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CARE

CAMEROON

MANDARA WATER SUPPLY

PROJECT No. 631-0025

JULY 79

Country : Cameroon

Project Title : Mandara Water Supply Project 631-0025

Period : 1980-1983

Prepared by : CARE-Cameroon

Introduction

This project seeks to provice the technical, administrative, and material assistance for the construction of 56 water catchments and rehabilitation of 36 existing wells in the Margui-Wandala Department of Northern Cameroon.

The operations will be performed by experienced well digging and water catchment teams. The concerned local communities will be actively involved on a self-help basic in supplying materials such as sand and stone and in some cases providing manual labor.

The project will be administered by CARE-Cameroon, while certain technical support and day to day supervision will be provided by Genie Rural (Service of Rural Engineering) and the Department of Community Development.

A list of sites has been drawn up in response to communities request, the CARE water Engineer's individual site surveys and taking into consideration the United Nations Soundness Analysis report and other projects underway in the Northern Province.

The intended beneficiaries are the villagers of the Department of Margui-Wandala. The population of this area is 496,310 inhabitants with 98.00 % of the population residing in the rural areas in the Mandara Mountains. The average income of the Department is estimated at under $ 50.00 per year. The project will touch about 27 percent of the rural population ; approximately 136,384 persons at a cost of 21 dollars per beneficiary.

Ninety-two sources of water will be provided. Each water catchment will serve an average of 2114 people ; each well, an average of 500 people. Thus one water source will serve an average of 1482 people.

Project Design

Statement of Problem

The Margui-Wandala region is one of the poorest areas of Cameroon. A study completed ten years ago revealed a per capita cash income of 17 dollars per year in the Northern Province, the lowest in the country. The school attendance rate of twenty-two per cent is only one-third of the national average. Estimated health statistics of the late 1960's indicated an average life expectancy of twenty-four years for parts of the Mandara Mountains and there is no evidence that it has substantially improved since then. The area is characterized by inadequate sanitation, poor diets, and insufficient medical care.

While the National Nutrition Survey performed in 1978 showed the highest proportion of chronically undernourshed children were in the Western part of the country, it revealed that 7,5 percent of the children in the North are suffering from acute malnutrition, and over 20 percent were chronically malnourished. With approximately half of the population in the North having no toilet facilities, there is a great risk of contaminating unprotected water sources. As a result, dysentery and other diarrheal diseases are very prevalent in the Margui-Wandala, and are the leading causes of the high morbidity rates in the area.

Collection of water is the major occupation of the women inhabitants of the Margui-Wandala. An adequate year-round supply of drinking water is not available in many of the villages of the area. Most of the population relies upon shallow wells, streams and rivers water as its sources of drinking water. Not only are these sources unsanitary but in many cases water is available only during the short rainy season from June to September and occasionally for a short time thereafter. During the rest of the year the search for water is a chronic problem. This search for water is the major occupation of the women of the region who spend an average of four hours a day collecting water during a dry season that lasts six to eight months. This excessive demand on the time of the women and children prevents them from engaging in other productive activities which would contribute to their personal and their families wellbeing. This annual shortage of water causes many families to migrate to available water sources within the region or, in some cases, to the neighboring country of Nigeria. Convenient, reliable, water sources would make a significant contribution to the quality of life of the people who live in the Margui-Wandala.

This project will take steps to alleviate these problems through the rehabilitation of existing wells by deepening, capping, and installing pumps and by capturing and protecting springs, that will provide reliable year-round sources of improved drinking water.

These wells and water catchments will be maintained by Genie Rural, Community Development and the village committees under their supervision. In addition CARE in collaboration with the concerned Government Services and Peace Corps will develop an ongoing program of health and hygiene education aimed at the adoption of better sanitary practices among the target population.

Final Goals

1. The first goal is to improve the health of the people by enabling them to get more water of an improved quality through the provision of reliable water sources closer to their homes.

With more water available, a better standard of cleanliness is possible and the health of the people can improve. It is planned that this intervention combined with the health education component of this project, the adoption of some basic health practices and the introduction of some curation services will reduce the incidence of water borne diseases in the target group.

2. The second goal is to give the women and children, whose traditionnal job is to draw water, more leisure time which can be used for educational, productive or social activities.

Since these watering points will be closer to their homes less time will be required to get water.

Intermediate Goals

In order to achieve project goals the following principal intermediate goals must be accomplished :

1. Provision of at least fifty litres of improved water per capita per day for 365 days per year.
2. Improved water quality at ninety-two water sources.
3. A twenty-five percent reduction in the time spent by beneficiaries in collecting water.
4. The development of health hygiene community education activity reaching target beneficiairies in all project communities.

PROJECT ACTIVITY TARGETS

Activity	Target	Period	Location
Well Improvement	6	1st Year	Margui-Wandala
	6	2nd Year	Margui-Wandala
	12	3rd Year	Margui-Wandala
	12	4th Year	Margui-Wandala

Activity	Target	Period	Location
Water Catchment	8	1st Year	Margui-Wandala
Water Catchment	16	2nd Year	Margui-Wandala
Water Catchment	16	3rd Year	Margui-Wandala
Water Catchment	16	4th Year	Margui-Wandala

Activity	Period	Location
Health and C.D. Department extension agents and Peace Corps, Health Volunteers working with the target population to improve sanitation practices in order to keep water free from pollution.	YR 1 to 4	Given the limited number of extension agents attempts will be made to reach as many of the villages chosen as water project sites as possible.

Project Overview

Project Development

Northern Cameroon, classified as part of the Sahelian region, has an average rainfall of under 900 mm a year. Apart from the Logone, there are no important permanent rivers in North Cameroon. Mayos or dry rivers have plentiful amounts of water in the rainy season but during the dry season surface waters are limited to residual ponds and a few streams. Although wells have been dug by traditional means by Genie Rural and by other organizations, and although there are a small number of dams, the scarcity of a year round water supply in most of the Margui-Wandala is a problem recognized by the local population and the administrative authorities. In inquiring as to what type of assistance from CARE would be of greatest benefit, local government officials and villages replied that more water was an urgent need. Village hydrology is an important priority of the Government of Cameroon. Of the 50 000 000 francs CFA from the investment budget and 60 000 000 CFA of financing provided by FONADER in 1976/1977 (for village hydrology projects) almost half was allocated to Northern projects due to the importance the Government attaches to the provision of water in this region.

The President of Cameroon, M. Ahmadou Ahidjo in his presentation of the budget before the National assembly on June 2, 1979 committed the Government to strenuous efforts in order to make water available to all Cameroon placing special emphasis on the North where scarcity of water during certain months is a serious problem.

Despite the Government's increased funding to improve rural water supply many villages still suffer from the lack of a year round water supply.

Since access to, and the provision of water, is a key to development efforts in any given region, the Government, the United Nations and USAID have all provided financial and material assistance for the exploration of surface and underground water resources over the past several years.

Although the technical reports have been helpful in the formulation of this project, not all the villages have been covered by those surveys. Prospection of sites and information acquired from the well digging and water catchment teams working for many years in the North provided additional data for the projects design.

The Provincial Service of Genie Rural and Community Development in the Northern Province submitted lists of potential sites to CARE for well and water catchment projects, accompanied CARE representatives on field visits and will provide personnel required for project implementation who have many years of experience working in this field.

As a result of these different forms of inquiry, an appropriate technology for this project and equipment needs have been determined. In addition other local agencies have been evaluated for their ability to participate in the project.

(1) Direction du Génie Rural Raport Annuel Exercice 1976/1977, 1978 P. 10

- Project Strategy

As has been mentioned earlier, development in any area may only commence when there is a source of water readily available. The Government and all international agencies emphasize that successful implementation of agricultural, health and other projects is dependent on first providing a source of water. For this reason the Government's 4th five year plan has singled out rural village water supply as a priority among rural development activities. The Government's goal is to provide a water point for every 560 inhabitants. Even with an increased budget for Genie Rural and funding from external sources the Government has not been able to statisfy all of the demands by the local population for water.

Involved in developmental activities in the North on a major scale are the World Bank, USAID and FED (Fonds Européen du Développement). The World Bank is currently financing the FSAR (Fond Special d'Action Rurale) project. This project will include construction of 10 small dams, the repair of already dug but non functioning wells and the installation of pumps, and the drilling of small bore wells equiped with pumps.

USAID has many different projects currently underway in the North. Most closely allied to CARE's Margui-Wandala water supply project is a proposed project which will finance approximately 35 small dams in the Margui-Wandala.

The FED has shown interest in a project to establish irrigated areas in the Department of Logone and Chari. Currently the FED is engaged in a resettlement project in the upper Benoue Valley.

CARE's water supply project will be complementary to both the USAID dam project and the World Bank project. CARE will only be working in areas of the Largui-Wandala where the World Bank is not planning to provide or improve water source. Several of CARE's water sites will be in places originally scheduled for USAID dams, as these were later found during site inspections to be better suited to catchment systems. By providing healthier, more reliable sources of water in the Largui-Wandala to villages where there will be no dams, CARE will be increasing the portion of the local population with an adequate water supply.

Project Impact

By providing 92 water sources, the year round availability of water will be significantly increased in the area.

Since women bear most of the burden for fetching water, the project will have an immediately beneficial effect on them. One third of their day may be spent during the dry season in walking to and from sources of water and waiting turn in line once there. With an adequate year round water supply, women will walk shorter distances and devote less time to the retrieval of water and will have more time and energy for taking care of themselves, their children and their households as well as having more time for income producting activities.

A year round water supply may also stimulate the planting of small vegetable gardens which will bring about nutritional benefits. Livestock quality and health during the dry season will improve from the constant and abundant supply of water.

Those workers recruited to work with the teams will be trained in well and water catchment construction. They will benefit from the technical skills they learn as well as from an increase in income.

Since the water will be protected from animal and human contamination, the incidence of water-borne deseases will decrease. As a result, less time and money will be spent for treatment of diseases.

Project Continuity

Genie Rural and C.D. Department are currently involved in water projects. They will be responsible for day to day supervision and the continuation of such activities when external support is no longer available. The equipment and spare parts bought for the project will be

given to the Government to facilitate this task. Trained teams and an administrative structure already formed and in place, will assume responsibility for the successful evolution of this project.

Genie Rural in its 1976 - 1977 Annual Report cited the lack of equipment for its operational units as the major factor limiting its activities. The acquisition of equipment of the service has not followed the expansion of its personnel. Thus, in providing equipment to Genie Rural, CARE will have afforded this service the means not only to maintain functioning sites but also to continue its construction of improved water sources at an accelerated rate.

The villagers will also play an important role in the maintenance of the water catchment facilities. Repairs of masonry and done by the villages under the guidance of CD agents and the teaching of technical aspect done by the construction teams. Repair of wells because of the greater skill required, will be performed by Genie Rural utilizing the equipment left to them at the end of the project. Genie Rural has stated the problem of maintenance is a function of equipment.

Project Potential

This proposal, as mentioned earlier, will reach 27 % of the Margui-Wandala's population. It is beyond the scope of the project to answer all the needs for water supply, since external and host country resources do not permit a wider scale application of the project at this time.

The need for potable water supplies will continue. This project, once it has demonstrated its viability, may serve as a prototype for other projects of similar nature in Cameroon.

Project Constraints

The obstacles that might temporarily impede or limit project implementation are difficulties in the timely procurement of certain pieces of equipment, long or hard rainy seasons during which most work cannot proceed.

Also lack of a good working relationship with the officials of Genie Rural would be an impediment as the chef de service and his assistants will have important supervisory roles.

Project Implementation

Pre-Implementation Conditions : This project will be implemented under CARE's agreement with the Government of Cameroon, signed March 13, 1979 for the expansion of self-help activities. The Director of the Community Development Department and the Director of Genie Rural have both approved this project.

Pre-project technical surveys have been conducted to determine sites with favorable conditions for well and water catchment construction.

CARE, Genie Rural, the Community Development Department and Peace Corps will hold discussions to delineate each party's responsibility and role in the realization of this project.

Bids for expensive equipment will be solicited so that once the project is approved, materials can be purchases immediately.

Implementation Plan and Schedule

Pre-Project Activity

1. Meet with C.D., Genie Rural and PCV's Directors to ensure that each Agency clearly understands its responsibility.
2. Solicit bids for large equipment such as vehicles and compressor
3. Project approved by USAID, and contract signed by AID and CARE.

Activity Schedule

Activity	Month	Duration (mos.)
Order equipment	1	2
Delivery of equipment	1	5
Establish office, garage and warehouse ..	1	6
Recruit construction workers	1	5
Recruit education workers	1	4
Selection of 14 water points	3	4
Collection and analysis of base-line data for education activity	5	8
Train construction workers	6	1
Construction of 14 water points	7	3

Activity	Month	Duration (mos)
Testing of hand pumps	8	6
Rainy season equipment maintenance	10	3
Selection of 16 water points	10	3
Construction of 16 water points	13	8
Design of education activity and development of materials	13	6
Order and delivery of hand pumps	14	6
Implementation of education activity	21	28
Selection of 31 water points	21	4
Construction of 31 water points	25	8
Mid project evaluation (CARE, AID, GURC)	26	1
Evaluation and redesign of education activity.	27	2
Rainy season : equipment maitenance	33	4
Selection of 31 water points	33	4
Evaluation and redesign of education activity.	35	2
Construction of 31 water points	37	8
Final project evaluation by CARE	45	4

Technical Considerations

The major considerations in designing the project have been the characteristics of the sites and the technical level of the Cameroonian counterparts.

a) Characteristics : Part of the data has been provided by the United Nation's groundwater investigations in the Northern Province. The experience of the construction teams of Genie Rural and field surveys completed the hydro-geological information.

1) Hydrology

Margui-Wandala has three zones with different pluviometric conditions.

North	780 mm/year
Center	968 " "
South	890 " "

2) Lithological Sequence

North (Average)

Depths

0 - 9	M	Alluvial deposits with sands from 3 to 9 m
9 - 19	M	Alterites, feldspactic clay
19 - 25	M	Granite wash, slight argillaceous
25 - 29	M	Altered granite

The piezometric level (water table) varies from 3. 14 to 11. 08 M. deep.

Center

Depths

0 - 1.5	M	Argillaceous silt
1.5 - 4.00	M	Granite wash
4 - 21	M	Altered and fractured granite
21 - 25.80	M	Compact granite slightly fissured on top

The piezometric level range from 4.8 to 6.6 M. deep.

South

In this area the geophysical study was carried out through the establishment of several seismic bases. The results show that the depths of the alteration fringe and fractures zone of the crystalline subtratum range from 8 and 15 M. in depth. This generally concurs with the lithological sequence of the wells dug by Genie Rural in the Southern villages.

3) Hydrogeogical Conditions and water Resources

In the whole area of Margui-Wandala, the water bearing aquifers are discontinuous and confined to the Mayos which traverse the region. They probably correspond to ancient river beds. In some places there are springs which emerge from underground.

b) Counterparts Both Genie Rural and Community Development will actively participate in the project. The office for the project will be the

Community Development building in Bokolo.

As in several other provinces, the two departments are both headed by the same person in the North. Those agents below the chef de service in the administrative hierarchy clearly have one background or another. Those attached to the Community Development Department will be responsible for organizing the village contribution either in labour or in locally available materials, those in Genie Rural will provide some of the technical assistance in construction of water catchments and wells. The Community Development Department will also be involved in the health education component of the project through its agents and Peace Corps volunteers.

c) Other considerations

1) Experience has shown that dams, in order to be fully functional, must be furnished with a pumping station, a treatment plant and a reservoir. This project will not have the financial means required for the large expenditures entailed by a dam project. On the other hand, with small bore wells, the only access to water is through a pumping system. With the breakage of the pump, which is a frequent occurence, the well must be abandoned.

2) Taking into account the above mentioned factors, this project will have a technology adapted to the local conditions. The two methods used to improve the water supply will be the rehabilitation of existing but non functioning wells and the building of water catchments.

3) The rehabilitation of wells will present no major difficulties and so will be one of the early steps in the project's implementation. The advantage is that in a small amount of time the communities will have a water supply, and thus confidence in the project will have been gained. Well improvement will only require an average of one month per well. Motivation for participation in other projects will come more readily as a result.

4) The working year for water catchment teams and well rehabilitation team will be 8 months, since the rainy season does not permit year round construction activity.

5) In cases where improvement is necessary the well shaft will be lined with concrete in order to avoid the infiltration of surface water, which is a vehicle of contamination. A metal form will be used to arrive at a standard diameter of 1.20 meters and a reinforced concrete tickness of 10 cm. The intake pipes will penetrate to the optimal depth to provide the necessary discharge and refill in the least amount of time. The pipes used will be prefabricated.

The well head will be elevated and built of concrete. A well head apron with a drain and soakpit will be provided to project the well from contamination due to surface water infiltration down the sides of the well shaft. The provision of drainage will avoid stagnant water around the well head. The cap will have a door to permit access to the water even when the manual pump is not functioning. This will also avoid damage to the pump (See Annex III).

6) An analytic table will be drawn up to group wells according to their depth and the population to be served. This will establish the specifications to be furnished to different pump vendors. The installation teams will work first with sample pumps to familiarize themselves with the equipment and also to compare the different pumps so that the pumps most suitable for the sites will be ordered in quantity.

7) For pump selection, specifications have been examined, and seven pumps picked out to be tested :

Vergnet	(France)
Solo II	(")
Pitcher	(Germany)
Mark II Inalsa	(India)
AID Pump	(PVC/CAE)
Dempster	(U.S.A.)
Robbins Myers	(")

The test will last for a period of six months, and the following points will be examined :

- durability of unit
- rust resistance
- efficienceof valves and moving parts such as handle, piston
- availability of parts
- maintenance required.

8) Water catchments utilized in the project will consist of :

a) a gravel filter
b) a holding basin
c) a slow type filter (gravel and sand)
d) a reservoir

In cases where the discharge is more than that required for domestic seeds, the surplus flow will be utilized for animals and irrigation. The data for each water catchment will be acquired on site. After a survey has shown sufficient flow for both the needs of the population and for irrigation, the source will be developed.

9) The local communities will participate in certain aspects of the work such as the digging of trenches to temporaly change the spring's path. With the communities help, each water catchment will require approximately 3 - 4 months for completion.

10) The base of operations will be at Mokolo, the capital of the Department. Construction teams composed of experienced personnel, many of them whom have already worked for Genie Rural, will be formed. There will be 8 water catchment teams, 2 well, 1 pump installation team and a topographical team. A mechanic, a driver, two assistants, a warehouseman, a secretary, an evaluator, a watchman and laborers will be located in Mokolo.

In each of the selected cases, the community has requested, through the local authorities, an improved water supply.

Half of the sites of water catchment and well rehabilitation have already been chosen. The remaining sites will be selected during the course of the first year of the project through consultations with Genie Rural and the local Prefets and Sous-Prefets. A list of the chosen sites is attached, (Annex I).

11) Consumption

Water catchment sites.

Target population average	:	2114
Daily consumption/person	:	50 l
Total daily consumption	:	105.700 ltrs
Consumption factor	:	2.5

Total consumption/sec.

$$\frac{105.700}{24 \times 3600} \times 2.5 \qquad 3.05 \text{ ltr/sec.}$$

Well

Target population average	:	500
Daily consumption/person	:	50 ltr
Total daily consumption	:	25 000
Consumption factor	:	2.5
Total consumption/sec	:	0.72 l/sec.

The yield of the water catchments range from 8 to 25 l/sec ; the wells, varying from 0.9 and 2.4 ltrs/sec. Therefore no problem is foreseen in furnishing 50 liters of water per person per day at each water catchmen and well sites.

Procurement Requirements

A. Equipment

I T E M	Quantity Required	Rate/Unit (CFA)	Total Cost (F.CFA)	U.S. Purchases ($)	Local Purchases ($)
Compressor and tools	6	3 766 000	22 596 000	107 600	
Air pump	6	485 000	2 910 000	13 857	
Cistern	16	435 000	6 960 000	33 143	
Sheerlegs, winch, cable	4	285 000	1 140 000	5 428	
Well lining shuttering (set)	3	220 000	660 000		3 143
50 liter bucket	10	50 000	900 000		4 285
Small tools (set)	4	300 000	1 200 000		5 714
5 liter plastic bucket	20	2 985	59 700		285
30 meters rope ≠ 22	12	7 000	8 400		400
Wheelbarrow	12	10 000	20 000		571
5 kg sledge hammer	10	5 970	59 700		285
Miner's bar	36	6 000	216 000		1 028
Pick	48	4 000	192 000		914
Shovel	48	4 000	192 000		914
Helmet	6	5 960	35 760		171
Trowel	20	2 490	49 800		238
Mason's level	12	4 490	53 880		257
Meter measure	12	1 500	18 000		86
Surveying level	1	325 500	325 500	1 550	
Story poles	3	43 500	130 500	622	
Welding machine and electrodes ...	2	450 000	900 000	4 285	
Metric mechanical tool set	1	175 000	175 000		833
9" Vice	3	33 000	99 000	471	
Ø 20 x 10 PVC Pipe	50	10 000	500 000		2 380
Glue (gallon)	2	3 400	6 800		33
Piping accessories		10 000	10 000		48
Drafting table and instruments ...	2	100 000	200 000		952

An exchange rate of $ 1 = 210 CFA has been used in all calculations

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I T E M	Quantity Required	Rate/Unit (F.CFA)	Total Cost (F.CFA.)	U.S. Purchases ($)	Local Purchase ($)
Audio visual equipments	2	150 000	300 000		1 428
Paper, ink, eraser, point (set)	2	50 000	100 000		476
Equipment subtotal	.....	.....	40 193 640	166 956	24 441
Contingency 10 %	.....	.....	.....	+ 16 695	2 444
Equipment total cost	.....	.....	.....	183 651	26 885
Cost of U.S. and locally procured equipment combined				210 536	

Prices are based on the FSAR project (world bank) and on quotations from suppliers. Adjustments will be made upon receipt of tenders.

Procurement Requirements (cont'd)

B. Vehicles

		CFA	$ US
1	8 T Truck	5,425,000	25,800
1	12 T Truck	9,523,000	45,300
1	3/4 T Pick Up	1,765,000	8,400
2	4-W Dr	5,200,000	24,710
3	Motorcycles Trail 125 cc ..	781,200	3,700
	TOTAL	21,913,200	107,900

C. Water-Catchment Materials per Site x 56

	F. CFA	$ US
Cement 6 T	198.000	942
Gravel 8 m3	28.000	133
Steel Ø 6, Ø 8, 40 T, 36 T	83.000	395
Iron mesh 1 roll	2.400	12
Timber 100 BMF	15.000	72
Pipe	50.000	238
Accessories (elbow, tés, valves)	30.000	142
Subtotal	406.400	1.934
Contingency 10%	40,640	193
	447.040	2 127 per site in first year.

It is thus calculated that in the first year water catchment materials will cost 447,040 CFA or $ 2.127 per site. In each subsequent year an increase of 10 % in the cost of materials per site has been allowed for inflation.

	YR1	YR2	YR3	YR4	Total
No of sites	8	16	16	16	56
Cost in $-US	17,016	37,435	41,178	45,296	140,925

D. Well Rehabilitation Materials per site x 36

	F.CFA	US Dollars
New well linear meter	30,000	143
Rehabilitated well is estimated at 6 linear meters of a new well	180,000	857
Contingency 10 %	18,000	85,7
	198,000	943 per site in the first year

It is thus calculated that in the first year well rehabilitation materials will cost 198,000 CFA or $ 943 per site.

Personnel Requirements

International Personnel

1 Engineer full time
1 Engineer Technologist full time
1 Director 30 % of the time

Local Personnel

No. of teams and types

8 - Water catchment teams

1 Foreman (mason)
2 masons
2 Workmen

2 - Well teams

1 Chief sinker
2 Assistants
1 Mechanic
2 Workmen

1 - Pump Installation teams

1 Plumber
1 Helper

2 - Supply team

1 Driver
3 Workmen

1 - Base team

1 Mechanic
2 Assistants
1 Watchman
1 Secretary
1 Evaluator
2 Laborers
1 Cartographer
2 Helpers
1 Warehouseman
2 Draftsmen
1 Driver

Administrative Personnel

Local staff in Yaounde 30 % of the time

Genie Rural Personnel

Per diem for field visits by supervisory staff.

Procurements (Summary Sheet Figures in $ U.S.)

U.S. Purchases

	Total	YR1	YR2	YR3	YR4
Equipment (A)	183,651	183,651	---	---	---
Pumps (E)	28,455	4,200	11,550	12,705	---
	212,106	187,851	11,550	12,705	

Local Purchases

Equipment (A)	26,885	26,885			
Vehicles (B)	107,900	107,900			
Water catchment materials (C)	140,925	17,016	37,435	41,178	45,296
Well rehab materials (D)	40,637	5,658	6,224	13,693	15,062
	316,347	157,459	43,659	54,871	60,358

Funds For Repair

Replacement and operation of equipment (excluding vehicles) (F)	145,073	5,700	42,107	46,3[illegible]	50,949
Grand Total....	673,526	351,010	97,316	113,893	111,307

Project Evaluation

Final Goals

The evaluation of the improvement in health through the reduction of the incidence of water-borne diseases will be conducted by measuring the incidence and frequency of the common and obvious symptoms associated with these diseases among randomly selected households in representative project communities. These measurements will be made prior to other project activities and will be continued at regular intervals thereafter.

The evaluation of the second goal concerning the creation of more productive and leisure time will be measured by direct observation and through questionnaires in representative project communities both before and after the water source improvement activities.

The evaluation will be carried out at 40 percent of the sites. The baseline data will be composed of

a) distance, beofre and after project, covered by the population to collect water
b) time for water collection and return trip home
c) incidence of water borne diseases
d) water storage techniques of the people

The evaluators will also examine changes in habits of water utilization and the impact of readily available clean water on the communities. An evaluation of the improvement in health of the people is beyond the scope of this project. The project will evaluate the quality and quantity of the water available before and after the sources have been improved.

Intermediate Goals

1. Provision of at least fifty litres of water per target beneficiary per day for 365 days per year.

   Data will be collected at two month intervals for randomly selected sites. Consumption per beneficiary will be established through observation and measurement. Regularity of supply will be measured by questioning consumers.

2. A twenty-five percent reduction in the time spent by the beneficiary in collecting water.

This will be measured through observation and by a questionnaire in representative communities before and after the water source improvement activity.

3. The development of a health/hygiene community education program reaching target beneficiaries in all project communities.

The program result in each target community will be assessed at six month intervals throughout the life of the project.

4. Improved water quality at ninety-two water sources.

The quality of the water at each sources will be measured before and after the improvement. Standard tests related to presence of harmful bacteria, appearance, taste, mineral and salt content, and the presence of foreign bodies will be made. These tests will be repeated one year after the source improvement.

Financial Plan - OIG Proposal

CARE Managed Inputs

A. In Kind Contribution	1st Yr	2nd Yr	3rd Yr	4th Yr	Total
1. CD Dpt	4 969	4 969	4 969	4 969	19,876
2. Dpt Genie Rural	19,997	19 997	19 997	19 997	79,988
3. Concerned villages	28 000	44 000	56 000	56 000	184,000
4. U.S. Peace Corps	30 000	30 000	30 000	30 000	120,000
Total	82,966	98,966	110,966	110,966	403,864

B. Materials and Equipment					
1. U.S. Purchases	187 851	11,350	12 705	---	212 106
2. In Country Purchase	157 459	43,659	54 871	60 358	316 347
3. 3rd Country Purchases	---	---	---	---	----
4. Equipment repair and operation	5,700	42,107	46,317	50,949	145,073
Total	351,010	97,316	113,893	111,307	673,526

C. Personal and Operations					
1. Int."l. Personnel	72,420	90,403	93,563	96,208	352,594
2. National Personnel	128,504	155,486	171,028	188,635	643,153
3. Int'l. travel	1,440	15,304	15,382	12,564	44,690
4. In country travel	4,200	4,500	4,900	5,500	19,100
5. Office cost incl. Equipment and maintenance	18,788	17,367	19,103	21,013	76,271
6. Vehicle maintenance and repair	37,765	41,541	45,695	50,265	175,266
7. Other support costs transport and transit	85,000	25,000	25,000	25,000	160,000
Total	348,117	349,601	374,671	398,685	1,471,074

Grand total Exclusive of Overhead 2,548,464

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Summary Funds Requested AID/OFG

	1st Yr	2nd Yr	3rd Yr	4th Yr	Total
1. Materials and Equipment	237,410	97,316	113,893	111,307	559,926
2. Personnel & operations	285,924	185,744	129,652	65,718	667,038
3. Training cost	---	---	---	---	---
4. Overhead (AID audited rate 7.92 %	41,448	22,418	19,288	14,020	97,174
	564,782	305,478	262,833	191,045	1,324,138

Summary of CARE Managed

Input Sources

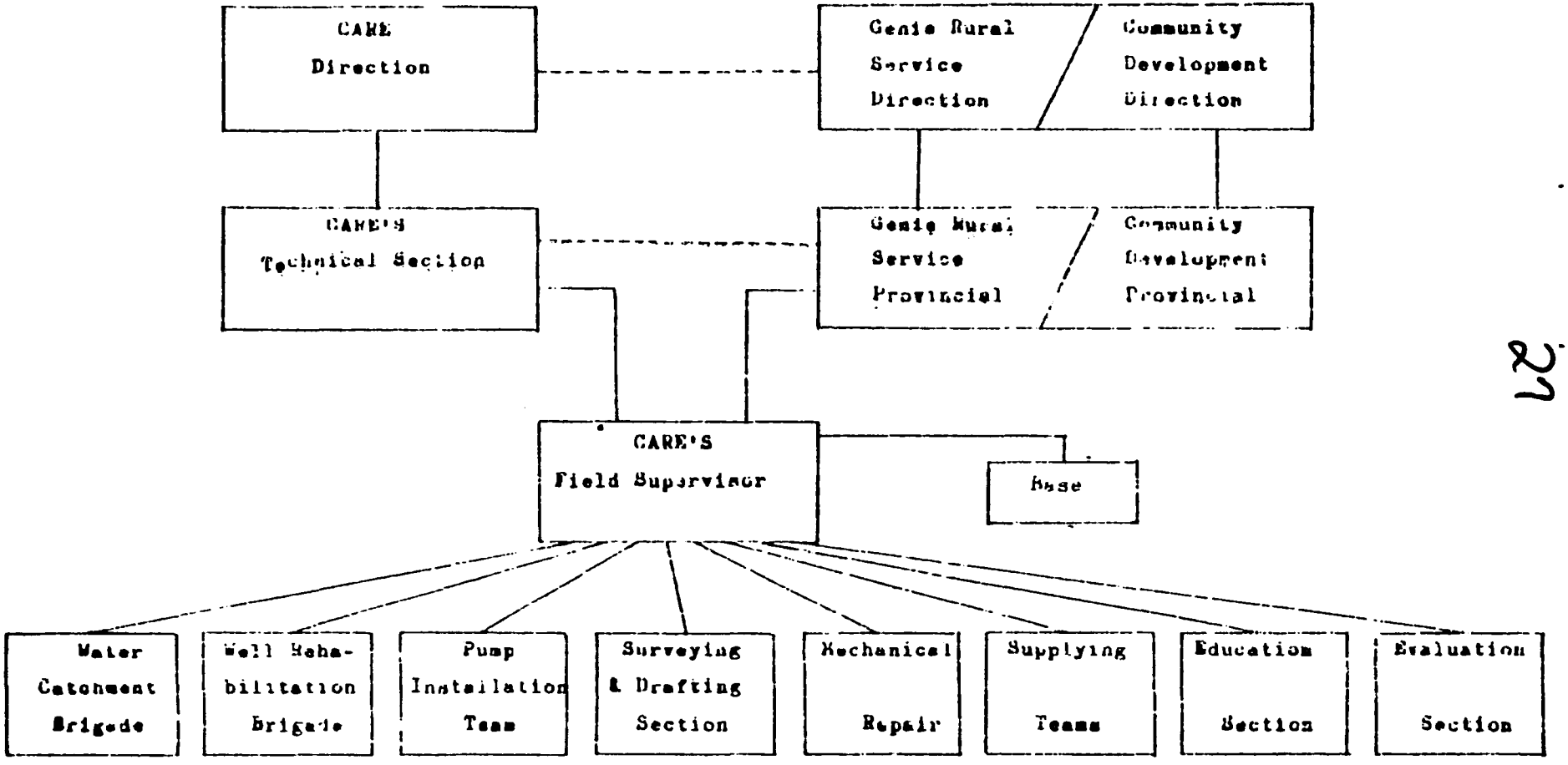
A. CARE Generated					
1. General public principally from North American and Europe	175,793	163,857	245,019	332,967	917,636
2. Host Government	52,966	68,966	80,966	80,966	283,864
3. US Peace Corps	30,000	30,000	30,000	30,000	120,000
Total	258,756	262,823	355,985	443,933	1,321,500
B. AID/OFG	564,782	305,478	262,833	191,045	1,324,138

ANNEX I LIST OF SITES

MARGUI-WANDALA

Site No.	Village	Well Rehabilitation	Water Catchment
1	Ziling	0	2
2	Madaka	0	1
3	Mofolé	0	1
4	Mayo-Lagumaré	0	1
5	Kossehone	0	1
6	Biskavaï	0	1
7	Mayo-Tchaski	1	1
8	Zamaï - Windé	1	0
9	Gouringuel	1	0
10	Mansour	1	0
11	Lougueréo	1	0
12	Salva	1	0
13	Oubauraf	1	1
14	Mayo Mafda	1	1
15	Kaftaka	1	1
16	Gonozo	1	1
17	Gougong	0	0
18	Gamdougoum	0	1
19	Hina-Windé	0	1
20	Zidim	1	1
21	Diméo	1	0
22	Mbélézé	0	2
23	Mayo Plata	0	1
24	Gansé	1	1
25	Lagoumaz	1	1
26	Palleara	3	0
27	Roumzou	0	2
28	Roumsiki	1	4
29	Tourou	0	2
	Total	18	28

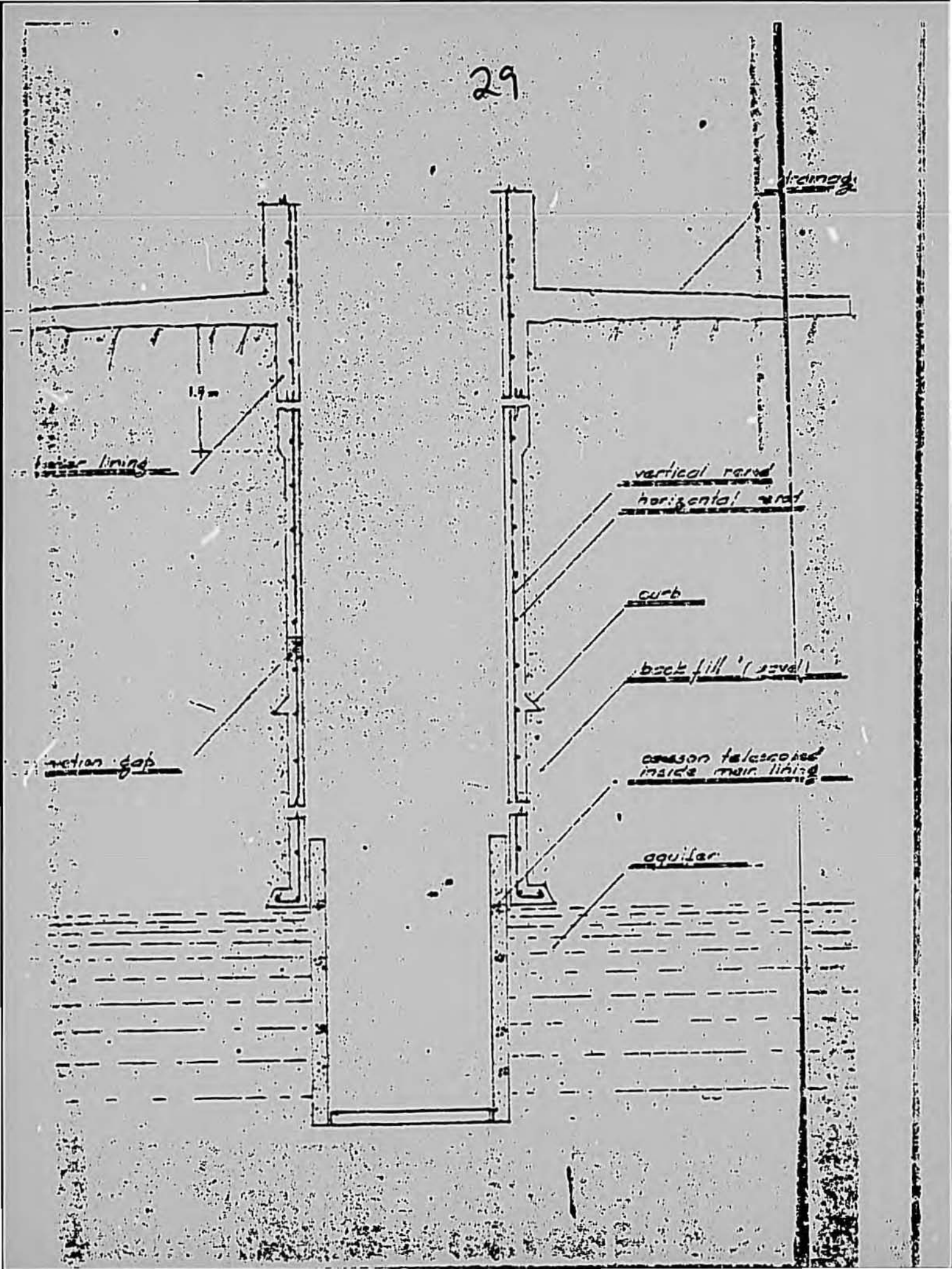
ANNEX II. ORGANIGRAM

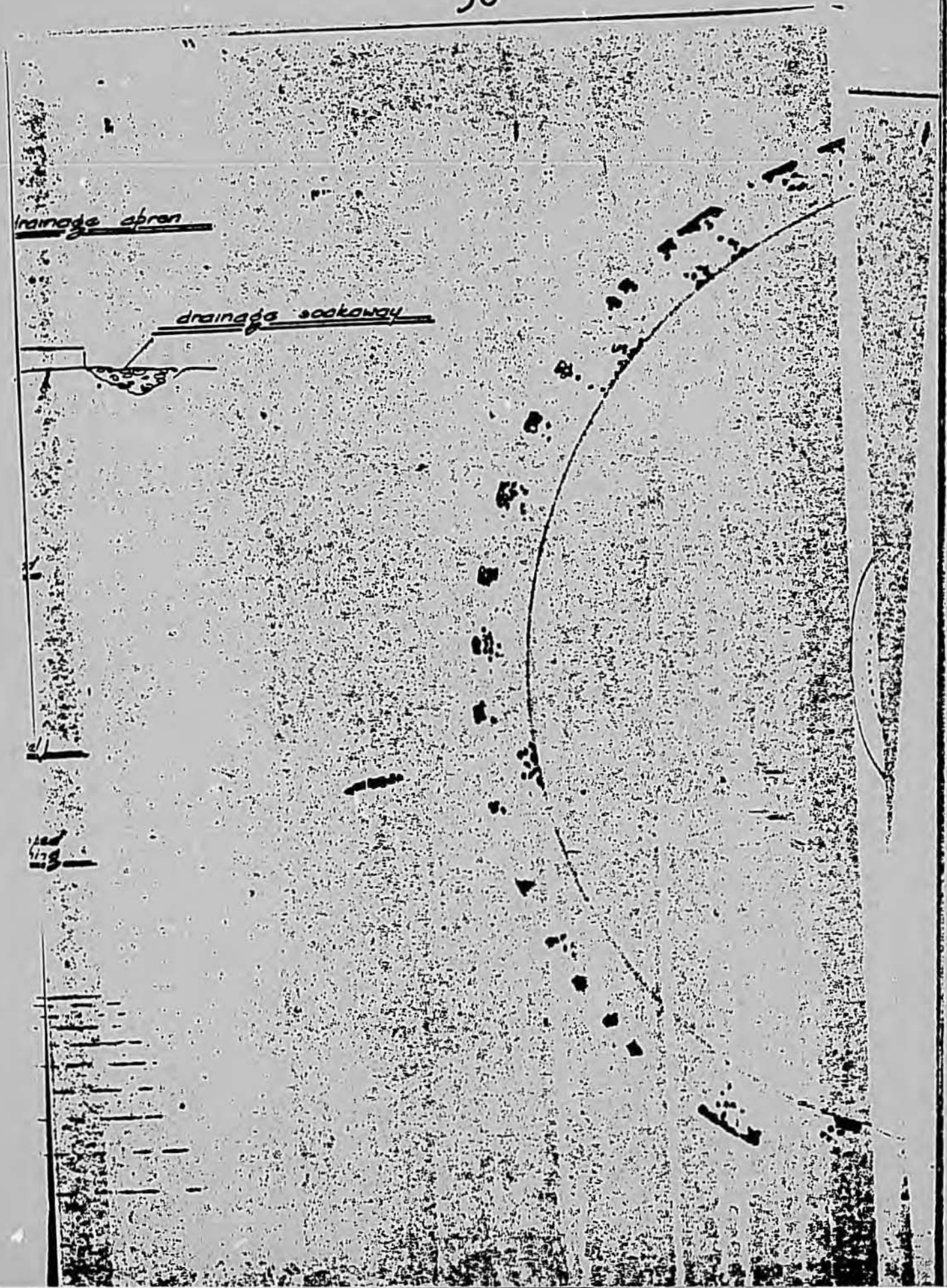


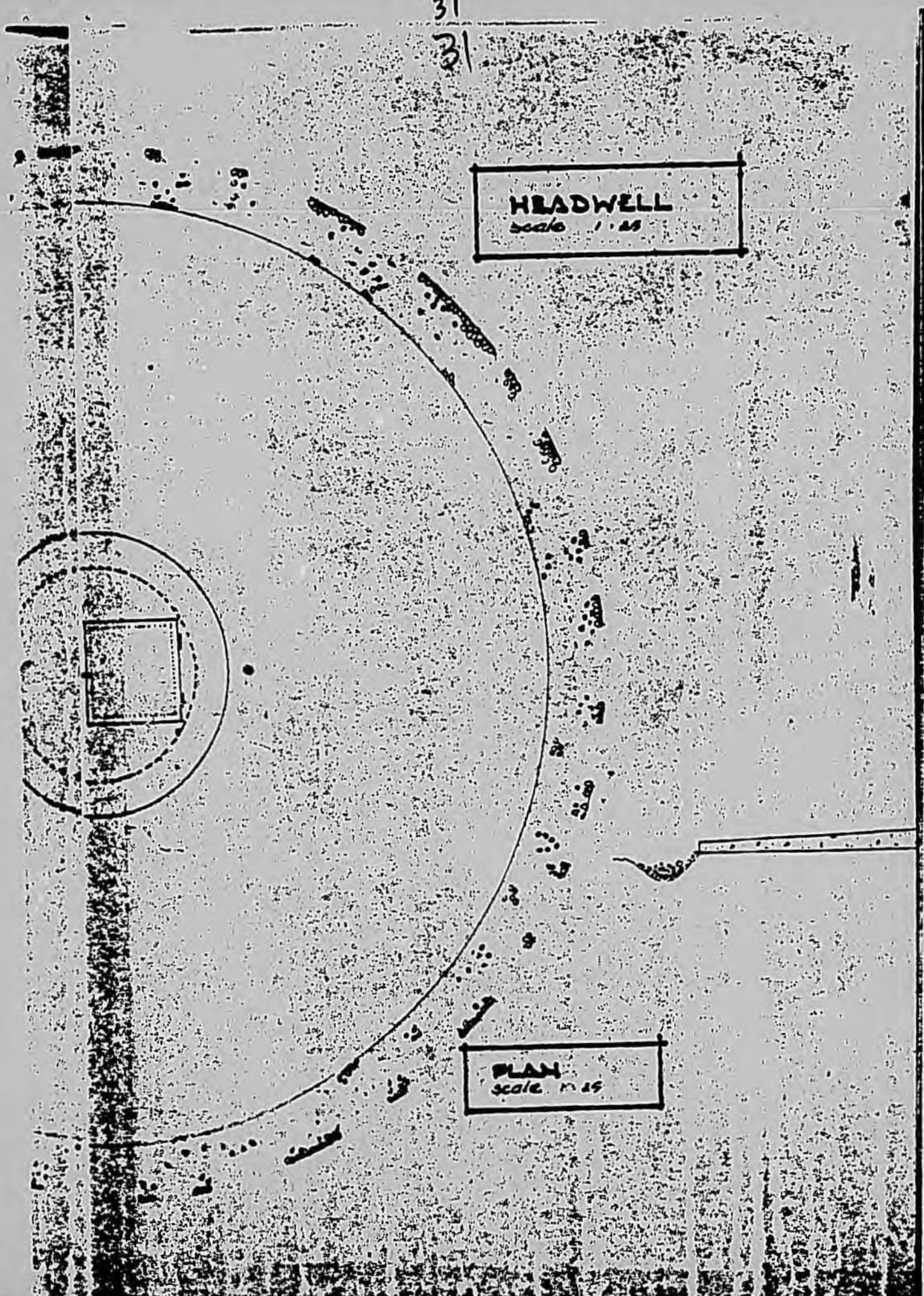
ANNEX III
MARGUI-WANDALA WATER SUPPLY
CARE / USAID

GARY FILIPPI : ENGINEER

DUG WELL
scale 1:25


1.9 m
liner lining
vertical reinf
horizontal reinf
curb
back fill (gravel)
caisson telescoped inside main lining
aquifer

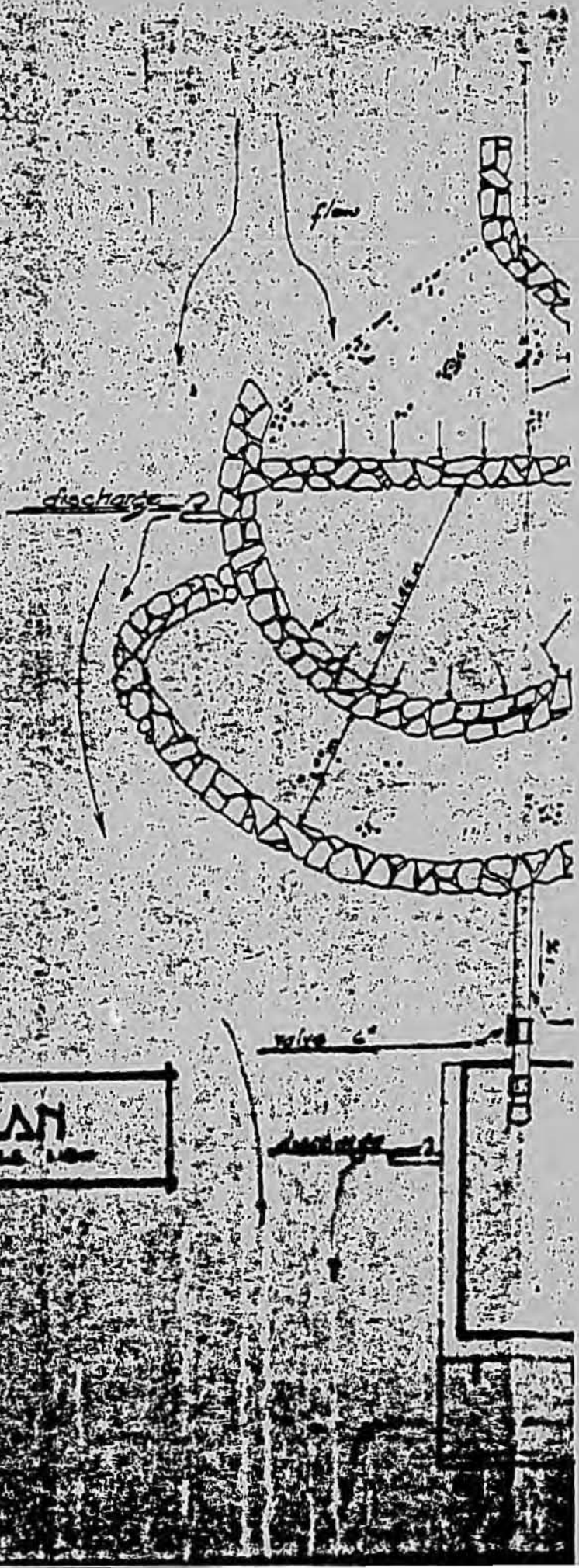

drainage apron
drainage soakaway

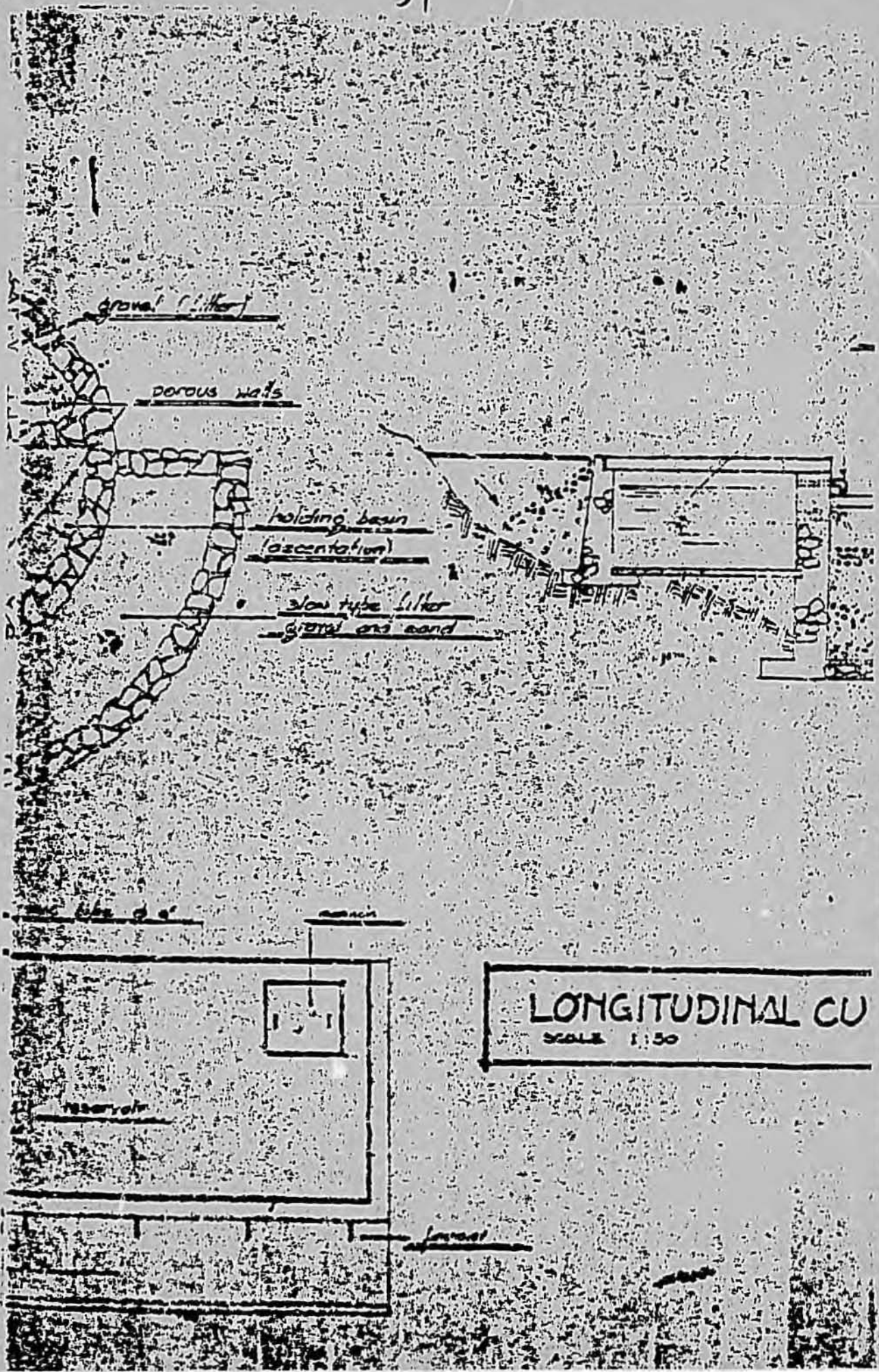

HEADWELL
scale 1:25
PLAN
scale 1:25

32

ANNEX III.
WATER CATCHMENT

BASIC DESIGN




porous walls
holding basin
(decantation)
slow type filter
gravel and sand
reservoir
LONGITUDINAL CU
SCALE 1:50

HARGUI WANDILA WATER SUPPLY
CARE / USAID PROJECT
GORY FLUPPI ENGINEER