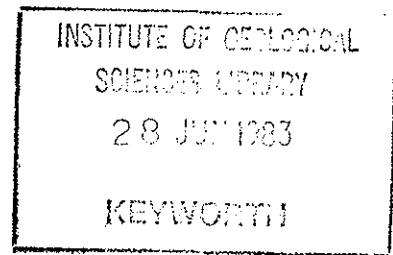


KW 9428



REPUBLIC OF ZAMBIA

MINISTRY OF RURAL DEVELOPMENT

**ANNUAL REPORT**  
**OF THE**  
**DEPARTMENT OF WATER**  
**AFFAIRS**  
**1971**

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1971

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DEPARTMENT OF WATER AFFAIRS  
ANNUAL REPORT FOR THE YEAR 1971

GENERAL

1. Staff turnover was frequent and high and, at the superscale level, one left without replacement. The post of Deputy Director, Data and Planning, was created and Mr G. A. N. Starmans was promoted to that post. The posts of Chief Water Engineer, one Deputy Director and one Senior Water Engineer remained vacant at the superscale level. Professional staff appear to shy away from Government service preferring para-statal and private sector posts due to more attractive fringe benefits. In spite of the above and other recruitment difficulties the staff position improved considerably and the professional staff level was at an all-time high of twenty-three. Even so, in the GP/1 grade there remained eight vacant posts.

2. In the Provinces the staff position improved and it was possible to appoint one additional Engineer each to Northern and Eastern Provinces to cope with the increase in work subsequent to the take-over of piped water supplies from the Ministry of Power, Transport and Works.

3. It is the intention of the Department to open a new provincial office at Solwezi as soon as the necessary accommodation at Solwezi becomes available. The biggest single bottleneck to progress of work in the field was lack of transport, though lack of housing also added to the difficulties. However, the capital expenditure was more in many Provinces than in previous years.

4. Progress has been made in taking over the responsibility for Government's public water supplies operated and maintained by the Buildings Branch of the Ministry of Power, Transport and Works. All new capital works on water supplies except institutional supplies of less than 100,000 litres/per day are now being handled by Water Affairs Department. Responsibilities for the maintenance of water supplies in three Provinces, Eastern, Northern and Southern, have now passed into the hands of Water Affairs Department, and the rest of the Provinces will be taken over progressively as the necessary staff is recruited. Presently there is a dearth of mechanical staff in the sub-professional and supervisory grades. Out of eight posts of Senior Mechanical Superintendent only two had been filled and, of these, one was by promotion within the Department. The only Engineering Assistant transferred from the Buildings Branch was promoted to Water Engineer on his obtaining professional qualification. He did not renew his contract and left.

5. Work on water supply schemes at Chisamba, Petauke, Nyimba, Siavonga and Feira was started and is expected to be completed by the end of the year. Also, critical analyses of water supply and sewerage schemes were made for the Ministry of Provincial and Local Government for loan purposes.

6. The Copperbelt Water Resources Survey was completed and the consultants, Sir Alexander Gibb and Partners, presented their final report at the end of the year. This report and its recommendations, if accepted by the Government, will form the basis for future planning and work on more detailed surveys of the water resources in particular areas of the Copperbelt.

7. The Departmental Headquarters still remained in the semi-permanent building in Jacaranda Road, with the Hydro-Geology Section remaining in Mulungushi House, due to lack of space at Jacaranda Road, and the Hydrology Section with the Deputy Director, Data and Planning, at Sheki Sheki Street. With the intention of bringing all the sections under one roof negotiations to obtain the former British High Commission offices have been successful and the Department will move early in 1972.

HYDROLOGICAL BRANCH

8. The Hydrological Branch now comes under the new division created under the Deputy Director, Data and Planning.

9. The Hydrological Year Books 1960/61 to 1965/66 have been published and distributed to all concerned. The *Surface Water Resources of Zambia* also has been completed and published

in the journal of the Zambian Institution of Civil Engineers. A new advanced computer programme has been completed for compiling the Hydrological Year Books 1966/67 to 1970/71.

10. During the year new sites for stream gauging and water levels were completed in North-Western, Eastern and the Copperbelt Provinces. The number of new stations is as follows:

Copperbelt Province .. .. .	9
North-Western Province .. .. .	16
Eastern Province .. .. .	10

11. In continuation of the suspended sediment analysis programme with a view to the construction of a soil erosion map for the whole country and to study the problem of reservoir sedimentation approximately 300 samples of river water were taken for analysis. Though not an intensive programme, as no separate funds were available for the work, the samples were taken during routine visits to the flow gauging stations.

12. As a result of the Kafue Pollution Committee's decision to supervise the water quality in the Kafue River, fifty-eight samples have been taken at a total of twenty-two stations in the Kafue River basin and were sent to the Government Analyst, Mines Laboratory and Kitwe City Council for partial and full chemical analysis.

13. Special mention should be made of a flood in Chipata area. In mid-February the rainfall in the area was approximately 50 per cent above normal resulting in flooding in the Mchinji Hills sector with a flood discharge of 850m<sup>3</sup>/sec in the Lutembwe River. A vast area of the Luangwa Valley was inundated causing much hardship to the local populace.

14. The water levels and discharges over the Zambezi basin were above normal during the hydrological year 1970/71. From mid-March discharges were below normal and during the months of August and September the discharges were above normal.

15. The discharges of the Kafue River basin during the hydrological year 1970/71 were above normal all the year round except the last ten days of March and the first ten days of April.

16. The discharges over the Luangwa River basin were above normal from 1st October, 1970, to 20th March, 1971, below normal from 21st March to 10th May and then above normal till the end of the year.

17. The discharges and water levels over the Chambeshi basin and the Luapula basin were slightly above normal during the whole year.

18. Special hydrological investigation and studies were carried out for ZESCO for the working programme of Kafue Gorge Dam and the construction of Itoshi Teshi Dam, for SWECO for new projects, for Zam-Tan for their water supply at Kapiri Mposhi, Kasama and Mpika, and for various other consultants and Government Departments.

#### HYDRO-GEOLOGICAL BRANCH

19. The beginning of the year saw the integration of the Hydro-Geological and Hydrological Branches under the new Data and Planning Division headed by the Deputy Director, Data and Planning. The Branch had a successful year in spite of senior staff changes and transport difficulties. In all, 438 sites were selected for boreholes by means of resistivity survey. Seventy-one additional sites were investigated but not recommended for drilling. As usual the biggest client was the Water Affairs Department for village water supplies, followed by private organisations and individuals. A breakdown by Province and client is tabulated below.

<i>Client</i>	<i>Central Province</i>	<i>Southern Province</i>	<i>Eastern Province</i>	<i>Copperbelt Province</i>	<i>Northern Province</i>	<i>Total</i>
Water Affairs Dept ..	70	50	39	21	—	180
Agricultural Dept .. ..	20	18	3	14	—	55
Other Government Depts ..	26	6	—	8	2	42
Para-statal and Semi-Government Depts ..	36	16	15	6	—	73
Private .. .. .	125	29	3	2	—	159
<b>TOTAL .. .. .</b>	<b>277</b>	<b>119</b>	<b>60</b>	<b>51</b>	<b>2</b>	<b>509</b>

20. Important groundwater assessments were made for Kapiri Mposhi glass factory, Chibwe, Soli catchment conservation plan and Chalimbana Teachers' Training College. Transmissibilities of some aquifers like granite gneisses, quartzite and schist were calculated and explorations of new aquifers were made.

#### DRILLING SECTION

21. The staff position continues to give concern. Only two drillers remained with the Drilling Section. Of the two, one, Mr Landsberg, died during August in Chipata. The other, Mrs Wessels, had to carry on for the remainder of the year supervising all the departmental rigs in Eastern Province. Four young Zambians were recruited as Trainee Drillers and commenced their training on the rigs.

22. During the year forty-eight holes were successfully drilled departmentally compared to fifty-two in 1970. The clean-outs were eight compared to five the previous year. Therefore, it can be said that the overall output has been maintained. This was possible only because the rigs were concentrated in one area resulting in better supervision of staff. The in-service training of local staff is continuing but, due to shortage of qualified supervisory staff, training is slow. The learner drillers still have to learn a great deal, particularly in drill sharpening.

23. The contractors who worked mostly along the line-of-rail had a good year with 195 successful boreholes completed and 18 clean-outs. The total number of boreholes drilled both by contractors and departmentally was 303 compared with 183 in 1970. This is creditable in view of the shortage of staff mentioned earlier.

24. Details of boreholes drilled in 1971 are given at Appendix II, Part 8 (a).

#### CENTRAL PROVINCE

25. Due to lack of funds no new dams were constructed during the year. Most of the activities were directed to providing piped water supplies, equipping boreholes and constructing wells in the rural areas.

26. Provision of pipe-borne water supplies, which usually means equipping a borehole or a well, providing an over-head tank, with a short distribution main and stand pipes, was undertaken for two villages (Nalubi and Rufunsa), two clinics (Kasarasa and Chibwe), a hospital (Chitambo) and a settlement scheme (Mumbwa). With regard to Chitambo Hospital, difficulties were experienced in the sinking of the borehole and a second attempt also did not succeed. This is being further investigated.

27. Under rural water supplies thirty-nine boreholes were equipped with hand pumps and handed over to the local authorities in the various districts. Also sixty-four wells were completed, lined and equipped with windlasses and buckets. Although conservation work had suffered due to lack of funds, work in providing potable water supply in the rural areas had gone on apace without interruption.

28. A total of 30 km of new canals were constructed in the Lukanga Swamps, and the existing 40 km of canal was maintained in good repair, and Waya and Chilwa harbours improved by dredging and raising the embankments.

29. The growth of water hyacinth in the Kafue River along 12 km of its length upstream of Kafue Gorge Dam was kept under control by chemical spraying.

30. Mkushi and Serenje water supplies were under construction and also Chisamba (minor improvement). Feira water supply was started (improvements).

31. Details of the year's work are given in Appendix II and summarised below:

Canals . . . . .	30 km new, 40 km maintained
New piped water supplies . . . . .	2 completed, 4 in hand
New hand-dug wells . . . . .	64 completed, 1 in hand
Water Rights investigated . . . . .	29
New boreholes completed . . . . .	95
Old boreholes cleaned out . . . . .	5

## SOUTHERN PROVINCE

32. One large dam, the Chikankata Dam of capacity 1,600 megalitres and height 16.7 m, was nearly completed, Only the completion of the chute spillway remains. This replaces an old weir and will give an assured supply of water to the Chikankata Mission, schools and hospital. No other dam was constructed but the Chivolyunga Dam spillway was completed and the Kambulamwanda Dam wall repaired.

33. Improvements were carried out to many township water supplies. At Chirundu two new Flygt pumps were installed to pump raw water, thereby doubling the existing capacity and one new K.S.B. pump was installed to pump the treated water to the storage tank. For the Namwala water supply new pumps have been received and are to be installed to meet the increasing demand, especially of the secondary school. Siavonga water supply is being altered and extended to increase the capacity and a new pump has been installed at Sinazongwe.

34. New treatment works were built at Zimba and put into operation at the end of the year, providing clean potable water to the township which had long put up with brownish water due to the high iron content in the water which was not properly treated.

35. Under co-operative and village supplies Mbabala was provided with a new treatment works which supplies the small rural council township. The Kariba fish market scheme supplies water to eight markets along the Kariba Lake. At each market water is pumped by D40 Mono pumps to 4,500 litre capacity over-head tanks which are connected to two stand pipes. At Ngwezi Settlement East B, three boreholes have been equipped and supply domestic water for the farmers settled there. Chilala Clinic and Mandoli School were provided with piped water by equipping boreholes and constructing over-head tanks and stand pipes.

36. Details of the year's work are given in Appendix II and summarised below:

New dams .. .. .	1 in hand
Dam repairs .. .. .	2 completed
New piped water supplies .. .	6 completed
New hand-dug wells .. .. .	95 completed, 7 in hand
Investigations, surveys and design	16
Water rights investigated .. .	4
New boreholes completed .. .	76
Old boreholes cleaned out .. .	9

## EASTERN PROVINCE

37. The highest number of wells were sunk in this Province during the year though a proper comparison cannot be made with the previous years as work was cut down due to shortage of funds. The number of boreholes drilled was the third highest next to Central and Southern Provinces, and the interesting feature is that all the boreholes were drilled by Water Affairs Department staff. They also had a very low percentage of unsuccessful holes.

38. Three new dams, Jimu, Mwangazi and Chabori, were started (of which one was completed) by hand labour, giving employment to local villagers of the area. These were mainly conservation works for stock watering.

39. Under the National Water Supply Programme a new water supply scheme for Nyimba Township is nearing completion. The source of supply is the Chikuyu Dam and the water will be treated before distribution to the Township. The ground level storage tank, treatment works and pump-house are complete and will become operational during the early part of 1972.

40. Plans are complete to improve the water supply to Petauke Township by drilling new boreholes and installing new pumps.

41. Under piped water supplies for villages Zambia Youth Service was provided with pipe-borne water by equipping a borehole, erecting a pump-house and over-head tank of capacity 22,000 litres. Also the Msoro Mission Hospital was provided with pipe-borne water by equipping a borehole and erecting a pump-house and over-head tank of capacity 11,000 litres.

42. Details of the year's work are given in Appendix II and summarised below:

New dams	.. .. .	1 completed, 2 in hand
New piped water supplies	.. .. .	2 completed, 1 in hand
New hand-dug wells	.. .. .	134 completed
Investigations and surveys	.. .. .	4
Water rights investigated	.. .. .	2
New boreholes drilled	.. .. .	48
Old boreholes cleaned out	.. .. .	8

#### WESTERN PROVINCE

43. The main work in the Province is the construction of drainage and navigational canals, mainly in the flood plains of the Zambezi River. For successful cultivation of maize in the flood plains the water-logging after the floods have receded has to be reduced and to do this new drainage canals are planned for construction every year in addition to the maintenance of the existing canals in good repair. This year more drainage canals have been completed than navigational canals to give greater incentive for maize cultivation in which Western Province has been lagging behind other Provinces.

44. The easy and cheap method of transport in the flood plains is still by canoes and launches and the deepening of navigational canals approved by the various District Development Committees and the Provincial Development Committee was continued for the benefit of the people living in the plains. Difficulties were experienced in keeping the two dredgers working continuously in the Mongu-Kalabo Canal due to lack of spares. These are specialist machines and spares are not stocked in Zambia and have to be ordered from USA and Holland where the dredgers were manufactured. The Mongu-Kalabo Canal is now complete and the future work of the dredgers will be to deepen sections which are silted due to the annual floods. Under the co-operative and village water supplies programme well-point sinking and the installation of Uganda hand-pumps continued and in all 135 well-points were completed successfully, 24 more than in the previous year. There were fewer abandoned well-points as it was possible to use the small percussion rig to drill deep enough to reach the water table where the jetting method had failed. However, this is slower than jetting and expensive on labour.

45. The year also saw the completion of piped water supplies to three villages and a school for the blind.

46. Details of the year's work are at Appendix II and summarised below:

Navigation canals improved	.. .. .	14 km
New drainage canals dug	.. .. .	83 km
Old drainage canals improved	.. .. .	8 km
Canals maintained	.. .. .	493 km
New piped water supplies	.. .. .	4 completed, 2 in hand
New hand-dug wells	.. .. .	13 completed, 1 in hand
New well-points water supplies	.. .. .	134 completed, 1 in hand

#### COPPERBELT AND NORTH-WESTERN PROVINCES

47. K. B. Nair, the Provincial Water Engineer, completed his contract on 21st October, and left the service. Mr M. A. Chaudhry, a new recruit, took over from him. The Provincial Water Engineer, Copperbelt Province, still continued to be responsible for work in North-Western Province. Lack of housing and office accommodation at Solwezi prevented the opening of a separate office for North-Western Province.

48. In the Copperbelt Province two water supply schemes with pumps, overhead tanks and stand pipes were completed at Zambia Youth Service Agriculture Camp and Luanshya Centre for the Blind. Another twenty-two boreholes were drilled for the provision of water supplies to villages and co-operatives and are awaiting pumps for installation. For primary schools in the area, seven wells were completed. The water supply for Chiwala Primary School was combined with that of the Chiwala Village project and a piped water supply was provided. In North-Western Province new piped water supplies to Monze, Chavuma, Chitokoloki and Muzimanyora villages reached various stages of construction. In most cases the delay in completion was due to the inability to obtain the required type of pumps within the country.



The well programme for villages continued and eleven wells were completed with five still under construction. Under the primary school water supply programme eight wells were completed and one abandoned due to rock. Development in North-Western Province could be speeded up if a Provincial Office is opened at Solwezi and with this in view pressure is being brought on the Permanent Secretary, North-Western Province, to provide the necessary housing and office space.

49. Details of the year's work are at Appendix II and summarised below:

	<i>Copperbelt</i>	<i>North-Western</i>
Dam improved .. .. .	1	—
New piped water supplies .. .. .	2 completed, 1 in hand	4 in hand
New hand-dug wells .. .. .	21 completed, 2 in hand	30 completed, 5 in hand
Investigations, surveys and designs ..	7	—
Water rights investigated .. .. .	25	—
New boreholes drilled .. .. .	22	2
Old boreholes cleaned out .. .. .	4	—

#### LUAPULA PROVINCE

50. There was a change in the provincial engineers during the 1st quarter of the year. Mr I. Rysdyk resigned and left and Mr R. P. Patel, Senior Engineering Assistant, took over as Acting Provincial Water Engineer.

51. Under village water supplies sixty-four water supplies were completed, thirty-eight equipped with windmills, eight with rotary hand pumps and eighteen with Uganda-type hand pumps.

52. Work was started on the Samfya Township water supply by Messrs Cencon Ltd, of Chingola, costing K184,000. Forty-five per cent of the work had been completed by the end of the year. Kazembe water supply costing K50,000 was completed by direct labour. The scheme involved the construction of pump houses, over-head tanks and filtration plant.

53. Canal construction went on apace both by manual labour and machines. A total of 14 km of canal were done by machines and 22 km by hand, employing local labour. Canal construction gave employment to local labour for at least seven months of the year. The absence of a Mechanical Superintendent was felt badly in the maintenance and upkeep of dredgers and excavators in the Province.

54. Details of the year's work are at Appendix II and summarised below (the canals shown include those in the Northern Province part of Bangweulu; all were controlled from Luapula office):

New canals dug in Bangweulu .. .. .	35.6 km
Bangweulu canals maintained .. .. .	409 km
New piped water supplies .. .. .	3 in hand
New hand-dug wells .. .. .	22 completed, 22 in hand
Investigations and surveys .. .. .	3
Water rights investigated .. .. .	8

#### NORTHERN PROVINCE

55. At the beginning of the year the Acting Provincial Water Engineer, Mr R. Smith, died suddenly and the Senior Engineering Assistant, Mr Simunyola, from Lusaka, took over the station temporarily. In May, Mr I. I. Nwankwor took over as Provincial Water Engineer. The Staff position improved during the latter half of the year by the appointment of an additional Water Engineer and a Mechanical Superintendent.

56. Lack of building materials has been a stumbling block in the completion of projects to schedule in this Province. For example, the completion of Kaputa water supply was unduly delayed due to lack of pipes and couplings. Also, well programmes in Luwingu, Mporokoso and Kaputa could not be completed due to lack of cement.

57. This is one of the Provinces where Water Affairs Department has taken over the maintenance of water supplies. Water supplies to Mpika, Luwingu, Mporokoso, Mpulungu and Chinsali were taken over for operation and maintenance. Luwingu, Mporokoso and Chinsali are now being completely redesigned and work is expected to start early.

58. Details of the year's work are at Appendix II and summarised below (Bangweulu Swamps canals are included under Luapula Province as this work was controlled from that Province):

New piped water supplies .. .. .	2 completed, 1 in hand
New hand-dug wells .. .. .	24 completed, 10 in hand
Investigations and surveys .. .. .	10
Water rights investigated .. .. .	5

### THE WATER BOARD

59. The year started without a Secretary as Mr Katuna was transferred to the Ministry of Power, Transport and Works at the end of 1970. Mr Mudenda was later transferred from the Ministry and carried on as Secretary until July when Mr Katuna was again transferred back to the Water Board. It is hoped Mr Katuna will be here permanently as constant transfers disrupt work, and each time a change is made it has to be officially gazetted. There is still understaffing in junior grades.

60. In all, seventy-three applications for water rights were investigated by the Department of Water Affairs and reported on to the Water Board. The greatest number of applications were from the Central and Copperbelt Provinces. The total number of applications was very much lower than the previous year when 122 applications were investigated.

61. The Board held three public inquiries at Kitwe, Chingola and Lusaka respectively and a summary of the decisions reached is as follows:

Granted .. .. .	69 new permits and 8 temporary permits
Renewed .. .. .	22 permits
Deferred .. .. .	3 permits
Rejected .. .. .	7 permits

62. The award varied from as low as 5m<sup>3</sup>/day for a poultry farm to 27,000m<sup>3</sup>/day for the Chingola City Council. The increase in abstraction due to new awards amounted to 64,485 cubic metres. Abstraction for an amount of 38,737 cubic metres was renewed and temporary permits were issued for a total abstraction of 2,528m<sup>3</sup>/day.

63. Although Western Province is now covered by the Water Ordinance no water right applications have been received so far. This may be due to ignorance and the matter will have to be pursued further to enlighten the people on the necessity to obtain water rights to abstract water from all tributaries of the Zambezi River except from the Zambezi River itself which is excluded from the Ordinance.

### CONCLUSION

64. This had been a successful year. The number of professional staff stood at the highest level since the inception of the Department and the output has been correspondingly high. Credit is due to all members of the staff, especially the Provincial Water Engineers and their staff who had to work under trying and difficult conditions to complete the projects to schedule.

65. Thanks are also due to the other departments in the Ministry of Rural Development and to other outside departments for the co-operation rendered in our work.

W. N. CARTWRIGHT,  
Director of Water Affairs

## STAFF

## TECHNICAL STAFF AS AT 31ST DECEMBER, 1971

*Director:*

W. N. Cartwright, BSC, ACGI, FICE, MIWE, MEIZ

*Deputy Director:*

R. E. Williams, BSC, MSC, MICE, MIWE, MASCE, MEIZ

*Chief Water Engineer:*

G. A. N. Starmans, BSC, AMIMM

*Senior Water Engineers:*

V. E. Crust, BSC

H. A. Nelson, FICE, FIMVWE, FIWE, FCS

K. P. Sitsapesan, BSC, MICE, MIWE, MIEC

One vacant

*Senior Hydro-Geologist* .. .. . 1 post vacant*Principal Hydrologist:*

M. S. E. Shalash, BSC, MSC, D ENG, MASCE

<i>Water Engineers</i>	.. .. .	20 posts, 8 vacant
<i>Hydro-Geologists</i>	.. .. .	4 posts, 1 vacant
<i>Hydrologists</i>	.. .. .	2 posts, 1 vacant
<i>Chief Engineering Assistant</i>	.. .. .	1 post, 1 vacant
<i>Chief Drilling Superintendent</i>	.. .. .	1 post, 1 vacant
<i>Senior Engineering Assistants</i>	.. .. .	11 posts, 5 vacant
<i>Senior Mechanical Superintendents</i>	.. .. .	8 posts, 6 vacant
<i>Engineering Assistants</i>	.. .. .	37 posts, 15 vacant
<i>Mechanical Engineer</i>	.. .. .	1 post, 1 vacant
<i>Mechanician</i>	.. .. .	1 post, 1 vacant
<i>Water Development Officers, Grade I</i>	.. .. .	15 posts, 8 vacant
<i>Drillers</i>	.. .. .	6 posts, 4 vacant
<i>Mechanics</i>	.. .. .	2 posts, 2 vacant
<i>Water Development Officers, Grade II</i>	.. .. .	25 posts, 10 vacant
<i>Assistant Laboratory Technician</i>	.. .. .	1 post, 1 vacant
<i>Water Development Officers, Grade III</i>	.. .. .	33 posts, 17 vacant
<i>Learner Drillers</i>	.. .. .	5 posts
<i>Tracers</i>	.. .. .	2 posts

## RETIREMENTS AND RESIGNATION

*Senior Hydro-Geologist:* M. Tague*Water Engineers:* K. B. Nair, L. Pickering*Senior Engineering Assistants:* B. G. Harter, I. Rysdyk, R. Smith (*deceased*), J. D. Price*Mechanic:* J. Lockman, P. Lewer*Water Supply Superintendent:* J. Edwards*Senior Mechanical Superintendent:* J. H. Reilly*Assistant Water Supply Foreman:* G. Mbewe (*deceased*)*Engineering Assistant:* D. A. C. Long*Senior Water Development Assistant:* E. B. Muyoba

## RECRUITS

*Water Engineers:* M. A. Chaudhry, I. I. Nwankwor, M. Kurukulasuriya*Engineering Assistant:* C. F. Cassie, G. M. Tailor*Water Supply Superintendent:* J. Edwards

## VSOs

P. Harding

J. Haslam

## EXECUTIVE STAFF AS AT 31ST DECEMBER, 1971

<i>Chief Executive Officer:</i>	.. .. .	1 post
<i>Executive Officers:</i>	.. .. .	7 posts
<i>Senior Stores Officer</i>	.. .. .	1 post

## WORK COMPLETED OR IN HAND

## I. DAMS AND WEIRS

<i>Name and Province</i>	<i>Fill m<sup>3</sup></i>	<i>Max ht/m</i>	<i>Capacity megalitre</i>	<i>Cost K per megalitre</i>	<i>% completed end of 1970</i>	<i>% completed end of 1971</i>
<b>NEW DAMS</b>						
Jimu (Eastern) .. ..	26,000	12	775	60	—	50
Mwangazi (Eastern) ..	12,841	9	136	200	—	100
Chabori (Eastern) .. ..	27,910	8	200	289	—	45
Chikankata (Southern) ..	40,000	16.75	1,600	34	—	90

NEW WEIRS Nil

## REPAIRED AND IMPROVED DAMS

Chivolyonga (Southern) Spillway Amos slab completed  
 Kabulamwanda (Southern) Dam wall repaired  
 Mope Dam (Copperbelt) Wall raised by 1 ft

## 2. CANALS AND WATER WAYS

*Luapula Province:*

	<i>km</i>
(a) New canals completed:	
Samfya District .. ..	29
Kawambwa District .. ..	3
Nchelenge District .. ..	3.6
(b) canals maintained .. ..	409

*Western Province:*

(a) Navigational canals Deepened:	
Nakuna .. ..	3.0
Mapungu-Kalabo .. ..	6.0
Luandala .. ..	5.0
<b>TOTAL .. ..</b>	<b>14.0</b>

(b) New drainage canals completed:	
Sindende .. ..	11.0
Ndanda .. ..	5.0
Sishekanu .. ..	12.0
Nambenda Nasilimwe .. ..	29.0
Mbale .. ..	8.0
Namaloba .. ..	9.0
Lukute .. ..	9.0
<b>TOTAL .. ..</b>	<b>83.0</b>

(c) Drainage canals deepened:	
Limangula .. ..	8.0
(d) Canals maintained .. ..	493

*Central Province:*

	<i>km</i>
(a) New canals completed:	
Canal from 9 km point on Waya-Chilwa route to Lake Liombe ..	30
(b) Canals maintained:	
Waya to Chilwa Island .. ..	40

### 3. PIPED WATER SUPPLIES

Name	Province	Expenditure (K)	% completed end of 1970	% completed end of 1971
Nalubi Village .. ..	Central	8,500	0	100
Kasarasa Clinic .. ..	Central	4,800	0	100
Rufunsa Village .. ..	Central	15,000	0	90
Chibwe Clinic .. ..	Central	1,700	0	90
Chitambo Hospital .. ..	Central	6,200	0	60
Mumbwa Resettlement .. ..	Central	5,000	0	40
Samfya Township .. ..	Luapula	184,000 (Total Estimate)		45
Munkata Village .. ..	Luapula	4,900	0	80
Kazembe Township .. ..	Luapula	40,000	20	80
Zambia Youth Service .. ..	Eastern	5,346	0	100
Msolo Mission Hospital .. ..	Eastern	2,014	0	100
Nyimba Township .. ..	Eastern	36,532	0	80
Zimba Township .. ..	Southern	28,200	0	100
Mbabala Rural Compound .. ..	Southern	25,605	0	100
Kariba Fish Market .. ..	Southern	2,636	0	100
Ngwezi Settlement Ext. B .. ..	Southern	4,807	0	100
Chilala Clinic .. ..	Southern	1,571	0	100
Mandali School .. ..	Southern	974	1	100
Zambia Youth Service Agriculture Camp .. ..	Copperbelt	10,000	0	100
Luanshya (Fisenge) Blind Centre .. ..	Copperbelt	14,572	0	100
Chiwala Village .. ..	Copperbelt	3,080	0	90
Mize .. ..	North-Western	1,002	0	20
Chavuma .. ..	North-Western	5,323	0	80
Chitokoloki .. ..	North-Western	5,501	0	60
Mujimanzovu .. ..	North-Western	5,516	0	90
Chimba .. ..	Northern	6,000	0	100
Senga Hill .. ..	Northern	80,000	40	60
Chifwile .. ..	Northern	25,000	0	100
Watopa .. ..	Western	4,000	50	100
Sikayu .. ..	Western	8,000	0	100
Sefula Blind School .. ..	Western	6,000	40	100
Mwandi .. ..	Western	4,000	0	50
Lukona .. ..	Western	3,000	40	60
Shangambo .. ..	Western	8,000	0	100

#### 4. (a) WELLS

Province	Number excavated	Number abandoned	Number completed	Number not completed	Depth lined (metres)	Total Depth (metres)
Central .. ..	72	7	64	1	659	776
Northern .. ..	36	2	24	10	415	620
Western .. ..	14	1	13	1	174	198
Southern .. ..	117	15	95	7	1,262	1,439
Eastern .. ..	136	2	134	—	1,533	1,838
Luapula .. ..	60	16	22	22	546	355
Copperbelt .. ..	26	3	21	2	233	226
North-Western .. ..	46	11	30	5	358	475

NOTE: It will be seen that in certain cases the depth lined is more than the depth excavated. This is due to inclusion of linings done for wells excavated the previous year.

#### 4. (b) WELL-POINTS

Province	Number sunk	Number abandoned	Number completed	Not done
Western .. ..	150	15	135	4

1971

### 5. INVESTIGATIONS AND SURVEYS

	Central	Southern	Eastern	Copperbelt	North-Western	Luapula	Northern	Total
Dams .. ..	—	5	3	2	—	—	—	10
Weirs .. ..	—	—	1	—	—	—	—	1
Water Supplies .. ..	—	7	—	—	—	3	10	20
Miscellaneous .. ..	—	—	—	1	—	—	—	1

6. DESIGNS COMPLETED

	Central	Southern	Eastern	Copper-belt	North-Western	Luapula	Northern	Total
Dams .. ..	—	1	—	1	—	—	—	2
Weirs .. ..	—	—	—	—	—	—	—	—
Water Supplies	—	3	—	3	—	—	—	6
Miscellaneous ..	—	—	—	—	—	—	—	—

7. WATER RIGHTS INVESTIGATED

Central	Southern	Eastern	Copperbelt	North-Western	Luapula	Northern	Total
29	4	2	25	—	8	5	73

8. (a) BOREHOLES DRILLED

CONTRACTORS:

Province	Number successful	Number duds	Total yield litre/sec	Total depth (metres)	Number clean-outs
Southern .. ..	76	33	83.20	5,004.01	9
Copperbelt .. ..	22	Nil	84.14	1,277.39	4
North-Western .. ..	2	1	1.30	141.20	—
<b>TOTAL .. ..</b>	<b>195</b>	<b>59</b>	<b>327.81</b>	<b>12,550.10</b>	<b>18</b>

WATER AFFAIRS

Province	Number successful	Number duds	Total yield litre/sec	Total depth (metres)	Number clean-outs
Eastern .. ..	48	1	77.67	2,234.39	8
<b>GRAND TOTAL .. ..</b>	<b>243</b>	<b>60</b>	<b>405.48</b>	<b>14,784.49</b>	<b>26</b>

8. (b) BOREHOLES EQUIPPED

Province	No.
Central .. ..	39
Southern .. ..	37
Copperbelt .. ..	2
Eastern .. ..	40

Appendix III

PROVINCIAL OFFICERS' EXPENDITURE

Expenditure in K × 10<sup>3</sup>

Province	1970 Capital Expenditure	Capital Expenditure		Recurrent Expenditure	
		All works	Canals only	General and Travelling	Maintenance and Investigation
Central .. ..	240	211	49	19	3
Southern .. ..	216	259	Nil	41	15
Eastern .. ..	286	240	Nil	44	16
Copperbelt .. ..	92	145	Nil	12	2
North-Western .. ..	27	62	Nil	12	2
Luapula .. ..	222	175	91	40	169
Western .. ..	242	134	150	7	93
Northern .. ..	45	93	Nil	10	33
Drillings .. ..	275	269	Nil	9	80
<b>TOTAL .. ..</b>	<b>1,645</b>	<b>1,588</b>	<b>290</b>	<b>194</b>	<b>413</b>

## COMPARISON OF ANNUAL WORKS

	1971	1970	1969	1968	1967	1966
Number of professional staff .. ..	23	21	22	20	17	18
Number of dams and weirs completed ..	1	5	3	7	13	4
Number of major dam repairs .. ..	3	5	2	1	9	12
Number of wells completed .. ..	403	436	286	218	182	60
Number of well-points completed .. ..	135	111	133	71	60	0
New canals completed (km) .. ..	148	94	155	188	273	6
Number of successful contractor boreholes ..	195	90	120	80	106	44
Number of successful Departmental boreholes	48	50	25	28	29	34
Number of boreholes sited .. ..	509	442	404	366	327	218
Number of Water Right applications ..	73	122	109	125	95	82
Number of water supplies completed ..	18	9	3	7	9	8