stored in the tunnel when not needed.

The cost of the scheme, which is still in hand, will be approximately £2,300. The exact quantity of water that will be obtained from the tunnel upon completion is not yet known and the area of land to be irrigated cannot therefore be stated.

(*E*) *Limnitis.*—This scheme is being carried out in three parts, viz. the original one started in 1949 and there have been two successive extensions. The extensions were at the request of the Irrigation Division who were impressed by the benefits received from the first part. For the purpose of this note the three parts are combined and described together. The scheme aims chiefly at utilizing the winter and spring flow of the Limnitis river for irrigating both banks in the lower part of the valley. It is noteworthy in two respects, first that it includes three weir crossings of a type new to Cyprus and secondly that it will make use of water brought to the surface by an experimental sub-surface weir built in 1945 about 1 mile upstream of the present works.

The works comprise a sub-surface weir, a 4-inch pipe line 1,650 feet long, a groin type intake, three masonry weir crossings, 2½ miles of lined channels, 3¾ miles of earth channels, and a double 6-inch pipe syphon under the river. The weir crossings are built as low weirs extending transversely across the river bed, founded on gravel not on bed rock. Ordinary flow from the upper river and the sub-surface weir is conveyed across each of the lower weirs without loss in a channel that may be easily cleared of accumulated gravel by opening sluice gates placed at intervals across it. At each weir water from the river may be diverted into the main channel but surplus will pass over the crest and continue down the river.

The water supplying the works is derived from a forest valley and in summer transpiration losses from plant growth in the stream bed are to be expected. This is borne out by measurements taken in the summer of 1950, e.g. the night flow at the sub-surface dam on 27.7.50 was at the rate of 6,500 gallons per hour while in the day it was only 3,000 gallons per hour.

Work was commenced on the scheme early in 1949 and is continuing. A total of 750 donums is commanded of which up to 150 or 200 donums may be irrigated in summer. The cost of the scheme will be approximately £9,000.

(*F*) *Kouklia* (*Paphos*).—The water of the Dhiarizos river, formerly privately owned, has been acquired by Government as part of the Kouklia Chiftlik. The new works are being carried out to facilitate irrigation on the Chiftlik lands and to prevent waste of water, particularly in summer.

There are two main channels, one on either bank, the right bank intake being about a mile upstream of that on the left bank. No weirs have been constructed at the heads of the channels but intakes of the groin type have been provided, the first of their kind in Cyprus. These are simply low masonry walls on deep lime-concrete foundations extending from the solid rock of the river bank out into the gravel of the river bed, on which they are founded. Each channel is designed to take 4 cusecs when running full but for economy the lower lengths in each case are masonry-lined only for an estimated summer flow of 2 cusecs. This means that in winter the lining will be submersed, but in summer when water is scarce and valuable, all will be contained within the lined portion and none will be wasted. An 8-inch pipe syphon crosses the river near the intake of the left bank channel and enables water to be passed from the right bank to the left. A borehole located by a geophysical survey followed

by 8 trial boreholes has been drilled on the right bank between the two channels and is fitted with a 10,000 gallons per hour deep well turbine pump and pipe lines to supply extra summer water to both channels. A 7-day pump test carried out in November, 1950, produced a yield of 18,000 gallons per hour with a maximum drawdown in water level of 26 feet.

The scheme has been enlarged since it was prepared in 1949 and as revised it includes some 3 miles of lined channels and 3 miles of unlined. In order to render more difficult the theft of water from channels above the chiftlik lands as well as to prevent leakage these channels are being lined throughout with masonry or lime concrete, and weir outlets with screw gates have been installed for private irrigators. The width of each weir in inches is equal to the number of donums served so that an even distribution of irrigation water will be obtained if the height of water is the same at each weir. The area commanded is 2,762 donums.

The work was begun in May, 1949, and is now nearing completion. Although the scheme has been extended the cost will be less than estimated. It is now expected to complete the enlarged scheme for about £16,000 as against the former estimate of £19,300.

(*G*) *Akhelia.*—The water of the Ezuza river has been acquired by Government from its former owners as part of the Akhelia Chiftlik, and works are in progress for improving irrigation. Akhelia is the largest of the four recently acquired Paphos Chiftliks but the quantity of water available per donum of land in summer is the least. The provision of additional summer water is, therefore, important and has called for special measures.

The lands commanded by the scheme are on the left bank of the river and they are served by two intakes, the upper one for summer water and the lower one for the large winter flow. In addition two channels on the right bank are being brought under control by masonry headworks and measuring weirs. In all cases groin type intakes have been adopted as at Kouklia. The winter channel is designed for 12 cusecs and is unlined while the summer channel takes 4 cusecs and is lined throughout in masonry. The winter and summer channels join and thereafter the lining is for 4 cusecs only, it being an accepted principle that the lining will be submersed in winter.

To explore the possibility of obtaining extra summer water from the gravels of the river bed at reasonable cost a geophysical survey was made followed by 4 trial boreholes. These showed that at a point some 180 feet downstreams of the summer intake the gravels are 100 feet deep and underlain by the solid and impervious white and yellow marls which also form the sides of the valley. It was thereupon decided to sink an open well in the marls beside the irrigation channel down to the level of the bottom of the gravels and from the bottom of the well to drive a horizontal gallery under the river to tap the water of the gravels from below. This involved the somewhat dangerous operation (sometimes known among engineers as " operation bath-plug ") of tunnelling to meet a body of water which at any time might burst through the roof of the excavation. The task was completed without accident although when water was struck the tunnellers were forced to abandon some of their tools in their haste to escape the flood.

Upon completion of the gallery a 15,000 gallons per hour turbine pump with a 12 h.p. engine was installed on the well and housed in a masonry hut. A continuous 30-day pump test carried out in October, 1950, gave a yield of 14,600 gallons per hour with a maximum drawdown of 21 feet 6 inches, and a 24-hour test at 20,000 gallons per hour in September showed a drawdown of 21 feet 0 inches. During these tests no change in the surface discharge of the river was noticeable. With the machinery available it was not possible to pump at a higher rate or to lower the water to the bottom of the shaft. The water will be pumped into the channel as needed in the summer months.

The scheme has been enlarged since it was prepared in 1949 and as revised it will include some 2½ miles of lined channels and 3 miles of unlined. The area commanded is 4,721 donums of which about 40 is occupied by a nursery of the Department of Agriculture.

The work was begun in 1949 and is now nearing completion. Although the scheme has been extended the cost will be less than estimated. It is now expected to complete the enlarged scheme for about £16,000 as against the former estimate of £18,000.

(*H*) *Potima.*—This irrigation scheme is the third to be undertaken following the acquisition of the Paphos Chiftliks. In this case the waters of the Mavrokolymbos river, which are part of the former Potima Chiftlik, are being canalized in masonry in order to facilitate irrigation and minimize losses of water.

A weir 246 feet long and 3 feet high across the river forms the headworks. In order to prevent leakage under the weir or around the ends it was necessary to key the foundations and abutments into bed rock, i.e. the weir is of the " sub-surface " type, the greater part of the masonry being below ground level. The depth of the foundation in the centre of the river was 9 feet below river bed level.

The channel from the weir is designed to take 2 cusecs. At a point about 2,000 feet from its head it divides into two branches, the one continuing on the left bank and the other crossing the river through a pipe syphon to serve the right bank.

The total length of main channels is about 3 miles of which about 1½ have been lined in masonry. The area commanded is 726 donums. Work was started in May, 1949, and finished in October, 1950, at a cost of £6,542 as against the estimate of £7,700.

APPENDIX 2.

DESCRIPTION OF CERTAIN VILLAGE WATER SUPPLY SCHEMES.

(*A*) *Anoyira.*—This scheme is particularly notable because in order to shorten the length of the pipe line it was decided to drive a 2,000 foot tunnel through a ridge instead of going round. By this means not only was the length of pipe line reduced by about 3 miles but, since the gradient was increased, a smaller size of pipe was sufficient.

The water is taken from the Perdikes spring which was excavated and built in 1947. A 7,500 foot pipe line of 2½ inch diameter crosses the Kha Potami valley and on the opposite side passes through a tunnel to Anoyira village. To facilitate progress in the tunnel a well drilling machine was used to sink 25 vertical shafts along its length. These were used both for ventilation and for the removal of spoil. The rock in the tunnel was very hard, necessitating the use of explosives and air compressing plant to break it.

The scheme was commenced in May, 1949, and is still in progress. The tunnel is completed and the main pipe line has been laid and now conveys water to the village. Work is continuing on the construction of a storage tank on the outskirts of the village and on the distribution system of pipes and fountains within the village.

The estimated cost of the scheme is £7,420 of which the tunnel has accounted for £4,800. The population of the village by the 1946 census was 651 so that the cost will be about £11.4 per person. The village share of the cost was £3,710 of which £1,000 was kindly donated by Mr. H. M. Michaelides of Limassol.

(*B*) *Kalavasos.*—This is a pumped village water supply. The source is a well and the works consist of a plunger pump and engine, pump house, rising pipe line 680 feet long and 3 inch diameter, 2,300 of main pipe line 3 inches diameter, two covered masonry storage tanks each of 8,000 gallons capacity, a pipe distribution system and 30 public fountains.

The well was sunk by the village on its own initiative but was lined and deepened by the Department. The engine was kindly provided free of charge by the Hellenic Mining Company who also paid half the cost of the village share of the pump.

The scheme was started in December, 1949, and completed in December, 1950. The cost, excluding the engine, was £3,828 amounting to £3.08 per head of the 1946 population (1,243).

(*C*) *Pissouri.*—This village is situated on a waterless plateau near the sea coast. To convey water to it there was no alternative but to tap a mountain spring seven miles inland across precipitous country.

The scheme involves the purchase of the lower Mesaporos spring, the excavation and building of the spring to increase the discharge and to protect it from contamination, a 3-inch pipe line 37,000 feet long across hills and valleys, a standard reinforced concrete 1,500 gallon storage tank, distribution pipes and 15 fountains.

The excavation of the spring was started in June, 1950, and water was flowing in the village by November. Work on the distribution pipes and fountains will be commenced shortly.

The estimated cost is £9,400 and the population in 1946 was 1,071. The cost per person is thus £8.77.

(*D*) *Ayios Elias.*—In this case conflicting rights to the use of water from a spring have led, for administrative reasons, to the adoption of a scheme that would otherwise have been too expensive.

The chief source for Ayios Elias is the Vournia spring which runs to waste in the winter but is used by the Kantara summer resort in the summer. In winter the flow is surplus to the requirements of both places. In order that all needs will be satisfied it has been decided to build a large covered storage tank at Kantara to store the surplus winter water for use by Kantara in summer ; and an arrangement has been made whereby Ayios Elias will receive the full flow of the spring in June, July and August but only three quarters for the rest of the year. The remaining quarter during nine months will flow into the reservoir for Kantara. The storage tank, built of masonry and reinforced concrete, will be of 300,000 gallons capacity, the largest in Cyprus.

In addition to its share in the Vournia spring Ayios Elias has the right to all water from a smaller spring called Agriosykia.

The works comprise the excavation and building of the Agriosykia spring, the construction of the 300,000 gallons covered reservoir, 32,000 feet of 1½ inch pipe line, a 1,500 gallon storage tank in the village, and distribution pipes and fountains. Work was started in May, 1950, and at the end of the year the masonry floor and walls of the tank had been completed and construction of the reinforced concrete roof was in hand. The main pipe line to the village has been laid and water from Agriosykia is flowing in the village. Water from Vournia will not reach Ayios Elias until the main reservoir is filled for Kantara.

The cost of the scheme is estimated at £11,300. The population of Ayios Elias in 1946 was 631 ; in Kantara there are several hundred people resident in summer but practically none in winter. The rate is thus about £18 per head of the Ayios Elias population or say £13 per head if the summer visitors to Kantara are included.

(*E*) *Louroujina.*—This pumping scheme supplies one of the large villages of Cyprus from a borehole drilled by the Department in 1945.

The works comprise the borehole, a 2,000 gallons per hour pump and engine, an 8,000 gallon covered masonry tank, distribution pipes and 26 public fountains. The borehole, 315 feet deep, was tested on 22nd November, 1945 to 6,000 gallons per hour with a draw-down in water level of 39 feet which indicates that a small surplus of water above the domestic needs of the village will be available for irrigation. Additional water for irrigation may also become available from the old village well no longer needed for drinking purposes.

Work was put in hand in July, 1950, and completed by the end of the year. The population of the village in 1946 was 1,816 and the cost, amounting to £4,000, represents an expenditure per person of £2. 2*s*.

(*F*) *Ayios Nikolaos.*—This is a straightforward scheme typical of those installed in hill villages where no reliable spring is near at hand. It consists of the excavation and building of the Trimouttiko spring, the laying of 17,000 feet of 3-inch pipe line, the construction of a storage tank at the village, and the installation of distribution pipes and 9 public fountains.

The main pipe is big enough to convey the whole flow of the spring, which is in excess of normal domestic requirements, so that a surplus is available for a certain amount of irrigation at the village.

Work commenced in August, 1950, and is now nearing completion. The estimated cost is £4,500, and the village population by the 1946 census was 520. The expenditure is thus £8.7 per person.

(*G*) *Ayios Amvrosios.*—This large Kyrenia village has had water from the Halkon spring for many years but only enough for a small part of its needs. The new scheme provides water from another spring, Pittaroulla, and includes improvements of the old source together with the replacement of the old worn-out pipe line. Six times the previous quantity of water is now conveyed to the village.

The new source consists of a half share in the Pittaroulla spring which the Bishopric of Kyrenia agreed to sell to the village. Tunnelling, excavations and building were carried out at both sources and pipe lines laid to the village, in the first case 5,000 feet of 3-inch pipe and in the second 3,000 feet of 1½ inch. Three standard 1,500 gallon reinforced concrete tanks were built and a distribution system installed to serve the whole village. Ayios Amvrosios is very scattered, spreading over a large area of land, and in consequence a great number of fountains was needed—in all no less than 48.

The works were commenced in June, 1949, and finished in September, 1950, for a total cost of £5,670 including the purchase of the spring. The expenditure per person was £3.19 (1946 census population 1,779).

(*H*) *Lefka.*—The scheme consists of long awaited additions and improvements to an old piped water supply.

The town's water comes from several sources only one of which was dealt with in the present scheme. A tunnel 900 feet long connecting together 16 wells was repaired throughout and lined where necessary with masonry. The water was conveyed through 5,980 feet of 3-inch pipe to a main storage tank of 9,300 gallons capacity, built of masonry with a reinforced concrete roof. A system of distribution pipes and 7 public fountains was installed. Provision was required for house connections and so, according to Cyprus practice, distribution boxes were installed to enable the available volume of water to be evenly distributed among subscribers in pre-arranged shares. Eleven distribution boxes, providing for 150 independent connections were included.

The cost of the works was £4,970 amounting to £1.2 per head of the 1946 population (3,752). Although Lefka, being a municipality, is not ordinarily entitled to Government assistance in works of this type an exception was made in this case and a Government grant was given equivalent to a half share in all works except the distribution boxes and the connections thereto. Of the £4,970 Government paid £2,030. Work on the scheme commenced in May, 1949, and was completed in September, 1950.

(*I*) *Pedhoulas.*—The village of Pedhoulas is also a summer resort. The population, which in winter is about 1,400, may rise to 6,000 in summer. The water supply is designed to cope with the larger population and includes, in addition to the street fountains of the ordinary village scheme, provision for house connections.

The water comes from six springs two of which have been excavated and built. Two additional storage tanks have been constructed, the one of 20,000 gallons and the other 10,000 gallons capacity. Each tank is of masonry with a reinforced concrete roof. The main pipe lines include 6,400 feet of 3-inch and 2½-inch pipe. There are 12 street fountains and 24 distribution boxes providing for an even distribution of water to as many as 900 house pipes.

The total cost of the scheme is estimated at £5,000 which is less than £1 per head of the summer population or about £3.5 per head of the winter population. The village has paid the full cost of the house to house distribution boxes, but is assisted to the extent of 50% on the remainder of the scheme. Of the £5,000 Government is paying £1,350. Work was started in May, 1950, and was still in progress at the end of the year.

APPENDIX 3.

LIMASSOL WATER SUPPLY SCHEME, 1950.

The scheme provides an entirely new water supply system for Limassol. The water will come from the three springs Mavromata, Kria Pighadhia and Kephalovryso all situated in the hills to the north-west of the town and all virtually unused at present.

2. A volume of about 1,250,000 gallons of good spring water will be delivered to the town daily. At an average water consumption of 30 gallons per person this will be sufficient for a population of 40,000 people or at 40 gallons per person, 30,000 people. The population of Limassol in 1946, was according to the census, 22,799. It is not proposed to supply large factories with water from the new works.

3. The proposed works consist of the excavation and building of the three springs, 34,000 feet of 6-inch and 8-inch pipe connections to a collecting tank near Khalassa, a 10-inch main pipe line 68,000 feet long from the collecting tank to Limassol, an 800,000 gallon covered service reservoir and chlorinators, a 10-inch diameter distributing ring main 26,000 feet long, and street mains throughout the town. The pipes from the springs to the reservoir will be of steel with victaulic joints while the distributing pipes including the ring main will be of asbestos cement. Provision is made for fire hydrants in the central part of the town and for a number of public fountains distributed as needed. No provision is included for connections to private premises as it is assumed these will be at the expense of the owners.

4. Tenders for the supply of pipes were invited in November, and at the end of the year replies were under consideration.

5. The estimated cost of the scheme, subject to modification according to changing costs of materials and labour is as shown :—

	£
Headworks and Main Pipe line	125,000
Service Reservoir	18,000
Ring Main	22,000
Distribution System	135,000
	£300,000

APPENDIX 4.

FAMAGUSTA WATER SUPPLY SCHEME, 1950.

The scheme that has been prepared is in the nature of pilot scheme. It will relieve Famagusta from the most pressing of its domestic water difficulties and, by providing a full scale test of a new water bearing area, will ensure that further development of that area may be on a sound basis.

2. The new works will provide Famagusta with 384,000 gallons of water per day from the Municipality's new boreholes at Phrenaros, and an increased delivery of 32,000 gallons from the Panayia spring, the latter without pumping. The total water provided by the project, all of high quality, will thus be 416,000 gallons per day, which is roughly equivalent to 60% of Famagusta's present summer consumption estimated in 1948 to be 701,000 gallons. Waters of unacceptable quality will no longer be drawn from the existing sources at Famagusta but the better waters will be mixed with the new 416,000 gallons. It is estimated that upon completion of the scheme a daily total of 809,000 gallons of good quality water will be available if there is no further deterioration in the existing wells.

3. It is not proposed to utilise the new boreholes to their present full capacity but the scheme is such that if, after a few years of use, no deterioration in output or quality occurs, then other boreholes in the same area can be brought into operation and the main pipe line duplicated to cope with whatever quantity of water is thought to be available in the light of knowledge then acquired.

4. The Works planned are the following :—

(*a*) Four electro-submersible pumps are to be installed on different boreholes, two capable of delivering 8,000 gallons per hour and two 4,000 gallons per hour. Independent rising pipe lines from the pumps will discharge into a 3,000 gallon balancing tank in which automatic float switches will control power to the pumps.

(*b*) An asbestos cement pipe line, 8-inch diameter and 34,300 feet long will be laid from the balancing tank to the ground level reservoir at Stavros. It will be capable of delivering about 400,000 gallons per day to ground level or a smaller quantity to the top of the existing tower.

(*c*) A covered masonry and reinforced concrete storage tank of 200,000 gallons capacity, equivalent to approximately half a day's flow of the pipe line, will be built at ground level near the existing tower.

(*d*) The 14 mile aqueduct from the Panayia spring will be repaired and coated inside with water-proofing material to prevent leakage. The spring will also be cleaned, and rebuilt with protecting masonry.

5. The scheme is estimated to cost £38,000 of which £27,000 is for the pipe line and the pumping installations at Phrenaros, £4,000 for the reservoir at Stavros, and £7,000 for repairing the Panayia aqueduct. These estimates were made in January, 1950, and are of-course subject to modification according to changing costs of materials and labour. Electricity connections to Phrenaros are being arranged by the Municipal Council and do not form part of the scheme described above.

6. Tenders for the supply of materials were invited by the Municipal Council in November, and at the end of the year replies were under consideration.

7. Following the completion of the works described, Famagusta will need the following to put its water supply in order.

(*a*) Additional sources of good water. If the present scheme does not overtax the Phrenaros resources then new supplies will naturally be drawn from the same area.

(*b*) A new pipe distribution system within the town including chlorinators and a larger service reservoir.

Both (*a*) and (*b*) require considerable planning. The cost of construction will be many times that of the works described.

APPENDIX 5.

SILTING OF RESERVOIRS AND RATES OF SOIL EROSION IN CYPRUS.

By David J. Burdon, Ph.D., M.Sc., B.E., F.G.S., *Assistant Water Engineer.*

(*A*) *Silting of Reservoirs.*—In order to estimate the urgency of fitting desilting gates in the seven dams recently constructed on the flanks of the Troodos range, measurements were made in the autumn of 1949, and the silting rates calculated for each reservoir, as shown in the tabulation below. Desilting gates have now been fitted to 4 of these dams and the information obtained will also be used in the design of further reservoirs. The investigation was extended to the three old reservoirs of the Eastern Mesaoria. Two of these had long been abandoned as reservoirs, not because of excessive silting but because of insufficient water and because more revenue could be made by leasing the silted bed of the abandoned reservoir. Kanli Keuy—built in 1949— was measured in July, 1950, and it was found that the abnormal floods of the 1949–1950 winter had deposited silt so as to reduce its capacity by 9.25%.

Percentage Loss in Capacity due to Silting of 11 Reservoirs in Cyprus.

Reservoir	Constructed in	Years of Silting	Original Capacity (c.f.x1000)	Loss by Silting per annum	Remarks
Lythrodhonda ..	1944	5	1,440	1.14%	
Lymbia	1945	4	930	7.73%	These seven reservoirs lie on the flanks of the Troodos Range.
Kalokhorio ..	1946	3	2,400	3.03%	
Kophinou ..	1946	3	160	14.33%	
Akrounda	1946	3	800	5.55%	
Petra	1947	2	1,120	3.90%	
Galini	1947	2	828	4.10%	
Syngrasis	1899	31	60,000	0.08%	Silting from 1909-40.
Kouklia	1900	49	170,000	0.36%	Still in use.
Akhyritou ..	1900	38	800,000	0.13%	Silting from 1900-38.
Kanli	1949	1	8,000	9.25%	Abnormal winter 1949-1950.

(*B*) *Rates of Erosion.*—It was found that the average rate of soil erosion differed widely for the seven circum-Troodos catchments. Many possible reasons for this variation were investigated, and it was found that the rate of soil erosion varied directly according to the type of vegetative cover and the land-use of the catchment area. These rates of erosion have been calculated, and are shown below :—

Rates of Soil Erosion According to Vegetative Cover on Circum-Troodos Catchments.

Type of Vegetative Cover	Rate of Soil Erosion		
	Cub. ft. of soil per sq. mile per year	Inches depth of soil	Tons of material per sq. mile per year
Heavy Forest	1,044	0.00045	43.7
Light Forest	4,627	0.00166	168.4
Bare and Agricultural land ..	6,106	0.00219	213.2
Vineyards	8,349	0.00300	284.5

These figures apply directly to the flanks of the Troodos range. When applied to Kouklia catchment, they are probably valid for the area above 500 feet M.S.L. (117 square miles), because erosion and sedimentation seem to balance each other on the lower ground. They also apply to Akhyritou catchment when it is combined with that of Kouklia. At Syngrasis, it is found that the rates of erosion are lower than for Troodos, even when allowance is made for sedimentation above the reservoir ; this may indicate that much sediment has been carried right through the reservoir. In the 1949-1950 winter, Kanli Keuy catchment was eroded at 12.5 times the normal circum-Troodos rates.

APPENDIX 6.

IRRIGATION SCHEMES COMPLETED IN 1950.

	Location	Nature of Construction	Donums Commanded. New Irrigation		
			Winter	Summer	Total
1	Ayios Therapon ..	Weirs, channels and river crossings	—	170	170
2	Ay. Theodoros (Ll.)	Masonry channelling ..	—	35	35
3	Ay. Marina Xyliatou	,, ...	35	25	60
4	Ay. Erini & Kannavia	Springs and piping ..	50	10	60
5	Akrounda	Installation of a desilting gate	—	—	—
6	Alona (Pano Dhipotamia) ..	Irrigation tank	—	40	40
7	Alona (Kato Dhipotamia) ..	,, ...	—	26	26
8	Ayios Ioannis (Ll.) (Alonarka) ..	Masonry channels ..	—	19	19
9	Agros (Paleolinos) ..	Spring & masonry channels	—	17	17
10	,, (Ayiasmata)	,,	—	14	14
11	,, (Pano Karkoupolia) ..	,,	—	12	12
12	,, (Kato Karkoupolia) ..	Masonry channels ..	—	8	8
13	,, (Mylos) ..	,, ..	—	20	20
14	Agridhia (Pano and Kato Leftina) ..	Spring, exploratory works	—	10	10
15	Ayios Konstantinos (Fountana) ..	Masonry channels & tank ..	—	23	23
16	Ayios Konstantinos (Pano Vrysi) ..	Storage tank and piping ..	—	6	6
17	Ayios Neophytos (Anatoliko Monry.) / Ayios Neophytos (Ayiasma)	Spring and tank	—	10	10
18	Ayios Neophytos (Karkotis) ..	Enlarging of tank	—	30	30
19	Dhymes (Pano Pighi)	Small weir, channel & tank	—	23	23
20	Episkopi (Paphos) (Kakoskales) ..	Masonry channels ..	—	40	40
21	Inia (Paphos) (Mega Pyghadhi) ..	Spring, channels and tank	—	90	90
22	Khandria (Yeroladjia)	Spring	—	12	12
23	Koloni	Spring excavation	—	10	10
24	Kato Pyrgos ..	Piping, repairs to channels and tank	—	70	70
25	Kissonerga (Appis)	Masonry channels	—	15	15
26	Kourdhali (Vrysitou-khoriou) ..	Masonry channels and tank	—	15	15
27	Kourdhali (Appidhes) ..	,,	—	10	10
28	Kourdhali (Kato Anastasi) ..	Weir and piping	—	10	10
29	Kochati and Ayia Varvara	Tunnels and masonry channels	1,600	—	1,600
30	Kato Lefkara ..	Masonry channels	500	—	500
31	Kyperounda (Kontarka) ..	Small weir, tank and channels	—	8	8
32	Kyperounda (Mangouris) ..	Tank and channels ..	—	10	10
33	Konia (Vrysi-Khoriou) ..	Masonry channels and tank	—	70	70
34	Khrysorroyiatissa Monastery (Papalouca) ..	Piping	—	15	15
35	Khryssorroyiatissa (Ayiasma) ..	Spring and channels ..	—	15	15
36	Khrysorroyiatissa (Chrysanthou) ..	Springs, piping and channels	—	20	20
		Totals carried forward ..	2,185	908	3,093

	Location	Nature of Construction	Donums Commanded. New Irrigation		
			Winter	Summer	Total
		Brought forward ..	2,185	908	3,093
37	Kalokhorio (Orongou) ..	Spring, exploraroty works	—	10	10
38	Kalokhorio (Pano-Kambos) ..	Weir and channelling ..	45	—	45
39	Kalokhorio (Pervoloudhia) ..	,, ..	60	—	60
40	Kalokhorio (Keramidhia) ..	,, ..	50	—	50
41	Lagoudhera (Harkokolympos)	Small weir and channels ..	40	16	56
42	Livadhia (F'gusta.)	Pre-cast cement piping ..	—	35	35
43	Linou	Irrigation ports and masonry walls	—	20	20
44	Limnitis	Masonry channels and pipes, river crossings ..	700	50	750
45	Louvaras	Masonry channels and tank	—	20	20
46	Lefkoniko	Irrigation ports and masonry walls	50	—	50
47	Lymbia	Installation of a desilting gate	—	—	—
48	Mandrai (Chain of wells)	Lining tunnels	—	70	70
49	Marathounda ..	Masonry dam	—	30	30
50	Onisha (Chiftlik) ..	Piping and channelling ..	—	150	150
51	Prodhromos (Sklidhros) ..	Weir, channels and tanks ..	—	60	60
52	Polystipos (Pano Lagoudha) ..	Springs and tank	—	11	11
53	Polystipos (Dhafni)	Weir and tank	—	11	11
54	Polystipos (Floudhi-tou-Rousou) ..	Spring, piping and tank ..	—	16	16
55	Polystipos (Pefkos)	Spring, channels and repairs to tank	—	12	12
56	Polystipos (Karabela)	Small weir, channel and tank	—	13	13
57	Polystipos (Manoyili)	Masonry channels ..	—	16	16
58	Phterykoudhi (Strata)	Spring, channels and tank	—	20	20
59	Phterykoudhi (Atia)	Channels and tank.. ..	—	15	15
60	Potima (Chiftlik) ..	Channelling & pipe crossing	—	726	726
61	Potamitissa ..	Weir, channels and tank ..	—	21	21
62	Phlasou	Irrig. port and retaining walls	—	14	14
63	Platanistasa(Kontarga)	Spring, channels and tank	—	30	30
64	Vroishia	Spring, exploratory works	—	—	—
65	Sarandi (Pyrgos) ..	Spring and channels ..	—	15	15
66	Ayios Epiphanios (Kato Dexameni)	Excavation of spring ..	—	5	5
67	Vitsadha (Kuchuk Dere)	Anti-erosion weir	—	—	—
68	Khrysorroyiatissa (Hoghladjeri) ..	Spring, exploratory works	—	—	—
69	Chakistra	,,	—	—	—
70	Athalassa	Repairs to weir	—	—	—
71	Asha	Repairs to irrig. channels..	—	—	—
72	Gastria (F'gusta.) ..	Construction of retaining walls, reforming of earth bank, etc.	—	—	—
73	Gaidhouras.. ..	Repairs to weir, wingwalls, earth embankment and construction of irrigation ports	—	—	—
74	Gouphes	Repairs to channels ..	—	—	—
75	Kalavasos (Larnaca) ..	Repairs to channels and retaining walls	—	—	—
76	Kivisil (Larnaca) ..	Repairs to weir and channel	—	—	—
77	Kanli Keuy (Nicosia) ..	Repairs to spillway and construction of 2 masonry spillways	—	—	—
		Totals carried forward	3,130	2,294	5,424

	Location	Nature of Construction	Donums Commanded. New Irrigation		
			Winter	Summer	Total
		Brought forward ..	3,130	2,294	5,424
78	Knodhara (F'gusta.)	Repairs to spillway ..	—	—	—
79	Lapathos (F'gusta.)	Repairs to bank and spillway	—	—	—
80	Lefkoniko (F'gusta.)	Repairs to earth embankment and irrigation channels	—	—	—
81	Larnaca	Draining of St. Lazarus marshes	—	—	—
82	Livadhia (F'gusta.)	Repairs to earth banks, channels and retaining walls	—	—	—
83	Livadhia (Larnaca)	Repairs to retaining wall and weir	—	—	—
84	Lysi (Famagusta) ..	Repairs to anti-flood canal	—	—	—
85	Marathovouno ..	Repairs to weir and channel	—	—	—
86	Milia	Repairs to main irrigation channels	—	—	—
87	Mousoulita, Pyrga, Prastio, etc. (Pedhieos).	Enlarging of spillway, repairing of earth bank, etc.	—	—	—
88	Peristeronopiyi ..	Repairs to weir and channels and spillway	—	—	—
		Repairs to retaining wall and bank	—	—	—
		Repairs to weir, earth embankment and channel	—	—	—
89	Prastio (Famagusta)	Enlarging of spillway, repairing of earth banks and repairs to channels	—	—	—
90	Psilatos	Repairs to weirs, channels, reforming of earth embankment, etc. ..	—	—	—
91	Platani (Famagusta)	Repairs to main irrigation canal, construction of retaining walls			
92	Styllos, Limnia, Ay. Seryios.	Repairs to weirs, reforming of earth banks, repairs to spillways	—	—	—
93	Sinda	Repairs to aqueduct ..	—	—	—
94	Syngrasis & Trikomo	Repairs to weir, channel, earth bank and construction of retaining walls ..	—	—	—
95	Syngrasis, Ayios Yeoryios.	Repairs to apron of masonry weir	—	—	—
96	Vitsadha	Repairs to weir, wingwalls and reforming of earth banks	—	—	—
97	Mesaoria Irrigation Works (Akhyritou Section).	Repairs to spillway, apron construction of retaining walls	—	—	—
98	Mesaoria Irrigation Works (Kouklia Section).	Repairs to Kouklia reservoir main embankment, spillway, enlarging of earth spillway, construction of a foot-bridge, etc. ..	—	—	—
	,,	Construction of an earth breaching section in main embankment, reforming of earth embankment ..	—	—	—
99	Syngrasis (Section)	Repairs to main embankment, spillway and retaining wall	—	—	—
100	Yenagra (Famagusta)	Repairs to channels and wingwalls. Installation of gates	—	—	—
101	Exometokhi ..	Repairs to main irrigation channel and gate	—	—	—
		Totals	3,130	2,294	5,424

Note.—Items 70 to 101 are repairs to the damage caused by the record floods of December, 1949.

APPENDIX 7.

IRRIGATION SCHEMES IN HAND AT THE END OF 1950.

	Location	Nature of Construction	Donums Commanded. New Irrigation		
			Winter	Summer	Total
1	Alona (Kokkina) ..	Chain of wells, tunnels ..	—	20	20
2	Ayios Neophytos (Ayiasmata, Arghaki).	Excavation of springs and construction of retaining wall	—	9	9
3	Akhelia (Chiftlik) ..	Channels, installation of pump engine	3,521	1,200	4,721
4	Ayios Epiphanios (Orinis)	Irrigation tank and piping	—	8	8
5	Ayios Pavlos (Pano Xyries) ..	Weir, channel and tank ..	—	20	20
	(Kato Xyries) ..	,, ...	—	14	14
6	Geunyeli	Weir, channel, tunnel, syphon	2,000	—	2,000
7	Galini	Desilting gate and masonry channels	—	70	70
8	Kouklia (Chiftlik) ..	Channels, syphon and installation of pump ..	1,562	1,200	2,762
9	Kalokhorio (L'sol.)	Spring	—	9	9
10	Kanli Keuy ..	Earth channelling	100	—	100
11	Lagoudhera (Ayios Epiphanios) ..	Weir and masonry channels	40	16	56
12	Limnitis	Construction of additional channels	—	50	50
13	Phterykoudhi (Kato Kalamithasa) ..	Channels and irrig. tank ..	—	14	14
14	Polystipos (Sklinijera) ..	Spring piping and tank ..	—	16	16
	(Platanoudhia) ..	Spring and channels ..	—	15	15
15	Pretori	Irrigation tank and channel	—	30	30
16	Prodhromos (Kharchi).	Channels and excavation of spring	—	200	200
17	Sarandi (Kandjelli)	Masonry channels ..	—	20	20
18	Lythrodhonda ..	Heightening crest of dam	—	25	25
19	Milikouri	Masonry channels and piping	—	6	6
20	Prodhromos (Sklidhros) ..	Excavation of springs ..	—	6	6
21	Yerasa	Weir, channels, piping and tank	100	90	190
22	Ayia Erini (Kannavia) (Krio-Nero) ..	Spring, channels and tank	—	20	20
23	Ayios Elias (Famagusta) ..	Repairs to main irrigation channels, construction of retaining walls and gates	—	—	—
24	Angastina	Construction of weirs, masonry, earth channels and gates	100	—	100
25	Patriki	Reforming of earth banks, repairs to culverts, weirs, screw-gates and channels	—	—	—
26	Gypsos	Construction of small diversion weirs, reforming of earth banks, etc. ..	—	—	—
27	Mora	Repairs to intake	—	—	—
28	Moutoullas ..	Repairs to small weirs, channels and retaining walls	—	—	—
29	Kalopanayiotis ..	Repairs to masonry channels, weirs and irrig. tank	—	—	—
30	Ayios Konstantinos	Repairs to masonry channels and retaining walls	—	—	—
		Totals	7,423	3,058	10,481

Note.—Items 23 to 30 are repairs to the damage caused by the record floods of December, 1949 and June, 1950.

APPENDIX 8.

IRRIGATION SCHEMES READY FOR CONSTRUCTION AT THE END OF 1950 BUT NOT YET STARTED.

	Location	Nature of Construction	Donums Commanded. New Irrigation		
			Winter	Summer	Total
1	Ayios Konstantinos (Philippou) ..	Masonry channels and tank	—	11	11
2	Agros (Esso-Yitonia)	Spring, channels and tank ..	—	15	15
3	,, (Dihalorotsos)	Channels	—	40	40
4	,, (Pano Netikon)	Spring	—	8	8
5	,, (Rodhitis) ..	Weir, spring and tank ..	—	13	13
6	,, (Kato Vrysia)	Spring, repairs to bank and channel	—	13	13
7	,, (Pano Vrysia)	Spring, channels and tank	—	17	17
8	,, (Mesi Vrysia)	Spring and tank	—	10	10
9	Alona (Dhali) ..	Springs	—	9	9
10	,, (Mahos) ..	,, ...	—	6	6
11	Alithinou (Kapsalos)	Spring	—	9	9
12	Ayios Ioannis (Ll.) (Akros) ..	Masonry channels ..	—	40	40
13	,, (Karpasitis) ..	Masonry channels and tank	—	14	14
14	,, (Spilios) ..	Channels	—	6	6
15	,, (Macheras) ..	,, ...	—	10	10
16	Athrakos (Kalimera)	,, ...	—	50	50
17	,,	Weir and channels	—	20	20
18	,, (Mavrosykiotis)	Spring, channels and tank	—	50	50
19	Ayios Sozomenos and Potamia	Weir, intake and channel ..	1,500	—	1,500
20	Askas (Ayia Paraskevi)	Spring, channels and tank	—	20	20
21	Ayia Erini (Kannavia) (Pera Yitonia) ..	,,	—	13	13
22	Ayios Theodhoros (L'sol) (Monadhia)	Channels	—	20	20
23	Ay. Theodhoros (Ll.) (Limni) ..	Channels and tank	—	19	19
24	,, (Lasmarka)	Channels	—	12	12
25	Ayios Epiphanios (Melisandra) ..	Spring and channels ..	—	12	12
26	Dhora (Karkas) ..	Weir, piping, channels and tank	120	80	200
27	Dhymes (Livadhi)	Channels and tank	—	18	18
28	,, (Hji Fisouni)	Channels	—	32	32
29	,, (Kardhama)	Spring, channels and tank	—	17	17
30	Fterykoudhi (Pano-Kalamithasa)	Masonry channels ..	—	15	15
31	,, (Paravkasha)	Spring	—	10	10
32	,, (P. Kountouros)	,, ...	—	20	20
33	,, (Vartali) ..	Spring and channels ..	—	10	10
34	Kalokhorion (Kambi)	Repairs to weir, channel and tank	—	13	13
35	,, (P. Marammenos)	Masonry channels	—	15	15
36	,, (K. Marammenos)	,, ...	—	10	10
37	Korakou-Tembria	Concrete channels ..	400	360	760
38	Kyperounda (Katashi) ..	Weir, channels and tank ..	—	25	25
39	,, (Vrysi tou Mangouri) ..	Spring, channel and tank ..	—	20	20
40	Kato Mylos (Koutsoulas) ..	Masonry channels ..	—	20	20
41	Kharcha (Merra tou Nerou) ..	Springs, channels and repairs to tank	—	60	60
42	Kithasi (Dhiorizos)	Masonry channels ..	—	90	90
43	Louvaras (Tsoukalas)	Weir and masonry channel	—	17	17
		Totals carried forward	2,020	1,269	3,289

	Location	Nature of Construction	Donums Commanded. New Irrigation		
			Winter	Summer	Total
		Brought forward ..	2,020	1,269	3,289
44	Lefka (Kafizes) ..	Masonry dam, piping and channel	200	500	700
45	Lasa	Masonry channels ..	—	10	10
46	Marathasa	Weir and channelling ..	—	500	500
47	Mitsero (Koulou-pashi) ..	Weir, masonry channel and tank	—	35	35
48	,, (Rhodanis) ..	Channels and tank.. ..	—	30	30
49	Odhou (Makria-dhomi)	Small weir and channels ..	100	50	150
50	Omodhos (Pano Krampiotis)	Channel, tank and piping	50	—	50
51	,, (Pighadhia)	Channels and tank.. ..	50	—	50
52	,, (Ayiasma)	Exploratory works ..	—	—	—
53	,, (Timios Prodhromos)	Spring, tank and channels	—	25	25
54	,, (Kypia) ..	Spring, irrigation tank ..	—	30	30
55	Pedhoulas	Masonry channelling and piping	—	232	232
56	Polystipos (Para-kania)..	Channels	—	20	20
57	,, (Makrinas)	Spring and tank	—	6	6
58	,, (Macroullis)	Weir, channel and tank ..	—	24	24
59	Platanistasa (Plata-niou)	Spring, channels and tank	—	30	30
60	,, (Koukoupas)..	Spring and channels ..	—	15	15
61	,, (P. Themelion)	Spring	—	7	7
62	,, (K.Themelion)	,, ...	—	4	4
63	,, (Pishara) ..	,, ...	—	8	8
64	,, (Vrysi) ..	Spring, channel and tank	—	25	25
65	Palekhori (Orinis) .. (Sklidhros) ..	Weir, masonry and earth channels	1,080	20	1,100
66	Paleosophos ..	Masonry channels ..	—	24	24
67	Pano-Panayia (Pano Pighi) ..	Springs and piping ..	—	24	24
68	,, (Vrysi Pighi)	Channels and tank.. ..	—	30	30
69	,, (Monadhia)	Spring, channel and tank	—	20	20
70	Sykopetra (Kountouros) ..	,,	—	17	17
71	Statos (Kato-Pighadhi) ..	,,	50	25	75
72	Spilia (Kalamionas)	,,	—	21	21
73	,, (Karydhia-Kambos) ..	Weir and piping	—	15	15
74	,, (Sklydhros-Karydhia) ..	Enlarging of tank	—	10	10
75	,, (Kolymbos)	Weir, channel and tank..	—	20	20
76	,, (Vrysi) ..	Excavation of spring ..	—	6	6
77	Sisklipos (Vrysi-tou-Khoriou) ..	Spring, channels and repairs to tank	—	20	20
78	Tersephanou ..	Weir masonry and earth channels	500	—	500
79	Tymbou	Intake, masonry and earth channels	300	—	300
80	Zoopiyi (P. Kremmos)	Spring, channel and tank ..	—	25	25
81	,, (Mesi Kremmos)	,,	—	15	15
82	,, (Kato Kremmos)	,,	—	20	20
83	,, (Lymbidhes) ..	,,	—	10	10
84	, (Karka-tou-Matera) ..	,,	—	16	16
85	Ayia Anna ..	Masonry channelling ..	30	—	30
86	Alona (Dendra-ton-Poulion)	Enlarging of irrigation tank	—	8	8
		Totals	4,380	3,166	7,546

APPENDIX 9.

VILLAGE WATER SUPPLIES COMPLETED IN 1950.

1. Gaidhouras
2. Ayios Therapon
3. Kapilio
4. Ayios Yeoryios Kafkalou
5. Gastria
6. Kormakiti
7. Prastio (Famagusta)
8. Trypimeni
9. Boghaz
10. Mandria (Paphos)
11. Monagroulli
12. Aplanda
13. Menoyia
14. Kouklia (Paphos)
15. Pomos
16. Tokhni
17. Mia Milea
18. Khirokitia
19. Anadhiou
20. Pano Panayia
21. Anaphotia
22. Kalopanayiotis
23. Timi
24. Arghaki
25. Palekythro
26. Kazaphani
27. Sotira (Limassol)
28. Amargeti
29. Artemi
30. Kellaki
31. Mesoyi
32. Paramali
33. Maroni
34. Ayios Yeoryios (Paphos)
35. Lefka
36. Moutoullas
37. Gouphes
38. Ayios Amvrosios (K'nia)
39. Armenokhori
40. Avgalidha
41. Ovgoros
42. Pano Arodhes
43. Liveras
44. Kouka
45. Akaki
46. Mathikoloni
47. Prastio (Limassol)
48. Kalavasos
49. Vrecha
50. Pano Koutraphas
51. Eledhiou
52. Louroujina

APPENDIX 10.

VILLAGE WATER SUPPLIES IN HAND AT THE END OF 1950.

1. Geunyeli
2. Athienou
3. Kato Platres
4. Prodhromos
5. Karmi
6. Anoyira
7. Ayios Dhometios
8. Vavla
9. Alambra
10. Tembria
11. Pissouri
12. Komi Kebir
13. Kandou
14. Kato Amiandos
15. Letimbou
16. Ayios Nikolaos (Paphos)
17. Paralimni
18. Perapedhi
19. Pano Pyrgos
20. Kato Pyrgos
21. Akhyritou
22. Pedhoulas
23. Ayios Elias
24. Sanidha
25. Ay. Theodhoros (F)
26. Astromeritis
27. Pano Dhikomo
28. Kato Dhikomo
29. Asomatos (Kyrenia)
30. Klavdhia
31. Ayios Dhimitrios
32. Polemi
33. Strongylos
34. Psilatos
35. Vitsadha
36. Pendalia
37. Ayios Theodhoros Soleas
38. Ardhana

APPENDIX 11.

VILLAGE WATER SUPPLIES SCHEMES READY FOR CONSTRUCTION AT THE END OF 1950 BUT NOT YET STARTED.

1. Kilani
2. Yeroskipos
3. Chakistra
4. Kambos
5. Khandria
6. Yialousa
7. Phlamoudhi
8. Peristerona (Famagusta)
9. Lemithou
10. Alethriko
11. Sophtadhes
12. Zoopiyi
13. Khalasaa
14. Pyrga (Larnaca)
15. Ayios Ioannis (Paphos)
16. Ephtakomi
17. Gastria
18. Agros
19. Pano Lefkara
20. Paleomylos
21. Akanthou
22. Omodhos
23. Silikou
24. Skoulli
25. Goudhi
26. Mousoulita
27. Palekhori Morphou
28. Temblos
29. Phterykoudhi
30. Klirou
31. Petra tou Dhiyeni
32. Aredhiou
33. Dhali
34. Hamid Mandres
35. Mazotos
36. Voroklini
37. Livadhia (Larnaca)
38. Pyla
39. Apsiou
40. Ypsonas
41. Erimi
42. Kolossi
43. Yerasa
44. Ayios Theodhoros (Ll)
45. Akhna
46. Leonarisso
47. Kouklia (Famagusta)
48. Mandres
49. Prastio (Paphos)
50. Lasa
51. Nikoklia
52. Trimithousa (Paphos)
53. Keumurju
54. Kinousa
55. Arminou
56. Agros
57. Plataniskia
58. Lazania
59. Mitsero
60. Yerakies
61. Trakhonas
62. Pharmakas
63. Karavostasi
64. Kakopetria
65. Galata
66. Evlenja
67. Milikouri
68. Sellain t'Appi
69. Ayii Vavatsinias
70. Ayia Anna
71. Prastio Evdhimou
72. Ayios Pavlos
73. Pyrgos (Limassol)
74. Ayios Konstantinos
75. Galatia
76. Dhavlos
77. Korovia
78. Avgorou
79. Phinikas
80. Tala
81. Polis
82. Mamonia
83. Stavrokono
84. Mamoundali
85. Kallepia
86. Galinoporni
87. Analiondas

Notes.—Nos. 1 to 19 have already provided their share in the cost of the works.
Nos. 20 to 28 have applied for loans to cover their share in the cost of the works.