

PD-AA6-142

880 0201
004201

AGENCY FOR INTERNATIONAL DEVELOPMENT

PROJECT PAPER FACESHEET

1. TRANSACTION CODE

A ADD
C CHANGE
D DELETE

PP

2. DOC. CODE

3

3. COUNTRY ENTITY

Benin

4. DOCUMENT REVISION NUMBER

5. PROJECT NUMBER (7 digits)

680-0201

6. BUREAU OFFICE

A. SYMBOL

AFR

B. CODE

06

7. PROJECT TITLE (Maximum 40 characters)

BENIN RURAL WATER SUPPLY

8. ESTIMATED FY OF PROJECT COMPLETION

8 | 5

9. ESTIMATED DATE OF OBLIGATION

A. INITIAL FY

86

QUARTER

1

C. FINAL FY

88

(Error 1, 2, 3 or 4)

10. ESTIMATED COSTS (\$000 OR EQUIVALENT \$) -

A. FUNDING SOURCE	FIRST FY			LIFE OF PROJECT		
	B. GRANT	C. LOAN	D. TOTAL	E. GRANT	F. LOAN	G. TOTAL
AID APPROPRIATED TOTAL						
GRANT	1188	812	2000	4094	2613	6707
LOAN						
OTHER U.S.				540		540
OTHER COUNTRY					1325	1325
OTHER DONORS (UNDP/CDF)	1900		1900	1900		1900
TOTALS	3088	812	3900	6534	3938	10472

11. PROPOSED BUDGET APPROPRIATED FUNDS (\$000)

A. APPROPRIATION	B. PRIMARY PURPOSE CODE	PRIMARY TECH. CODE		E. 1ST FY 80		H. 2ND FY 81		I. 3RD FY 82	
		C. GRANT	D. LOAN	J. GRANT	K. LOAN	L. GRANT	M. LOAN		
(1) HE	513	540		2000		2734		1973	
(2)									
(3)									
(4)									
TOTALS				2000		2734		1973	

A. APPROPRIATION	N. 4TH FY		O. 5TH FY		LIFE OF PROJECT	12. DEPTH OF OBLIGATION SCHEDULE
	P. GRANT	Q. LOAN	R. GRANT	S. LOAN		
(1) HE					6707	
(2)						
(3)						
(4)						
TOTALS					6707	

9 | 8 | 2

13. DATA CHANGE INDICATOR. WERE CHANGES MADE IN THE PID FACESHEET DATA, BLOCKS 12, 13, 14, OR 15 OR IN THE FACESHEET DATA, BLOCK 12? IF YES, ATTACH CHANGED PID FACESHEET.

1

14. ORIGINATING OFFICE CLEARANCE

SIGNATURE

Fernando J. Spencer

TITLE

Director AFR/CWA

DATE SIGNED

02 | 22 | 80

15. DATE DOCUMENT RECEIVED IN AID/W, OR FOR AID/W COMMENTS, DATE OF DISTRIBUTION

11 | 19 | 76

JUN 20

ACTION MEMORANDUM FOR THE ASSISTANT ADMINISTRATOR FOR AFRICA

FROM: AFR/DR, ^{JW Kuehling} John W. Kuehling

SUBJECT: Benin Rural Water Supply Project (680-0201)

I. Problem: Your authorization is needed for a life of project grant of Six Million Seven Hundred and Seven Thousand Dollars (\$6,707,000) from Section 104 of the Foreign Assistance Act of 1961, as amended, Population and Health Program (HE), to the Government of the Popular Republic of Benin (GPRB) for the subject project. The planned obligation for FY 80 is Two Million Dollars (\$2,000,000).

II. Discussion:

A. Project Description

This project consists of activities that have been designed under the two major components, Water Resource Development and a Village Health and Sanitation Program. The project area covers the Atacora and Borgou provinces in northern Benin. Under the component Water Resource Development, the GPRB's Ministry of Hydraulics will exploit and distribute water from 7 springs and drill, construct and commence to operate 225 wells, each equipped with a hand-operated Moyno pump. In support of the activities initiated under the component Village Health and Sanitation Program, project outputs will help improve and expand existing instruction in personal hygiene, the prevention of water-related diseases, and proper excreta disposal. Approximately 60 latrines will be constructed near public schools, medical facilities, and in several compounds, where they will serve as demonstration models for further replication elsewhere in the villages.

All the activities organized and supported under this project will be coordinated and implemented concomitantly at the village, regional, and national levels. Both components will be supported by a village operation maintenance center. The project will strengthen the GPRB's institutional abilities to plan and deliver health education and sanitation services, and monitor the quality of water available for human consumption.

B. Financial Summary

Life of project A.I.D. financing totals \$6,707,000, of which approximately \$2,306,000 (25%) will be disbursed in local currency. In accordance with A.I.D.'s OYB and allotment procedures, \$2,000,000 will be obligated in FY 1980. Budgets for FY 80 and life of the project are as follows:

	(U.S. \$000's)	
	<u>FY 1980</u>	<u>LOP</u>
1. Technical Assistance	440	2,815
2. Training	137	230
3. Commodities	634	755
4. Other Costs		
Construction	482	1,017
Operations	200	590
Inflation and Contingencies	167	1,300
5. Total	<u>2,000</u>	<u>6,707</u>

This project is a multidonor effort. Other donors participating in the project are the U.S. Peace Corps, whose assistance will total \$540,000, the United Nations Development Program, which will provide U.S. \$300,000, and The United Nations Capital Development Fund, with a contribution equal to \$1,600,000. The project will be administered under the direction of the Government of the Popular Republic of Benin (GPRB), whose contribution will total \$1,325,000. Total project cost is equal to \$10,472,000.

C. Summary of Analyses

Throughout the project area, villages are actively participating in developing village water supplies. Villages are contributing time, effort and often materials to combat the problem of scarce water supplies. The project population already is accustomed to paying for well construction and basic medication. In view of this situation, and given the project's stated assumptions, the PP analyses indicate more than favorably social and economic benefits. Based on the IEE, the Mission Director has made a negative determination; the Project Review concurred in the recommendation. The State Desk has advised that no issues exist in Benin with respect to U.S. concerns about human rights and this project.

D. Project Implementation

Goods and services, except for ocean shipping, financed by A.I.D. under the project shall have their source and origin in the Cooperating Country and in countries included in A.I.D. Geographic Code 941 except as A.I.D. may otherwise agree in writing. Ocean shipping financed by A.I.D. under the project shall, except as A.I.D. may otherwise agree in writing, be financed only on a flag vessel of the United States or the Cooperating Country.

Project implementation will require procurement waivers for hand pumps for rural water systems, mopeds and motorcycles, spare parts for drilling rigs and vehicles and aerial photo interpretation. Purposes and justifications for these waivers are contained in Annex 13, page 172 of the Project Paper.

Certification has been made that requirements of section 611(a) of Foreign Assistance Act of 1961, as amended, have been fulfilled regarding substantive technical aspects of construction. Certification of requirements contained in section 611(a) that the Government of the Popular Republic of Benin has the capacity to effectively maintain and utilize facilities put in place by this project, has also been made. These certifications may be found in the Project Paper as Annexes VI and VII.

The primary implementing agency is the Direction of Service in the GPRE's Ministry of Hydraulics.

E. Committee Action and Conditions and Covenants

A Project Review was held on December 5, 1979; an ECPR was chaired by the AA/AFR on December 20, 1979. The principal issue discussed was the overall administrative support available in the Mission for project implementation. A decision was made to provide for project management through a proposed contract for technical assistance. This modification has now been made in the project paper.

Prior to initial obligation of funds in FY 1980, the following conditions precedent are of major significance. The GPRE will submit to A.I.D.:

1. A copy of the agreement executed between the GPRE and the United Nations Development Program (UNDP) and its Capital Development Fund (UN-CDF) covering UNDP-CDF's contribution to the project; and
2. A detailed pump maintenance plan.

In addition, the GPRE will provide, by FY 1982, a written plan for the progressive assumption by the GPRE of recurring costs of the project for the remainder of the project and upon its termination. The ECPR also concurred with other conditions and covenants which, along with those cited here, appear in full in the attached Project Authorization.

F. Responsible Project Officers are

R. Fontaine, Program Officer, USAID/Cotonou

J. R. McCabe, Projects Officer, AFR/DR/SFWAP

III. Congressional Notification

Page 183 of the FY 1980 Congressional Presentation projected an obligation of \$990,000. It has been determined a minimum \$2,000,000 is required during the first year of the project. Therefore, a Congressional Notification was submitted January 18 to advise of an increase in the obligation for FY 1980 from \$990,000 to \$2,000,000; the waiting period for the CN expired on February 2, 1980.

IV. Recommendation: That you sign the IEE (Annex 4), indicating your approval of the recommendation for a negative determination; and that you sign the Project Authorization (Attachment A) authorizing the Rural Water Supply Project with planned obligation up to \$6,707,000 in accordance with procedures described in authorization.

APPROVED *[Signature]*

DISAPPROVED _____

DATE 6/20/80

Clearances:

DAA/AFR:WHNorth
AFR/DR/SFWAP:JMcCabe (draft)
AFR/DR/ENGR:FZobrist (draft)
AFR/DR/SDP:JHester (draft)
AFR/CWA:ELane (draft)
AFR/DR/SFWAP:CBuxton (draft)

AFR/DR:NCohen *C*
AFR/DR/EHR:PShaw (draft)
AAFR/DR/HR:CDebose (draft)
AFR/CWA:FSpencer (draft)
GC/AFR:NFrame (draft)
AFR/DP:RStacy (draft)

Drafted by:CBuxton, AFR/DR/SFWAP:1/28/80:fn

PROJECT AUTHORIZATION

Name of Country: Benin

Name of Project: Rural Water Supply

Number of Project: 680-0201

1. Pursuant to Section 104 of the Foreign Assistance Act of 1961, as amended (the "Act"), I hereby authorize the Rural Water Supply Project for the People's Republic of Benin involving planned obligations not to exceed \$6,707,000 in grant funds over a three year period from date of authorization, subject to the availability of funds in accordance with the A.I.D. OYB/allotment process, to help in financing foreign exchange and local currency costs for the project.

2. The project consists of developing water distribution networks from 7 springs and constructing 250 wells, of which 225 will be equipped with pumps. Project inputs directed at the development of the Village Health and Sanitation Program will help improve and expand existing instruction in personal hygiene, the prevention of water-related diseases, and proper excreta disposal. About 40,000 people will benefit directly from spring captation, 36,750 from the wells constructed and 125,000 people from the Village Health and Sanitation Program.

3. The Project Agreement, which may be negotiated and executed by the officer to whom such authority is delegated in accordance with A.I.D. regulations and Delegations of Authority, shall be subject to the following essential terms and covenants and major conditions, together with such other terms and conditions as A.I.D. may deem appropriate.

4. a. Source and Origin of Goods and Services

Goods and services, except for ocean shipping, financed by A.I.D. under the project shall have their source and origin in the Cooperating Country and in countries included in A.I.D. Geographic Code 941 except as A.I.D. may otherwise agree in writing. Ocean shipping financed by A.I.D. under the project shall, except as A.I.D. may otherwise agree in writing, be financed only on flag vessels of the United States or the Cooperating Country.

Paragraph 4d. of this project authorization sets forth additional waivers needed to proceed with implementation of this project.

b. Conditions Precedent

1. Prior to any disbursement, or the issuance of any commitment documents under the Project Agreement, the Cooperating Country shall furnish in form and substance satisfactory to A.I.D., a copy of the agreement executed between the Cooperating Country and the United Nations Development Program - Capital Develop-

ment Fund - covering UNDP-CDF's contribution to the Rural Water Supply Project along with documentary evidence that the agreement is fully effective and that any conditions precedent to disbursement have been satisfied, except any that may be reciprocal with this condition.

2. Prior to any disbursement or the issuance of any commitment documents under the Project Agreement to finance equipment and commodities, with the exception of the disbursement of funds for procurement advisory services, a joint commodity and equipment procurement plan will be drafted and approved by AID, the Cooperating Country and the UNDP-CDF. The procurement plan will include procurement arrangements, schedules and detailed specifications of equipment to be procured.

3. Prior to any disbursement, or the issuance of any commitment documents under the Project Agreement, with the exception of the disbursement of funds for procurement advisory services, the Cooperating Country shall furnish in form and substance satisfactory to AID evidence that it has assigned the responsibility of implementing the project to a particular government representative.

4. Prior to any disbursement or the issuance of any commitment documents under the Project Agreement, with the exception of the disbursement of funds for procurement advisory services, the Cooperating Country will furnish in form and substance satisfactory to A.I.D. a detailed pump maintenance plan which includes the organizational entities responsible for insuring proper pump maintenance, operational plans for assigning adequate personnel to the pump maintenance program, plans for providing adequate funding for pump maintenance and a logistical plan indicating where pumps will be stored and how spare parts will be distributed to villages. A.I.D. understands that such a plan will be subject to modification as a result of experience gained during the implementation of the project.

5. Prior to any disbursement or the issuance of any commitment documents under the Project Agreement to finance construction of a warehouse and offices for the project, the Cooperating Country will furnish in form and substance satisfactory to AID, evidence of construction supervisory arrangements, building plans and specifications, bidding and contractor selection procedures, executed construction contracts and the availability of support from the Cooperating Country sufficient to cover 50 percent of the construction contracts.

c. Covenants

1. The Cooperating Country shall covenant to furnish by FY 1982, in form and substance satisfactory to AID, a written plan for the progressive assumption by the Cooperating country of the recurring costs of the project for the remainder of the project and upon its termination.

2. The Cooperating Country shall covenant that it will ensure that women participate in the in-country and participant training programs in every category of jobs generated by the project.

3. The Cooperating Country shall covenant that the drilling equipment and supplies granted to it by the UNDP-CDF and AID will be assigned to the project management unit to be used for project purposes in the specified zones for the duration of the project.

4. The Cooperating Country shall covenant that it will provide: expendable drilling materials for forty (40) productive wells during the final two years of the project; 15% of the total operational and maintenance costs of the project equipment and vehicles in the fourth year of the project and 20% of such costs in the fifth and final year of the project; and 50% of the construction costs of the three offices and two warehouses required for the project.

5. The Cooperating Country shall covenant to provide the personnel required by the project (as described in the expanded project description contained as an annex to the Project Agreement) to ensure the successful execution of the project.

6. The Cooperating Country shall covenant that it will request Peace Corps Volunteers to assist in the implementation of the project as described in the Project Agreement.

d. Waivers

The following waivers to A.I.D. regulations are hereby approved based on the justifications set forth in Annex 13 of the Project Paper:

1. I hereby approve a nationality source waiver from Geographic Code 941 to Code 899 and a proprietary procurement waiver for the procurement of photo-interpretation services, and I certify that the interests of the United States are best served by permitting the procurement of services from free world countries other than the Cooperating Country and countries included in Code 941.

2. I hereby approve a proprietary procurement waiver to permit the procurement of approximately 250 Moyno hand pumps, pump accessories, spare parts and pump maintenance tool kits.

3. I hereby approve a procurement source/origin waiver from Code 941 to Code 899 to permit the procurement of eight motorcycles and twelve mopeds and spare parts for the project vehicle fleet and project drilling equipment. I hereby certify that exclusion of procurement from free world countries other than the Cooperating Country and countries included in Code 941 would seriously impede attainment of U.S. foreign policy objectives and objectives of the Foreign Assistance Program. I, therefore, find that special circumstances exist to waive Section 636(1) of the Act to permit the procurement of the eight motorcycles and twelve mopeds.


Goler T. Butcher
Assistant Administrator
for Africa

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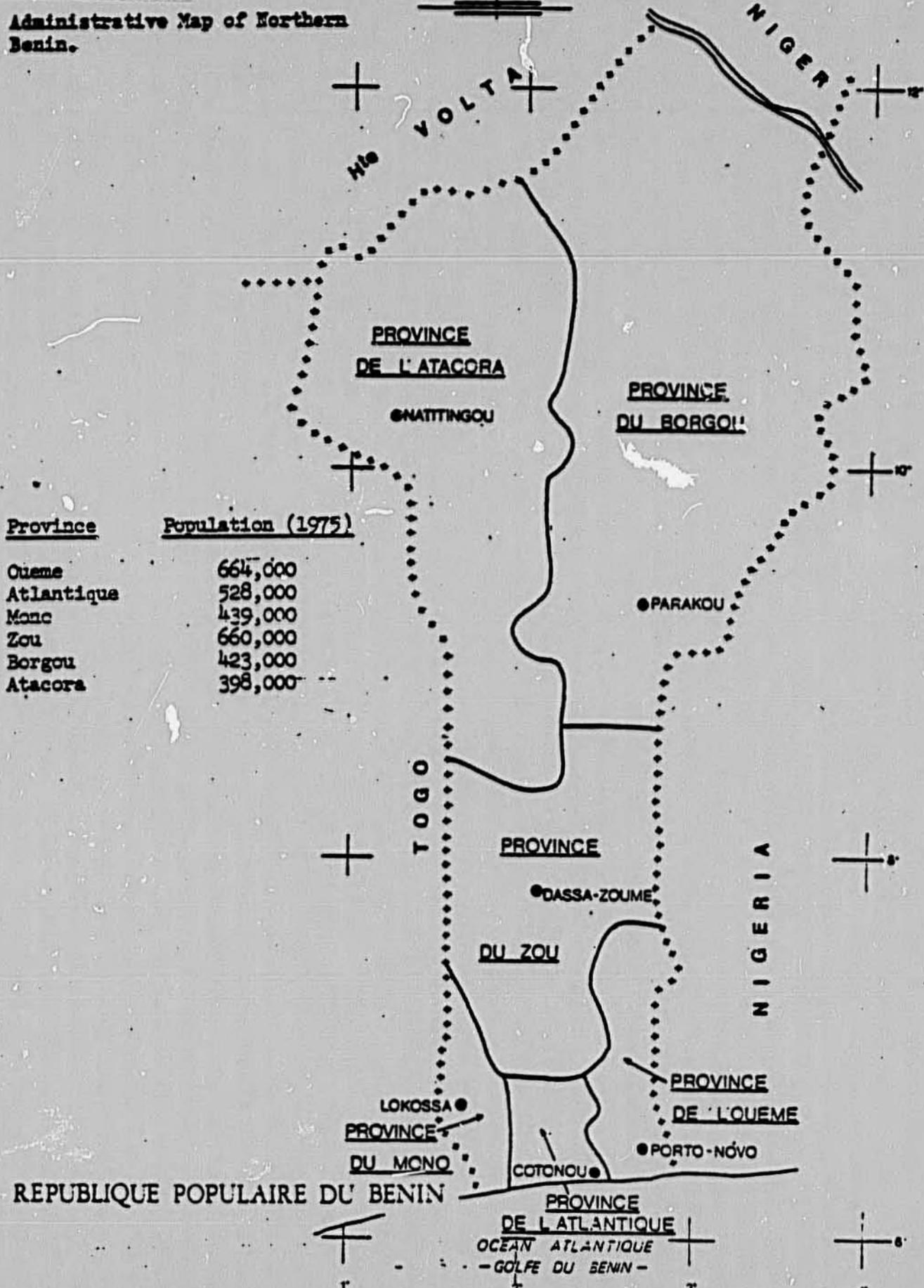
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DECOUPAGE ADMINISTRATIF

ECHELLE 1/3000000

Administrative Map of Northern
Benin.



Province	Population (1975)
Oueme	664,000
Atlantique	528,000
Mono	439,000
Zou	660,000
Borgou	423,000
Atacora	398,000

REPUBLIQUE POPULAIRE DU BENIN

PROVINCE
DE L'ATLANTIQUE
OCEAN ATLANTIQUE
- GOLFE DU BENIN -

I. Summary and Recommendations

A. Face Sheet. A summary of the proposed project's fiscal data is presented on the preceding Face Sheet.

B. Recommendations. The Mission recommends that AID/W authorize a grant totaling U.S.\$6,707,000 from Population and Health Program appropriations. The grant will help achieve the project summarized in this document. Other donors participating in the project are the U.S. Peace Corps, whose assistance will total \$540,000, the United Nations Capital Development Fund, with a contribution equal to U.S.\$1.6 million, and the United Nations Development Program which will provide U.S.\$300,000. The project will be administered under the direction of the Government of the Popular Republic of Benin (GPRB), whose immediate contribution will total U.S.\$1,325,000. Total project cost is equal to U.S.\$10,472,000.

1. Goal

Activities initiated under the project will help further the GPRB's efforts to upgrade the quality of health and hygiene in northern Benin.

2. Purpose

As a result of the activities designed under the two major categories of water resource development and health education, the project will provide the rural population in the Atacora and Borgou provinces with (a) adequate and safe sources of potable water, and (b) improved levels of hygiene.

3. Outputs

Under the category of Water Resources Development, the GPRB's Ministry of Hydraulics will successfully (a) exploit and begin to distribute water from 7 springs and (b) drill, construct, and commence to operate 225 wells, each equipped with a hand-operated MOYNO pump. These two activities will be supported by a village operation and maintenance program which, in turn, will receive support from a regional maintenance center.

Approximately 40,000 people will be served by spring captation. At the end of this activity, three technicians from the Hydraulic Service will have received on-the-job experience in building and maintaining spring captation. Two work crews will be in operation and able to develop additional springs when identified. The equipment used will remain available for additional springs or will be available to the Hydraulic Service for deepening existing large diameter wells.

By the end of the project, two Beninese drilling teams will have been trained in operating and maintaining drilling equipment. They will also have gained experience with well construction techniques adapted to the major types of geological terrain in Benin. As a result of academi

training and on-the-job experience, the Ministry of Hydraulic's staff will increase its ability to plan and supervise drilling operations in various hydrogeological conditions. The drilling equipment used during the project will be reconditioned and available for future service. A two-year drilling program will be planned and ready for execution, using the equipment provided by the project and administered by project-trained technicians.

At the end of the project, the Hydraulic Service will have a trained staff to supervise, maintain, and repair hand pumps. About 400 villagers will also be able to maintain and make minor repairs on the pumps installed in their villages. An important element in developing an ability to maintain pumps is a continued analysis of the pump's requirements (and the needs of the project's village-level maintenance personnel). Adequate personnel have therefore been included to monitor operations in the project. Periodic evaluation will also assist the GPRB in developing similar maintenance capacities in other areas. At the end of the project, a tested training program will remain for the GPRB to continue upgrading basic skills in equipment maintenance.

Project inputs directed at the development of the Village Health and Sanitation Program will help improve and expand existing instruction in personal hygiene, the prevention of water-related diseases, and proper excreta disposal. About 60 latrines will be constructed in public schools, medical facilities, and in several compounds, where they will serve as demonstration models for further replication elsewhere in the village. The project will strengthen the GPRB's institutional abilities to plan and deliver health education and sanitation services, and monitor the quality of water available for human consumption. At the end of the project, villagers, living where improved water supply facilities have been constructed, will have a better understanding of the relationship between water resources, water-borne diseases, and the importance of excreta disposal. Village school children will also benefit from similar training. Latrines will be available to about 60 to 70% of the target population. Training methodologies and materials in public health education will be tested and available for use in public schools and village training programs. The Ministry of Health's field offices will have increased technical personnel trained in preventive health practices and rural sanitation and available to implement village-level programs. A water control laboratory will be operational.

All activities organized under this project will be coordinated and implemented concomitantly, at the village, regional, and national levels. A number of Beninese will also have received both in-country and participant training according to their role in the organization and implementation of specific project activities (see project inputs for types and numbers of trainees).

4. Inputs

In support of project activities listed below, A.I.D. will provide:

For the spring captation activity.

- one engineering geologist/civil engineer for three years;
- expendable supplies for the construction of the captation systems (cement, valves, water pipes, hand tools, et.c);
- a portion of the operational costs of the component.

Peace Corps will provide 2 volunteers for two years over a period of four years.

The UNDP/CDF will provide vehicles and motorized equipment as required.

The GPRE will contribute construction crews and supervisory personnel. The GPRM will also provide a portion of the cement required for the spring captation structures, and about 30% of vehicle operational and maintenance costs during the third year of the project.

For activities related to the identification, drilling, and construction of wells, A.I.D. will provide:

- a three-person team and a procurement and logistical advisor for three years (see Annex III, pp. 50-51);
- approximately one-half of the equipment needed during the drilling operations and, construction materials for approximately 35 production wells;
- operational costs (fuel and vehicle/equipment maintenance) to drill during the first two years of the project and, thereafter, on a cost-sharing basis with the GPRB;
- long-term, U.S. academic training for two drilling hydrogeologists, and a drilling engineer. Two years training at a suitable African institution for the four heavy equipment mechanics; and
- approximately 50% of the construction costs of two offices and one warehouse in which to store expendable well construction material, equipment, and spare parts (see Annex III, pp. 52-53).

UNDP/CDF will provide:

- one program and policy advisor to the Hydraulics Service for an estimated four years;

- drilling equipment needed by the activity (one drilling rig, pickups, water truck, down-the-hole-hammer attachments (3), and compressors). (See detailed list of equipment in Annex 10.)

The CDF will also provide construction materials for approximately 150 productive wells.

The GPRB will provide:

- a drilling activity supervisor for four years; two drilling crews for three years and an equipment maintenance and repair team for the operational life of the project;
- construction materials for 40 production wells;
- approximately 20% of the activity's operational cost during the third operational year of the project.

In support of activities related to the installation and maintenance of pumps, A.I.D. will provide:

- one pump maintenance supervisor for two years (see Annex 10, pp. 122-123, 128);
- pumps and pipes required for 225 wells, with the spare parts and replacement pumps, vehicles and tools required to install and maintain these pumps (see Annex 10, pp. 55-56);
- fuel and maintenance costs for the repair and maintenance vehicles and the costs of training seminars for village pump maintenance personnel (Annex 10, p. 56);
- 50% of the cost of constructing a regional warehouse and office. Peace Corps will provide two volunteers during four years to assist in the pump maintenance and repair program.

UNDP/CDF will provide the 4-wheel vehicles required for this activity.

The GPRB will provide:

- one pump maintenance supervisor, three pump mechanics and two village maintenance personnel trainers for the life of the project (Annex 10, p. 59);

- approximately 20% of the fuel and maintenance costs of operating the pump maintenance vehicles during the final year of the project;
- 50% of the cost of constructing a regional warehouse and office.

Under the Village Health and Sanitation Program, A.I.D. will assist the Ministry of Health by providing:

- one Public Health specialist for approximately three years (see Annex III, pp. 50-51);
- potable water analysis equipment, audio-visual training equipment, and construction materials;
- operational costs of the program (including village and district health education seminars, laboratory supplies, printing and distribution of teaching aids, fuel and maintenance); and,
- U.S. long-term training for 1 environmental sanitarian for 2.5 years, long-term academic training in an African university for 1 Sanitary Engineer for 2 years, long-term academic training (3 years) for 4 rural sanitarians in African health training centers, and 8 short refresher courses at WHO institutions in Africa (see Annex III, Table C, between pp. 62 and 63).

Peace Corps will provide five volunteers over a four-year period.

UNDP/CDF will provide two 4x4 vehicles for use in the village sanitation program.

The GPRB will provide:

- 5 supervisory staff, 6 health education and training staff, 10 district-level supervisors, 15 village sanitarian agents, and 2 latrine construction crews;
- approximately one-fourth of the construction material required for the construction of latrines, and an increasing percentage of the cost of health education seminars during the third year of the project; and
- office space as required for the supervision of the health program.

In resume, this program will require investments by A.I.D., P.C., the Government of the Popular Republic of Benin, and the United Nations Development Program. The A.I.D. contribution will include the following:

- A. Technical assistance totaling U.S. \$2.8 million.
 - Water Resource Development, 183 pm over 3½ years;
 -
 - Health education and sanitation, 36 pm over 3 years;
 - B. Equipment and commodities at a total cost of U.S. \$755,000;
 - C. Participant training (4 Beninese trained in the U.S., 4 Beninese trained in Africa for 3 years, 5 trained in Africa for 2 years and 8 trained in short courses in Africa.) Total planned expenditures for training is \$230,000;
 - D. Operational costs for the project which will be shared with the GPRB. A.I.D. will provide approximately 80% of the operational costs for about \$590,000;
 - E. Construction costs of buildings, spring captation facilities, wells and latrines, are expected to total about \$1.017 million; and
 - F. Inflation and contingency totaling \$1.3 million (20%).
- Total cost of A.I.D. inputs - \$6,707,000.

The UNDP will provide \$1,600,000 worth of equipment and materials from its Capital Development Fund, plus one technical advisor (at a cost of \$300,000 for 4 years).

The GPRB will be providing the following:

- A. Personnel (estimated cost to the government, \$765,000).
- B. Operational cost valued at \$133,000.
- C. Construction of facilities estimated to cost approximately \$172,000.
- D. Contingency and Inflation on the above cited inputs is expected to cost \$225,000.

Finally, the U.S. Peace Corps is expected to provide 36 PCV years valued at \$540,000.

The following table provides a summary of all project inputs.

	<u>FY 1980</u>	<u>FY 1981</u>	<u>FY 1982</u>	<u>Total</u>
		(<u>\$000</u>)		
<u>A.I.D.</u>				
-- Personnel	440	1,415	960	2,815
-- Equipment & Commodities	634	121		755
-- Local Cost	100	245	245	590
-- Training	137	93		230
-- Construction	482	316	219	1,017
-- Contingency	207	544	549	1,300
SUB-TOTAL	\$2,000	\$2,734	\$1,973	\$ 6,707
<u>UNDP/CDF</u>				
-- Personnel	300			300
-- Equipment	1,600			1,600
SUB-TOTAL	\$1,900			\$ 1,900
<u>Peace Corps (U.S.G.)</u>				
-- Personnel		540		540
<u>GPRB</u>				
-- Personnel		765		765
-- Construction		172		172
-- Operations		133		133
-- Training		30		30
-- Contingency		225		225
SUB-TOTAL		\$1,325		\$ 1,325
TOTAL	<u>\$3,900</u>	<u>\$4,599</u>	<u>\$1,973</u>	<u>\$10,472</u>

5. Strategy

The success (or failure) of this project to improve health conditions among rural villages in northern Benin will depend directly on the general approach applied when planning, organizing, and administering the project's various activities. A number of steps have been identified by the project's design team which, if adopted, should facilitate the project's implementation. Steps discussed here are primarily concerned with the manner in which new skills and technology will be introduced to the target population. In those sections covering administration, procurement, and implementation, the discussion centers on procedures and mechanisms that will be used to implement, through existing or planned government institutions, project inputs.

Technical assistance, equipment, and materials that are to support the village health program will be closely coordinated with project inputs directed to the well drilling and spring captation activities. Prior to the arrival of well drilling and spring captation crews, the village and regional personnel (animatrices, sanitary agents and Peace Corps volunteers) should be trained, on site, and working.

Approximately three months before the scheduled arrival of the drilling crews, the district authorities will be contacted and a two-day meeting set up to verify and finalize the site selections of the wells. Two Health/Sanitation teams will make explanatory visits to target villages where they will discuss briefly the principles of disease transmission, environmental sanitation, the project program, and village participation requirements. These meetings will be held with key villagers such as the village delegate, men's and women's council members, teachers, and village people selected for pump maintenance training.

Each team will include Health/Sanitation and Hydraulics representatives, animatrice supervisors, animatrice rurales, sanitation agents, Peace Corps volunteers, and agricultural extension workers. After the team visit, and before drilling activities begin, all training and recyclages will take place. The animateur d'hygiene members of the village health units will be selected and trained at the district level by the district supervisory personnel. The village health unit birth attendants and medical facilities staff will be given recyclages in prevention and hygiene. Teaching and training materials should be in possession of the district trainers (animatrices, sanitary agents, Peace Corps volunteer counterparts). Around the scheduled drilling date, latrine sites will have been chosen, the types of appropriately technical latrine construction decided upon, and latrine construction crews coordinated and ready to start. As soon as possible after the installation of the drilled wells, a follow-up visit will be made by Health/Sanitation and Hydraulics representatives to the target villages. Since the spring captation teams will be on one site for as long as six months, the concurrent health and sanitation activities will have a slightly different aspect. A team visit about the same time the spring captation crew arrives to begin construction (see p. 152, Annex XI). Team visits will take place about the same time the captation team arrives.

The strategy for long-term health and sanitation activities in villages will be developed by the village health units and the villagers themselves, teachers, medical facilities staff and political authorities, with technical guidance supplied by the sanitary agents, animatrices rurales, Peace Corps volunteers, and conseillers pedagogiques. As a result of the project's approach, there should exist enough trained and experienced host-country personnel to carry out present and future related activities.

6. Issues

This project was first proposed as part of a Project Identification Document in mid-1977, when the A.I.D. Mission in Niger included in its Annual Budget Submission for 1979, a proposal for a Regional Water Supply Project. As a result of this proposal, a pre-project analysis of water resource development was completed for Togo, Upper Volta, Chad, and Benin in December 1977. The following July 1978, a project design team spent five weeks in Benin and designed the proposed project. A Project Paper (PP) was subsequently submitted for approval to AID/W December 24, 1978. The initial grant request (which totaled U.S. \$12.965 million) surpassed feasibility within the then total available program funds. A revision of the PP was thus required in which the project's budget would reflect approximately 50% of the original grant. The revised PP version, requesting U.S. \$6.707 million, was therefore submitted to AID/W by the Mission July 6, 1979. Since July 1979, the PP has been subject to further revision by a project Committee. A major concern of the committee was agreement between the summaries of information presented in the revised PP from the detailed analyses offered in the original project annexes. With the assistance of several members from the original PP design team and a contracted hydrologist, the revised PP has been edited to present the project proposal for authorization.

7. Beneficiaries

Residents of the participating villages, especially women and children, will benefit directly from this project. An estimated 40,000 villagers will benefit from the development of springs, about 56,250 people from drilled wells, and close to 125,000 people from the improved and expanded instruction in health and sanitation. Included in the latter beneficiaries are about 75,000 people who will benefit from the construction of village (at local schools and infirmaries) and compound latrines. Additional beneficiaries of this project include the drill teams, pump maintenance and health personnel and technicians hired and trained during the project's evolution. As a result of the implementation of the various activities composing this project, the GPBR will not only be able to initiate in Atacora and Borgou the National Rural Water Supply Program, but will also be able to introduce new technologies and skills which will inevitably help continue the project's activities once donor assistance terminates.

The outputs of the project will affect women in several ways. First, drawing water will be made physically easier by the installation of handpumps and decreasing the distance one must often travel to find a water source. Secondly, the amount of time spent in obtaining water for the family's needs will be reduced, giving women time for other pursuits. Thirdly, the combination of a sanitary water supply and better village sanitation conditions will improve rural women's health as well as that of their families. Fourthly, the project will provide numerous new avenues and strengthen existing channels through which women can better integrate themselves into the development process of these rural villages. Lastly,

the implementation process of the project will provide jobs for women having technical skills especially in the health field, and will train and upgrade the professional skills of other women.

8. Environmental Impact

According to the impact evaluation and initial examination, the proposed activities will not have significant effects on either the physical or social environments. It is therefore recommended that a Negative Determination is appropriate as the Threshold Decision, and thus, no further environmental action is required.

C. Description of the Project

1. Background

Benin's rural population considers potable water a scarce and, therefore, precious commodity. Close to 87% of the country's total population inhabits about 300 rural villages. Few of these villages have a reliable and clean water supply. In most villages, women and children must fetch water from hand-dug wells located several miles from the village. The problems surrounding water supplies are most severely felt in the northern provinces where climate and geological conditions make survival difficult. In Benin's two most northern provinces, Borgou and Atacora, daily per capita consumption of water barely attains five liters (WHO's accepted daily minimum is 20 liters per person).

During the rainy season, or when other sources of water are more conveniently located, the general consumption of water rises slightly. These same additional sources of water are unfortunately contaminated. Animals roam freely in the same ponds and streams that families must bathe in and draw water from for their domestic use. As a result, water-borne and water-related diseases constitute a large percentage of the diseases identified in rural medical facilities. About 54% of the diseases endemic to Benin's rural areas are infectious and parasitic (these include malaria, schistosomiasis, cholera, onchocerciasis, amebiasis and typhoid). Pregnant women are the most seriously affected by these unfavorable conditions, which are concomitantly major causes of infant mortality.

Scarce water supplies also impair efforts to advance agricultural production. In Atacora and Borgou, where geological conditions alone have prevented rapid economic development, a lack of basic infrastructure and the paucity of social services exacerbate problems that are due to scarce supplies of water. The lack of adequate year-round water supplies and limited infrastructure in the region have led to population dispersal. Since population dispersal increases the cost of providing services, the adverse conditions of Benin's north are only reinforced. As a result of regional disparities between Benin's northern provinces and its more accessible coastal regions, the general standard of life in the north is considerably below the rest of the country.

Per capita income in Atacora and Borgou is between one-half to two-thirds of the national average. About 97% of these two northern provinces' population is illiterate, the highest rate of all of Benin. In an effort to reduce regional disparities, the Government of the Popular Republic of Benin (GPRB) is giving highest priority in its development plans to the Borgou and Atacora provinces. Emphasis is placed on providing the rural villages in these provinces with an adequate and safe supply of potable water.

As part of its fundamental policy to improve the basic living standards of Benin's rural poor, the GPRB has developed a Rural Water Supply Program. The immediate objective is to increase the daily average per capita consumption of water from its present rate of 5 liters to a minimum of 10 liters. Over the long-run, the GPRB plans to progressively increase water supplies until average per capita consumption reaches 25 liters per day.

Using the criteria of one well supplying 500 persons with a minimum of 10 liters per day, the GPRB's Direction of Hydraulics has estimated that 6,000 wells are needed to meet the country's minimum requirements. Current requirements are satisfied by 600 wells and a number of large diameter open wells (which are not considered adequate from a public health standpoint). In addition, few of these wells are within easy access to the villages they serve.

Under the current five year plan (1978-1982), the GPRB plans to construct 2,400 wells. Forty percent of these wells are to be built in Atacora and Borgou, where the need for water is most severe. Although scarce water supplies evince the need for these wells, implementing such a program, far exceeds the GPRB's present financial and administrative capacity. The GPRB is nevertheless fully cognizant of its current limitations and has consequently requested assistance from other donors.

A national program has been identified by the GPRB for the development of the country's water resources. In addition, the GPRB has requested that UNDP act as a coordinator of all donor-supported activities in water resource development. Within an institutional framework already identified by the GPRB, UNDP's major task will be to insure that resources and technical assistance from participating donors are coordinated in such a way to maximize their effectiveness.

2. Detailed Description

Activities proposed under this project were designed with the objective of helping the GPRB implement its National Rural Water Supply Program in the Atacora and Borgou provinces. Two complementary components have arranged a number of activities to help improve existing GPRB services involved with the development of water resources in rural areas of Benin. Project activities initiated under the first component will support the exploration and development of sub-surface water resources identified in rural Benin. The project will concentrate

on developing the two major types of water resources in northern Benin: springs through "captation systems" and ground-water aquifers through drilled and dug wells.

Based on site observations and information provided by the GPRB, at least seven permanent springs in the Atacora and Borgou provinces have been identified as being viable sources of abundant, clear water. Villages use springs in northern Benin but few have captation structures. Thus, the water available from springs becomes highly susceptible to contamination. If properly developed, these sources will provide quantities of water with minimal recurring costs and maintenance requirements. Water from these springs will be piped to public basins in village quarters through a gravity-fed distribution system. The basins will be closed with several valves which, when opened, obtain water. An appropriate drainage system will be constructed around the basins to eliminate possible sources of contamination. As part of this component, three GPRB technicians will receive on-the-job experience in building and maintaining spring captation, and two work crews will be prepared to develop additional springs, as identified. Approximately 40,000 people will be served by these springs.

Groundwater resources will be developed using two different technologies appropriate to conditions within the project zone. Large diameter dug wells currently provide groundwater to villages. These wells are dug by the local population or by the GPRB's Hydraulic Service which uses limited technics and occasionally explosives. Wells constructed using present technology do not attain depths that intersect major water-bearing aquifers. As the dry season progresses and the demand for water increases, these aquifers provide progressively smaller quantities of water. At the same time, large diameter wells are susceptible to pollution through the open mouth of the well and from pollution entering the subsoil. Pollution infiltrates into the well easily because the thin layer of topsoil and porous, weathered rock do not provide an adequate filter to purify the water.

Drilled well technologies are better suited for the sedimentary basin areas of the Atacora and Borgou provinces. Soft sandstones in these two provinces are thick and can be penetrated without much difficulty. Lined wells prevent internal contamination. In addition, drilled well construction technologies require capping and a mechanical means of extracting water, thus eliminating the most frequent causes of water contamination.

A rotary drilling rig (similar to a Failing 1250 Model) with a "down-the-hole hammer" will be used. This type of machine adjust easily to the different types of terrain (see Annex 10, p. 128) in the project area. Under normal conditions and once fully operational, this type of drilling rig is capable of drilling about 75 wells per year. A borehole logger, included with the rig, will provide hydrological data and information required by the drilling crews who must determine appropriate drilling and construction methods for site-specific conditions.

Approximately two years after the project agreement is signed, well construction will begin where drilling conditions are most favorable (primarily in the areas with sandstone formations). Seventy-five wells, both test and production, will be drilled first in the Kandi sandstone formation (see map in Annex 10, p. 137). An additional 25 wells will be drilled afterwards in the crystalline and metamorphic rock formations to the west of the Kandi sandstone zone. The GPRB's Hydraulic Service will prepare an implementation schedule based on the first year of the drilling program. An estimated 250 wells will be drilled, 225 of which will be developed for village use. By the end of the project, two Beninese drilling teams will be trained and equipped to operate and maintain drilling and well construction equipment. Using a conservative figure of 250 persons served per well, an estimated 56,250 people will benefit from the wells drilled and capped.

Based on its performance elsewhere in Africa and in several Asian countries, the project recommends the MOYNO pump for extracting water from the 225 wells to be constructed in the project area. The hand-operated MOYNO pump has a helical metallic rotor turning inside a fixed sleeve within the well shaft. With only five moving parts, a considerable amount of wear is reduced. In addition to greater durability, the pump can also be easily adapted in the future to motor drive or other drive systems.

Rural villages in Benin are governed by village council composed of five members, each of whom has responsibilities for certain aspects of village life and development. Village policies concerning water supply operations will be the responsibility of this council and the person(s) responsible for social aspects of village life will supervise the implementation of village policies concerning usage and maintenance of the pumps. Each village in which a well is constructed will select two people to supervise operations of the pumps and to assist in maintaining the village pump(s). The selected individuals will be trained in basic pump operations, preventive pump maintenance and minor repair. The training will be conducted in small seminars organized at the district level. The village pump maintenance personnel will be furnished with repair and operations manuals, a small kit of basic tools, and small supply of spare parts, after having completed their training. In order to supervise and reinforce the village-level maintenance and repairs, technical personnel and pump mechanics will be trained by the project and assigned to the regional office within the project zone. This office will maintain a limited supply of spare pumps and pump parts, undertake major repair work of the pumps, periodically inspect the pumps and quality of the water supply, and supervise the village-level maintenance personnel. The regional center will be located at Kandi and have a larger stock of pumps and spare parts, as well as be responsible for supplying the districts and villages with spare parts.

Health benefits from improved water resources are considerably reduced in the absence of other basic sanitary improvements. The project's second component, therefore, concerns the development of measures that will

help target populations realize basic hygienic habits and practices. Project support will be directed to improving and extending existing health and village sanitation programs.

Existing health education and village sanitation programs lack trained personnel, materials, and infrastructure. However, an important shift in priorities, from curative to preventive medicine, is demonstrated by the recent reorganization of the Ministry of Health. As a result, a more decentralized health delivery system is being instituted. Activities initiated under the project's second component will reinforce and expand these new initiatives in the reorganization, especially those relating to preventive health practices and village sanitation.

Health and sanitation instruction already takes place in public schools, local health facilities, and, where necessary, common village grounds. Some curriculum in health education exist and, with improvement, can be better used by those responsible for instruction. These instruction materials can also, with proper development, serve rural school teachers in health education as reference material during in-house seminars that focus on water-related health and sanitation problems. The project will support further in-service training on subjects relevant to health and sanitation, to local dispensary and maternity staff.

In addition to assistance for health and sanitation instruction, the project will provide material and technical support for the construction of latrines. Basic sanitary improvements, such as proper excreta disposal, help assure that water resources improved or developed during the project are maintained. A village sanitation program will coordinate the construction of sanitary facilities according to the individual conditions of participating villages. The use of local materials and labor will, whenever possible, be emphasized by the program. Latrines will be provided to schools and dispensaries in those villages where wells are to be constructed. The project will also experiment with providing village and compound latrines. Because of a lack of qualified personnel in the Ministry of Health's sanitation service, the project will provide training to the appropriate field and technical personnel. Once trained, these agents will assist in village health and sanitation instruction.

At the end of the project, villagers in the project area will benefit from an increased understanding of the relationships between sources of water, the importance of proper excreta disposal, and water-borne diseases. Moreover, the project will have strengthened the GPRB's institutional abilities in planning and delivering health and sanitation education services, as well as monitoring the quality of potable water.

II. Project Analyses

A. Social Analysis

Both the Atacora and Borgou provinces form part of the Sudan-Savanna zone that covers close to half of Benin's total land surface. The relative importance of national parks, forests, and game reserves covering these two northern provinces helps determine, in part, why they are also the country's least populated provinces. In addition, fewer people are attracted to Atacora and Borgou because of their meager services and lack of basic infrastructure. While colonial and post-colonial development has benefited Benin's coastal provinces, Atacora and Borgou has suffered from relative neglect and isolation.

Despite inequalities prevalent between northern and southern Benin, close to 30% of the total population lives in Atacora and Borgou. In an effort to eliminate unnecessary disparities, the government of Benin is channeling more resources into projects that will improve the north's system of roads, expand its schools and medical facilities, and revitalize the region's agriculture. Investments in northern Benin, nevertheless, must deal with a number of complex social and economic obstacles.

A myriad of ethnic groups inhabiting Atacora and Borgou impede the establishment of workable regional entities with a national identity. About 97% of Atacora and Borgou's total population, almost all subsistence farmers, is illiterate, the highest rate among Benin's six provinces. Close to half of the area's total population is under 14 years of age. Parts of the area are uninhabited because of onchocerciasis. Few adequate water supplies exist throughout the area. Shortly after the rainy season, surface water dries up or becomes brackish and, in some instances, infected with schistosomiasis.

The major ethnic groups, Bariba, Dendi, Fulani, and Somba, have different traditional approaches to the common problem of scarce water. The Bariba and Dendi share the same tradition of organizing themselves individually in groups to dig wells. On the other hand, the Somba scatter themselves over a large area, thus reducing their demand on any one source of water. Fulani tend to disperse to a lesser degree than the Somba but require larger quantities of water for their cattle. Where the more sedentary Fulani live, however, they adapt the approaches more similar to those of the Dendi and Bariba.

Except for the Sombas, traditional village institutions exist for developing and maintaining a village water supply. Furthermore, in village governing councils encouraged by the GPRB, certain council members are charged explicitly with the responsibility of maintaining the village's public wells. The extent to which this responsibility is carried out differs between villages and depends largely on the quality of local leadership.

Throughout the area, efforts are witnessed of villages actively participating in developing village water supplies. Villages contribute time, effort and often materials. Some of these efforts are initiated and supported by religious groups or voluntary agencies, but some originate from the village's own initiative. The problem is so severe that villages will keep returning to find a water supply even when past efforts have only provided very limited quantities and at a real cost to the village.

The prevalent attitude among the four major ethnic groups is that fecal matter is unclean and should be well removed from the family's living quarters. It remains to be seen how quickly people will adapt to using latrines even though most people interviewed expressed a willingness to do so. A good number of the villagers interviewed felt acceptance would be greater if separate facilities were provided for males and females. Proper means of excreta disposal will be accepted more rapidly as the public health education program develops an understanding of the links between village health conditions and excreta disposal.

As part of the village sanitation program, which will accompany the well construction program, proper excreta disposal will be emphasized. Some schools and dispensaries already have latrines which are used and appreciated. At schools, many of the latrines are dug and maintained by the pupils themselves. It was noted that in schools where health courses are part of the curriculum, the latrines tend to be better constructed, cleaner, and more frequently used. Latrines at dispensaries are also used and maintained: it was noted, however, that it will probably be necessary to build two latrines at the dispensaries, one for the dispensary staff and a second for patients.

A lack of baseline data makes it difficult at this juncture in the project's development, to enumerate specific beneficiaries of individual project activities. Because women and children are primarily responsible for drawing water and maintaining the family compound, they will benefit more directly as a target population. Women will also benefit as direct participants during the project's administration and implementation. A covenant stipulates that the GPRB agrees to make every effort to ensure that women benefit as candidates for training in every category of jobs generated by the project.

The project's target population corresponds exactly with AID's congressional mandate of working with the rural poor and especially of improving the quality of life. Local participation is included not only during construction, but all activities require dialogue between the project's technical teams and villagers. Acceptance by the local populations of the project objectives depends on the nature of concepts to be introduced, the manner in which they are introduced, and the receptivity of the local populations to new ideas which will vary between villages, as well as ethnic groups. The project was designed to insure that the proposed project interventions are well understood by the villagers.

B. Economic Analysis

1. Cost-Benefit Analysis

By providing safe water to rural villages, this project will reduce sickness and death resulting from the consumption of or contact with contaminated water. It will also reduce considerably the number of hours spent fetching water from more distant supply points. In both instances, there will be an economic gain. Death reduces the number of actual or potential producers. In addition, the costs of feeding, training, and clothing a child up to his death is a loss. Production is diminished by reason of absenteeism due to disease. Sickness debilitates and reduces the quantity and quality of work. In Indonesia, for example, the cure of anemia increased the productivity of workers 19%. Sickness diminishes the concentration of students and thereby reduces the effectiveness of costly education and training. Enteric diseases impair the intestinal absorption of nutrients. In addition, the costs of treating illness, whether by purchasing drugs or making payments to traditional healers, are an additional burden on the community.

Wells situated in villages would also save many hours that are wasted fetching water. Several trips must be made every day and sometimes, especially during the dry seasons, at distances of 10 to 20 kilometers. Assuming that the women would utilize at least half of the hours saved in more productive tasks, there would be a significant economic gain.

It is impossible to estimate in any meaningful way the economic advantages of a convenient safe water supply point and to balance these benefits against the cost of a well. As a result, one is inclined to disregard these intangible gains and consider them negligible. As a matter of fact, however, they are significant.

In 1978, for a tubewell project in Chad, an AID economist made an attempt to estimate the economic gains of a village well. He limited his analyses to only four benefits. First, he calculated the cost of food for an infant (0-6 months) and a child (0-5 years) and the extra food consumed by their mothers during pregnancy and lactation. Secondly, he estimated the average number of workdays missed because of water-related diseases and the resulting loss of income. Then he figured the average cost of treatment of water-related diseases in the village, and finally, he calculated the gains of a woman who earned money during half of the time saved in fetching water. After every conservative calculations, he arrived at the following savings resulting from the installation of a tubewell in an average village of 300 residents:

Cost of food of infant and child before dying prematurely	\$ 590.84
Cost of absenteeism from work	729.00
Cost of medical treatment	776.00
Value of time gained	<u>1,676.00</u>
TOTAL ANNUAL GAIN	\$3,771.84

This amount represents more than 12% of the village's annual income. Since the AID contribution of the installation of one project well is \$17,400, and the maintenance is estimated at \$100 per year, the total expenditure of a village well would be fully compensated at the end of six years.

2. Cost-Effectiveness of Rural Water Project

Few sources of water in northern Benin provide the population adequate and clean supplies of water throughout the entire year. Scarce water supplies are not due, however, to a lack of surface and subsurface sources. Instead, the traditional approaches used to locate, develop, and draw water restricts the extent to which human consumption can be satisfied. In most areas of northern Benin, groundwater is extracted from large diameter hand-dug wells. These wells rarely attain depths sufficient to intersect major water-bearing aquifers.

As the dry season progresses, large diameter wells provide progressively smaller quantities of water. At the same time, the population's demand for water increases. Women, the principal drawers of water, will spend most of the night at a well located several kilometers from her compound in hope that water will collect from minute discharges in the aquifer. Traditional approaches to satisfying basic needs for water restrict considerably the amount and quality of water derived from an important amount of human effort. In economic terms, the level of technology used to produce water in northern Benin results in a corresponding limitation on how much water the population can supply itself. When considering what the labor used to produce water could have produced (opportunity cost), the cost of producing water is relatively high in northern Benin.

This project will result in considerable savings in terms of human resources and related costs in supply water. Women will spend less time in drawing water. How they will allocate this time will determine the opportunity cost of their labor. When asked how they would take advantage of this extra time, women responded in general that they would (1) increase their involvement in domestic activities, (2) try to earn more money by increasing field production or in commercial activities, (3) learn new artisanal skills, and (4) spend more time caring for children. Over the long-run, women will be able to improve or acquire new skills which will, in turn, help improve their well-being.

The possible approaches to improving the availability and quality of water supplies in West Africa are numerous and have, in recent projects, included almost everything from traditional hand-dug wells to deep, large-bore wells with diesel powered pumps. The design of this project has been based on the need to identify a cost-effective technology that will provide adequate water to a relatively scattered population in northern Benin, where options are limited by the physical characteristics as noted in the technical analysis of this paper.

The traditional hand-dug wells costing 30,000 to 40,000 CFA per well are by far the cheapest type of wells that could be dug in the area. For the purposes of this project, however, they have been rejected for a number of reasons. There are only a few areas in northern Benin where they can be successfully dug and even in those areas, they often do not provide sufficient water in the dry season to meet village requirements. Pollution of the wells by ropes and containers used to draw water is a continuous problem as is the possibility of children and animals falling into the well. They require periodic cleaning and redigging and their estimated life is relatively short, 4 to 5 years. Slight improvements to the traditional well are possible, such as the addition of cement rings to increase the life of the wells, as is being undertaken by a German volunteer program in Benin. This increases cost per well by only 30,000 to 40,000 CFA (not including technical assistance provided by the volunteers), but solves none of the other technical problems of this type of well.

The open-mouthed, hand-dug well, lined with cement, built up at the top and surrounded by a cement platform, commonly known as the FED-type well, offers another possibility. The cost of this type of well is, however, relatively high, \$10,000 to \$28,000*, with an average cost of \$17,000 per well. Some of the problems with this well are that pollution is not eliminated or even substantially reduced, and the cost of digging this type of well in the hard-rock areas of northern Benin would be at the extreme high end of the range of figures cited above, if feasible at all. One advantage of these wells is that they do not require pumps and the development of a pump maintenance program to insure operation of the well.

Drilled wells will provide the best source of year round water in the hard-rock areas of northern Benin. The average cost of the 225 wells to be drilled during the life of the project is \$18,420 per well, with \$12,300 of this provided by A.I.D. This figure, however, over estimates the cost of wells during the four years of the project as it distributes the cost of the equipment and training of drill teams over 225 wells, when in fact, these inputs will continue to serve the GPRB in the continuation of its well drilling program in northern Benin.**

Development of surface water could include both spring capture systems and small dams for catchment and storage of rain water. A program of surface water catchments was rejected from consideration for the purposes of this project because of the related health and environmental problems associated with this type of water resource development program. A

* Pacific Consultant: "West Africa Water Supply and Sanitation Pre-Project Analysis," pp. 3-24.

**See Table II for estimated cost of continued well drilling program.

spring captation program, on the other hand, provides an adequate supply of potable water in certain villages of northern Benin, and will reduce health problems associated with the present utilization of this water. These springs will also be located in areas where well-drilling is very problematic due to the existing geological formations.

Cost Per Beneficiary						
Major Outputs	Number of Beneficiaries	I*		II**		III***
		AID	TOTAL	AID	TOTAL	
Spring Captation	40,000	\$35	\$46	\$39	\$52	\$2.6
Drilled Wells	56,250	\$56	\$76	\$60	\$82	\$5.5
TOTAL/AVERAGE	96,250	\$46	\$63	\$51	\$70	\$4.2
<p>I* : For the development of the water resource, pumps, and piping.</p> <p>II** : Distributed cost of health, development of the water resource.</p> <p>III***: Estimated cost per capita/per year. (Spring captation life equals 20 years; well and pump life equals 15 years.)</p>						

C. Technical Analysis

1. Hydrogeological and Drilled Well Construction

Hydrogeological and drilled well construction analysis indicates that the crystalline, igneous and metamorphic rock formations which cover approximately three quarters of the project zone are difficult areas for groundwater resource development. These formations yield little or no water except in localized faults or fractured zones, or where the weathered mantle is abnormally thick. Best yields are obtained when these two conditions occur simultaneously. Identification of those areas having the greatest potential for groundwater development may require both geologic and hydrogeologic research and the use of exploration geophysics, such as earth resistivity, gravity and seismic refraction. In order to determine whether study is required, a small test drilling program in the hard-rock zone will be undertaken after prospecting the zone with available geophysical equipment and using existing studies, interpretation of aerial photos (and, if available, ERTS imagery).

Sedimentary rocks cover approximately 25% of the project zone and are generally capable of producing substantial quantities of water. In these areas, the availability of water tends to be uniform throughout

the more homogeneous formation. Well site selection becomes more predictable after collecting a minimal amount of subsurface data from an exploratory drilling program. Approximately 10 test holes drilled within the Kandi sandstone basin to depths averaging 100 meters should be adequate to define the potential water producing zones and the areas having the potential for flowing wells.

Drilling and well construction techniques differ considerably according to geological conditions and northern Benin offers one of the most complex situations for a drilling program. Drilling the metamorphic formations will require the use of "down-the-hole" hammer air rotary techniques. Considerably less complex and less expensive technologies suffice for the sedimentary formations. Variations in the type of well construction (e.g., optimum depth, well spacing, water bearing fracture development, casing, screening, cement grouting, open-hole or gravel pack) also depend on the local hydrogeologic conditions.

For the drilling program, the equipment specified for the project is that required for drilling in the hardest rock formations but can also be used in the softer sedimentary rock. Included with the drilling equipment is borehole logging equipment, mounted in four-wheel drive vehicles. This equipment will provide an unbiased record of the subsurface lithologies which is necessary in the sedimentary, igneous and metamorphic rock areas. The drilling hydrogeologist will be responsible for the analysis of the borehole geophysical logs.

To adequately train Beninese technicians in drilling technologies, the program must provide experience in drilling and well construction in each of the major hydrogeological units existing in northern Benin. The drilling schedule specified in the project has been designed to acquaint the national drilling teams with drilling techniques and well construction technologies in each of these formations. The drilling program will start in the sedimentary zone and will continue in metamorphic rock formations. Drilling sites will be determined in conjunction with the co-directors of the drilling activity, and the project director. The success or failure of drilling programs implemented by the GPRB's Hydraulic Service, after this project, will depend largely on the training and experience gained by the drilling crews under this project, especially that acquired for well construction techniques in hard rock areas.

2. Pump Installation and Maintenance

One of the most critical aspects of this project is the choice of the handpump to mount on small diameter wells and the development of a maintenance and repair capacity that is timely in repairing pumps and cost efficient. Before recommending a pump for use by the project, the project design team considered the Vergnet, Abit, Briau, the AID/BATTELE pump, the Dempster pump, and the MOYNO pump. The project design team concluded by recommending the MOYNO pump, based on experience with the pump in other African countries, its low maintenance requirements, rugged construction and simple design, its ease of operation, and comparative low price with

other models of manual pumps. The American manufacturer of the MOYNO pump is a reliable firm, financially sound, and seriously interested in entering the West African market. The manufacturer is willing to provide installation and maintenance manuals in French, to assist in periodic evaluation of the pump's performance, and to assist in making adjustments and modifications to the pump which will facilitate its operation in West Africa. The project is requesting proprietary procurement of the MOYNO pump. It is understood that a similar procurement waiver has been requested and approved to purchase these pumps for a water supply project in Upper Volta. Standard use of one type of pump will greatly facilitate pump maintenance. When stipulating the terms of the contract with the pump manufacturer, the mission should clearly state to the manufacturer of the pump, the project's need for spare parts to repair and maintain pumps for the expected duration of their productive life (10 years).

It is estimated that the hand-operated MOYNO pump can provide an adequate water supply up to 250 people. If a school or dispensary is located in the village, consideration should be given to providing water to these institutions if geological conditions are favorable. Where possible, wells should be grouped so that they are in adjacent communities, rather than scattered randomly throughout the province. Grouping wells together will facilitate maintenance operations and will decrease the down-time as the drill rigs move from a completed well site to a new site.

In the long term, maintenance of handpumps should become the responsibility of the villagers as it is neither extremely complex or costly. The role of the Hydraulic Service is to introduce the technology, assist in developing a local capability to maintain pumps, and eventually, become primarily a supplier of pumps and spare parts. In order not to lose sight of this long-term objective, villages should participate in sharing the pump maintenance cost from the beginning of the program. Flexibility must be maintained in initially setting up this system as neither the maintenance cost of the pumps is clearly known, nor the ability of local villages to collect funds for maintaining pumps. It has been noted, however, that villages do contribute substantial amounts collectively for the development of water resources for the village. In many instances, they pay to have wells dug and constructed.

3. Village Health and Sanitation Program

There is considerable empirical evidence that the provision of a safe, convenient water supply and sanitation system will significantly reduce the incidence of water-borne and water-related disease, perhaps up to 60%, according to a World Bank study. A safe water supply system, while a necessary condition for improved health, is not a sufficient condition. Safe water for consumption and bathing must be accompanied by a sanitary excreta disposal system, proper waste disposal, sanitary food marketing, processing and preparation, and personal hygiene.

In an effort to accomplish specific activities designed under the Village Health and Sanitation Program, the project will work to the

greatest extent possible through existing and/or planned government institutions, primarily schools and village health centers, and whenever possible, employ Beninese personnel (technicians, animatrices rurales, sanitation agents, nurses midwives, teachers, village health leaders) with the technical assistance provided by a USAID public health specialist and Peace Corps volunteers. The program further proposes to strengthen training institutions, support pre- and in-service training of public health and sanitation personnel, and assist in the creation and production of teaching and training materials.

At the national level, the Ministry of Health will have the most important input into this component of the project. Directly under the Project Director from the Ministry of Hydraulics and the Contracted Project Manager, will be a Health/Sanitation Assistant from the Ministry of Health. The Ministries of Rural Development and of Education will also be involved in the project's administration.

District-level personnel will include animatrices rurales, sanitation agents, conseillers pedagogiques, and Peace Corps volunteers. In the well drilling and digging activities, the animatrices and sanitation agents will each have a Peace Corps volunteer counterpart. In the spring captation activity, the Peace Corps volunteer member of the captation crew will also be counterpart to the animatrice and sanitation agent assigned to that area. (For details on the spring and well activities, see the Water Resource Development Technical Report.) The rural sanitation agents are new personnel which have been programmed by the Direction du Genie Sanitaire. Thirty-six agents have already been trained for urban work by Genie Sanitaire and 30 will be identified, retrained for rural work and assigned to the project area. They will supervise latrine construction and provide technical assistance to village construction crews, the sanitation member of the village health unit, school directors and medical facilities staff.

Under the Ministry of Rural Development, the animatrices rurales will train, supervise and collaborate with the birth attendant member of the village health unit and maternite/dispensaire staff in matters of public health education. They will also provide on-the-spot training and technical assistance to teachers in the execution of health classes. There are two conseillers pedagogiques in every district. Many have received training under the Ministry of Education's health education program, and, thus, can be incorporated into the supervisory team without much extra training. All supervisory personnel at the national and district levels will be responsible for coordinating the different activities through regularly scheduled meetings. At the district level, they will also be responsible as a team for organizing recyclages for teachers, village health unit members, medical facilities staff.

By 1980, the Benin Government intends to create in the larger villages, health units, each composed of one pharmacist, one birth attendant and one first aid person. The members will be chosen by the villages and trained by the government at the district level. The emphasis of the

services to be provided by these health units is more on curative than preventive medicine. The addition of a fourth member of the village health units in project target villages is felt necessary. This fourth member will be the "animateur pour l'hygiene" and will be trained by the project at the district level. The trainers will be sanitary agents, Peace Corps volunteers, and medical facilities staff.

Training and teaching materials will be made available to the animatrices, sanitary agents, Peace Corps volunteer counterparts, teachers, dispensary and maternity staff, and village health unit members. A variety of such material has already been developed for Benin and Togo. Project and government leaders will review and select the appropriate materials to reproduce for project use.

The effectiveness of the water supply and sanitation project will depend to a great extent on close coordination of the well drilling and spring captation activities with the health education/village sanitation activities. At the provincial project direction level, activity directors will be expected to meet for formal coordination of activities on a quarterly basis. These meetings will coincide with the preparation of quarterly reports to the Project Director.

D. Financial Plan

The extensive and rather diverse nature of this project's technical and institutional requirements also represent a considerable investment in the country's human resources. Given the importance of each financial source, the design of this project is such, that all of the activities financed during the project are mutually essential. Any additional cut in finances would only jeopardize the entire effort.

In designing the project and determining an appropriate division of project inputs, two principles were followed: (a) the GPRB contribution should be significant enough, in terms of actual fixed and variable costs, that the GPRB realizes the magnitude of operating and maintaining the project after donor assistance terminates; and (b) the economic costs of project inputs are calculated on their social rather than financial worth. This is especially important when assessing the relative worth of host country personnel (for a detailed analysis of project inputs, refer to Annex 3, page 49).

Total financing for the project equals U.S. \$10,472,000. Table I plots total financing according to donor contributions (source) and projected use. In Table 2, sources of finance are presented according to inputs and project activity. Table 3 represents only A.I.D. expenditures, by input and per fiscal year.

Inflation and contingency allowances are difficult to derive. During the design of the project, several formulae were used to establish a valid and reasonable allowance. Local currency costs were separated from foreign exchange costs. Differing rates of inflation were applied

to commodity procurement and personnel since the rate of inflation was likely to be higher for the former (up to 15% estimated for local purchases). In the final budget, 20% of all project input costs have been calculated for inflation and contingency.

Total financial obligations from each donor are concentrated during the project's initial phase because of the larger technical assistance and capital outlay required by the drilling operation. In addition, the pre-implementation strategy will require early obligations.

Recurring Cost Structure and Satisfaction of 611 (b) of FAA

The current annual budget for the Hydraulic Service covers basically the personnel costs of the service. Very few financial sources are available for program, operational or equipment costs. The service presently relies on donor assistance, or contracts from other governmental agencies, to fund program operations. These sources of finance tend to fluctuate considerably from year to year. The GPRB and the Hydraulic Service are currently exploring the feasibility of establishing a National Investment Fund for rural water supplies. This fund will cover equipment and construction costs. An estimated minimum amount necessary for this fund is about \$790,000 annually, which would cover drilling and pump equipment, expendable drilling supplies, and drilling operations costs.

Table 4 shows the recurring costs of continuing the project. The geophysical survey will not be continued as a permanent program of the GPRB. Instead, the research capacity will be developed during the drilling program. The spring captation program will also not continue as a full-time activity. It is possible that as people move into the zone, currently uninhabited because of onchocerciasis, additional springs can be developed to serve new villages. Thus, recurring costs for these two components will be small and the equipment and personnel capable of implementing such activities can be assigned to other tasks and only used for a continuation of these activities when required.

The drilling operation will be continued and should be capable of developing approximately 75 wells per year. The drilling operations will most likely be located in one area for a year at a time and then move to additional areas. This decreased mobility will require fewer vehicles and reduce recurring costs considerably.

The pump maintenance and repair component will continue with little change in operations. This component will also eventually need to be enlarged as the drilling program moves into new areas. After several years of operation in one district, it may be possible to reduce district level office staff. This of course depends on villagers' ability to maintain their pumps themselves.

Managerial, planning, and supervision costs associated with the continuing activities will be assumed by the Direction of the Hydraulic Service and the Ministry of Health.

The recurrent requirements of the project will require increases in the current personnel expenditures of the Hydraulic Service. Most of the increase is due to the manpower requirements of the pump maintenance program. The largest impact of the project's recurring cost structure concern the equipment replacement costs, and drilling and well construction costs. As stated above, the Hydraulic service's budget is very limited and funding levels tend to be erratic. Continuation of the program will require a substantial and stable investment for these costs. Current plans to establish an investment fund to cover these costs could meet some recurring costs of a continuing program.

Recurring costs to cover the village health program must include adequate financing for increased staffing in several divisions of the Ministry of Health. Since most of the recurring costs will be assumed by the GPRB, approximately 2 to 3 years after the project begins, it is recommended that a condition precedent to third year funding require the GPRB to develop an appropriate plan for covering recurrent costs beyond the third year. Various schemes for dealing with recurrent costs will, however, be considered by all donors and the GPRB during the initial 2 years of the project's implementation and a proposed formula will be decided upon before the beginning of the project's third year.

Section 611 (b) of the Foreign Assistance Act, ^{of 1961} as amended, applies to this project because its' primary focus is to develop water resource supplies and, also, because the construction costs of water resource development during the project exceeds \$100,000. Consequently, the technical, economic, social and environmental analyses have, insofar as practicable, considered relative project costs and benefits. Overall national economic efficiency should improve as a result of increased productive output by women in other domestic and market activities, once they are freed somewhat from drawing water. The quality of the environment will be enhanced as a result of the drilled well technologies, sanitary facilities and expanded, improved instruction in hygiene which will be introduced over the life of the project.

For a similar rural water supply project in the southern part of Upper Volta, just to the north of Atacora and Borgou in Benin, it was estimated during the project design there, that women spend an average 2 1/2 hours per day fetching water. Assuming the women in northern Benin spend about the same amount of time to fetch water as do women in southern Upper Volta, its likely that women in both countries experience the same general economic and social benefits from easier access to cleaner, more permanent sources of water. As presented in the Upper Volta Rural Water Supply project paper, it can be assumed that time saved as a result of rural water supply projects in the Sahel approximates 2 hours per day or 730 hours per beneficiary per year. With easier access to rural water supplies and assuming 50 women beneficiaries per well (of the 250 persons per well), women's time saved over the useful life of the project wells (20 years) is calculated at: 225 wells x 50 women per well = 11250 women; and, 730 hours x 11250 women = 8,212,500 hours x 20 years = 164,250,000 hours saved by 11,250 women over a 20 year period.

If the value imputed to a 12 hour work day for rural women is \$.50/day then the value of time saved as a result of the project equals \$6,843,750. This total benefit is arbitrarily calculated but slightly exceeds AID's total contribution to the project.

TABLE 1

Summary Cost Estimates and Financial Plan
(\$000)

Project No. 680-0201

Benin Rural Water Supply and Sanitation

Use \ Source	AID		GPRB		UNDP/CDF		Peace Corps		Total		TOTAL
	FX	LC	FX	LC	FX	LC	FX	LC	FX	LC	
Personnel	2380	435	-	765	300	-	540	-	3220	1200	4420
Equipment	749	6	-	-	1600	-	-	-	2349	6	2355
Training	160	70	-	30	-	-	-	-	160	100	260
Operations	60	530	-	133	-	-	-	-	60	663	723
Construction	215	802	-	172	-	-	-	-	215	974	1189
Inflation/Contingency	837	463		225	-	-	-	-	837	688	1525
TOTAL	4401	2306	0	1325	1900	0	540	0	6641	3631	10472
Total contribution per financial source	6707		1325		1900		540		10,472		

TABLE 3

Projected AID Financial Requirements by Fiscal Year
(\$000)

Project No. 680-0201

Benin Rural Water Supply and Sanitation

Inputs	FY 80		FY 81		FY 82		Total	
	FX	LC	FX	LC	FX	LC	FX	LC
Personnel	440		1155	260	785	175	2380	435
	440		1415		960		2815	
Equipment	727	27	115	6			749	6
	754		121				755	
Training	80	57	80	13			160	70
	137		93				230	
Operational costs	10	105	30	215	30	215	60	530
	115		245		245		590	
Construction costs	215	542	-	316	-	219	215	802
	757		316		219		1017	
Inflation and Contingency	126	81	387	187	354	195	837	463
	207		544		549		1300	
TOTAL	1188	812	1737	997	469	804	4401	2306
	2000		2734		1973		6707	

TABLE 2

**Costing of Project Activities by Inputs
(\$000)**

Project No. 680-0201

Benin Rural Water Supply and Sanitation

Project Inputs	Project Activities			
	#1	#2	#3	TOTAL
<u>AID</u>				
Personnel	455	1560	800	2815
Equipment	95	537	123	755
Training	0	140	90	230
Operations	67	413	110	590
Construction	505	395	117	1017
Inflation/Contingency	272	748	280	1300
Sub-Total	1394	3793	1520	6707
<u>Other U.S. (Peace Corps)</u>				
Personnel	120	120	300	540
<u>Host Country</u>				
Personnel	110	320	335	765
Training	0	0	30	30
Operations	12	93	28	133
Construction	50	95	27	172
Inflation/Contingency	35	110	80	225
Sub-Total	207	618	500	1325
<u>Other Donors, UNDP/CDF</u>				
Personnel (UNDP)	0	300	0	300
Equipment (UN-CDF)	304	1225	71	1600
Sub-Total	304	1525	71	1900
TOTAL	2025	6056	2391	10472

Major Outputs

- Activity #1 - Seven springs developed serving an estimated 40,000 people.
- Activity #2 - 225 drilled wells serving an estimated population of 50,000. Wells equipped with handpumps will be located in an estimated 125 villages. Approximately 400 villagers will be trained in basic pump maintenance and repair. Hydraulic service strengthened.
- Activity #3 - Health education and village sanitation programs operating in approximately 150 villages.

TABLE 4

Annual Recurring Project Costs for the GPRB
(\$000)

Project No. 680-0201

Benin Rural Water Supply and Sanitation

Project Inputs	Project Activities ¹			
	#1	#2	#3	Total
Personnel	10	70	70	150
Equipment/Supplies ²	135	190	45	370
Construction Material	10	90	15	115
Operations	15	90	10	115
Construction ³	10	50	5	65
Contingency/Inflation	25	75	25	125
TOTAL	205	565	170	940

1 - #1 Maintenance and repair of spring captations (7) and limited expansion using existing equipment.

#2 Well construction and maintenance. Planned increase of 75 wells (drilled) per year.

#3 Public Health Education and Sanitation. Planned increase of approximately 40 villages per year.

2 - Includes depreciation of equipment over 5 years.

3 - Includes depreciation of warehouse and offices.

TABLE 5

Cost Schedule for UNDP/CDF Inputs
(\$000)

Project No. 280-0201

Benin Rural Water Supply and Sanitation

Equipment	Quantity	Total Cost
Failing 1250 mud/air rotary*	1	\$ 170,000
TWR Mission hammers*	2	10,000
5t. 4X4 water truck	1	50,000
5t. flat bed truck winch and pump hoist	1	40,000
Camping equipment		35,000
Drill Stem		5,000
Casing		100,000
Screens		35,000
Tricone drill bits	200	60,000
Mission hammer bits	24	20,000
Trencher	1	30,000
I-R Air Compressor*	2	20,000
I-R Air Hammer*	2	12,000
I-R Air Drills*	2	12,000
Cement mixers	2	10,000
5t. Dump truck	1	40,000
4X4 pickups	7	105,000
2X2 pickups	6	48,000
Spare Parts	25%	201,000
Shipping	30%	301,000
Contingency		296,000
TOTAL		\$ 1,600,000

* - or suitable equivalent.

E. Implementation Arrangements

1. Divisions of Responsibility and Project Management Arrangements

This project represents a multi-donor effort with the GPRB to establish and implement a viable program of rural water supply development. For the orderly implementation of the project, the following divisions of responsibilities are envisioned by the parties contributing to this project.

a. The Ministry of Equipment is responsible for rural water supply policy, planning and implementation. Within the Ministry, the Direction of Hydraulics is the technical service that is charged with carrying out these responsibilities. The Direction of Hydraulics will provide the project director for this Project.

b. The UNDP policy and program advisor will assist the Direction of Hydraulics in developing an overall rural water supply policy and a long-term plan for a national rural water supply program. The advisor provided by the UNDP will ensure that all donor activities have a compatible approach to the problem of rural water supply development and will ensure coordination between the individual projects.

c. The AID project manager* will be responsible for managing and supervising all activities implemented with AID provided resources.

d. Contract teams and their Beninese counterparts assigned to the project will be responsible for the implementation of project activities with the provincial authorities of the Hydraulic service and the Health Education and Sanitation services.

The project management structure has been designed to ensure supervision and coordination of various project activities and to ensure that the project follows closely the national plans for rural water supply development. A management structure has been defined which will permit the project to be managed and implemented as an integral part of the Direction of Hydraulic's program. The project management structure has three principle levels: project and policy direction; project management; supervision and monitoring; and, project implementation.

The director of the project will be the Director of the Hydraulic service, who is responsible for rural water supply policy formulation, program planning and the supervision of implementation. The project director will be responsible for coordinating the project into the national program. In regards to the implementation of this project, the project director will be responsible for assuring that all agreed-upon inputs to the project are available as needed, approving annual work plans and delegating responsibility to the field offices for the implementation of approved work plans, approving contracts, and negotiating modifications in the project paper,

implementation plans or grant agreements as required for the successful completion of the project.

The project director will delegate limited authority for making modifications in budget and implementation plans to the project management unit and the Regional Offices of the Hydraulic Service, which cover the Atacora and Borgou provinces. These sub-division offices will represent the project director in managing and supervising the various activities and project components which are being implemented in their respective provinces. For the health and sanitation component, field authority will be granted to the provincial representatives of the Directions of Public Health Education and Sanitation, with supervision from the Provincial Health Service Chief.

The project management office will be responsible for assisting in supervising and monitoring the project's implementation. One person from the Direction of Hydraulics and from the Direction of Sanitation, plus the AID contracted project manager, will staff this office. The contracted AID project manager will supervise and monitor the implementation of the project, and will serve as a liaison between the project and various AID supporting offices such as REDSO/WA. The project management office will be assisted by the project accounting procurement and secretarial offices. In addition to monitoring the project, the project management office will prepare and submit annual project work plans and budget for approval; procurement and commodities and their distribution as needed to the project implementation staff; and, preparation of AID implementation orders and evaluation reports.

The project will be implemented as three activities at the national level, as well as the local and provincial levels. Each of these activities will be managed jointly by a GPRB designated supervisor and an AID designated activity supervisor. The Beninese activity supervisor will be from the division of the governmental technical service normally responsible for the execution of activities of this nature. For example, the Beninese supervisor for the spring captation activity will be from the division of Hydrology of the Direction of Hydraulics. This division handles projects dealing with surface water utilization. The AID designated activity supervisor will be the senior AID funded advisor for each activity. For example, the AID supervisor for the drilled well construction activity will probably be the drilling hydrogeologist provided to the project by an AID funded contract.

The activity supervisor will be responsible for drafting annual activity work plans, schedules and budgets with the assistance of the project management staff. After these work plans are approved and the necessary inputs are made available, the activity supervisors are responsible for implementing these work plans. The activity supervisors will participate in drafting quarterly project reports and semi-annual project reviews.

For the implementation of this project, AID will contract with a suitable institution for the provision of technical assistance. The contract will specify that the contractor is responsible for the administration and logistical support of the technical assistance team. Commodities and equipment procurement and management will be the responsibility of the project personnel and the procurement agent. Thus, the implementation of this project will not increase the administrative and support workload of the U.S. Embassy in Cotonou.

F. Implementation Schedule

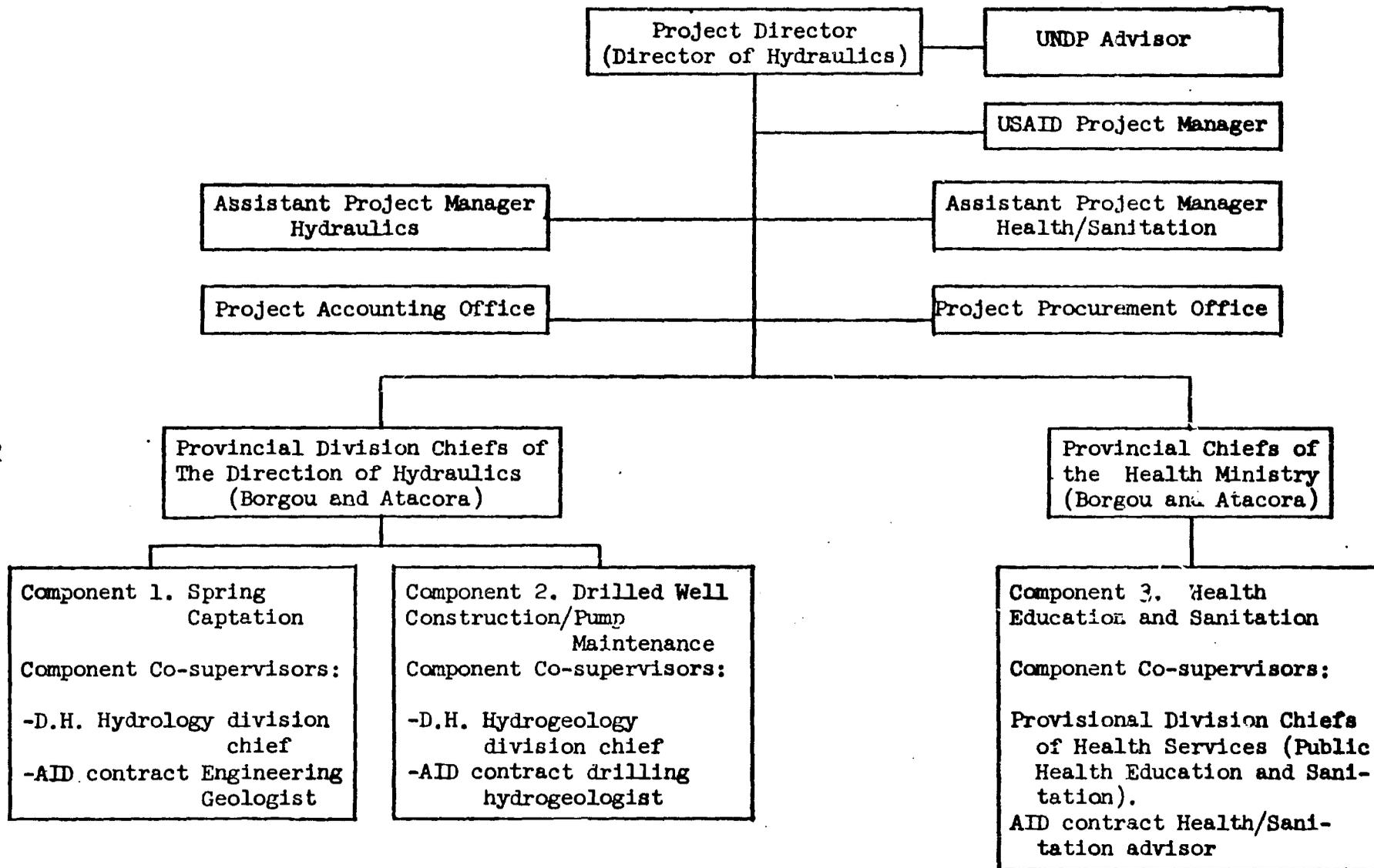
The Grant Agreement between the GPRB and AID will be signed in the third quarter of FY 1980. The Project Agreement between the GPRB and UN-CDF will be signed before the end of CY 1979. Conditions Precedent are expected to be met at appropriate dates.

After signing the agreements, donors and GPRB will need to finalize specific and detailed procurement lists and plans for project commodities and equipment. These negotiations should take place soon after signing the agreements in order to avoid delays in the actual start up of project operations. Furthermore, it is critical that there is close collaboration between the UN-CDF and AID for the procurement of project equipment to ensure the technical compatibility of equipment procured by each party. Equally important for all parties is a joint description of procurement procedures and estimated delivery times for the items being procured in order to insure the arrival of the Technical Assistance team when needed. It is absolutely necessary that a representative of the technical assistance contractor assist in drafting the detailed commodity procurement list for AID inputs and, at least, review the procurement documentation, equipment specifications, requests for bids, documents, and the bid evaluation documents of the UN-CDF for their inputs. Among other things, attention should be given to the listing of spare parts to be furnished with the purchase of equipment to insure their appropriateness given the field conditions under which the equipment will be operating. Funding for this procurement advisory service (estimated 3 p/m) has been in the initial year funding. This funding is exempt from all CPs contained in the GA except that one concerning the requirement for a signed agreement between the GPRB and the UN-CDF. As stated above and to avoid future problems in implementation, it is strongly recommended that the institution or company contracted to provide the project technical assistance, also provide this procurement advisory service.

The most critical factor determining the date when the operational phase of the project can begin is the expected date of arrival of AID funded U.S. commodities and equipment. These inputs can not be ordered until CPs have been met and will most likely have a delivery time of twelve months from the time a firm order is submitted by the procurement agent. The second most critical factor is the construction schedule of

PROJECT ORGANIZATIONAL CHART

Table 6.



a warehouse, offices and housing for the contractor's families. The project has a bit more flexibility in this second factor as temporary measures can be arranged if required and for contractor housing and offices, the possibility does exist to use pre-fabricated units from Nigeria.

UN-CDF equipment can be expected to arrive by March 1981 assuming that most of the equipment is of European origin. The AID financed project equipment will most likely arrive by June 1981. This arrival schedule will permit a full start of project operations in October 1981 given seasonal labor constraints of villagers and reduced mobility due to the annual rains.

The AID contracted project manager should arrive and begin assuming project management responsibilities in February 1981. The technical assistance team will receive several months of intensive french language training and are scheduled to arrive in-country between May and September 1981. The engineering geologist, hydrogeologist and mechanical supervisor will arrive earlier in this period in order to organize and plan their respective duties, set up the equipment and draft construction plans and schedules. The pump maintenance supervisor and public health advisor will arrive in July 1981 to assist in the organization of their work plans and personnel in order to be fully operational in October 1981. The master driller is expected to arrive shortly before the commencement of the drilling activity. For the project management support team, the procurement assistant will be needed as early as February 1981 when project equipment (UN-CDF) begins to arrive. It is assumed this person will be assisted by the GPRB project director and the UNDP advisor. The accountant and translator/secretary will be hired in April 1981.

The project is expected to be fully operational in October 1981. Project activities funded under this project should be completed by mid-1984, at which time the drilling equipment will be overhauled and put into good mechanical condition. The project assistance Completion Date is estimated to be September 1984.

1. Procurement

a. Technical Services

1) While the GPRB has in the past contracted with American firms for the execution of infrastructure construction projects (bridges and roads), the objectives being sought from contractors in this project are sufficiently different in nature to have led the Ministry of Equipment to recognize that it is not realistically possible for them to carry out effectively the contracting of the specialized, long-term technical assistance required by the project. The Ministry of Equipment has therefore requested that AID contract the technical assistance required to implement the project in accordance with the mutually accepted project design. Thus,

<u>Position</u>	<u>P/M funded</u>	<u>Est. Lang. Trg required</u>	<u>Est. Arrival Benin</u>	<u>Est. Depart Benin</u>
1) Direct Hire Project Mger			2/81	4/85
2) Engineer/Geologist	36	2	5/81	2/84
3) Hydrogrolgist	42	2	5/81	8/84
4) Master Driller	36	3		
5) Mechanical Superintendent	42	2		
6) Pump Maint. Supervisor	24	2	7/81	4/83
7) Public Health Adivsor	36	2	7/81	4/84
8) Accountant	42	X	4/81	9/84
9) Translator/Secre.	42	X	4/81	9/84
10) Procurement Advis.	42	X	2/81	7/84
11) Geophysist	4	X	1/82	4/82
12) PCV-Health	-	4*	6/81	6/84
13) PCV - Walls	-	4*	6/81	6/85
14) PCV - Springs	-	4*	6/81	6/85

*Training in-country

the necessary PIO/Ts will be issued as soon as possible, after the signing of the Grant Agreement and forwarded to AID/W in order that the contracting procedures be started as expeditiously as possible. The Mission approves a waiver of the AID Host Country contracting policy preferenca for the procurement of technical assistance personnel.

BEST AVAILABLE DOCUMENT

The technical assistance team required for the implementation of the project will be contracted to a suitable institution who can supply the number of technicians needed within a reasonable time frame and with the necessary French-speaking capability. It is recommended that for the technical assistance team, AID contract with an appropriate American institution or firm with a "self-sufficiency" clause in the contract.

3) The project management office will require the services of an accountant, bilingual secretary and a procurement assistant. The project envisions that persons locally available will be hired under AID personal services contracts to perform these functions. Accordingly, a waiver of AID Host Country contracting policy has been approved by the Mission for the procurement of project management support services. The estimated amount of these three personal services contracts, each for 42 p/m is \$420,000.

4) Before beginning a test-drilling program in the hard rock formation found in the Banikoara area, a photo-interpretation study will be performed in limited geographical areas to determine the drilling sites having the greatest potential of producing adequate quantities of water. The project anticipates using BRGM (Bureau de Recherches Geologiques et Minières) to supply this analytical service. A waiver permitting sole source procurement of these services and a waiver of the authorized nationality source (code 941) to code 899 are being requested. The justification for these two waivers is that a) no other institution having the authorized nationality is represented or operating in Benin to perform this type of analysis and b) because of the small size of the contract, American companies would not be interested in competing for the contract.

2. Commodities

a. Procurement

Practical experience gained through the last several years of project implementation in various parts of West Africa has shown that the most effective method of procurement of U.S. source project commodities is through the use of a Host Country designated procurement agent based in the U.S. This proven method will be followed for the implementation of this project. It is anticipated that the African-American Procurement Center will act as the procurement agent for the GPRB. The director of the Hydraulics Service in the Ministry of Equipment will be assigned responsibility for commodity procurement and will serve as the principal contact for procurement matters.

Hand pumps, however, will be purchased directly by the GPRB from the manufacturer on a CIF basis under a proprietary procurement waiver. The contract established between the government of Benin and the pump manufacturer will contain a provision requiring the manufacturer/supplier to assure the continued availability of spare parts and components for the makes and models of pumps purchased by the project for the expected operating life of those pumps (an estimated ten years). Such an agreement is deemed necessary considering past experience with an AID water supply project in Benin, where pump parts proved impossible to obtain because of a change in distributorship rights of the model of pump installed by the project. Justification for this proprietary procurement is located in Annex 13.

b. Source and Origin

The authorized source and origin for this project is AID Geographic Code 941 plus the host country. While maximum effort will be made to buy all suitable material and equipment in the U.S., the practicality of the project will necessitate that some of the items be procured from Code 899 source and origin. Two such cases have been identified and requests for waivers from Code 899 are included in the project authorization. One waiver is for the procurement of French and Japanese manufactured mopeds and motorcycles. The second waiver is for spare parts required to maintain the project vehicle fleet (French and British manufactured vehicles) and drilling equipment (as yet undetermined origin). Justification for these waivers is contained in Annex 13 of this Project Paper.

c. Method of Procurement

Procurement of material and equipment will be conducted according to AID Handbook 11. Procurement of equipment and materials undertaken in this project, when the estimated landed cost under a single transaction is less than \$50,000, is exempt from IFB requirements. In such cases, purchases will be conducted on the basis of good commercial practices, and when practical, on the basis of competitive solicitation of offers.

d. Summary of Commodity Procurement Waiver Requirements

1) Waiver permitting the proprietary procurement of approximately 250 Moyno hand pumps, pump accessories, spare parts, and pump maintenance tool kits. The estimated value of commodities procured under this waiver is \$250,000.

2) Waiver from Code 941 source & origin to Code 899 source/origin for mopeds and motorcycles. Eight motorcycles and mopeds will be required by the project health/sanitation and pump maintenance activities and will be procured under a waiver of FAA 631(i) since they are not manufactured in the U.S. The estimated value of commodities procured under the source & origin waiver is estimated to be \$25,000.

3) Waiver from Code 941 source & origin to Code 899 source/origin for spare parts for the project vehicle fleet and project drilling equipment. The estimated value of Code 899 source/origin spare parts required by this project is \$50,000.

G. Project Evaluation

Project evaluation will be a continual process as a part of the project implementation. Programming on-going evaluation mechanisms is especially appropriate for this project because many of the project activities will operate under conditions of uncertainty and will be introducing new concepts and technologies. A continual evaluation process will insure that the project direction will have sufficient flexibility to make modifications as required in order to efficiently attain the goals and objects set forth in this paper.

Quarterly reports and reviews will be held for each activity. The contractor and activity co-directors, provincial chief, and the project manager, will participate in these reviews. The function of the reviews is primarily to monitor the activities progress against the annual work plan and budget. The project manager, project director, UNDP advisor and Hydraulic service representative in the Direction fo Studies and Planning will meet twice annually; once to review and approve project implementation schedules for the or coming year and once toward the end of the operational year reviewing progress to date.

The first evaluation of the project will be scheduled in March 1982, approximately five months after the start-up of project activities. The evaluation will be largely an "in-house" evaluation using project personnel, GPRB personnel and OAR/Lome and/or REDSO staff. The evaluation will determine the rate of progress towards achieving the purposes and outputs of the project and revising, if necessary, implementation plans, arrangements and schedules. If the project is not yet operational or if major implementation problems are apparent, this evaluation team should recommend suspension of the project until it can be properly redesigned.

The evaluation is expected to require a three-person team in addition to contract and GPRB project personnel for approximately two weeks. As the evaluation will utilize only project personnel and AID staff, no funding for this evaluation is contained in the project budget.

A special evaluation will be conducted in May/June 1972 to review the pump maintenance program and the GPRB's capability to continue the proposed maintenance program. The evaluation will specifically address at least the following concerns:

- 1) maintenance requirements of the MOYNO pu
- 2) Financial requirements of the proposed pump maintenance program (will include village input, GPRB financial input,

- and, if necessary, donor input required).
- 3) Personnel requirements of the proposed pump maintenance program. (Success of village training programs, GPRB technicians required, continued donor assistance, etc.)
 - 4) Logistical requirements of proposed pump maintenance program. (Number of outposts required, supply of spare parts and where best located, transportation needs of field technicians, etc.)

This evaluation will require the services of a financial analyst and a rural development specialist with experience in systems analysis for approximately two and three weeks, respectively. Funds for this evaluation have not been included in the project budget. REDSO/WA should have the resident technical capabilities required to undertake the evaluation or contract for such an evaluation using PM and R funds.

An independent project evaluation will be conducted in September/October 1983. This evaluation will focus on an assessment of drilling program completed to date, on the appropriateness of the technologies used to exploit these water resources. The GPRB's progress towards institutionalizing various aspects of the project and finally, whether improved water supplies are being effectively utilized by the local populations. The evaluation will measure progress made toward the project purpose and project goal and determine follow-on assistance that may be required in order to fully meet those objectives. The project evaluation team will also consider the appropriateness of extending the project into other geographical areas not covered during this project. The evaluation team will be comprised of a geophysicist, drilling hydrogeologist and public health specialist for approximately six weeks each. Funding for this evaluation has not been included in the project budget.

The final evaluation is planned approximately nine months after the project assistance completion date. The focus of this evaluation will be primarily the effect of the project on the target population. This evaluation will use project documentation and reports, the AID financed social and economic study undertaken during the early years of this project, and sample surveys of the situation as of the current date (April-May 1985). This final evaluation will require the services of a public health specialist, a rural development specialist, and a hydrogeologist with general management and planning experience for approximately eight weeks.

H. Special Conditions, Covenants and Negotiation Status

1. General

This project has been designed in conjunction with the Beninese technical services which will be responsible for its implementation. The project paper has been discussed in detail with concerned governmental services and the planning and studies divisions of both the ministries of Health and Equipment. The project also has been designed in cooperation with UNDP officials in Benin representing the Capital Development Fund. UN-CDF officials have reviewed the present project outline and will prepare their documentation for approval within the same timeframe as AID. A UNDP consultant has reviewed the project and

suggested minor modifications which for the most part are reflected in this project paper. The UNDP Resident Representative in Benin has requested that copies of the project paper be distributed to the Capital Development Fund in New York for final approval.

The Ministry of Plan of the Government of Benin has followed the design of the project, and with the Hydraulic service, is coordinating various donor activities. All parties of this project are expecting to sign the necessary project agreements.

2. Conditions Precedent

a. As the inputs to be provided by the UNDP-CDF are an integral part of the project (and which are necessary for launching the project), the Grant Agreement between the GPRB and AID will specify that before the first disbursement of funds from this AID grant, the GPRB shall furnish to AID a copy of the agreement executed between the GPRB and UNDP-CDF with evidence that the agreement is fully effective and that any conditions precedent to disbursement have been satisfied.

b. Prior to any disbursement of the grant for equipment and commodities, a joint commodity and equipment procurement plan will be drafted and approved by the GPRB, UN-CDF and AID. The plan will include procurement arrangements, procurement schedules, and detailed specifications of equipment to be procured.

c. The Grant Agreement will stipulated that before the first disbursement of this grant can be made, except those funds contained in the GA for procurement advisory services, the GPRB shall assign a government representative to be responsible for the implementation of the project.

d. The Grant Agreement will stipulate that before the first disbursement of this grant can be made, except those funds contained in the GA for procurement advisory services, the GPRB shall submit with assistance of AID and UNDP technical assistance, a detailed pump maintenance plan indicating the organizational entites responsible for insuring proper pump maintenance, operational plans for assigning adequate personnel to the pump maintenance program, plans for providing adequate funding for the pump maintenance program, and a logistical plan indicating where pumps will be stored and how spare parts will be distributed to villages. AID, on the other hand, recognizes that such a plan will be of a preliminary nature and subject to modification in light of experience gained during the actual implementation of the project.

e. Prior to the obligation of any FY 82 funds which become available, the GPRB shall furnish to AID in form and substance satisfactory to AID, a written plan for the progressive assumption by the cooperating country of the recurring costs of the project for the remaining duration of the project and afterwards.

f. Prior to any disbursement of the grant for the construction of a warehouse and offices for the project, the GPRB will furnish evidence of supervisory arrangements, plans, and specifications, bidding and contractor selection procedures, executed construction contracts, and the availability of

GPRB support sufficient to cover 50% of the construction contracts.

3. Covenants

a. The GPRB agrees that all materials, drilling equipment, commodities and supplies granted to the GPRB by the UNDP-CDF and AID will be assigned to the project management unit to be used for project defined purposes in the specified zones for the duration of the project.

b. The GPRB agrees to provide: expendable drilling materials for forty (40) productive wells during the final two years of the project; ~~15%~~ of the total operational and maintenance costs of the project equipment ~~and materials~~ in the fourth year of the project and 20% in the fifth and final ~~year~~ of the project; and 50% of the construction costs of the three offices and ~~two warehouses~~ required for the project.

c. The GPRB agrees to provide the personnel required by the project (as described in the expanded project description contained as an annex to the grant agreement) to ensure the successful execution of the project.

d. The GPRB agrees to request Peace Corps volunteers as specified in this Project Paper.

e. The GPRB agrees to take measures that will insure women benefit as candidates for training in every category of jobs generated by the project.

BEST AVAILABLE DOCUMENT

PROJECT PAPER ANNEXES

**ANNEX 1
PROJECT DESIGN SUMMARY
LOGICAL FRAMEWORK**

Life Project: 4 years
From FY 79 to FY 82
Total U.S. Funding: \$6,677,000
Date Prepared: 1/6/1979

Project Title & Number: Benin Rural Water Supply and Sanitation 680-0201

NARRATIVE SUMMARY	OBJECTIVELY VERIFIABLE INDICATORS	MEANS OF VERIFICATION	IMPORTANT ASSUMPTIONS
<p>Program or Sector Goal: The broader objective to which this project contributes:</p> <p>To provide means for a qualitative improvement in the health and living conditions of the rural population of Northern Benin.</p>	<p>Measures of Goal Achievement:</p> <ol style="list-style-type: none"> 1. Health improvements: <ol style="list-style-type: none"> a) reduction in water-borne diseases; b) reduction in morbidity and mortality rates; c) increased personal hygiene. 2. Economic improvements: <ol style="list-style-type: none"> a) increased time available for economic activities by rural women; b) urban migration reduced; c) increased time available for agricultural production by rural populations. 3. Social Improvements: <ol style="list-style-type: none"> a) increased time available for instruction of children by rural mothers; b) increased knowledge and understanding of technology by rural people; c) increased level of participation in community development by local populations. 	<ol style="list-style-type: none"> 1. Government of Benin health statistics on rural areas. 2. Government of Benin and donor statistics on rural economic activities and agricultural production. 3. Surveys and in-person observations of rural activities. 	<ol style="list-style-type: none"> 1. The GPRB will continue to place a high priority on providing investments for the development of the rural sector; including rural road infrastructure, agricultural development, rural water supplies, and public health and sanitation education. 2. Rural populations will respond to technological packages introduced to improve the quality of life. 3. Donors will continue to support projects designed to improve the quality of rural life.
<p>Project Purpose:</p> <p>To assist the Government of the Popular Republic of Benin (GPRB) provide rural villages with reliable and safe water supplies and village sanitation.</p>	<p>Conditions that will indicate purpose has been achieved; End of project status:</p> <ol style="list-style-type: none"> 1. GPRB capabilities for project continuation enhanced by: <ol style="list-style-type: none"> a) GPRB agency responsible for development and maintenance of village water systems permanently established 	<ol style="list-style-type: none"> 1. Evaluation of GPRB capabilities to provide rural water supplies and sanitary excreta disposal systems. 	<p>Assumptions for achieving purpose:</p> <ol style="list-style-type: none"> 1. The existence of suitable water sources adjacent to selected villages in sufficient quality and quantity to satisfy local needs.

NARRATIVE SUMMARY	OBJECTIVELY VERIFIABLE INDICATORS	MEANS OF VERIFICATION	IMPORTANT ASSUMPTIONS
	<p>in each of the two northern provinces of Benin;</p> <p>b) GPRB agency has access to technologies required to effectively utilize available water resources of the region.</p> <p>c) Budgetary implications of water supply development known and accepted by the GPRB.</p> <p>2. Rural communities in Northern Benin utilizing and having effective maintenance of water supply and sanitation facilities.</p> <p>3. The existence of a village health education program which is addressed to both school-age children and adults, and concentrates on preventive health measures and sanitary excreta disposal.</p>	<p>2. Surveys and in-person inspection tours of rural villages.</p> <p>3. Ministry of Health and/or Ministry of Education statistics on health education program in rural schools and seminars for villagers conducted at or by rural health dispensaries. The existence of rural health teams operating in villages with new water supply systems.</p>	<p>2. The GPRB will continue to recognize and actively respond to the need for coordination among various governmental organizations at the national, provincial and local levels who are charged with the development and exploitation of water resources.</p> <p>3. The U.S. Government will continue to support rural water supply and sanitation projects, and provide sufficient funding to support project activities at the levels indicated for the life of the project.</p> <p>4. The technologies introduced by this project will be accepted and provide impetus for continuing support by the GPRB and the target population.</p> <p>5. Indiscriminant deposition of human fecal matter increases the potential for contamination of ground and surface water, and this point will be accepted by the target population.</p> <p>6. Village participation can effectively be organized through the village governing council without promise of national compensation.</p>

NARRATIVE SUMMARY	OBJECTIVELY VERIFIABLE INDICATORS	MEANS OF VERIFICATION	IMPORTANT ASSUMPTIONS
<p>Outputs:</p> <p>1. Beninese trained in pertinent aspects of water resources development and management, sanitation and systems maintenance.</p> <p>2. Population educated in advantages of using and maintaining sanitary water supply and excreta disposal facilities.</p> <p>3. Village water supplies developed and improved.</p> <p>4. Sanitary excreta disposal facilities constructed.</p> <p>5. Pump installation and maintenance/repair program established in the project area.</p> <p>6. GPRB organizational structure developed to respond to further project design, execution and monitoring</p>	<p>Magnitude of Outputs:</p> <p>1. 100 Beninese trained (water resources development and management 16; equipment and pump maintenance 28; public health education and sanitation 56).</p> <p>2. Public health/sanitation education carried out in 250 villages and 60 schools where water development program are carried out simultaneously.</p> <p>3. 225 wells and 7 springs developed for safe and reliable water supply.</p> <p>4. Multiple hole public latrines constructed at schools, dispensaries; two-hole slabs for village compounds constructed.</p> <p>5. 225 wells mounted with AID purchased pumps; 400 villagers trained in basic pump maintenance and repair; 9 pump repair and maintenance men trained for major repair and maintenance supervision; At least a three year supply of spare parts retained at pump maintenance and repair centers.</p> <p>6. National, provincial and district offices of the Hydraulic service functioning. Policy and program coordinating bodies functioning at the provincial and national levels.</p>	<p>1. Project statistics and GPRB personnel records.</p> <p>2. Project evaluations.</p> <p>3. In-person observations and project progress reports and evaluations.</p> <p>4. Project statistics, progress reports, evaluations and in-person observations.</p> <p>5. Project statistics, progress report, evaluations and in-person observations.</p> <p>6. Project evaluation, organizational analysis of the GPRB rural project planning and implementation capabilities.</p>	<p>Assumptions for achieving outputs:</p> <p>1. GPRB administrative and financial support will be provided for persons trained to carry out their tasks.</p> <p>2. a) Population is receptive to educational programs in villages and schools; b) GPRB personnel are willing and able to carry out rural village level programs.</p> <p>3. a) Adequate (quantity and quality) water supply is available in the project area; b) Pumps are socially acceptable to local populations.</p> <p>4. a) Latrines are socially acceptable to local populations; b) villagers will cooperate with program to dig pit latrines.</p> <p>5. Villagers and GPRB personnel required for pump maintenance/repair will become available as required by the well installation schedule.</p> <p>6. Donors involved in village water supply projects will actively coordinate project implementation and conform to organizational plans defined by the GPRB.</p>

ANNEX 1
LOGICAL FRAMEWORK - INPUTS
(in \$000)

	<u>FY 1980</u>	<u>FY 1981</u>	<u>FY 1982</u>	<u>Total</u>
		(\$000)		
<u>A.I.D.</u>				
-- Personnel	440	1,415	960	2,815
-- Equipment & Commodities	634	121		755
-- Local Cost	100	245	245	590
-- Training	137	93		230
-- Construction	482	316	219	1,017
-- Contingency	207	544	549	1,300
SUB-TOTAL	\$2,000	\$2,734	\$1,973	\$ 6,707
<u>UNDP/CDF</u>				
-- Personnel	300			300
-- Equipment	1,600			1,600
SUB-TOTAL	\$1,900			\$ 1,900
<u>Peace Corps (U.S.G.)</u>				
-- Personnel		540		540
<u>GPRB</u>				
-- Personnel		765		765
-- Construction		172		172
-- Operations		133		133
-- Training		30		30
-- Contingency		225		225
SUB-TOTAL		\$1,325		\$ 1,325
TOTAL	<u>\$3,900</u>	<u>\$4,599</u>	<u>\$1,973</u>	<u>\$10,472</u>

17. Drilling Program terminates	7/84	GPRB/NWWA
18. Drilling Equipment Reconditioned	8/84	GPRB/NWWA
19. PACD	9/84	OAR
(Final evaluation)	(3/85)	(REDSO/WA/AID/W)

Project Description

ANNEX A.

Benin's rural population considers potable water a scarce and, therefore, precious commodity. Close to 87% of the country's total population inhabits about 300 rural villages. Few of these villages have a reliable and clean water supply. In most villages, women and children must fetch water from hand-dug wells located several miles from the village. The problems surrounding water supplies are most severely felt in the northern provinces where climate and geological conditions make survival difficult. In Benin's two most northern provinces, Borgou and Atacora, daily per capita consumption of water barely attains five liters (WHO's accepted daily minimum is 20 liters per person).

Activities proposed under this project will assist the GPRB implement its National Rural Water Supply Program in the Atacora and Borgou provinces. The project will concentrate on developing the two major types of water resources in northern Benin: springs through captation systems and ground-water aquifers through drilled and dug wells. The water of seven springs will be collected and channeled to neighboring rural villages and provide safe water to some 40,000 persons. In other villages, 225 tubewells will be installed and provide water for a rural population of 55,000.

In addition project inputs directed at the development of the Village Health and Sanitation Program will help improve and expand existing instruction in personal hygiene, the prevention of water-related diseases, and proper excreta disposal to nearly 125,000 rural Beninese.

This program will require investments by AID, Peace Corps, Benin and the United Nations Development Program. A summary of these contributions is provided below:

	<u>FY 1980</u>	<u>FY 1981</u>	<u>FY 1982</u>	<u>TOTAL</u>
		(\$000)		
<u>A.I.D.</u>				
— Personnel	440	1,415	960	2,815
— Equipment & Commodities	634	121		755
— Local Cost	100	245	245	590
— Training	137	93		230
— Construction	482	316	219	1,017
— Contingency	207	544	549	1,300
	SUB-TOTAL	\$2,000	\$2,734	\$1,973*
				\$6,707

* "We will attempt to arrange full LOP funding in FY 80 and FY 81 to avoid a funding request for FY 1982"

	<u>FY 1980</u>	<u>FY 1981</u>	<u>FY 1982</u>	<u>Total</u>
<u>UNDP/CDF</u>				
-- Personnel	300			300
-- Equipment	1,600			1,600
SUB-TOTAL	\$1,900			\$1,900
 <u>Peace Corps (U.S.G.)</u>				
- Personnel		540		540
 <u>GPRB</u>				
-- Personnel		765		765
-- Construction		172		172
-- Operations		133		133
-- Training		30		30
-- Contingency		225		225
SUB-TOTAL		\$1,325		\$1,325
 TOTAL	 \$3,900	 \$4,599	 \$1,973	 \$10,472

The UNDP has allotted \$1.6 million and its Capital Development Fund has allotted \$500,000. However release of UNDP/CDF funds are contingent upon the authorization of the AID project.

The Peace Corps has identified 36 volunteers, and is awaiting AID project authorization.

The GPRB has already allotted money in its budget, appointed counterpart personnel, and began to develop a maintenance plan.

The Ministry of Equipment is responsible for rural water supply policy, planning and implementation. Within this Ministry, the Direction of Hydraulics is the technical service that is charged with carrying out these responsibilities. The Direction of Hydraulics will provide the project director for this Project.

The UNDP policy and program advisor will assist the Direction of Hydraulics in developing an overall rural water supply policy and a long-term plan for a national rural water supply program. The advisor provided by the UNDP will ensure that all donor activities have a compatible approach to the problem of rural water supply development and will ensure coordination between the individual projects.

The AID project manager under a personal services contract will be responsible for managing and supervising all activities implemented with AID provided resources.

Contract teams and their Beninese counterparts assigned to the project will

be responsible for the implementation of project activities with the provincial authorities of the Hydraulic service and the Health Education and Sanitation services.

A project management office will be established for assisting in supervising and monitoring the project's implementation. One person from the Direction of Hydraulics and from the Direction fo Sanitation, plus the AID direct-hire project manager, will staff this office. The AID project manager will supervise and monitor the implementation of the project, and will serve as a liaison between the project and various AID supporting offices such as REDSO/WA. The project management office will be assisted by the project accounting procurement and secretarial offices. In addition to monitoring the project, the project management office will prepare and submit annual project work plans and budget for approval; procurement and commodities and their distribution as needed to the project implementation staff; and preparation of AID implementation orders and evaluation reports.

ANNEX 2
PPT - CPI Descriptions
Benin Rural Water Supply - 680-0201

Event and Description	Month	Office Responsible for Action
1. Signature of AID-GPRB Grant Agreement	1	OAR/GPRB
2. Signature of UN-CDF-GPRB Grant Agreement	1	CPF/GPRB
3. Meeting CPs	2	GPRB/OAR
4. UN-CDF Equipment Orders placed with selected contractors	2	CDF/NWWA
5. AID Equipment Ordered	2	NWWA/OAR REDSO/WA
6. Short Term Third Country Health Training begins	3	OAR/GPRB
7. Contract signed for project technical assistance	3	AID/W/NWWA
8. Long-term Academic training begins in U.S.	5	OAR/GPRB
9. Construction contracts let	3	OAR/GPRB REDSO/WA
10. UN-CDF Equipment arrives	11	CDF/GPRB
11. AID EQUIPMENT ARRIVES	14	GPRB/OAR
12. T.A. team arrives	17	GPRB/NWWA
13. Project Operations begin (all activities)	18	GPRB/NWWA
(first project evaluation)	23	(GPRB/OAR REDSO/WA)
14. Photo interpretation and limited Geographical study of test drillings sites in hard rock area (Banikoara) completed	26	GPRB/NWWA
15. Begin test drilling operation in Banikoara region	29	GPRB/NWWA
(Special evaluation-Pump Maintenance	32	(REDSO/WA)
16. Participants sent for training in U.S. return	38	OAR/GPRB
(Second evaluation)	41	(OAR/REDSO/WA)

ANNEX THREE

PROJECT PROCUREMENT AND IMPLEMENTATION

I. AID PROCUREMENT

A. INSTITUTIONAL CONTRACT FOR TECHNICAL ASSISTANCE

The technical assistance requirements for this project are large, diverse and will require a combination of skills that is not easily found. The project as designed will provide seven technicians for a total of 18.3 person-years. The technical skills required by the project range from public health and sanitation to geophysics. Yet each member of the technical assistance team is linked in the process of finding, developing and utilizing water resources and in the process of training Beninese counterparts whom will eventually assume responsibility for the project. Given the difficult geological conditions of Northern Benin, the project technicians involved in locating and developing water resources must be well versed in methodologies for both hard rock and softer rock formations. In order to pass these same skills on to their Beninese counterparts, the team must have French language capabilities and the personal characteristics required to effectively work with and train national counterparts. The technician charged with developing natural springs will need skills as an engineering geologist in order to judge the geological formations giving rise to the natural springs, to judge its capacity for development and will need skills in civil engineering in order to plan and supervise construction that will enhance the water production of the natural spring and ensure future contamination will be effectively sealed off. The technical skills of the Public Health specialist and the pump maintenance supervisor may be somewhat less exacting, but these technicians will be expected to develop skills among villagers in very traditional and often isolated villages.

The terms of reference for the contract personnel will be prepared and the PIO/T for this technical assistance will be ready for signature by late CY 1980 when funds are available for the technical assistance component of the project. Short descriptions of the qualifications of the American contract positions are contained in the technical annexes to this project paper. The contract for technical assistance will provide the following inputs to the projects:

1 Hydrogeologist (42 pm)	\$ 487,000
1 Mechanical Superintendent (42 pm)	360,000
1 Master Driller (36 pm)	310,000
1 Engineering Geologist (36 pm)	310,000
1 Pump Maintenance Supervisor (24 pm)	170,000
1 Public Health/Sanitation Advisor (36 pm)	255,000
1 Geophysicist (12 pm)	48,000
	<hr/>
Estimated Contract Total:	\$1,940,000

For the Spring Captation component, the contractor will provide an engineering geologist with construction experience. The Engineering Geologist will act as the co-director of the Spring captation component with a Beninese co-director from the Hydraulic Arrondissement of the Hydraulic Service. The contractor will be in charge of the design of appropriate spring captation systems and will supervise the construction of the captation structures. The co-directors of this component will report to the Beninese project director and the AID direct-hire project manager. The co-directors will supervise the Peace Corps Volunteers assigned to this component and the spring captation construction crews. The Engineering Geologist is expected to arrive in Benin during May-June 1981. Construction activities of the spring captation component are expected to start in January 1982.

For the drilled well construction component, the contractor will provide a hydrogeologist, a mechanical superintendent, a master driller, and a pump maintenance supervisor. The drilling hydrogeologist will act as the TA team leader and co-director of the drilled well construction activity. The Beninese component co-director will be

from the Arrondissement of Hydrology of the Hydraulic service. The activity co-directors will report to the Beninese project director and the AID project manager. The pump maintenance supervisor will report to the Regional representative of the Hydraulics Service based in Natitingou and Parakou (Atacora and Borgou provinces respectively). The hydrogeologist and the mechanical superintendent will arrive in country by May 1981 to assist in scheduling the well drilling program in the Borgou Province, and to set up the drilling equipment as it arrives. The master driller and pump maintenance supervisor will arrive several months later when the drilling program is scheduled to begin (September 81). The TA will provide a public health/sanitation advisor to assist in the public health education program envisioned by the project, supervise the implementation of this program and provide coordination between the health education program, the latrine construction program, and the installation of wells and pumps in villages. The incumbent will have professional experience in health related endeavors in West Africa. The public health/sanitation advisor will be the co-director of this component with the health service officer stationed in the Borgou and Atacora provinces. The contractor is expected to arrive in country in July 1981 in order to start the health education/sanitation program in villages where wells will be drilled and springs developed. The short-term geophysicist will arrive in early CY 1982 to assist in planning the test drilling program in the hard rock areas of the project zone. Housing, official vehicles, POL, maintenance and repair costs for project equipment, and project commodities themselves are not included in the contract. These will be supplied to the contractor by the project. The Health/Sanitation advisor, however, will most probably be housed in Parakou where housing can be rented. For this technician, housing costs have been included in the contract.

The project provides \$30,000 in FY-1980 funds for a contract for procurement advisory services. The contract will provide an equipment procurement advisor to review the equipment lists to be purchased by each source of finance, procurement regulation and procedures to be followed by each source of finance and will draw up a list of specifications for the equipment to be purchased by AID which will be compatible with the project equipment to be provided by the UN-CDF.

Efforts must be coordinated with UN-CDF so that the AID contractor can review UN-CDF equipment lists. Ideally, the UN-CDF and AID would jointly co-finance the procurement advisory services contract to provide detailed procurement specifications for the inputs of both donors and also eventually be responsible for the technical assistance team required to operate the project equipment. At this time, however, it is impossible to ascertain that such an arrangement is possible.

B. Personal Services Contracts for Project Management Support.

The project anticipates hiring three third country nationals to provide secretarial/translation, accounting and procurement/logistical services. Each of these contracts to provide services will be for an estimated forty-two months or the operational duration of the project. It is expected that these individuals will be contracted and begin work between October 1981 and February 1982. These three individuals will be supervised by, and will be responsible to, the AID contracted project manager and the Beninese project director. Personal Service Contracts are anticipated for the three positions, however, the project manager may wish to consider the use of host country contracts. Estimated costs of these three personal services are: Secretarial/Translator services, \$70,000; Accounting services, \$90,000; Procurement Assistant, \$260,000.

C. Local Contract for Assistance in the preparation of Training Materials.

Short-term non-personal services contracts will be let for providing assistance in the preparation of training material for the public health education and the well/pump maintenance activities of the project. Assistance provided through this contract(s) will provide assistance in the preparation of training materials, translation and illustration services, and typing and printing of documentation.

The contract(s) will be between the GPRB and a local institution. The project manager should consider the possibility of contracting the printing of the training material in the U.S., if the cost is lower and a suitable printer capable of handling materials in French can be found. Total estimated cost of this contract(s) is \$50,000 during the life of the project.

D. Contract for Photo-Interpretation of Existing Aerial Photos to Determine Well Site Placement.

A short-term non-personal services contract will be let for photo-interpretation of existing aerial photographs in preparation for the test drilling program (25 wells) in the hard rock zone during the second operational year of the project. Assistance provided by this contract will assist the project in determining the test drilling sites. The contract will be between the GPRB and an institution capable of performing the desired analysis. Most probably BRGM will be chosen as the contractor because of its predominate capability in this area. Total estimated cost of the contract is \$15,000. A waiver of code 941 nationality for this contract is being requested.

E. Construction Contract(s).

As the total amount of construction funded by the project is too small to interest American firms, or make it possible for them to recover mobilization costs, it is anticipated that the project funded construction activities will be contracted to a local construction company or companies. The contract(s) will be between the GPRB and local construction companies, and will be awarded on a competitive bidding process. AID will approve contracting procedures, construction plans, and sites.

(1) Construction Contract for Project Housing. As adequate housing does not exist in the project zone, it will be necessary to build four permanent residences for the project technical advisors and their families. Estimated cost per housing unit is \$68,750, and cost of all housing construction is \$275,000. The project manager and the project director may wish to consider the use of pre-fabricated housing available in Nigeria, or procurement of mobile homes in the U.S. for the technicians housing for families. The amount budgeted is sufficient for any of the three options available for technicians housing.

(2) Construction Contract for a Warehouse and Offices. As the Hydraulic Service (DH) does not presently have adequate infrastructure in the project zone, a warehouse will be constructed in which to store expendable drilling supplies, spare parts and maintenance equipment, and tools. To provide the office space needed by project technicians and the pump maintenance program, a small office will be built in Kandi and in Natitingou. To provide the office space needed for the project management staff, a small office will be built adjacent to the current Direction of the Hydraulic Service in Cotonou. For the warehouse and office construction, AID and the GPRB will each contribute 50% of the construction costs. The estimated cost of this construction is \$170,000, of which AID will contribute \$85,000.

F. U.S. Commodity Procurement Contract.

AID financed project commodities having a source of origin within the United States will be procured by a procurement agent under contract with the GPRB. The contract is expected to be a cost plus fixed fee contract with the fee estimated to be ten percent of cost. It is recommended that the Afro-American Purchasing Center (AAPC) be queried as to its interest and ability to provide these services and at what cost. A listing of commodities to be purchased is contained in this annex. The contract for the procurement of U.S. commodities, shipping and fee is estimated to be \$1,125,000.

G. Local Procurement.

A certain number of commodities will be purchased locally by the project. This type of procurement is limited to operational and maintenance costs, local construction materials to be used in the latrines, springs and well construction components of the project, and shelf-item purchases of both U.S. and local origin.

One of the largest expenditures of the project will be for fuel. Fuels will be purchased locally in Benin from the national petroleum product distributor. The contract for fuels will be negotiated as there is only one company involved in fuel distribution. It should be noted, however, that fuel prices in Benin are considerably lower than elsewhere in West Africa. Cement will be negotiated by contract with Benin's National Cement factory. Vehicle maintenance will be handled by the local distributory of the vehicles selected for purchase by UN-CDF on an as-the-need arises basis. The estimated value of direct purchases by the project is \$1,070,000. A detailed listing of commodities to be procured is contained in this annex.

II. Other Donor Procurement

The United Nations Capital Development Fund will provide approximately \$1.5 million for capital equipment need by this project. This fund will be used primarily for the purchase and shipment of the necessary drilling equipment, drilling materials and supplies, and vehicles needed by the project. A detailed listing and specifications listing of the equipment to be provided is contained in this annex.

Equipment and commodities procured by the UN-CDF will be granted to the GPRB with the stipulation that they are for use in a USAID-GPRB joint endeavor in providing sanitary water supplies in Northern Benin. The USAID-GPRB Grant Agreement will stipulate that equipment, vehicles and commodities provided by the UN-CDF will be made available for the duration of AID's activity involvement in this project. The procurement of these commodities will be handled according to the UN-CDF guidelines and USAID will intervene only once the equipment has arrived and is transferred to the GPRB.

III. Host Government Procurement

The GPRB will supply counterpart personnel as needed by the implementation of the project. Most of the needed personnel will be in the civil service of the host country. Unskilled workers will be hired locally as the implementation schedule and work plans require. Payment of temporary workers will be the responsibility of the Beninese activity co-directors. For the payment of temporary employees, GPRB funds will be deposited in an account upon which the activity co-directors can draw funds. Persons having regular civil-service status will be paid through the normal civil service channels.

AID and the GPRB will jointly contribute to the construction of one warehouse and three offices. Construction contracts for this activity will be jointly acceptable to both parties and will be let on a competitive basis.

During the final two years of the project, the GPRB is expected to provide funds for purchasing fuel and drilling supplies needed for the project. Funds to cover these purchases will be put into an account at the beginning of the project's operational year. Purchase of fuels and commodities will be made by the project against this account following procurement regulations of the Direction of Hydraulics.

PROCUREMENT LIST-AID

	Line-Item Sub-total	Category Sub-total	TOTAL COST
A. Contract for Technical Assistance			
1. Hydrogeologist (42 pm)	487,000		
2. Mechanical Superintendent (42 pm)	360,000		
3. Master Driller (36 pm)	310,000		
4. Engineering Geologist (36 pm)	310,000		
5. Pump Maintenance Supervisor (24 pm)	170,000		
6. Public Health/Sanitation Advisor (36pm)	255,000		
7. Geophysicist (4 pm)	48,000		
8. Procurement Advisory Services (3pm)	30,000		30,000*
B. Contracts for Project Management Support			420,000
1. Secretarial/translator services (42 pm)	70,000		
2. Accounting Services (42 pm)	90,000		
3. Procurement Assistant 42 pm)	260,000		
C. Contract for Preparation of Training Materials	50,000		50,000
D. Contract for Photo-Interpretation	15,000		15,000
E. Construction Contracts			360,000
1. Technical Housing (4)	275,000		
2. Warehouse (1)	32,000		
3. Offices (3)	53,000		
F. Contract for Procurement of U.S. Commodities			1,125,000
Commodities		750,000	
1. Flat bed trailers (4)	30,000		
2. 700 gal. fuel tanks trailer mt'd (4)	16,000		
3. Heavy duty trailer house for field use (PortaKamp) (3)	36,000		
4. Moyno Hand Pumps (250)	135,000		
5. Single side band radios (8)	8,000		
6. Water Analysis Kits (Hach Chemical Co. model DR L/z w/conductivity) (8)	10,000		
7. Gravity <u>Resistivity</u> meter (1)	25,000		
8. Electrical resistivity meter (1)	15,000		
9. Seismograph (1)	10,000		
10. Borehole Geophysical Logger (1)	25,000		
11. Miller D-5 Welder (1)	7,000		
12. Field light generator, 4.5 kw (1)	10,000		
13. Generators, 25 kw (3)	60,000		
14. Shop Air Compressor (1)	10,000		
15. Shop welding equipment	6,250		
16. Shop tire and wheel repair equipment	2,300		
17. General shop equipment	24,900		
18. Automatic shop tools	4,600		

* This item may or may not be part of the contract for project technical assistance.

PROCUREMENT LIST-AID

	Line-Item Sub-total	Category Sub-total	TOTAL COST
19. Office Supplies	7,350		
20. Construction hand tools	35,000		
21. Pump drop pipe	45,000		
22. Portable training material	5,000		
23. Audio-Visual training equipment	15,000		
24. Pump maintenance sets (300)	18,000		
25. Set of home furnishings (6)	120,000 *		
26. Office furniture sets (8)	20,000		
27. Office equipment sets (8)	12,000		
28. Draftsman's office furnishing (1)	3,000		
29. Storage bins, steel	6,000		
30. Storage shelves	4,000		
31. Safes (2)	3,000		
32. Water distribution valves/fittings	4,000		
33. Steel water distribution pipe	28,000		
Shipping 40%		300,000	
Fee 10%		75,000	
G. Non-U.S. Commodity Procurement (probable source code)		585,000	1,070,000
Mobylettes (12) (899)	9,000		
Motorcycles (8) (899)	12,000		
Cement 1350 Local	120,000		
Reinforcing steel(941)	80,000		
Roofing material Local	15,000		
Lumber Local	25,000		
Steel plates, covers, frames 941	25,000		
Well construction materials 941/shelf	35,000		
Water distribution pipe 941	190,000		
3,000 litre fuel tanks (2) 941-Nigeria	10,000		
Photo copy machine (2) shelf	4,000		
Local shipping of construction materials	60,000		
H. Operational Costs		485,000	
Fuel/Lubricants (800,000 litres)	270,000		
Spare Parts (899)	50,000		
Vehicle/Equipment maintenance (labor)	140,000		
Office supplies	20,000		
Training supplies and material	15,000		
I. Other Costs			1,432,000
Contingency for non-contract local construction	132,000		
Contingency	408,000		
Inflation	892,000		

* Both housing and furnishings will be added to the technical assistance contract.

UNITED NATIONS CAPITAL DEVELOPMENT FUND

Procurement List.

<u>Equipment*</u>	<u>Estimated Cost</u>
1. Failing 1250 mud/air rotary mounted with basic accessories (1)	\$ 170,000
2. TRW Mission Hammers (2)	10,000
3. 5-ton 4X4 truck with 1200 gal. water tank and pumps (1)	50,000
4. 4X4 Pick-ups, heavy duty with front mounted winches (Landrover) (3)	45,000
5. 2X4 pick-ups (Purgot 404 bachés) (4)	32,000
6. 5-ton Flat bed truck with winches and pump hoist	40,000
7. Misc. Camping equipment sufficient for 10 persons	35,000
8. Extra drill stem 400' 2-7/8" IF	5,000
9. Well casing for approximately 150 wells. Bulk of order will be for PVC casing.	100,000
10. Well screens (quantity sufficient for 150 wells)	35,000
11. Tricone drilling bits (200)	60,000
12. Mission Hammer bits (24)	20,000
13. Ditch Witch self-propelled Trencher (1)	30,000
14. I-R Air Compressor (2)	20,000
15. I-R Air Hammers (2)	12,000
16. I-R Air Drills (2)	12,000
17. Cement Mixers (Portable) (2), with diesel engine	10,000
18. 5-ton Dump truck, with front mounted winch	40,000

UN-CDF Procurement List (continued)

<u>Equipment*</u>	<u>Estimated Cost</u>
19. 4X4 Heavy Duty Land Rover Pick-up, with front mounted winch (2)	30,000
20. 2X4 Peugeot 404 baché pick-up (1)	8,000
21. 4X4 Heavy Duty Land Rover Pick-up, with 220V adapter on electrical system (2)	30,000
22. 2X4 Peugeot 404 baché pick-up (1)	8,000
23. Spare parts (25% of equipment costs)	201,000
24. Shipping (30% of equipment costs)	301,000
25. Contingency (15% of estimated Equipment costs)	.96,000
TOTAL:	<hr/> \$1, 00,000

* - Specific brand names are shown for illustrative purposes only. The actual name brand purchased will depend on international competitive bidding by interested equipment manufacturers and suppliers. However, the specification required for the equipment will closely approximate the name brands noted in the above listing.

GOVERNMENT OF THE PEOPLE'S REPUBLIC OF BENIN

PROCUREMENT LIST

A. Personnel (Salaried)

<u>Number of Persons</u>	<u>Position Title</u>	<u>Person/Years</u>	<u>Estimated Cost</u>
1	Project Director	4	\$ 24,000
2	Assistant Project Managers	8	36,000
2	Provincial Hydraulic Chiefs	6	27,000
1	Hydrogeologist (counterpart)	3	13,000
3	Project Office Staff	9	12,000
2	Drilling Rig Operators	6	18,000
2	Assistant Drillers	6	18,000
1	Vehicle Mechanic	3	6,000
1	Drilling Equipment Mechanic	3	9,000
1	Welder	3	6,000
1	Electrician	3	6,000
4	Laborers (full-time)	12	15,000
	Temporary Laborers		37,000
1	Pump Installation Supervisor	3	9,000
3	Pump Mechanics	9	16,000
1	Mason	3	6,000
2	Laborers (full-time)	6	7,500
2	Pump Maintenance Trainers	6	12,000
2	Warehousemen	6	12,000
5	Chauffeurs	15	18,000
1	Engineering Geologist (Counterpart)	3	12,000
1	Surveyor	3	7,000
1	Surveyor's Aide	3	3,500
1	Draftsman	3	6,000
2	Construction Foreman	6	12,000
10	Construction Workers	30	36,000
1	Equipment Mechanic	3	9,000
2	Provincial Health Directors	3	30,000
2	Provincial Sanitation Officers	6	21,000
2	Provincial Health Education Officers	6	27,000
6	Health Education Trainers	18	36,000
10	District Sanitation Agents	20	36,000
15	Village Animatrices	30	36,000
2	Latrine Construction Supervisors	6	12,000
8	Construction Workers (Latrines)	24	30,000
2	Health Office Staff	6	9,000
	Trainees	30	135,000
	Sub-total Salaried Personnel		\$765,000

GOVERNMENT OF THE PEOPLE'S REPUBLIC OF BENIN

PROCUREMENT LIST (Continued)

B. Non-Salaried Personnel

Activity	Approximate Person/Years	Estimated Value of Volunteer Force
Village Health Volunteers	120 p/yrs	\$108,000
Village Latrine Construction*		20,000
Village Spring Captation Construction**		32,000
Village Pump Maintenance Volunteers	185 p/yrs	166,000
	Sub-total Non-Salaried Personnel	\$326,000

* - Calculated at donated labor input of \$20.00 per latrine for the probable 1,000 latrines to be constructed for village households.

** - Calculated at a volunteer labor force of 10 persons during the duration of the construction activity (6 mos. for 7 springs).

GOVERNMENT OF THE PEOPLE'S REPUBLIC OF BENIN

PROCUREMENT LIST (Continued)

	<u>Estimated Cost</u>
C.	
Fuel/Lubricants	\$ 50,000
Vehicle/Equipment maintenance and repair	25,000
Office Utilities	12,000
Office equipment and supplies	6,000
Well construction materials	20,000
Aerial Photographs	5,000
Sub-total	108,000
D. In-country Training	
Non-formal Educational Training	15,000
Formal Academic Training	30,000
Sub-total	\$ 45,000
E. Construction Costs	
Office/Warehouse Construction Contracts	85,000
Construction Material for Spring Captation (sand, gravel, etc.)	50,000
Construction Material for Latrine Construction (cement, sand, gravel, etc.)	19,000
Construction Material for Wells	18,000
Sub-total	\$172,000
F. Contingency and Inflation	Sub-Total
	\$225,000
TOTAL (GPRB)	<u>\$1,325,000*</u>

* - Total does not include estimates of village labor for the project - (B. Non-Salaried Personnel).

MISSING PAGE
NO. 62

INITIAL ENVIRONMENTAL EXAMINATION

Project Location: ATACORA and BORGOU Provinces
République Populaire du Bénin

Project Title: Benin Rural Water Supply Project

Funding: FY 1979
LOP - \$6,677,000

I E E Prepared By: Murl Baker, USAID/Niger

Environmental Action Recommended: A negative determination. No further environmental action is required.

Concurrence: _____ Date: 7-1-79
Herbert L. Woods
AID Affairs Officer, Cotonou, Benin

_____ Date: 7-1-79
John Lundgren, OAR
Lome, Togo

Assistant Administrator's Decision:

Approve: [Signature] Date: 6/20/80
Disapprove: _____ Date: _____

I. Examination of Nature, Scope and Magnitude of Environmental Impacts

The proposed project for the development of rural water supplies and environmental sanitation in the Northern two provinces of Benin will have minimal impact on both the physical and social environments of the project zone. The project will develop 6-7 natural springs in the project zone, will be introducing drilled wells on a relatively new technology for the withdrawal of water supplies, namely pumps, which will improve both the quantity and quality of water available, and will change through education programs, personal hygiene habits regarding excreta disposal and village sanitation.

A. Description of the Project: The project is located in the Northernmost provinces of Benin which are predominately small rural areas important for their agricultural production. The project will assist the GPRB to provide rural villages with reliable and safe supplies of water and village sanitation facilities. The project has essentially two major aspects both of which support existing governmental services and programs. The first aspect of the project concerns the development of sub-surface water resources (and maintaining these facilities) for human consumption. The second aspect of the project concerns providing villagers with information and sanitation facilities thus permitting them to improve general health conditions in the villages. These two aspects of the project will be implemented together and will be coordinated at the village, district, provincial and national levels. This joint implementation and coordination at all levels of the project is necessary in order to insure that sanitary water supplies provided by the project are properly used and maintained and will have a substantial impact of improving the rural village health.

The project will concentrate on training Beninese in techniques of water resources development, pump installation, operations and maintenance, health and sanitation education, and latrine construction. In addition to giving individuals the technical skills required to continue the project activities, an integral part of the training process will be to develop coordinating linkages between health institutions and water resources development institutions. The primary objective of the project is to train people and as a result, the amount of tangible facilities implanted by the project will be a function of the training program rather than a primary objective. Thus in case of conflicting objectives, the training of Beninese counterparts will supersede the installation of a target number of facilities.

1. Water Resources Development

will

a) Natural Spring Captation: The project/develop 6-7 natural springs in the project area to provide sanitary water supplies to villages existing in close proximity of these springs. These springs are currently

2. Health Education and Sanitation

The project will provide the equipment, operating costs and personnel to implement a village health education program and construct latrines for private and public use. The health education program is designed to teach villagers about the personal and community benefits of utilizing the newly developed water resources and latrines. Many water supply and environmental sanitation projects have failed in the past because of the lack of motivation through education and understanding which results in only superficial and intermittent usage of the facilities by the intended beneficiaries. The public health education component of this project will utilize formal health training programs in public schools and adult non-formal education techniques. Community participation in the health effort will be stimulated by the training of persons from the villages and integrating the existing traditional health beliefs, treatments and habits with accepted public health principles. The health and sanitation education programs will be integrated into the existing basic health service delivery systems. Latrines will be provided for schools and dispensaries in villages where wells will be located. The project will also experiment with providing public latrines in villages organized to maintain these facilities and compound latrines in other villages. Coordinating linkages will be established by the project to insure that future rural supply projects which are justified on the basis of health improvements will actually promote better health.

3. AID Resources for the Project

To carry out the activities described above, approximately 18 person/years of AID financed technical assistance will be provided over the four year life of the project. In addition, Peace Corps Volunteers will be used to assist in the implementation of the project. Two PCVs will assist in the spring captation activity; two PCVs will assist in pump maintenance and repair; and, four PCVs will assist in the health education and village sanitation activity. AID will provide \$875,000 for the purchase of equipment, \$1.3 million for construction, and \$600,000 for operational costs. Total AID inputs cost into the project are estimated to be \$6,677,000 for the life of the project.

B. Identification and Evaluation of Environmental Impacts

The potential areas for environmental impact are few with the impact being limited. The highest potential for a negative impact is groundwater contamination if there is improper placement of the pit latrines constructed for the disposal of excreta. With the provision of technical assistance, supervision and training, the project will minimize this potential. A second potential for a negative impact is contamination of spring sources by people defecating in the immediate area of the spring source. The structures built to captate the spring

should eliminate this potential and the latrines constructed in the village should assure proper excreta disposal.

Water, a national resource, will of course be extracted. The impact of this will be negligible in that the rate of withdrawal will not exceed the recharge rate of the aquifer. The rate of extraction of the water resources will be minimal compared to the overall dynamics of the recharge system as long as hand pumps are used on the wells. Again, the hydrogeological research, technical assistance and training will be provided to assure proper placement of the wells and an appropriate extraction rate of groundwater resources.

There are expected to be socio-economic changes and modifications of current cultural practices. Out-migration could be reduced as adequate water supplies will make living conditions more attractive in the project zone. This may result in a slight increase in the project zone's population. It is doubtful that adequate water supplies will encourage in-migration. Easing the tedious demands of water collection will allow more time to be devoted to other economic and social pursuits, especially for women. Cultural practices are expected to change with the introduction of a health education program and sanitary excreta disposal facilities. The cultural practices to be introduced, if accepted, will result in a positive impact on the health of the project beneficiaries.

II. Recommendation for Environmental Action

The project will not have significant effects on either the physical or social environments. It is recommended, therefore, that a Negative Determination is appropriate as the Threshold Decision, and no further environmental action is needed. This recommendation is based upon the impact evaluation and discussion attached.

Discussion of Possible Impacts

A. Landuse

1. Changing the character of the land through:

a. Increasing the population of people or animals in an area of

Because/reliable sources of water throughout the year in the project area, seasonal outmigration of people should be stabilized or reduced. This could result in slight increases in population.

The wells to be developed are to provide sufficient water for domestic uses (approximately 20L/person/day). They will not have sufficient flows to water large numbers of animals and, thus, no increase in the domestic animal population is anticipated.

b. Extracting natural resources such as minerals or water

The rural water supply project will exploit limited quantities of ground water. The wells, equipped with manual pumps, will be capable of withdrawing water at a rate of approximately 1 M³/hr/well. The criteria for acceptance of each well is to be established at the same rate, so that discharge will be less than aquifer recharge within the zone of influence created by the pump.

c. Land Clearing

No land will be cleared by the project other than that immediately around the wells. No impact on the environment should be anticipated.

d. Changing the character of the soil

There will be no disturbing of the soil other than that required to drill the wells.

2. Altering some of the significant natural defenses provided by an area

There will be no natural defenses altered or disturbed.

3. Foreclosing important and perhaps better uses of the land

There will be none as the land will not be significantly disturbed.

4. Jeopardizing man or his works because either is put into a zone of potential disaster

This will not happen.

B. Water Quality

1. Changing the physical state of the water

2. Changing the chemical or biological states of the water

The geological conditions in the project area consist of highly fractured rocks at or near the surface. Because of these physical characteristics, the groundwater travels at very high velocities. Any contaminant placed at the ground surface will probably migrate to a point of discharge, e.g., well, shallow spring, or stream, within a short period of time.

The pits for latrines have the potential for contaminating the ground water if they are located within these fractured rocks, and are not constructed of reinforced concrete to prevent vertical or horizontal leakage into the aquifer. The collection of excreta creates a point discharge, whereas without disposal facilities there is a non-point discharge. The location and type of latrine construction will be specified by the project hydrogeologist after the borehole is drilled at each site to minimize the impact.

3. Changing the ecological balance of a water body, thereby changing its chemical and biological balance

No body of water will be disturbed. Well discharge will be less than aquifer recharge.

C. Atmospheric

There will be no air additives used in the project, nor will there be any air pollution or noise pollution caused as the pumps installed will be manual.

D. Natural Resources

1. Diversion, storage or increased use of water

Increased availabilities of water is a major purpose of the project, thus there will be an increased use of water. As

previously stated, however, well criteria will be established such that well discharge will no more than equal aquifer recharge.

2. Irreversible or inefficient commitments of natural resources

The natural resource to draw on, water, is "renewable" in that there is aquifer recharge. Thus there will be no irreversible or inefficient commitments of natural resources.

E. Cultural

1. Altering or destroying important physical symbols of a ~~culture~~

No physical symbols will be altered or destroyed. With ~~village~~ leaders participating in the decision making process for the placement of wells, any potential disturbing of sacred areas will be avoided.

2. Dilution of cultural traditions

No cultural traditions will be diluted though certain changes in cultural practices will be required. Care will be taken to avoid taboos such as those against common disposal of body wastes from males and females.

F. Socioeconomic

1. Changes in patterns of economic growth and employment

These will be little if any effect on the existing patterns of employment in the project. The assured availability of water may moderate out migration, the easing of water collection may provide more time for other economic activities, especially for women and/or children.

2. Movement, resettlement or changes in population

As previously stated, out migration from the project area may moderate and result in a natural slight increase in the local population. Sites or areas where wells are installed and equipped with pumps will be capable of providing water during the dry season, whereas little or no water has been available at that time of year in the past. There does exist a slight potential for temporary gatherings or clusterings of people during extreme drought conditions.

3. Changes in cultural patterns that could affect socioeconomic patterns.

The purposes of the project is to provide a more adequate and sanitary water supply to a rural population, and to improve hygienic practices through proper disposal of human excreta. This will require certain changes in cultural practices such as drawing water from a well with a pump, rather than from a stream, and sanitary excreta disposal as opposed to open, though private, disposal. With the adoption of these practices, economic, or leisure time activities could be increased as time required for gathering water or recovering from illnesses is reduced.

G. Health

1. Altering or destroying a natural environment.

No natural environment will be disturbed by the project which could cause an impact.

2. Eliminating an element in an eco-system.

The ecosystem will not be disturbed.

3. Other factors.

Though difficult to quantify, it is generally accepted that an adequate safe water supply reduces disease incidence. Combined with health education and sanitary excreta disposal, morbidity and mortality rates should be reduced which could have a moderate impact in other project area activities, such as economic activities for adults and time for schooling for children.

H. General

The project will have no direct or indirect international impacts. It is totally localized within Benin. The only controversial impacts which could arise would be local and be more concerned with required changes in certain cultural practices, which are desirable. Though part of a general country program for the development of rural water supplies supported by other donors, the AID program can be assessed on its own without larger program impacts.

IMPACT IDENTIFICATION AND EVALUATION FORM

Impact Areas and Sub-areas

Impact
Identification
and Evaluation 1/

A. LAND USE

- | | |
|---|----------|
| 1. Changing the character of the land through | |
| a. Increasing the population----- | <u>L</u> |
| b. Extracting natural resources ----- | <u>L</u> |
| c. Land clearing ----- | <u>N</u> |
| d. Changing soil character----- | <u>N</u> |
| 2. Altering natural defenses----- | <u>N</u> |
| 3. Foreclosing important uses----- | <u>N</u> |
| 4. Jeopardizing man or his works----- | <u>N</u> |

B. WATER QUALITY

- | | |
|--|--------------------|
| 1. Physical state of water----- | <u>Potential M</u> |
| 2. Chemical and biological states----- | <u>Potential M</u> |
| 3. Ecological balance----- | <u>N</u> |

1/ Use of the following symbols:

- N - No environmental impact
L - Little environmental impact
M - Moderate environmental impact
H - High environmental impact
U - Unknown environmental impact

IMPACT IDENTIFICATION AND EVALUATION FORM

C. ATMOSPHERIC

- | | |
|-------------------------|----------|
| 1. Air additives----- | <u>N</u> |
| 2. Air pollution----- | <u>N</u> |
| 3. Noise pollution----- | <u>N</u> |

D. NATURAL RESOURCES

- | | |
|---|----------|
| 1. Diversion, altered use of water----- | <u>L</u> |
| 2. Irreversible, inefficient commitments----- | <u>N</u> |

E. CULTURAL

- | | |
|---|----------|
| 1. Altering physical symbols----- | <u>N</u> |
| 2. Dilution of cultural traditions----- | <u>N</u> |

F. SOCIOECONOMIC

- | | |
|---|------------|
| 1. Changes in economic/employment patterns----- | <u>L</u> |
| 2. Changes in population----- | <u>L</u> |
| 3. Changes in cultural patterns----- | <u>L-M</u> |

G. HEALTH

- | | |
|--|----------|
| 1. Changing a natural environment----- | <u>N</u> |
| 2. Eliminating an ecosystem element----- | <u>N</u> |
| 3. Other factors | |
| <u>Improved health through provision of adequate</u> | |
| <u>safe water supplies'</u> | <u>M</u> |

H. GENERAL

1. International impacts-----	<u>N</u>
2. Controversial impacts-----	<u>N</u>
3. Larger program impacts-----	<u>N</u>
4. Other factors	
-----	-----
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AID HANDBOOK 3, App 5C Part I	TRANS. ITEM NO. 3:22	EFFECTIVE DATE April 12, 1978	PAGE NO. 5C(1)-1
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(This checklist has been updated to conform with deletions/additions for FY 1980
5C(1) - COUNTRY CHECKLIST)

Listed below are, first, statutory criteria applicable generally to FAA funds, and then criteria applicable to individual fund sources: Development Assistance and Security Supporting Assistance funds.

1. GENERAL CRITERIA FOR COUNTRY

1. ~~Has it been demonstrated that assistance will directly benefit the people of the recipient country, has the Secretary of State determined that this assistance is consistent with the national interest, and has the Secretary of State determined that this assistance is consistent with the national interest?~~ Yes, it can be demonstrated that assistance provided by this project will benefit the needy. There are no major violations of Human Rights in Benin.
2. FAA Sec. 481. Has it been determined that the government of recipient country has failed to take adequate steps to prevent narcotics drugs and other controlled substances (as defined by the Comprehensive Drug Abuse Prevention and Control Act of 1970) produced or processed, in whole or in part, in such country, or transported through such country, from being sold illegally within the jurisdiction of such country to U.S. Government personnel or their dependents, or from entering the U.S. unlawfully? No.
3. FAA Sec. 620(b). If assistance is to a government, has the Secretary of State determined that it is not controlled by the international Communist movement? Yes, the Secretary of State has determined that the People's Republic of Benin is not controlled by the international Communist movement.
4. FAA Sec. 620(c). If assistance is to government, is the government liable as debtor or unconditional guarantor on any debt to a U.S. citizen for goods or services furnished or ordered where (a) such citizen has exhausted available legal remedies and (b) debt is not denied or contested by such government? No.
5. FAA Sec. 620(e) (1). If assistance is to a government, has it (including government agencies or subdivisions) taken any action which has the effect of nationalizing, expropriating, or otherwise seizing ownership or control of property of U.S. citizens or entities beneficially owned by them without taking steps to discharge obligations toward such citizens or ~~entities~~? No.

6. FAA Sec. 620(a), 620(f); App. Sec. 10B, 114. Is recipient country a Communist country? Will assistance be provided to the Socialist Republic of Vietnam, Cambodia, Laos, Cuba, Afghanistan, Mozambique, or Angola?
- No, the Government of the Peoples Republic of Benin (GPRB) espouses a marxist/leninist ideology and accepts both military and economic aid from socialist countries but is not a Communist nor is it controlled by the international Communist movement.
7. FAA Sec. 620(i). Is recipient country in any way involved in (a) subversion of, or military aggression against, the United States or any country receiving U.S. assistance, or (b) the planning of such subversion or aggression?
- (a) No.
(b) Not known.
8. FAA Sec. 620(j). Has the country permitted, or failed to take adequate measures to prevent, the damage or destruction, by mob action, of U.S. property?
- No.
7. FAA Sec. 620(l). If the country has failed to institute the investment guaranty program for the specific risks of expropriation, inconvertibility or confiscation, has the AID Administrator within the past year considered denying assistance to such government for this reason?
- No.
10. FAA Sec. 620(o); Fishermen's Protective Act, Sec. 5. If country has seized, or imposed any penalty or sanction against, any U.S. fishing activities in international waters,
- N/A.
- a. has any deduction required by Fishermen's Protective Act been made?
- b. has complete denial of assistance been considered by AID Administrator?
11. FAA Sec. 620; FY 80 App. Act Sec. [518.] (a) Is the government of the recipient country in default for more than six months on interest or principal of any AID loan to the country? (b) Is country in default exceeding one year on interest or principal on U.S. loan under program for which App. Act appropriates funds?
12. FAA Sec. 620(s). If contemplated assistance is development loan or from Economic Support Fund, has the Administrator taken into account the percentage of the country's budget which is for military expenditures, the amount of foreign exchange spent on military equipment and the amount spent for the purchase of sophisticated weapons systems? (An affirmative answer may refer to the record of the annual "Taking Into Consideration" memo: "Yes, taken into account by the Administrator at time of approval of Agency OYB." This approval by the Administrator of the Operational Year Budget can be the basis for an affirmative answer during the fiscal year unless significant changes in circumstances occur.)

13. FAA Sec. 620(t). Has the country severed diplomatic relations with the United States? If so, have they been resumed and have new bilateral assistance agreements been negotiated and entered into since such resumption? No.
14. FAA Sec. 620(u). What is the status of the country's U.N. obligations? If the country is in arrears, were such arrearages taken into account by the AID Administrator in determining the current AID Operational Year Budget? Benin is not in arrears
15. FAA Sec. 620A, sec. 521. Has the country granted sanctuary from prosecution to any individual or group which has committed an act of international terrorism? no
16. FAA Sec. 666. Does the country object, on basis of race, religion, national origin or sex, to the presence of any officer or employee of the U.S. there to carry out economic development program under FAA? No.
17. FAA Sec. 669, 670. Has the country, after August 3, 1977, delivered or received nuclear enrichment or reprocessing equipment, materials, or technology, without specified arrangements or safeguards? Has it detonated a nuclear device after August 3, 1977 although not a "nuclear-weapon State" under the nonproliferation treaty? No.

B. FUNDING CRITERIA FOR COUNTRY

1. Development Assistance Country Criteria

a. FAA Sec. 102(c)(4): Have criteria been established, and taken into account, to assess commitment and progress of country in effectively involving the poor in development, on such indexes as: (1) small-farm labor intensive agriculture, (2) reduced infant mortality, (3) population growth, (4) equality of income distribution, and (5) unemployment,

While no specific criteria have been established for such indexes, the current Benin development plan focuses on increased food production, improved rural health and improved equality of income distribution.

o. FAA Sec. 104(d)(1). If appropriate, is this development (including Sahel) activity designed to build motivation for smaller families in programs such as education in and out of school, nutrition, disease control, maternal and child health services, agricultural production, rural development, and assistance to urban poor?

The public health education component of this project will deal with nutrition, disease control and maternal and child health care. In Benin, some introduction of family planning is usually incorporated into such public health education efforts. The instructors will certainly have limited training in addressing this subject. However, the population in the project zone is predominately Moslem and may not be generally receptive to public discussions of family planning.

2. Security Supporting Assistance Country Criteria

a. FAA Sec. 502B. Has the country engaged in a consistent pattern of gross violations of internationally recognized human rights? Is program in accordance with policy of this Section?

N/A

c. FAA Sec. 533(b). Will assistance under the Southern African Special Requirements fund be provided to Mozambique, Angola, Tanzania, or Zambia? If so, has President determined (and reported to the Congress) that such assistance will further U.S. foreign policy interests?

N/A

d. FAA Sec. 609. If commodities are to be granted so that sale proceeds will accrue to the recipient country, have Special Account (counterpart) arrangements been made?

N/A

e. App. Sec. 510. Will security assistance be provided for the purpose of aiding directly the efforts of the government of such country to repress the legitimate rights of the population of such country contrary to the Universal Declaration of Human Rights?

N/A

f. FAA Sec. 620B. Will security supporting assistance be furnished to Argentina or Chile.

5C(2) - PROJECT CHECKLIST

Listed below are, first, statutory criteria applicable generally to projects with FAA funds, and then project criteria applicable to individual fund sources: Development Assistance (with a sub category for criteria applicable only to loans); and Security Supporting Assistance funds.

CROSS REFERENCES: IS COUNTRY CHECKLIST UP TO DATE? IDENTIFY. HAS STANDARD ITEM CHECKLIST BEEN REVIEWED FOR THIS PROJECT?

A. GENERAL CRITERIA FOR PROJECT.

1. App. Unnumbered; FAA Sec. 653(b); Sec. 634A

(a) Describe how Committees on Appropriations of Senate and House have been or will be notified concerning the project;
(b) is assistance within (Operational Year Budget) country or international organization allocation reported to Congress (or not more than \$1 million over that figure

Special Notification required.

2. FAA Sec. 611(a)(1). Prior to obligation in excess of \$100,000, will there be (a) engineering, financial, and other plans necessary to carry out the assistance and (b) a reasonably firm estimate of the cost to the U.S. of the assistance?

This requirement has been met as part of the project design process. Please refer to Annex 6.

3. FAA Sec. 611(a)(2). If further legislative action is required within recipient country, what is basis for reasonable expectation that such action will be completed in time to permit orderly accomplishment of purpose of the assistance?

No further legislative action is required on the part of the host country.

4. FAA Sec. 611(b); App. Sec. 501. If for water or water-related land resource construction, has project met the standards and criteria as per *the Principles and Standards for Planning Water and Related Land Resources dated October 25, 1973?*

To the extent applicable, the intent of 611 (b) has been met - see parts II and III with data concerning economic, social, and environmental analysis

5. FAA Sec. 611(e). If project is capital assistance (e.g., construction), and all U.S. assistance for it will exceed \$1 million, has Mission Director certified the country's capability effectively to maintain and utilize the project?

Mission Director has certified host country's capability. See Annex 7.

6. FAA Sec. 209. Is project susceptible of execution as part of regional or multi-lateral project? If so why is project not so executed? Information and conclusion whether assistance will encourage regional development programs.

The United Nations Development Program, The United Nations Capital Development Fund, and AID are combining inputs with the GPRB for the project. Specific geological conditions and political factors require that the project not be implemented as a regional activity.

Part I

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7. FAA Sec. 601(a); Information and conclusions whether project will encourage efforts of the country to: (a) increase the flow of international trade; (b) foster private initiative and competition; (c) encourage development and use of cooperatives, credit unions, and savings and loan associations; (d) discourage monopolistic practices; (e) improve technical efficiency of industry, agriculture and commerce; and (f) strengthen free labor unions.
- This project was designed to improve the most basic living conditions of rural people in isolated areas of Benin. The project will most likely encourage the development of rudimentary cooperatives in rural areas, especially for pump maintenance and repair. The impact of the project on other concerns mentioned will most likely be very marginal.
8. FAA Sec. 601(b). Information and conclusion on how project will encourage U.S. private trade and investment abroad and encourage private U.S. participation in foreign assistance programs (including use of private trade channels and the services of U.S. private enterprise).
- Commodity procurement for the project will have their source and origin in the U.S. to the maximum extent possible.
9. FAA Sec. 612(b); Sec. 636(h). Describe steps taken to assure that, to the maximum extent possible, the country is contributing local currencies to meet the cost of contractual and other services, and foreign currencies owned by the U.S. are utilized to meet the cost of contractual and other services.
- The GFRB will provide the major part of the personnel required for the project; and increasing proportion of the operating cost of the project; and, 50 percent of the construction costs of project warehouse and offices.
10. FAA Sec. 612(d). Does the U.S. own excess foreign currency and, if so, what arrangements have been made for its release?
- No. U.S. does not own excess foreign currency.
11. FAA Sec. 601(e). Will the project utilize competitive selection procedures for the awarding of contracts, except where applicable procurement rules allow otherwise?
12. FY 80 App. Act Sec. [521.] If assistance is for the production of any commodity for export, is the commodity likely to be in surplus on world markets at the time the resulting productive capacity becomes operative, and is such assistance likely to cause substantial injury to U.S. producers of the same, similar or competing commodity?

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B. FUNDING CRITERIA FOR PROJECT

1. Development Assistance Project Criteria

a. FAA Sec. 102(b); Sec. 111; Sec. 281a.

Extent to which activity will (a) effectively involve the poor in development, by extending access to economy at local level, increasing labor-intensive production, spreading investment out from cities to small towns and rural areas; and (b) help develop cooperatives, especially by technical assistance, to assist rural and urban poor to help themselves toward better life, and otherwise encourage democratic private and local governmental institutions?

(a) A major GPRB policy is mobilize their own human resources for the country's development. In the spirit of that policy, the project will develop and support village health volunteers, village pump maintenance, and repair volunteers, and mobilize villagers to assist in constructing their own water distribution systems (spring captation) and latrines. The GPRB policy of providing rural villages with free or subsidized water rates is in effect redistributing investment in the rural sector and out of the urban sector.

(b) A second major local policy of the GPRB is the formation of revolutionary councils on an elected basis which provide the basis for a participatory democracy and structures which can mobilize grass root participation in development efforts.

Part I

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B1

b. FAA Sec. 103, 103A, 104, 105, 106, 107. Is assistance being made available: [Include only applicable paragraph -- e.g., a, b, etc. -- which corresponds to source of funds used. If more than one fund source is used for project, include relevant paragraph for each fund source.]

(1) [103] for agriculture, rural development or nutrition; if so, extent to which activity is specifically designed to increase productivity and income of rural poor; [103A] if for agricultural research, is full account taken of needs of small farmers;

(2) [104] for population planning or health; if so, extent to which activity extends low-cost, integrated delivery systems to provide health and family planning services, especially to rural areas and poor;

Provides clean water to villages using least costly - appropriate technology. Villages are located in most isolated rural areas of the country.

(3) [105] for education, public administration, or human resources development; if so, extent to which activity strengthens nonformal education, makes formal education more relevant, especially for rural families and urban poor, or strengthens management capability of institutions enabling the poor to participate in development;

(4) [106] for technical assistance, energy, research, reconstruction, and selected development problems; if so, extent activity is:

(a) technical cooperation and development, especially with U.S. private and voluntary, or regional and international development, organizations;

(b) to help alleviate energy problem;

(c) research into, and evaluation of, economic development processes and techniques;

(d) reconstruction after natural or manmade disaster;

(e) for special development problem, and to enable proper utilization of earlier U.S. infrastructure, etc., assistance;

(f) for programs of urban development, especially small labor-intensive enterprises, marketing systems, and financial or other institutions to help urban poor participate in economic and social development.

(5) [107] by grants for coordinated private effort to develop and disseminate intermediate technologies appropriate for developing countries.

(ii) technical cooperation and development, especially with U.S. private and voluntary, or regional and international development organizations;

(iii) research into, and evaluation of, economic development processes and techniques;

(iv) reconstruction after natural or manmade disaster;

(v) for special development problems, and to enable proper utilization of earlier U.S. infrastructure, etc., assistance;

(vi) for programs of urban development, especially small labor-intensive enterprises, marketing systems, and financial or other institutions to help urban poor participate in economic and social development.

c. [107] is appropriate effort placed on use of appropriate technology? (relatively smaller, cost-saving, labor using technologies that are generally most appropriate for the small farms, small businesses, and small incomes of the poor.)

d. FAA Sec. 110(a). Will the recipient country provide at least 25% of the costs of the program, project, or activity with respect to which the assistance is to be furnished (or has the latter cost-sharing requirement been waived for a "relatively least developed" country)?

e. FAA Sec. 110(b). Will grant capital assistance be disbursed for project over more than 3 years? If so, has justification satisfactory to Congress been made, and efforts for other financing, or is the recipient country "relatively least developed"?

f. FAA Sec. 281 (b).

Describe extent to which program recognizes the particular needs, desires, and capacities of the people of the country; utilizes the country's intellectual resources to encourage institutional development; and supports civic education and training in skills required for effective participation in governmental and political processes essential to self-improvement.

GPRB gives providing water to rural villages high priority. Using its own resources, the GPRB has completed a study of rural villages, and developed a priority listing of areas needing water supplies developed. The GPRB has, for the last several years managed the design of several projects, and has effectively coordinated various donor efforts. The project will utilize these capabilities at the national level, develop the technical skills required for a national rural village water supply program, and develop organization structures at the local level to assure proper maintenance and usage of latrines and pumps.

g. FAA Sec. 122(b). Does the activity give reasonable promise of contributing to the development of economic resources, or to the increase of productive capacities and self-sustaining economic growth?

As this is not a bilateral AID assistance project, FAA Sec. 110(a): Sec. 208(e) is not applicable. This project is a multilateral project with UN-CDF, UNDP and A jointly providing assistance to the GPRB

This section is not applicable as this is not a bilateral AID project.

2. Development Assistance Project Criteria (Loans Only)

a. FAA Sec. 122(b). Information and conclusion on capacity of the country to repay the loan, at a reasonable rate of interest.

b. FAA Sec. 620(d). If assistance is for any productive enterprise which will compete with U.S. enterprises, is there an agreement by the recipient country to prevent export to the U.S. of more than 20% of the enterprise's annual production during the life of the loan?

3. Project Criteria Solely for Economic Support Fund

a. FAA Sec. 531(a). Will this assistance promote economic or political stability? To the extent possible, does it reflect the policy directions of section 532?

c. FAA Sec. 531(c). Will assistance under this chapter be used for military, or paramilitary activities?

5C(3) - STANDARD ITEM CHECKLIST

Listed below are statutory provisions which normally will be covered routinely in those provisions of an assistance agreement dealing with implementation, or covered in the agreement by imposing limitations on certain uses of funds.

These items are arranged under the general headings of (A) Procurement, (b) Construction, and (c) Other Restrictions.

A. Procurement

1. FAA Sec. 602. Are there arrangements to permit U.S. small business to participate equitably in the procurement of commodities to be financed?
2. FAA Sec. 604(a). Will procurement be from the U.S. except as otherwise determined by the President or under delegation from him?
3. FAA Sec. 604(d). If the cooperating country discriminates against U.S. marine insurance companies, commodities be insured in the United States against marine risk with a company or companies authorized to do a marine insurance business in the U.S.
4. FAA Sec. 604(e). If offshore procurement of agricultural commodity or product is to be financed, is there provision against such procurement when the domestic price of such commodity is less than parity?
5. FAA Sec. 608(a). Compliance with requirement in section 901(b) of the Merchant Marine Act of 1936, as amended, that at least 50 per centum of the gross tonnage of commodities (computed separately for dry bulk carriers, dry cargo liners, and tankers) financed shall be transported on privately owned U.S.-flag commercial vessels to the extent that such vessels are available at fair and reasonable rates.
7. FAA Sec. 621. If technical assistance is financed, to the fullest extent practicable will such assistance, goods and professional and other services from private enterprise, be furnished on a contract basis? If the facilities of other Federal agencies will be utilized, are they particularly suitable, not competitive with private enterprise, and made available without undue interference with domestic programs?
8. International Air Transport. Fair Competitive Practices Act, 1974. If air transportation of persons or property is financed on grant basis, will provision be made that U.S.-flag carriers will be utilized to the extent such service is available?
9. FY 80 App. Act Sec. 1505. Does the contract for procurement contain a provision authorizing the termination of such contract for the convenience of the United States?

For the provision of commodities, it is anticipated that U.S. small business will be able to participate equitably. U.S. small business may also assist in providing Technical Assistance through the anticipated institutional contract for T.A. with NWWA.

BEST AVAILABLE DOCUMENT

B. Construction

1. FAA Sec. 601(d). If a capital (e.g., construction) project, are engineering and professional services of U.S. firms and their affiliates to be used to the maximum extent consistent with the national interest?
2. FAA Sec. 611(c). If contracts for construction are to be financed, will they be let on a competitive basis to maximum extent practicable?
3. FAA Sec. 620(k). If for construction of productive enterprise, will aggregate value of assistance to be furnished by the U.S. not exceed \$100 million?

C. Other Restrictions

1. FAA Sec. 122(b). If development loan, is interest rate at least 2% per annum during grace period and at least 3% per annum thereafter?
2. FAA Sec. 301(d). If fund is established solely by U.S.? contributions and administered by an international organization, does Comptroller General have audit rights?
3. FAA Sec. 620(h). Do arrangements exist to insure that United States foreign aid is not used in a manner which, contrary to the best interests of the United States, promotes or assists the foreign aid projects or activities of the Communist-bloc countries?
4. FAA Sec. 636(i). Is financing not permitted to be used, without waiver, for purchase, sale, longterm lease, exchange or guaranty of motor vehicles manufactured outside the U.S.
5. Will arrangements preclude use of financing:
 - a. FAA Sec. 104(f). To pay for performance of abortions as a method of family planning or to, motivate or coerce persons to practice abortions; to pay for performance of involuntary sterilization as a method of family planning, or to coerce or provide financial incentive to any person to undergo sterilization?
 - b. FAA Sec. 620(g). To compensate owners for expropriated nationalized property?
 - c. FAA Sec. 660. To provide training or advice or provide any financial support for police, prisons, or other law enforcement forces, except for narcotics programs?
 - d. FAA Sec. 662. For CIA activities?
 - e. FY 80 App. Act Sec. [504.] To pay pensions, etc., for military personnel?
 - f. FY 80 App. Act Sec. [505.] To pay U.N. assessments?
 - g. FY 80 App. Act Sec. [507.] To carry out provisions of FAA section 209(d) (Transfer of FAA funds to multi-lateral organizations for lending.)
 - h. FY 80 App. Act Sec. [511.] To finance the export of nuclear equipment, fuel, or technology or to train foreign nationals in nuclear fields?
 - i. FY 80 App. Act Sec. [515.] To be used for publicity or propaganda purposes within U.S. not authorized by Congress?

Recommendations for a Determination
Under Section 611(a)(1) of the Foreign
Assistance Act of 1961, as amended

The Benin Rural Water Supply Project has been designed by specialists in geophysical research and drilled well construction. Members of the team who specified and costed out the drilling equipment required by the project are currently involved in other international water resources development projects and are knowledgeable of current prices for necessary drilling supplies and equipment. Considerable effort has been made to insure that cost estimates contained in this project are properly detailed and accurate.

The final engineering design work for the spring captation activity will be performed as part of the project implementation work plan and by its nature will be specific for each individual site. However, the project Grant Agreement will contain a clause stating that the illustrative budget prepared for the spring captation activity represents the upper limit of AID's contribution to this activity.

Finally, construction costs have been formally reviewed by AID engineering staff and recommendations of the engineer have been incorporated into the project budget and financial analysis. For your reference, the consulting engineers report is attached in the annex.

On the basis of the above, I recommend that a determination be made that the project as presented satisfies the requirements of Section 611(a)(1) of the Foreign Assistance Act of 1961, as amended.


FOR John Lundgren, OAR
Lome, Togo

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AFR/DR:MCONEH

AFR/DR/ENGR:FZORRIST

AFR/CWA:BLANE

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TO AMEMBASSY ABIDJAN PRIORITY

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AIDAG: ABIDJAN PASS TO REDSO

E.O. 12065: N/A

*AGS:

SUBJECT: BENIN RURAL WATER SUPPLY 688-0201

1. DURING REDSO REVIEW OF SUBJECT PP IN JUNE 1979, REDSO DIRECTOR SIGNED RECOMMENDATION FOR DETERMINATION UNDER SECTION 611 (A) (1) OF FAA. SINCE REDSO'S LAST COPY MAY HAVE BEEN GIVEN TO LOME REPRESENTATIVE DURING SEPTEMBER SEMINAR, TEXT IS REPEATED IN ITS ENTIRETY:

QUOTE THE BENIN RURAL WATER SUPPLY PROJECT HAS BEEN DESIGNED BY SPECIALISTS IN GEOPHYSICAL RESEARCH AND DRILLED WELL CONSTRUCTION. MEMBERS OF THE TEAM WHO SPECIFIED AND COSTED OUT THE DRILLING EQUIPMENT REQUIRED BY THE PROJECT ARE CURRENTLY INVOLVED IN OTHER INTERNATIONAL WATER RESOURCES DEVELOPMENT PROJECTS AND ARE KNOWLEDGEABLE OF CURRENT PRICES FOR NECESSARY DRILLING SUPPLIES AND EQUIPMENT. CONSIDERABLE EFFORT HAS BEEN MADE TO INSURE THAT COST ESTIMATES CONTAINED IN THIS PROJECT ARE PROPERLY DETAILED AND ACCURATE.

THE FINAL ENGINEERING DESIGN WORK FOR THE SPRING CAPTATION ACTIVITY WILL BE PERFORMED AS PART OF THE PROJECT IMPLEMENTATION WORK PLAN AND BY ITS NATURE WILL BE SPECIFIC FOR EACH INDIVIDUAL SITE. HOWEVER, THE PROJECT GRANT AGREEMENT WILL CONTAIN A CLAUSE STATING THAT THE ILLUSTRATIVE BUDGET PREPARED FOR THE SPRING CAPTATION ACTIVITY REPRESENTS THE

UPPER LIMIT OF AID'S CONTRIBUTION TO THIS ACTIVITY.

FINALLY, CONSTRUCTION COSTS HAVE BEEN FORMALLY REVIEWED BY AID ENGINEERING STAFF AND RECOMMENDATIONS OF THE ENGINEER HAVE BEEN INCORPORATED INTO THE PROJECT BUDGET AND FINANCIAL ANALYSIS. UNQUOTE.

2. CONSULTANT HYDROGEOLOGIST, R. HILTY, WHO PARTICIPATED IN ORIGINAL DESIGN OF SUBJECT PROJECT AND WHO IS FAMILIAR WITH CURRENT PRICES OF DRILLING RIG AND WELLS MATERIAL, REVIEWED COST ESTIMATES AND FINANCIAL PLAN OF SUBJECT PP DURING WEEK DECEMBER 3 AND FOUND THEM VALID.

3. DURING COMMITTEE REVIEW, HOWEVER, IT WAS SUGGESTED THAT REDSO BE QUERIED WHETHER RECOMMENDATION QUOTED PARA 1 ABOVE STILL STANDS. REQUEST REDSO REPLY ASAP IN VIEW OF

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AIDAC

E. O. 12065: N/A
SUBJ: BENIN RURAL WATER SUPPLY 680-0201

REF: STATE 319253

1. REDSO RECONFIRMS RECOMMENDATION QUOTED IN PARA
1 OF REFTEL.

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UNITED STATES GOVERNMENT

Memorandum

TO : Herbert L. Woods

DATE: April 27, 1979

FROM : Lyle A. Weiss, Engineering Advisor REDSO/WA *LAW*

SUBJECT: Benin Rural Water Supply and Sanitation (Project 680-0201)

I Preliminary Plans

The facilities to be constructed and/or provided under this project are as follows:

<u>Quantity</u>	<u>Location</u>	<u>Description</u>
1	Natitingou	Office and warehouse for storage of pumps, pump parts, etc., and as a maintenance center for pump repairs (6m x 18 m) 5370
1	Kandi	Same as office and warehouse above
1	Natitingou	Open shelter for storage of pipe (plastic) and bulk materials (6m x 16m)
1	Kandi	Same as open warehouses above.
3	Kandi	Residences for Technical Assistance
1	Natitingou	Advisors about (10m x 15m)
3		Tent-type camps for each 15-man crew.
3		Mobile Office-camp for each crew (1 each with drill rig and captation crew)
7	Atacora Province & Borgou "	Spring captation and resevoir

The Pro-Ag to contain a Condition Precedent that GPRB shall submit plans and specifications for USAID for review and approval before commencing contracting procedures, except advertising for show of interest, which shall also be approved by USAID.

II. Construction Standards and Quality Control

The general specifications for construction shall be similar and equal to building construction being performed in Cotonou. In general, the



construction of houses, offices, and warehouses for pumps and parts shall be reinforced concrete foundations, columns and beams, walls shall be concrete block plastered both sides, roof sheet metal and drop ceiling in houses and offices, floors to be steel-trowled concrete.

The supervision of building construction shall be by either independent architect or engineer and/or Direction de l'Habitat et de la Construction.

The design and the supervision of construction for spring captation facilities shall be under the direction of expatriate geologist-civil engineer.

III. Construction Contracting

The Service Hydraulic of GPRB has indicated that sufficient contractors are available to perform the standard type of construction as needed for the houses, offices and warehouses.

The construction of spring captation and reservoir structures will be by government construction crews to be trained in the course of project activities -- two crews for spring captation work are to be trained.

IV. Construction Implementation Plan

The implementation plan shall include time required for advertisement of a notice for show of interest of U. S. firms -- the notice shall indicate location, number and size of houses, offices and warehouse to be constructed and the type of contract (lump sum or unit price).

Prior to contracting all plans, specification and copy of advertisement shall be reviewed by REDSO/WA engineer for compliance to quantity and quality as stated in paragraphs 1 and 2 above. After the contractor has been selected for award of construction contract, a REDSO engineer will review procedures and the technical and financial capacity of contractor prior to the award of contract. A REDSO engineer will be requested to review construction as it proceeds and will also make a final inspection upon completion of work.

The implementation plan for construction activities shall be developed by the project manager with the assistance of an AID engineer (REDSO) and the expatriate engineer for the captation segment of the project.

V. Estimates of Cost and Inflation

The estimates of cost are based on unit cost per square meter for construction of buildings of standard layouts and methods and type of construction. The special construction for spring captation is based on crew man-hours and materials. The contingency to be used varies according

to the unknowns, and the application of the inflation factor shall be compounded, i.e., yr 1 equals 1.08; yr 2 equals 1.17; yr 3 equals 1.26; yr 4 equals 1.36 for an eight percent rate of inflation.

VI. Recommendation

The facilities proposed have been adequately planned and design conforms to local custom where appropriate. The estimates of cost are based on current contract data for similar type of construction in project area. A contingency of 15% is included for building construction because exact locations of construction sites have not been selected. A contingency of ~~25%~~ is included for the captation construction because the site conditions and the spring outputs are unknown and therefore no definitive sizing of these structures could be made.

Final design, plans and bidding procedures will be reviewed by and approved by an AID engineer.

Thus the requirements of 611 A of the FAA have been fulfilled regarding the substantive technical aspects of construction in that acceptable plans and a reasonably firm estimate of cost for the work and services have been made. Therefore, it is recommended that a 611 A certification can be issued.

Certification of Section

611(e) of the FAA of 1961

as amended

Based on past performance, information presently available, and assurances that have been carefully planned for implementation under this project, I hereby certify that the Government of the Popular Republic of Benin has or will have by the end of the project, the capacity to effectively maintain and utilize facilities put in place by this project. The following factors were considered in reaching this conclusion.

- a) Equipment and pumps (motorized) installed in Benin under a former AID project have to a large degree been kept operational even in the face of extreme difficulties in obtaining spare parts. This fact speaks highly of the technical service which will be in charge of administering this project and maintaining pumps and wells installed under this project.
- b) To the extent possible, the project has been designed to facilitate follow-on maintenance. The spring captation structures should require minimal amounts of maintenance and what little maintenance is required can easily be performed by the Beninese Hydraulics Services. The project is recommending the procurement of pumps that according to information available require a lesser degree of maintenance than other pumps considered for this project. A guiding principle in project design was to choose whenever possible the technical option requiring the least and simplest amount of maintenance (p. of pp). The project, by providing an estimated three years supply of spare pumps parts and by procurement arrangements with the pump manufacturer will assure the continued availability of spare pump parts after the PACD of this project.
- c) Training will be a major component of this project at all levels. Villages will be given training in pump maintenance, proper pump utilization and health education. The technical service responsibility for assisting villagers maintain village pumps will also receive training. GPRB personnel will be provided on-the-job training for all aspects of water resources development, including operating and maintaining drilling equipment provided to the GPRB by this project.
- d) The GPRB places a high priority on providing water to people living in rural villages. The technical services and ministries involved in this endeavor are very conscientious of the cost of implementing this policy. Deliberations are taking place within the GPRB to assure adequate financing for their overall water resources development plans. Furthermore, AID included CPs to disbursement of AID funds to insure appropriate measures will be operational by the end of this project.

e) Lastly, evaluations will periodically be conducted to monitor the GPRB's progress in developing the capability to continue this project without future AID assistance, and maintain those facilities established under this project.



FOR John Lundgren, GAR
Lome, TOGO

PROJECT PAPER
TECHNICAL ANNEXES

ANNEX EIGHT

SOCIAL SOUNDNESS ANALYSIS

The Atacora and Borgou provinces of northern Benin are part of the Sudanian-Savanna zone which makes up more than half of the total area of Benin. Parks, forests, game reserves as well as onchocerciasis prevent people from living in certain river valley and make these provinces the least populated for the country as a whole. About 5% of the population is under 14 years of age, and approximately 100% of the adult population is rural sedentary subsistence farmers. The population is 97.8% illiterate - one of the highest rates for Benin as a whole.

Major food crops grown in northern Benin are sorghum, yams, maize, beans, millet, cassava, rice, fonio and sweet potatoes. Sorghum and millet production dominate as they are the basic year around staple food. A portion of these crops may be sold but they are not a major source of cash. The most important cash crops are peanuts and cotton followed by cashews, potatoes and tobacco.

While the southern regions of Benin long have benefitted from contact with the outside world which has helped them develop a more modern infrastructure with better access to positions within the administrative framework, the northern regions have suffered from relative neglect and isolation.

Today, the northern regions are still experiencing inequalities of development. However, the present government is trying to improve their infrastructure by improving the highway systems, building more schools and medical facilities and introducing new agricultural techniques and products to revitalize agricultural production. Many areas of northern Benin are still regarded as a hardship post by Benin civil servants, and the GPRB has difficulties in finding qualified personnel to work there. Furthermore, many people in the administrative cadre in the north do not speak the local languages and are unfamiliar with the beliefs and practices of the indigenous populations.

The Atacora and Borgou provinces are inhabited by a myriad of ethnic groups which have caused a major drawback for the GPRB in creating workable regional entities with a strong national identity. The Somba, Bariba, Dendi and Fulani (Gando) are the most prominent ethnic groups in northern Benin. The Bariba, Fulani and Dendi are for the most part Moslem and the Somba has remained mostly with its traditional religion. Smaller ethnic groups are mixed - practicing combinations of traditional and Moslem or Christian.

The Somba (Natimba, Otamari, Betamaribe, Niende and Yoabou) is characterized by its strong attachment to traditions, its house form (the Tata), its land use and a strong community organization revolving around the head of clans and villages. The Somba overwork their lands so it becomes quickly exhausted. Each male in the family has a right to a parcel of land for cultivation. The head of household is responsible for nourishing everyone in his Tata, and cannot sell or rent land belonging to the extended family. There is a strong division of labor with women clearing and sowing and men preparing and harvesting the land. Three factors have inhibited past development plans among the Somba: a taboo against digging wells (one must get water from rivers, ponds or springs), refusal to seek modern medical consultation, and a strong individualistic character which makes them extremely wary of outsiders.

The Bariba Wasangari used to form the noble class who were leaders and warriors. The Bariba Batomba were mainly cultivators, traders, hunters and artisans. Today the Bariba live closely together in compounds and have fields scattered throughout the bush. The family is tightly structured with roles specified so that the family works efficiently as an economic unit. Field work is almost exclusively a man's activity with women only participating in the harvest. A woman cannot own land but may farm a section provided to her by her husband. If a woman wants to have her own parcel, she is obligated to hire laborers to do the actual work of preparing and planting.

The Dendi engage in farming as well as commercial activities and weaving. They live grouped together in compounds with a head of household as the chief provider for the extended family. Women are not allowed to own land, but may be given a parcel to farm by their husbands. There is a strong division of labor in the fields with men clearing and preparing the land while women do the sowing and harvesting.

The Fulani (Gando) have adopted a more sedentary existence than other Fulani groups in West Africa. Most migration is of a short distance and is undertaken by males and their cattle while the women, children and elderly remain in their villages to harvest crops. The Fulani may care for the sedentary farmer's cattle in return for use of the cattle's milk to drink and make cheese. They also cultivate crops on land unused by local inhabitants. Division of labor is such that men clear and prepare the land, both men and women sow, and women and children harvest. Women do not work their own parcels of land, but may earn money from selling milk, cheese, millet and karité butter. They are exclusively Moslem.

Some changes can be seen in the strict division of labor among the major ethnic groups in northern Benin. As more women desire to cultivate their own fields to earn extra money, they are becoming more involved in all aspects of the planting cycle. This breakdown in the division of labor has been encouraged by the GPRB which is promoting equal rights for women in their on-going political reforms. However, in most instances, basic divisions of labor continue to exist despite these reforms.

At the present time all traditional political organizations have been replaced by a new system imposed by the national government in which traditional chiefs and their ruling structure have been superceded at least theoretically. All decisions are made at the national level and are then implemented at the provincial level. The country is divided into six provinces, each governed by a prefect who resides in the administrative capital of each province. Each province is divided into districts with an appointed chef de district responsible for the administration of the district. Each district is further subdivided into communes, both rural and urban, governed by an elected mayor and a governing council. Finally, each commune is divided into a cluster of from 5 to 12 villages, each governed by an elected village delegate and a village council.

The village council is made up of men and women from each of the revolutionary committees. These men's and women's committees are responsible for 1) production (overseeing village agricultural activities), 2) security (taking measures against thievery and settling quarrels), 3) social affairs (overseeing village sanitation and health education) and 4) revolutionary education (teaching revolutionary education).

Not all these committees are yet operational, but those that are will be an important channel of information and communication as well as an effective organization nucleus for project implementation. Women's committees are especially important for dissemination of health education. State agents and/or other trained personnel should meet with these committees to discuss problems of family health, child-raising, nutrition and precautions necessary to avoid contamination with water-borne diseases. Individuals responsible for social affairs should get basic health education training so they in turn can act as educators for other women in the community. Such a decision, however, must come from the local level involving committee members and project personnel.

In order to establish an effective well and pump maintenance capability at the village level, questions of who will be responsible for keeping the well and its surrounding clean, and who will be servicing the pump on a day-to-day basis need to be addressed. These and other related decisions must be made by the local authorities in conjunction with project personnel input. The village delegate might be assisted by the council to assign one or more persons to these tasks. As some training is necessary for pump maintenance, the person chosen must exhibit some mechanical capabilities and a desire to take on this responsibility. Similar questions as to labor and maintenance will arise in relation to the latrine construction program. Authorities in schools and dispensaries might make these decisions. Latrines for villagers should involve the village delegate and the council as well as heads of individual households.

Women and children are the principal drawers of water. Using buckets of inner tube, plastic or metal attached to handwoven or nylon cords, they draw water from wells that in some cases are great distances from their homes. Ponds, streams, springs, and dams are other sources, frequently with water available only seasonally. In some areas women must dig holes in the sandy bottom of dry river beds in order to capture the sub-surface moisture. Women bring the water back to the house in clay jars or in large metal pans (25 liters capacity). At home the water is put in large clay jars and covered. Bathing and washing of clothes is done near a well, river or dam. In the dry season when water is scarce there is less washing and bathing.

The first thing women do in the morning is to sweep the compound and fetch water. More water is used in the morning so four or five trips often have to be made. In the evening (between 4 and 5 p.m.) water is again needed for the evening meal and the women will make an additional two or three trips to the well. Given the existing variables, it is extremely difficult to estimate the time consumed by village women fetching water. Much depends on the distance to the water, the number of trips necessary to acquire enough water for the household needs, and how many children help. One can safely say that it is a time consuming and strenuous activity for most all women and children, especially in the dry season.

The dry season finds women abandoning wells which have gone dry for ponds, streams or digging holes in dry riverbeds. At those wells which have not gone completely dry, women will come and sleep at night at the rim of the well, waiting for water to accumulate in the well. Many women prefer to fetch water from ponds or streams when the wells are too deep as it is too much effort to haul water out of very deep wells.

Most women prefer well water to water from other sources because they regard the latter as dirty. "Dirty water" can be one or a combination of a) cloudy or muddy water, b) water with visible worms in it, c) stagnant water and rain water ponds, and d) clear water with strange taste or odor. Although most people consider the last category as unclean, they will drink it if that is all that is available.

To educate villages on the importance of clean water, a microscope demonstration as it has been successfully employed by the Canadians in their well-drilling program in the Ivory Coast, which could be particularly useful in this project. They took a microscope to the villages, prepared two slides - one with the normal village water and one with purified water. When the villagers saw the microbes swimming around in one and not the other, they were convinced.

Women interviewed were hesitant to contribute financially towards the maintenance of the pump and/or well. Asking them to make a financial contribution is feasible only if all who participate will benefit. If there are hold-outs, ill-feelings will develop and contributions will cease. Past experiences show that people who were asked to pay for water drawn from pumped wells abandoned the use of the well for water from other sources rather than pay. The possibility of village financial contribution towards well and pump maintenance must be addressed on a village by village basis and implemented where possible.

There are generally no latrines in the compounds in northern Benin. People regard fecal matter as dirty and something to be removed as far as possible from the home. They go into the bush and defecate on the ground, and do not dig a hole to cover the fecal matter. They do not go to the same place twice because it is regarded as dirty.

Representatives for every group questioned said they were willing to use privies if they were available. However, certain beliefs may give rise to problems, such as the notion of dirtiness connected with fecal matter and the male fear of menstrual blood. Within the compound there would have to be a privy for each sex. Whether or not they would be physically separate must be determined by local beliefs.

The Atacora and Borgou provinces in northern Benin receive rain during the summer months with the maximum in August and September. The wet season is the time of most active labor. Both men and women are engaged in preparing and planting the crops for the year. In addition, women are occupied with their own fields and in providing food and water to those working in the fields and to their families in the evening. During this season women have little time for other activities and fetching water from a distance becomes an added burden.

During the dry season people have more free time. The harvesting of crops is scattered over time and involves less intensive labor. During this period women become involved in activities around the compound such as making millet beer, nééré flour and karité butter and gathering firewoods to sell. However, the dry season also means scarcity of water and women will spend much time fetching water during this period.

March and April are traditionally the months for well construction in northern Benin. This is in the middle of the dry season at the time of the

most acute shortage of water. November and December also appear to be a period when other activities are at a minimum and thus would also be a good time for the project activities.

Providing people with a safe accessible year around water supply will reduce the amount of time women and children spend in drawing water. How they would allocate this free time becomes of major importance in terms of providing people with an opportunity to improve their living standards. When asked how they would take advantage of this extra time, women responded that they would 1) increase their involvement in household activities, 2) try to earn more money by increasing field production or in buying and selling merchandise, 3) learning new artisanal skills (especially knitting and sewing) and 4) spend more time caring for children. Additional research should be undertaken in order to determine the kinds of handicraft production feasible in terms of local availability of raw materials and those artisanal activities which would not conflict with existing division of labor customs.

women as the principal carriers and users of water would be the most motivated not only to be able to continue their nourishing role to the family, but also to free them from the sometimes day-long search for water in the dry season. Unfortunately, their strong desire for a permanent water supply generally overrides their concerns for the purity of water. Women do discern certain water quality standards, and given the choice they usually will choose the water which they feel is cleaner. Generally, women regard well water as being cleaner and safer than water from ponds, rivers, dams or rain ponds. However, during the rainy season when streams come alive and are nearer to the compound, women may abandon the use of pump-mounted well for what they see as a more accessible source of water. Women rarely take into account the health hazards of such actions.

The installation of latrines raises several problems. The most difficult area of finding adequate motivation in latrine construction is in private compounds. Regarding fecal matter as dirty, most people do not see the benefit of fecal matter disposal vis-a-vis the health of the family. To bring this activity nearer to other human activities raises basic conflicts in traditional belief systems that may be difficult to resolve. This is especially true for the Fulani transhumant population who consider privy-use contrary to their traditions. Latrines for medical facilities raises the same problems. People might believe that using the same site to defecate as a sick person, might make them sick as well. Consequently, hospital or medical facility staff might refuse to use on-site privies, and separate facilities may have to be built for patients and staff.

Latrine construction in primary schools will offer the most likely success and acceptance because children are more accessible to learning and adopting to new ways. It is assumed that these pupils will act as educating agents, sensitizing their families to the benefits and importance of latrine use. Villagers which have had frequent contact with state agents, PCVs, etc., exhibit a greater motivation for latrine construction and a better understanding of basic preventive health care than those villagers where such contact are minimal. Similarly, the villagers who have organized themselves into village cooperatives are usually more open to change and will be higher motivated to try new innovation. The government has given cooperatives a great deal of support, but scarcity of water and lack of planning for adequate water supplies have been a major obstacle to

continued growth and success of such village cooperatives. Project implementers should consider cooperatives high priority for the introduction of water supply and latrine construction.

Three profiles of minimum participators are identified here: first, the illiterate rural subsistence farmer and his family in the Borgou and Atacora provinces who adheres to traditional religious beliefs and customs that tend to impede social change. By clinging to traditional ways, living in isolated communities, these villagers tend to be interested in an increased water supply but not in the basic health rules necessary to maintain pure water. An extensive educational program will be necessary using both male and female extension agents. Preferably, these agents should be from the same ethnic group or at least be capable of speaking the local language and be willing to participate in village life.

Second, villagers who have had previous contact with outside agents and are aware of the importance of providing appropriate excreta disposal systems. Thus, in order to implement a successful water and latrine program for a village community, outside agents must address themselves to those elements of the society which are progressive, dynamic and command the villagers' respect; i.e., delegates, village councils, elders, educated residents (teachers, nurses, midwives, etc.), men's and women's committees and youth groups. Those villagers who have had previous contact with fecal matter disposal are quite eager to participate in a latrine construction program. Villagers who live in isolated communities such as the Fulani and the Somba will not see the necessity of building latrines, and an extensive program in health education emphasizing the importance of appropriate excreta disposal will be necessary in order to effectively bring about change.

Third, the staff and patients of local rural medical facilities. Each commune theoretically has a medical post located in the village which is the administrative center for the commune. The staff is usually quite small with a nurse (infirmier) and a helper (garçon de salle), who besides from being custodian, aids the nurse in her duties. At the district level there is a dispensary including a maternity ward with a doctor, three state nurses, one mid-wife, two assistant nurses, three male helpers and two female helpers. Generally, they are most occupied with curative medicine devoting little time to preventive or health education. However, the medical center personnel are important agents of change and the incorporation of these personnel into the program of well and latrine construction and health education is extremely important in providing another channel of information exchange to the rural villagers.

Certain constraints may act as an impediment to project implementation:

- 1) the scattered nature of living arrangements. The traditional compounds in certain regions of Atacora is dispersed over large areas making it difficult to install wells to benefit the greatest number of people. In addition, this type of living arrangement renders it hard to organize groups of people to work for a common goal and to deliver services to villagers dispersed over a large area.
- 2) The level of awareness of the villagers. The degree to which the local population is cognizant of basic health practices will influence their participation in the project. Where villagers stubbornly cling to traditional beliefs and

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regional center for training of personnel for well and pump maintenance in Kandi in Borgou Province. The establishment of an effective maintenance program at the regional level is of primary importance to insure the continued success of the project.

The district-level leadership plays the important role of backstopping and material assistance to the villages in terms of equipment maintenance, health education and supply of material. They will act as coordinators for the various aspects of the project and be the line of communication to the national level.

The leadership role at the local level or village level will play an important role for the successful implementation of the project. The authority figures will for the most part be the legitimate political structure-village delegates, village council, religious leaders, women's committee president, health committees, etc.

Seasonal migration occurs from Borgou and Atacora provinces to other regions and cities of Benin, as well as Togo, Nigeria and Ghana (the coffee-cocoa producing areas). These migrants may return after one season or they may stay for several years, but eventually most will return. Returned migrants are another potential source of leadership and diffusors of innovations as they have been exposed to new experiences which tend to make them question existing social values and customs.

Abandoning ponds, streams, dams and rain-water cisterns which harbor guinea worms, schistosomiasis and other such parasites in favor of wells with hand pumps, will reduce the incidence of gastrointestinal and other diseases. Greater quantities of water for washing clothes and for bathing will reduce the incidence of skin diseases, especially for women and children. Where there is a reduction of water-borne diseases due to better and adequate water supplies, communicable diseases and their potential carriers may also be reduced. Knowledge of, and concern with health care related to water-borne diseases will result from associated efforts at health education. Providing greater quantity and quality of water may also reduce the rate of seasonal and long term migration to cities and other cash-crop production areas. Consequently, investments in the productive potential of the local area are likely to increase.

The implementation of this project is unlikely to cause serious shifts in activities associated with specific roles. Water carrying and the bulk of water use will remain the responsibility of women and children.

Providing women with a safe, accessible and perennial water supply nearer to their households will provide them with more free time to engage in more productive activities. Consequently, the quality of life and the productive potential for women will increase.

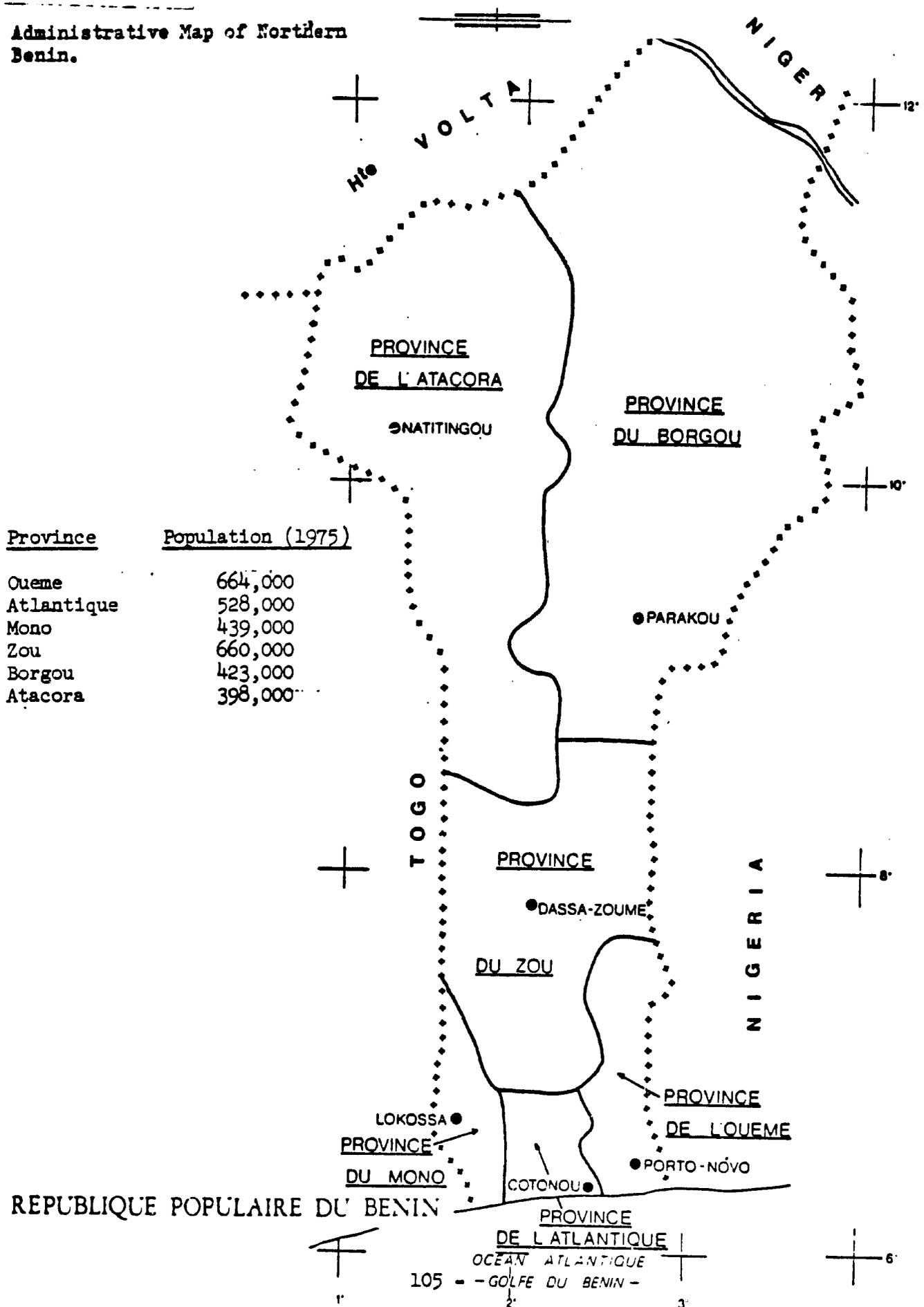
Finally, the project anticipates development of community participation in water supply and sanitation systems. This may provide a focus for community action in a context which has obvious benefits for all. Leadership which manifests itself in connection with this program at the village level may enhance the community's ability to articulate demands for development to local government and state agents.

DECOUPAGE ADMINISTRATIF

Figure 8-1

Administrative Map of Northern Benin.

ECHELLE 1/3000000



<u>Province</u>	<u>Population (1975)</u>
Oueme	664,000
Atlantique	528,000
Mono	439,000
Zou	660,000
Borgou	423,000
Atacora	398,000

REPUBLIQUE POPULAIRE DU BENIN

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ANNEX NINE

ECONOMIC ANALYSIS

Rural Water Resource Development in the
Atacora and Borgou Provinces of Bénin

September 1978

Prepared by: Diann H. Painter, Economist and
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I. BACKGROUND

Since 1970, real GDP in Bénin has exhibited little or no growth while population has continued to increase at the high rate of 2.8 percent per year. In addition, there has been a decline in Benin's terms of trade. Per capita income is currently about \$US 140 and the total population, based on extrapolations from the 1961 census, is close to 3.2 million inhabitants of which about 90 percent live in rural areas.¹ According to the criteria established by the U.N., Bénin, therefore, is one of the world's poorest nations.

In Bénin, the general level of social and economic welfare varies significantly by region and, in some cases, within provinces. Regional disparity with respect to such factors as revenue, social services and infrastructures is characteristic of the coastal countries of West Africa and results from the historical pattern of colonization, regional climatic differences and communications barriers associated with the geography of the area. Table I provides estimates of revenue per capita for the Atacora province. The Data reveal the extent to which inequities exist within the region and the deviations of district per capita income around the national average (\$US 140). It is reasonable to assume that the income figures for Borgou province follow a similar pattern.

¹ For a detailed analysis of economic conditions in Bénin, see the 1978 I.M.F. report cited in the Bibliography.

TABLE I

Estimates of Revenue Per Capita for the Districts of the Atacora Province (1976/77) *

	\$ U.S. **
Boukoumbe	37
Nerou	106
Nattitingou	93
Ouake	112
Bassila	128
Djougou	152
Tanguieta	65
Kouande	95
Atacora Province	97

* The Data are based on the results of a sample survey and the per capita income figures are derived from household income estimates assuming an average family size of 6-7 persons.

** \$ U.S. = 226 CFAF

Source: Ministère du Plan, de la Statistique et de Coordination des Aides Extérieures, Projet des enclavements internes de l'Atacora et d'intensification des structures Agricoles, Tome I, 7/77, p. 77.

It is noteworthy that, although water resource problems are severe for the entire region, the districts with the lowest levels of household income are areas where geological conditions prevent easy access to the water table.

Population density figures are also indications of regional disparity. In Bénin, population density varies widely by region from a high of 169.1 inhabitants per Km² in the Atlantique province to lows of 15.0 per Km² in Atacora and 8.5 per Km² in Borgou. (IMF, 1978, ~~Table 2.1~~ population densities in the North are ~~very low~~ the limited natural resources and the lack of ~~adequate water sources~~ in the region. During field trips, it was noted that the lack of adequate year-round water sources and the depletion of the land near population centers have led to further population dispersal in recent years. Since population dispersal increases the cost of providing services to the Northern populations, it only serves to reinforce adverse conditions and makes it more difficult to break the vicious circle of poverty in the area.

Officials in the Beninese Government are fully aware of the political and social ramifications of regional inequities and there is an attempt to reallocate resources for the development of the Borgou and Atacora provinces. On the political and social side, the Government is trying at the provincial, district and communal levels to mobilize rural residents in pre-cooperatives and other types of organizations such as health brigades. Many of the production oriented groups come under the jurisdictions of the Centres d'Action Régionale pour le Développement Rural (CARDER'S). On the economic side, the CARDER'S are engaged in what might be called integrated rural development schemes. They are responsible for projects designed to increase the production of the major food crops (sorghum, millet, yams, fonio, beans and maize) and cash crops (mainly, peanuts and cotton).

In order to accomplish regional goals, the Government of Bénin is seeking to supplement domestic resources with outside financial and technical assistance from such sources as the European Development Fund (FED), the World Bank, UNDP, USAID, and other international donors including bilateral aid from socialist countries.

In recent years, the Government has come to realize that rural production targets cannot be met unless sectors complementary to agriculture are developed. Consequently if producers are to respond to rural development programs, major efforts must be undertaken to improve the delivery of social services, to develop the water resources,

to ameliorate the transportation network. In this light, water resource and sanitation projects take on added significance because they have direct economic as well as social significance. Although health and related data are lacking for Bénin, it is clear that over 70 percent of the rural population in the North is without reliable water supply. If the criterion is added that water must be sanitary, then this figure rises to over 80 percent.

The Dijon Report cited in the bibliography estimates that there are 2,600 villages in Bénin of which about 1,400 have a population of 500-1000 persons. Further, if one assumes that it is necessary to have one water point for each group of 500 people or less, then given the existence of only 600 adequate water points nationwide, there is a need for about 6,000 new water sources. (Dijon, p. 3-4) According to the Hydraulic Service, the 600 existing water points are modern dug wells (1.8m in diameter) constructed between 1950 and 1977 by either the French colonial government, the Hydraulic service, or private contractors working under FED or other aid agreements. The National Plan reportedly calls for the construction of 2,400 wells over the period 1978-1982. This construction plan is to be preceded by an exploration phase. The Regional allocation of the 2,400 planned wells is presented in Table II. Forty percent of these planned wells are to be constructed in the northern two provinces of Bénin.

TABLE II

<u>PROVINCE</u>	<u>NUMBER OF WELLS</u>	<u>%</u>
Atacora	480	20
Borgou	480	20
Zou	480	20
Mono	360	15
Atlantique	288-312	12-13
Oueme	288-312	12-13
	<u>2,400</u>	<u>100</u>

Source: Mr. Konerin, Hydraulic Service

The economic analysis of this project is based on a cost effectiveness or least-cost approach. It has been selected because the outputs of this project are intended to improve the quality of life of the target population but can not readily be evaluated in monetary terms. Whereas such measurements as the Physical Quality of life Indicator (PQLI) developed by the Overseas Development Council can be useful in determining the need for such projects and used to evaluate their impact, it would be highly imaginative to put a monetary value on the reduced drudgery involved in securing water for basic requirements, and the reduced morbidity and mortality resulting from an adequate supply of better water. The PQLI for Bénin is currently 13 on a scale of 100 making it one of the lowest in the world. As has been identified in other parts of this paper one of the major reasons for this low rating in Northern Bénin is due to the lack of adequate and safe water. Improvements to the water supply system should therefore significantly improve the quality of life as measured by the PQLI and other indicators.

The analysis of the inputs required to achieve these outputs is divided into three parts. The first is an analysis of the options available for improving the availability and quality of water in the project area. The second is an analysis of the combination of inputs required. The third portion of the analysis identifies the project beneficiaries, how they will benefit, and the cost per beneficiary.

Options Available

The possible approaches to improving the availability and quality of water supplies in West Africa are numerous and have in recent projects included almost everything from traditional hand dug wells to deep, large-bore wells with diesel powered pumps costing 1/4 million dollars or more per well. The design of this project has been based on the need to identify a cost effective technology that will provide adequate water to a relatively scattered population in Northern Bénin where options are limited by the physical characteristics as noted in the technical analysis of this paper.

The traditional hand dug wells costing 30,000 to 40,000 CFA/well are by far the cheapest type of wells that could be dug in the area. For the purposes of this project however, they have been rejected for a number of reasons. There are only a few areas in Northern Bénin where they can be successfully dug and even in those areas they often do not provide sufficient water in the dry season to meet village

requirements. Pollution of the wells by ropes and containers used to draw water is a continuous problem as is the possibility of children and animals falling into the well. They require periodic cleaning and redigging and their estimated life is relatively short 4-5 years. Slight improvements to the traditional well are possible, such as the addition of cement rings to increase the life of the wells as is being undertaken by a German volunteer program in Benin. This increases cost per well by only 30,000 to 40,000 CFA (not including technical assistance provided by the volunteers) but solves none of the other technical problems of this type of well.

The open-mouthed, hand dug well, lined with cement, built up at the top and surrounded by a cement platform commonly known as the FED type well offers another possibility. The cost of this type of well is however relatively high, \$10,000 to \$28,000*/ with an average cost \$17,000 per well. Some of the problems with this well are that pollution is not eliminated or even substantially reduced and the cost of digging this type of well in the hard-rock areas of Northern Benin would be at the extreme high end of the range of figures cited above if feasible at all. One advantage of these wells is that they do not require pumps and the development of a pump maintenance program to insure operation of the well.

Drilled large diameter wells (30 inches) with a maximum depth of 30 meters offer another possibility, however, there are relatively few areas in Northern Benin where this technology would be viable. Equipment would have to be amortized over small number of wells and costs would equal or exceed the Entente Funds current estimates for the cost of this type well for Upper Volta which is \$336/meters or \$10,000 per well.

Drilled wells will provide the best source of year round water in the hard-rock areas of Northern Benin. The average cost of the 225 wells to be drilled during the life of the project is \$18,420 per well with \$12,300 of this provided by AID. This figure, however, over estimates the cost of wells during the four years of the project as it distributes the cost of the equipment and training of drill teams over 225 wells when in fact these inputs will continue to serve the GPRB in the continuation of its well drilling program in Northern Benin.*

Development of surface water could include both spring captation systems and small dams for catchment and storage of rain water. A program of surface water catchments was rejected from consideration for the purposes of this project because of the related health and environmental problems associated with this type of water resource development program. A spring captation program, on the other hand,

* / Pacific consultant: "West Africa Water Supply and Sanitation pre-project Analysis" p. 3-24.

* - See Table II for estimated cost of continued well drilling program.

provides an adequate supply of potable water in certain villages of Northern Benin, and will reduce health problems associated with the present utilization of this water. These springs will also be located in areas where well-drilling is very problematic due to the existing geological formations.

Combination of Inputs

The combination of AID inputs included in this project have been designed to first, include what is necessary to achieve an increase in quantity/quality of water, and second, to provide complementary inputs that are necessary to assure continued operations of the pumps in order to achieve the maximum social benefits from the improved water sources and third, to provide the GPRB with the capability of continuing their water development program.

The identification of drilling sites in much of the project area is difficult and risky. Previous well construction projects in similar geological formations have registered as much as a seventy-five percent failure rate due to the geophysical nature of the area. A detailed geophysical study of the area in the first three years of this project to identify the most promising points where one could be reasonably sure of finding groundwater was considered. This study was rejected however, because of its high cost (\$3.5 million). As the project is now designed, the well drilling activity will commence in the sedimentary rock formation where hydrogeological conditions are most favorable. A test drilling program in the second year of operation will be carried out in the more difficult terrain based on identification of well sites using photo-interpretation and limited geophysical exploration. The use of photo-interpretation for purpose, while unquestionably less precise than a detailed geophysical study, has proven feasible in neighboring Togo. As aerial photos already exist, this technology of well site selection will be much less costly. (Estimated cost for 300 villages is \$15,000.)

The pump installation and maintenance program has been included in the well component to provide pumps and sufficient spare parts to assure continued operation of the wells. Manpower will be trained and an organizational structure developed that will not only be able to maintain the pumps installed under this project but increase their coverage at little cost as the number of wells and pumps in the area increase.

A spring captation program has been included in this project because it provides the opportunity for significantly improving the quality of water and reducing time required for carrying water at the lowest possible cost per beneficiary. Maintenance requirements for

spring captation structures are minimal and they can be expected to last 30 to 40 years with little repair to the basic spring captation structure itself.

The health education component has been included to assist the local population in understanding the benefits of the improved water supply and enlist their cooperation in maximizing the use and maintenance of the wells and pumps. Evaluation of previous water supply activities has often noted the failure of projects to achieve their intended health benefits because of improper use of wells that were provided. With the managerial and training skills and materials supplied under the project, the local population can be convinced to effectively maintain the hygienic character of the water supply systems developed under this project and undertake additional village sanitation projects.

Beneficiaries

The primary beneficiaries of this project will be the residents of the villages where wells and pumps are installed or springs are capped. Under the spring captation component it is estimated that 40,000 people will benefit at a cost to AID of approximately \$39 per person or \$52 per person for total project cost.

Under the drilled wells component approximately 56,250 people will benefit. The cost per beneficiary, including the distributed cost of the health program, well construction, and pumps installation is \$60 for AID's inputs and \$82 per person for all contributors to the project.

While these costs per beneficiary may seem high, it should be noted that the benefits will extend over a number of years. If one conservatively estimates the life of the wells and pumps at 12 years the average cost per beneficiary is less than \$7 per year for potable water.

In addition to the beneficiaries listed above it is expected that an additional 125,000 people will benefit from the health education program. 225,000 additional people will eventually benefit from the training and equipment inputs as additional well sites are finally developed.

Secondary beneficiaries of the project will be the drill teams hired and trained by the project, the pump maintenance personnel and participants trained. The basic mechanical skills introduced into the villages through this project should form a foundation upon which additional mechanical skills can be introduced in the future.

Tertiary beneficiaries of the project will include the American manufacturers who supply pumps and equipment and American institutions providing technical and consulting services.

TABLE III

Estimated Cost of Continuing Drilled Well

Construction Program after AID-PACD

	<u>Cost per Well</u>	<u>Cost per Drill Team</u>
I. Personnel		
A. Supervisory		
B. Drilling Crew		
1 Hydrogeologist	75	5,500
2 Drillers	145	11,000
2 Drillers Aides	80	6,000
2 Mechanics	85	6,500
3 Workers	80	6,000
II. Equipment		
Cost of Project equipment depreciated over five years	1,400	105,000
III. Construction Supplies		
Drilling mud	\$ 15	1,125
Cleaning Agent	\$ 50	3,750
Drilling Shoes	\$ 60	4,500
Screens	\$ 300	22,500
Casing Steel	(\$2,350)	(176,500)
Casing PVC	(\$ 925)	(70,000)
Miscellaneous	\$ 25	1,875
IV. Operations		
Fuel	300	22,500
Maintenance	165	12,500
V. Construction		
Depreciation of Warehouse Offices and Residences	65	1,000
VI. Pump Installation		
Pump Pipe & Rods	600	45,000
Pump	600	45,000
VII. Contingency	600	45,000
	<hr/>	
TOTAL:	5,580	418,750

WATER RESOURCES DEVELOPMENT

PART I SUMMARY DESCRIPTION

A. Hydrogeology

The northern provinces of Benin essentially contain four different hydrogeologic units, each with its own physical characteristics and ability to yield water. The first major unit is located along the northwestern border of Benin and trends southwest to northeast. This sedimentary formation consists primarily of tightly cemented feldspathic sandstones and shales which should be capable of storing and yielding adequate quantities of water. Previous studies conducted in the area by Boudin and Gall confirm the potential for the development of ground-water resources in this region. In addition, the data collected during the recent site inspections and visits with the local people further support the potential of the area in that water has been obtained from the existing traditional hand-dug wells throughout the year.

The second hydrogeologic unit is located immediately east and parallel to the first. This unit includes the Atacora range and the foothills and plains to the west of the mountain chain and consists of rocks that have undergone varying degrees of metamorphism. The Atacora range is primarily composed of quartzites and mica schists and is bordered on the northwest by schists, mica schists, and phyllites and on the east-northeast by gneisses, quartzites and migmatites. The formations in this area have undergone considerable tectonic stress and exhibit intense folding and faulting as noted by AFFATON.

The water-bearing properties of metamorphic rocks depend upon the location and extent of the weathered, faulted and fractured zones. Water received in the region infiltrates these areas and is stored in the subsurface. The quantity of water that can be stored is determined by the porosity or open-area within these zones and the potential for developing the resource relies upon the permeability (primary and secondary) or the rate that water will flow or be released from the formation.

The weathered zones generally develop at depths of less than 30 meters. In addition, the degree of faulting and fracturing will generally decrease with depth. The potential for the development of water resources is contingent upon the thickness of the weathered zone which in turn depends upon the tectonic activity and chemical composition of the rock. The quartzites and mica schists of the Ataccra exhibit a rather thin weathered mantle and the transition zone between the weathered and parent rock is very thin (5-6 m.). The weathered zone in the plains area lying east-northeast of the mountain chain is slightly thicker. Therefore, the potential for developing water supplies within the weathered rock mantle in both areas

is very low (fig. 1). This has been confirmed in previous studies by Boudin and Gall which provided the criteria used by the Hydrogeological Service to determine the optimum depth for constructing wide diameter wells. It was decided that the depth of these wells should be limited to 20 meters or the parent rock, whichever was encountered first. Because of the level of technology used to develop wide diameter wells, greater depths have yielded very little additional water and the cost would be increased substantially.

On site-observations also confirm the existence of a thin zone of weathered rock which allows rapid infiltration immediately following a rain and provides a fair quantity of water from storage for six to eight months of the year. The amount of water available after the rainy season is more limited and is diminished considerably as the dry season advances. In some areas, however, this weathered mantle is thicker and mixed with sandy to silty sedimentary rocks which indicates the former existence of ancient stream channels that have been buried by more recent geologic activity. The potential for water resource development in these ancient channels or buried valleys is good, but such areas cannot be detected from surface inspection.

The second possible source of groundwater in the metamorphic and crystalline rocks is from the fractured and faulted zones. The availability of water from these areas is extremely localized and the well must intersect the zone directly to exploit the resource. In general, the potential for developing groundwater from these fractured zones decreases with depth and is also dependent upon the frequency and interconnection of the open spaces which have resulted from local and regional crustal movement. The general geologic structure has been mapped (AFFATON 7) and can best be described as an area of high tectonic activity and structural complexity. The potential for developing a local water supply will hinge upon defining the geology.

The third major hydrogeologic unit in the project area consists of loosely cemented sandstones, siltstones and shales located in the northeastern corner of the Borgou province and the extreme northwestern corner of the Atacora province. The major geologic unit, a loosely cemented sandstone, forms part of an old marine basin and is called the Kandi sandstone. This sedimentary formation is thick and has a high permeability which allows the development of large quantities of groundwater. Because of the good hydraulic properties of the deposit, the groundwater surface is fairly flat and, depending upon the surface topography, is approximately 25 meters below the ground surface. Previous studies (Boudin and Gall) have indicated that the area is one of the most favorable for groundwater development in Benin. One deep well constructed in the Kandi formation flows above the ground and the possibility exists that similar conditions can be found elsewhere in the formation.

The fourth major hydrogeologic formation in northern Benin consists of igneous intrusives or granites. These hard igneous rocks are located to the south of the Kandi sedimentary basin and to the east-southeast of the Atacora range. In Benin, the granitic formations can be described as having a thin weathered layer and discontinuous fractured zones. The potential for developing the water resources from the weathered zone will tend to be marginal both in quantity and quality whereas the fractured zones generally yield limited to very good quantities of water. No test drilling or geological research has been undertaken for this area so the subsurface data available are very limited. Most of the villages located within the granitic area do not have wells that produce adequate quantities of water throughout the year because the wells are wide diameter, employing traditional well construction technology and only allowing penetration of the upper weathered zone. For this reason, we can conclude that the weathered zone will probably not provide adequate quantities of water and more sophisticated technology will have to be utilized to exploit the water contained in the major fractured zones.

In conclusion, the poorest conditions for groundwater resource development are found where the crystalline and metamorphic (granites, gneisses and quartzites) rocks are located, which represents approximately 75% of the project area. These formations yield little or no water except in localized faulted or fractured zones, or where the weathered mantle is abnormally thick. The highest yields are obtained where these two conditions occur simultaneously. Identification of those areas having the greatest potential for groundwater development requires both geologic and hydrogeologic research and the utilization of exploration geophysics such as earth resistivity, gravity and seismic refraction. The preliminary study of an area should include the review of all existing data and interpretation of aerial photos and ERTS imagery to minimize the total project cost. In addition, the areas of investigation should be limited to those with existing population concentrations where water is currently not available in sufficient quantities.

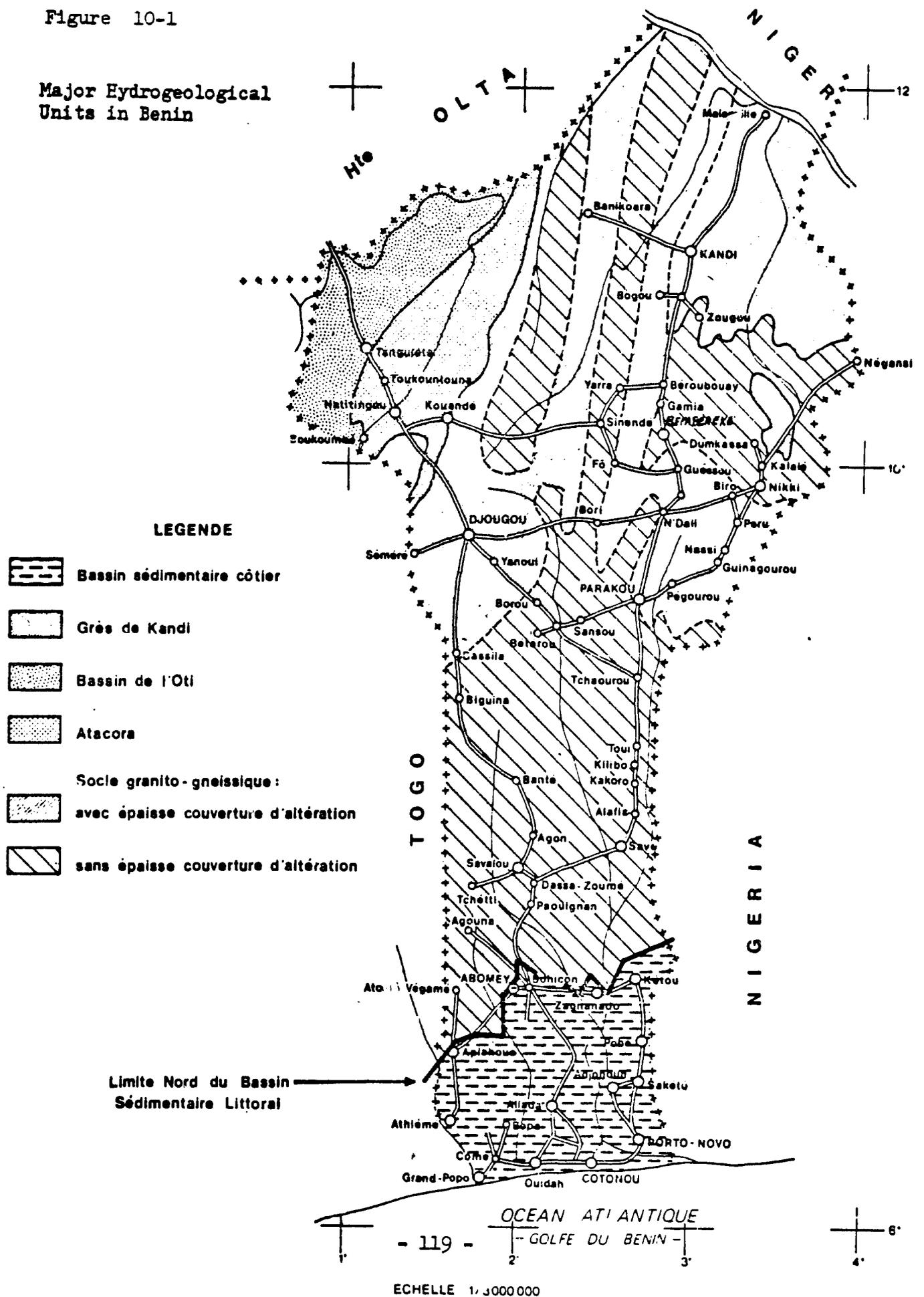
In contrast, sedimentary rocks, covering approximately 25% of the project area, are generally capable of producing substantial quantities of water and the availability of water tends to be uniform throughout the more homogeneous formation. Well site selection becomes more predictable after collecting a minimal amount of subsurface data from an exploration drilling program. Approximately 30 test holes drilled within the Kandi sandstone basin at depths averaging 100 meters should be adequate to define the potential water producing zones and the areas having the potential for flowing wells.

The drilling and well construction techniques differ considerably according to the geologic conditions, and northern Benin offers one of the most complex situations for the drilling program. Drilling the metamorphic and igneous rocks will require the use of "down-the-hole" hammer air rotary techniques while considerably less complex and expensive technologies would suffice for the sedimentary formations. Variations in the type of well construction, e.g., optimum depth, well spacing, casing, screening, cement grouting, open-hole or gravel pack also depend on the local hydrogeologic conditions. Thus, to adequately train local people in drilling technology, the program must provide experience in drilling and well construction in each of the major hydrogeologic units existing in northern Benin. For the drilling program, the equipment specified for the project is that required to drill in the hardest rock formations, but can also be used in the softer sedimentary rocks. Included with the drilling equipment is borehole geophysical logging equipment mounted on four-wheel drive vehicles. This equipment will provide an unbiased record of the subsurface lithologies which is necessary in the sedimentary, igneous and metamorphic rock areas. This information is utilized in evaluating the aquifer potential and designing the well construction at each site. The drilling hydrogeologist will be responsible for the analysis of the borehole geophysical logs.

The drilling schedule specified in the project has been designed to acquaint the national drilling teams with drilling techniques and well construction technologies in each of the major geological formations.

Figure 10-1

Major Hydrogeological
Units in Benin



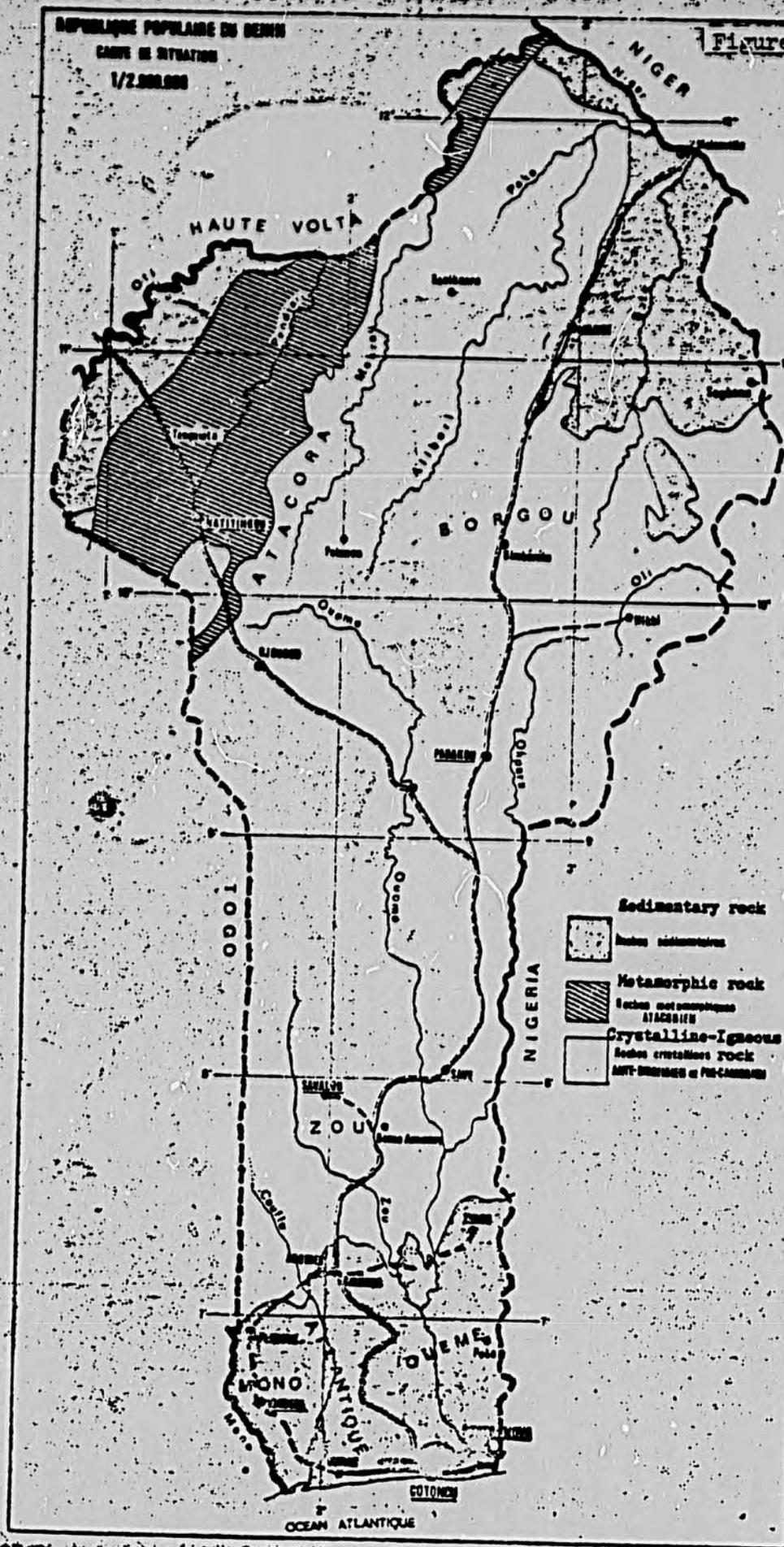


Table 10-1

Summary of Potential Water Yields from the Four Major Hydrogeological Units in Northern Benin

Formation	Lithology	Hydrogeological Unit	District or Town	Estimated Yield (m ³ /h)	Percentage of Project Zone	Remarks
I						
a) Bombouaka (Oti Basin)	Sandstone (SiO ₂ cemented)	Sedimentary	Tanguieta Datori	0.5-10	5%	Limited to good quantities. Aquifers tend to be generalized.
b) Buem	Feldspathic Sandstone Shales.	Sedimentary	Tanguieta Kobli Materi	0.5-10	5%	Quantity mixed to good. Aquifers generalized; few springs.
II						
a) Kanté (Plains of Tanguieta)	Schists, Mica-schists, Phyllites	Metamorphic	Tanguieta Boukoumbe Batia	0.5-2		Quantities marginal and aquifers very localized. Springs exist.
b) Atacorian	Quartzites Mica-schists	Metamorphic	Kouande Natitingou	1-3	60%	Entire area is plicated zone. Folding most extreme in Atacorian basin formation (Toukountouna basin). Weathered zone thin and contains only marginal quantities of water; fractured zones may yield more. One free-flowing well exists in Fractured zone (Perma).
c) Sahomean	Gneisses Quartzites Migamatites	Metamorphic	Kouande Kerou Banikoara Bembereke Djougou	0.5-2		Weathered zone thin and contains only marginal quantities of water; fractured zones may yield more. One free-flowing well exists in Fractured zone (Perma).
III						
Kandi	Siltstones, Sandstones, Shales.	Sedimentary	Malanville Kandi Segbana	30-40	15%	Good to excellent.
IV						
Nikki	Granites	Ingeous	Nikki Kalala Bembereke	3-30	15%	Marginal to good. Weathered zone normally marginal for water yield. Areas of fractures and faults can produce good quantities of water but are very localized.

B. Pump Installation and Maintenance

One of the most critical aspects of this project is the choice of the hand pump to mount on small diameter wells and the development of a maintenance and repair capacity that is both timely in repairing pumps and cost efficient. It has been correctly noted that about 70% of the existing wells in the project do not provide sufficient quantities of water during the dry season. A pump that is down 40% of the time yields less water than a poor well.

Benin's Hydraulic Service has had limited experience with the French manufactured Vergnet foot pump. Past experience with this pump has not been satisfactory, but the manufacturers have made considerable improvements in subsequent models. The Service is aware of the ABI pump, also of French manufacture, used extensively in the Ivory Coast. In addition to these two pumps, the project design team considered the AID/BATTELE, the Dempster and Moyno pumps. The team recommended proprietary procurement of the Moyno pump based on experience with it in other African countries (the Moyno pump has very little actual usage in West Africa; however, a pump with the same design has been manufactured in Great Britain and is presently being used in several African countries), its low maintenance requirements, rugged construction, simple design, ease of operation and low price in comparison with other models of manual pumps. In addition, the American manufacturer of the Moyno pump is a reliable firm, financially sound and seriously interested in entering the West African market. The manufacturer is willing to provide installation and maintenance manuals written in French, to assist in periodic evaluations of the pump's performance and in making adjustments and modifications to facilitate the pump's operations in West Africa.

Benin's Hydraulic Service has some reservations in accepting the project design team's recommendations, especially in light of past experience with maintenance problems with American manufactured pumps and without actually testing the pump before acceptance. Thus, a short demonstration and test program is being conducted at the present time.

It is estimated that the Moyno pump can supply adequate water for up to 350 people. The project design team recommends that one well be installed for every 225-250 village residents. If a school or dispensary is located in the village, consideration should be given to providing water to these institutions if geologic conditions are favorable. In selecting drilling sites for the wells, a minimum of three or four wells should be installed in an area having an approximate radius of five kilometers to facilitate maintenance of

the pumps and to provide villagers with alternative sources of water in case one pump is down. The majority of pumps should be placed in villages within five to seven kilometers of major roads in the area. No more than 60 wells should be placed in any one area covered by a district maintenance crew. One of these crews, fully equipped, should in time be capable of covering 120-130 wells adequately. It is recommended, however, that during this experimental phase, the crews should limit their activities to about half their eventual capacity.

Maintenance of hand pumps should eventually become the responsibility of the villagers, as it is neither extremely complex or costly. The role of the Hydraulic service is to introduce the technology, assist in developing a local capability to maintain pumps, and eventually become primarily a supplier of pumps and spare parts. To keep this long term objective in view, villages should participate in sharing the pump maintenance cost from the beginning of the program. This will permit the development of village-level arrangements to collect the money necessary for maintenance and the purchase of spare parts. It will also enable the Hydraulic Service to handle financial transactions on a commercial basis. Flexibility must be maintained in setting up the system as neither the maintenance costs nor the ability of local villages to collect the funds is known. It has been noted, however, that villages do contribute substantial amounts collectively from the development of village water resources.

PART II PERSONNEL AND EQUIPMENT REQUIRED BY THE PROJECT

A. Natural Spring Captation

1. Personnel

- a. Engineering Geologist/Civil Engineer
(1)
AID
36 p/m
Minimum of 2 years experience working in field construction. Design and construction of small reinforced concrete structures and water distribution systems. Interest and ability to design and supervise the construction of spring captations, small reservoirs and village water distribution systems. Fluent French and strong interest to work in Africa.
- b. Peace Corps Volunteers
(2)
December 1980 to January 1983.

2. Equipment

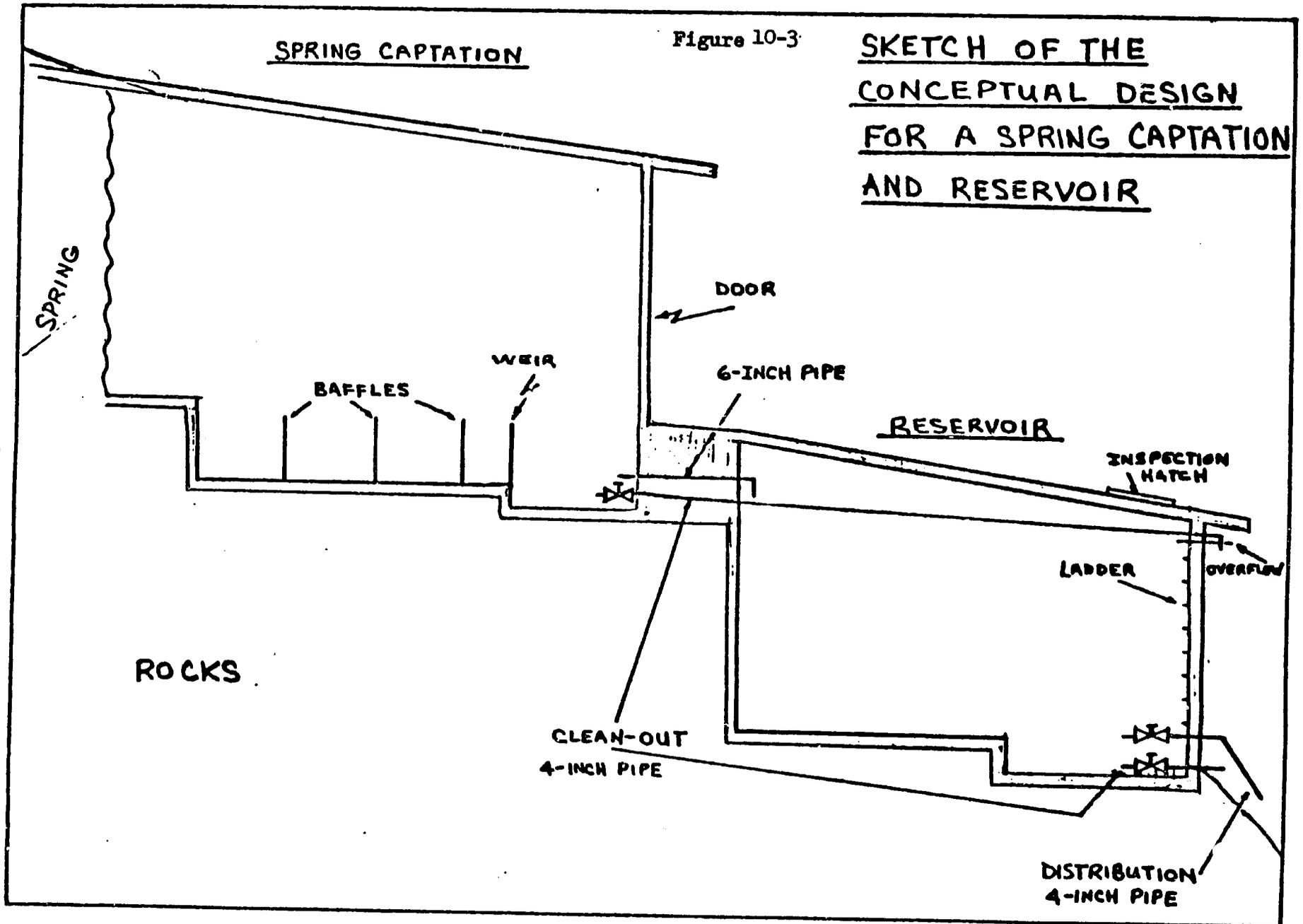
- a. UN-CDF
Ingersoll-Rand Air Compressor
600 cfm at 250 PSI, diesel engine, trailer mounted, 200 feet hose, regulator and filter.
- b. UN-CDF
Ingersoll-Rand Air Hammer
Assorted bits and chisels (Granite).
- c. UN-CDF
Ingersoll-Rand Air Drills
Carbaloy bits and extensions, assorted sizes.
- d. UN-CDF
Cement Mixer
3/4 - 1 m³ capacity, diesel engine, trailer mounted.
- e. (2) UN-CDF
4-wheel drive pick-up with diesel engine, front mounted winch canvas covered bed and trailer hitch.
- f. (1) UN-CDF
2-wheel drive (Type Peugeot baché) pick-up, canvas covered bed and trailer hitch
- g. (1) UN-CDF
Small self-propelled trencher, 15 hp gasoline engine and trailer.

2. Equipment (cont'd)
- h. (1) AID Porta-Kamp heavy-duty trailer house.
 - i. (2) AID Flat-bed trailers.
 - j. (2) AID 700 gal. fuel tank mounted on trailer.
 - k. (X) AID Hand Tools.
Picks, shovels, wheel barrows, sledge hammers, star drills, crow bars, tool chests (4) for masonry, carpentry, steel fitting and general mechanics.
 - l. (2) AID Motorcycles.
3. Construction Material (6 or 7 springs)
- a. AID/GPRB Cement 400 T.
 - b. GPRB Sand/Gravel.
 - c. AID Reinforcing rod and wire
 - d. AID Pipe:
 - (a) 6-inch steel: 45 m.
 - (b) 4-inch steel: 60 m.
 - (c) 3-inch PVC: 25,000 m.
 - (d) 1-1/2 inch PVC: 20,000 m.
 - (e) 3/4 inch Galvanized: 600 m.
 - e. AID Valves:
 - (a) 3/4 inch "waste not": 25
 - (b) 4-inch steel gate valves: 25
 - (c) 3-inch PVC (zone control): 75
 - (d) 1-1/2 inch PVC (zone control): 125
 - f. AID Steel plates and angle iron for frames.
4. Other
- (1) AID 25 KW Generator, mounted on skids for use at technicians residence/office.

SPRING CAPTATION

Figure 10-3

SKETCH OF THE
CONCEPTUAL DESIGN
FOR A SPRING CAPTATION
AND RESERVOIR



B. Drilled Well Construction Activity

1. Personnel

a. Drilling
Hydrogeologist
(1)
42 pm
AID

Minimum of 10 years education and experience in quantitative evaluation of hydrogeologic conditions; regional and site specific. Recent responsibilities (minimum 5 years) to include borehole geophysical logging and interpretation, drilling techniques and operation of equipment, implementation and evaluation of an exploration drilling program, well design and construction, aquifer testing and evaluation, and personnel training and project management. Fluent French speaking and international work experience, preferably Africa.

b. Mechanical
Superintendent
(1)
AID
42 pm

Minimum of 10 years experience in maintaining heavy construction equipment; preferably well drilling rigs and diesel engines. Experience and/or desire to train qualified nationals to perform all of the maintenance required for a well drilling operation. Fluent French speaking and international work experience; preferably in Africa.

c. Driller
(1)
AID
36 pm

Minimum of 10 years experience in the operation and maintenance of mud/rotary down-the-hole hammer combination drilling equipment in consolidated rocks. Exploration drilling, construction and development of open-hole, screened and gravel-pack wells. Experience and/or desire to train qualified nationals to perform work. Fluent French desirable and international work experience; preferably in Africa.

1. Personnel (cont'd)

- d. Pump Maintenance
Supervisor
(1)
AID
24 pm

General industrial arts background with experience in the installation and maintenance of small manual pumps. Experience and/or desire to train qualified nationals to install and maintain pumps and to establish regional and local preventative maintenance, repair and parts supply network, including inventory control and ordering of parts. Fluent French required and international work experience, preferably in Africa.

- e. Hydrogeologist/
Geophysicist
(1)
AID
4 pm

Minimum of 10 years education and experience in the application of exploration geophysics to evaluate the groundwater potential of an area: (metamorphic and igneous rocks) regional and site specific. Recent responsibilities (minimum 5 years) to include gravity, seismic, and earth resistivity surveying and interpretation of the data, and personnel training and project management. Experience and/or desire to train qualified nationals to perform the work. Fluent French and international experience, preferably in Africa.

2. Equipment

- a. (1) UN-CDF

Failing 1250 rotary drilling rig mtd. on 2050 IHC diesel with interlock, 5x6 Gardner-Denver mud pump, 400' 2-7/8 IF drill pipe - 20' lengths, subs for swivel and end rod, portable mud pit and parts for rig truck; table to be compatible with IRW Mission hammer.

Miller 180 amp Roughneck welder, tools and equipment mtd. on rig.

- b. (2) UN-CDF

TRW Mission Hammer
6-7/8" hole.

- c. (1) UN-CDF

Ingersoll-Rand air compressor
600 cfm at 250 PSI, diesel engine, trailer mtd., 100 feet hose, regulator and filter.

2. Equipment (cont'd)

- d. (1) UN-CDF 5T diesel truck with interlock, equipped with 1200 gallon water tank; tank to be equipped with vacuum, gasoline transfer pump and interchangeable suction hoses with strainers, Ramsey 12 T PTO winch mtd. on front of truck.
- e. (1) UN-CDF Cyclone F 40 pump hoist mtd. on 5-ton diesel truck.
- f. (3) UN-CDF 4-wheel drive pick-up, diesel engine, front mtd. winch, canvas covered bed and trailer hitch.
- g. (4) UN-CDF 2-wheel drive (Type 404 Peugeot baché) pick-up, canvas covered bed and trailer hitch.
- h. UN-CDF Camping equipment sufficient for three field teams of four persons each.
- i. (1) AID Johnson-Keck Mod. SR-3000, dual chart, self-recording, level-wind motorized winch (20 fpm). Gamma, SP, hole caliper, mud resistivity, fluid conductivity, resistivity (0.25, 2.5 and single-point).
- j. (1) AID La Coste & Romberg Gravity Meter.
- k. (1) AID Electrical Resistivity Meter.
- l. (1) AID Bison Signal Enhancement Seismograph, equipped with polaroid attachment and trailer mtd. hammer, extra rechargeable batteries and spare parts; 220 V, 50 Hz power.
- m. (2) AID 700 gal. fuel tanks mounted on trailers.
- n. (2) AID 3,000 liter fuel tank (stationary).
- o. (2) AID Motorcycles.
- p. (8) AID Single side bank radios with two base stations.
- q. (1) AID Mobile generator 4.5 KW gasoline engine, mounted on wheeled frame.

2. Equipment (cont'd)

- r. (2) AID Stationary 25 KW Generator.
- s. (2) AID Heavy duty trailer houses, approx. 8' x 25'; (Porta-Kamp).
- t. (1) AID Miller D-5 portable 200 amp continuous diesel-drive welder, 30 feet welding cables, (2) hoods, spare glass, gloves, and 200 lbs. No. 7013 5/32 rod. 220 V 50 Hz.
- u. (2) AID Airco oxygen/acetylene cutting outfit, equipped with necessary tips for heating, cutting and brazing; 30 feet hose, tip cleaners and strikers, hose adapters for fitting metric threaded oxygen/acetylene tanks, two-stage regulator, gauges (PSI and kg/cm²); check valves, goggles, etc. to be included.
- v. (1) AID Shop Air Compressor
- w. (1) AID Complete set of automotive repair, tire repair, and basic metal working shop tools.
- x. (250) AID Hand-pumps, Moyno manual operated, deep well model complete incl. connecting rods. Specify metric fasteners for pump head assembly.
- y. AID Extension pipe. Metric equivalent of 2" drop pipe with threads corresponding with head assembly; 8,000 m.
- z. (5) AID Tool chest for district-level pump maintenance centers. Tool chest will include: pipe wrenches (4) pipe cutter and threader (3/4") (2), vice, and basic plumbing tools.
- aa. (200) AID Tool kit for village-level pump maintenance. (Tools specified in Robbins/Myers bulletin 678.)

2. Equipment (cont'd)

bb. (X) AID Audio-visual training equipment for pump maintenance and repair training programs (slide projectors, overhead projectors, etc.)

cc. (X) AID Hand tools (Picks, shovels, Wheelbarrows, sledge hammers; set of masonry, carpentry, steel fitting and general mechanics).

3. Well Construction Materials and Supplies

a. UN-CDF Drilling mud (bentonite); Quick-gel
AID 3 bags/hole x 225 holes.
GPRB

b. UN-CDF Barafos and cleaning agent
AID 1 bag/hole x 225 holes
GPRB

c. UN-CDF Well casing (4" - Black, 0.250 wall,
AID T & C, API TH.); 100 m/well x 50 wells.
GPRB

d. UN-CDF Well casing (4" PVC);
AID 50 m/well x 175 wells.
GPRB

e. UN-CDF Rotary drill shoes (225); well screens,
AID 304 ss Johnson, No. 12 slot, 4' lg.
GPRB pipe-size screen and fittings (225).

f. UN-CDF Bits
AID (a) hammer bits (24)
GPRB (b) tricone bits (200)

g. AID Cement 200 T.
GPRB

h. AID Gravel 300 m³.
GPRB

i. UN-CDF Drill stem, 400' x 2-7/8" IF.

PART III. OPERATIONAL COSTS

A. Estimated Fuel Costs for Project Equipment

(A)	(B)	(C)	(D)	(E)	(F)	(G)
EQUIPMENT	Estimated Daily Fuel Consumption (Liters)	Number of Units	Annual use (days)	Annual Fuel Consumption (Liters)	Annual Fuel Cost (\$)	Life of Project Fuel Cost (\$)
Concrete Mixers	20	2	140	2,800	935	2,800
Air Compressor	30	2	140	4,200	1,400	4,200
Generator	40	1	90	3,600	1,200	3,600
Dump Truck	40	1	150	6,000	2,000	6,000
4x4 LR	17	2	600	10,200	3,400	10,200
2x4 - 404 P.	12	1	240	2,900	960	2,900
25 KW Generator	40	1	100	4,000	1,300	4,000
4x4 LR	20	2	600	12,000	4,000	12,000
2x4 - 404 P.	12	1	250	3,000	1,000	3,000
Drill Rig	450	1	250	112,500	37,500	112,500
Water Truck	50	1	250	12,500	4,200	12,500
Hoist Truck	40	1	250	10,000	3,300	10,000
4x4 LR	17	2	720	12,250	4,080	12,250
2x4 - 404 P.	12	4	960	11,500	3,850	11,500
4.5 KW Generator	40	1	250	10,000	3,300	10,000
25 KW Generator	40	2	500	10,000	3,300	10,000
Start-up Activities						30,000
Lubricants					20,810	62,550
TOTAL				227,450	\$96,573	\$320,000

Of which:

AID provides
GFRB provides

\$270,000
50,000

B. Spare Parts and Maintenance Costs for Project Equipment

A	B	C	D	E	F
EQUIPMENT	UNITS	Percentage and amount of spare parts ordered with equipment (1)	Planned percentage and amount of spare parts purchased during project operations	Annual maintenance per equip. unit	Life of project total for equipment maintenance
Drill Rig	1	25% 42,500	10% 17,000	3,000	9,000
Trencher	1	25% 7,500	10% 3,000	2,500	7,500
5T. Trucks	3	25% 32,500	05% 6,500	2,500	22,500
4X4 IR	7	25% 23,900	05% 5,000	1,500	31,500
2X4 - 404	6	25% 12,000	05% 2,200	1,200	21,500
4.5 KW Generator	1	10% 1,000	10% 1,000	1,000	2,000
25 KW Generator	3	10% 6,000	12% 7,000	1,000	9,000
Trailer Houses	3	10% 3,600	10% 3,600	800	7,200
Trailer mtd. fuel tanks	4	- -	- -	200	2,400
Geophysical Loggers	1	10% 2,500	20% 5,000	300	900
Geophysical Research Equipment	3	10% 5,000	20% 10,000	300	2,700
Maintenance Shop Equipment	X	X X	30% 14,000	X	X
Air Compressors	2	25% 5,000	10% 2,000	800	4,800
Cement Mixers	2	25% 2,500	10% 1,000	500	3,000
Mobylettes	12	- -	25% 2,100	100	3,600
Motorcycles	8	- -	25% 2,400	150	3,600
Air Drills/Hammers	4	25% 6,000	10% 1,200	50	800
			83,000 (2)		132,000 (2)

(1) A twenty-five percent spare parts component has been added to all equipment to be purchased by UN-CDF. This spare parts supply will be ordered with the equipment. The project (GPRB and AID) have also budgeted an additional amount to cover additional repairs that may be required during the three years operation of the project. This additional amount is shown in Column C. For AID financed equipment, a ten percent spare parts component has been included with the initial purchase of the equipment and an additional amount (normally 20%) has been included as an operational expenditure.

(2) Column D represents expenditures for spare parts in excess of the original spare parts component which was ordered at the time the purchase of equipment was made. Column F represents periodical maintenance and labor costs of replacing spare parts. The total of columns D and F make the line item "Equipment maintenance and spare parts" in the budget under the heading Operational Costs. AID will contribute \$190,000 of the total \$215,000 with the GPRB contributing approximately \$25,000.

PART IV. WATER RESOURCES DEVELOPMENT IMPLEMENTATION PLAN

- 19 Grant Agreement signed.
- 19 a) Equipment Ordered, and
b) Technical Assistance contracted.
- May 1980 Natural Springs studied (output)
- 198 a) Drilling Equipment arrives
b) Hydrogeologist (Team Leader) and Mechanical Superintendent arrive to begin planning of first year drilling campaign and setting up equipment.
- 1981 Remaining team members arrive and all FCV trained and on-site.
- Feb 1981 Drilling program, Spring Captation, and Pump Maintenance programs start.

Drilling Operation
begins in priority villages in triangular area between Malanville-Segbana-Kandi in Sandstone formations.

Spring Captation -
one team begins operation in Kouanda. Second team begins construction in same vicinity probably Maka. Construction will probably require 9 months in both areas. Feb 1981-Nov 1981.

- June 1981 Photo interpretation begins of metamorphic rock area around Banikoara.
- Sept 1981 Geophysical survey begins between Kandi and Banikoara.
- Nov 1981 Results of photo interpretation and geophysical survey analyzed, and a thirty test-wells program designed for hard rock area.
- Dec 1981 Approximately 60 wells completed in sandstone region.

Drilling Operation (cont'd)

Spring Captation (cont'd)

Jan 1982	Drilling program begins for 30 test wells in hard rock zone.	
Apr 1982	Test well program completed and results analyzed and future year drilling programs made.	
June 1982	Drilling resumes in sandstone region for duration of rainy season.	Spring captation construction begins at two new sites.
Oct 1982	Drilling begins in area selected for future year drilling programs.	
Feb 1983		New sites selected for spring captation. Construction (one or two depending on survey of existing springs).
July 1983	Drilling equipment serviced and 1983-4 program planned.	Spring captation advisor terminates.
Sept 1983	Final year of drilling program begins.	
July 1984	Drilling equipment serviced. AID provided TA terminates.	

Figure 10-4

Potential Sites for
Natural Spring Captation.

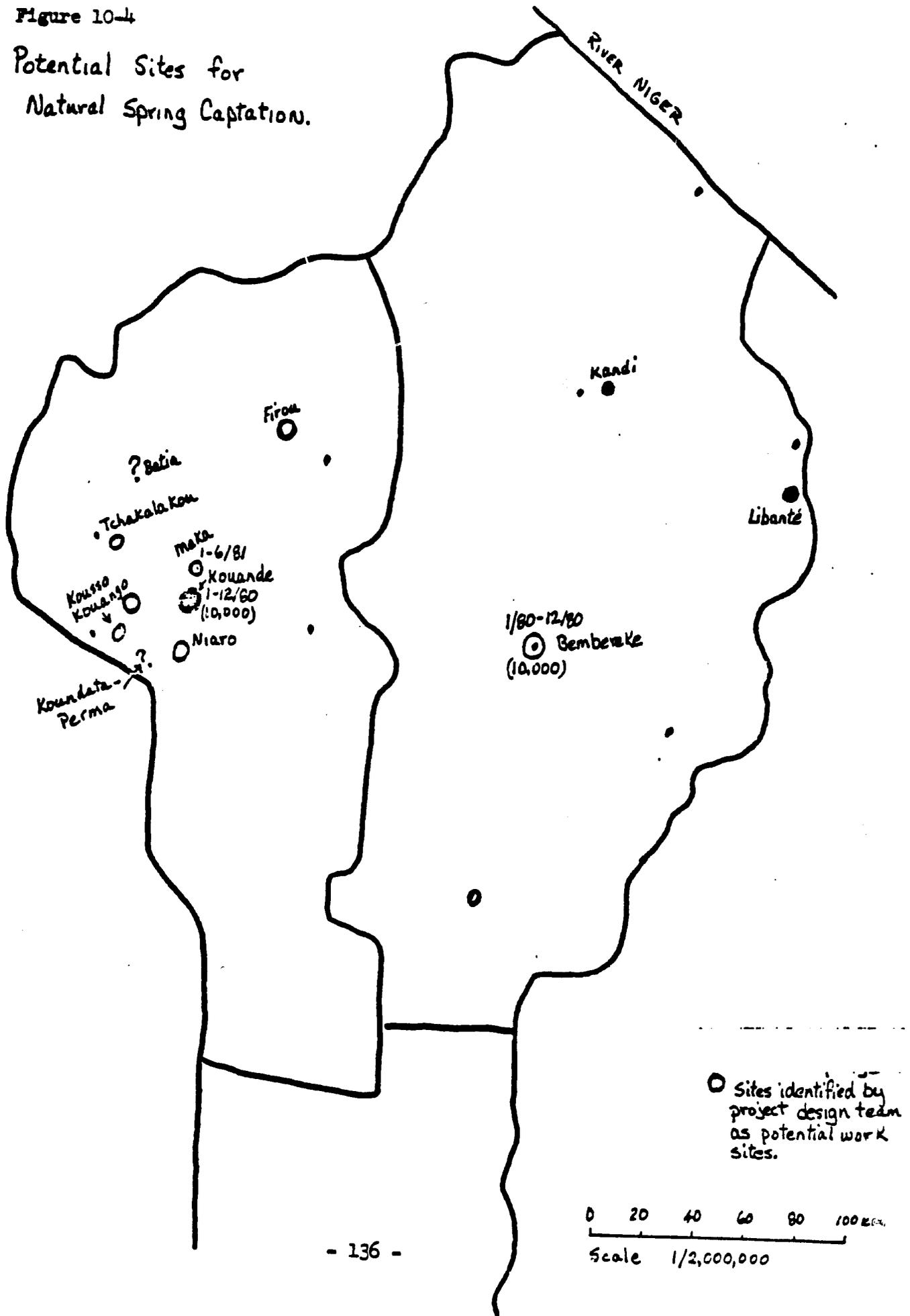


Figure 10-5

Implementation Schedule for the Drilled Well Construction Activity.

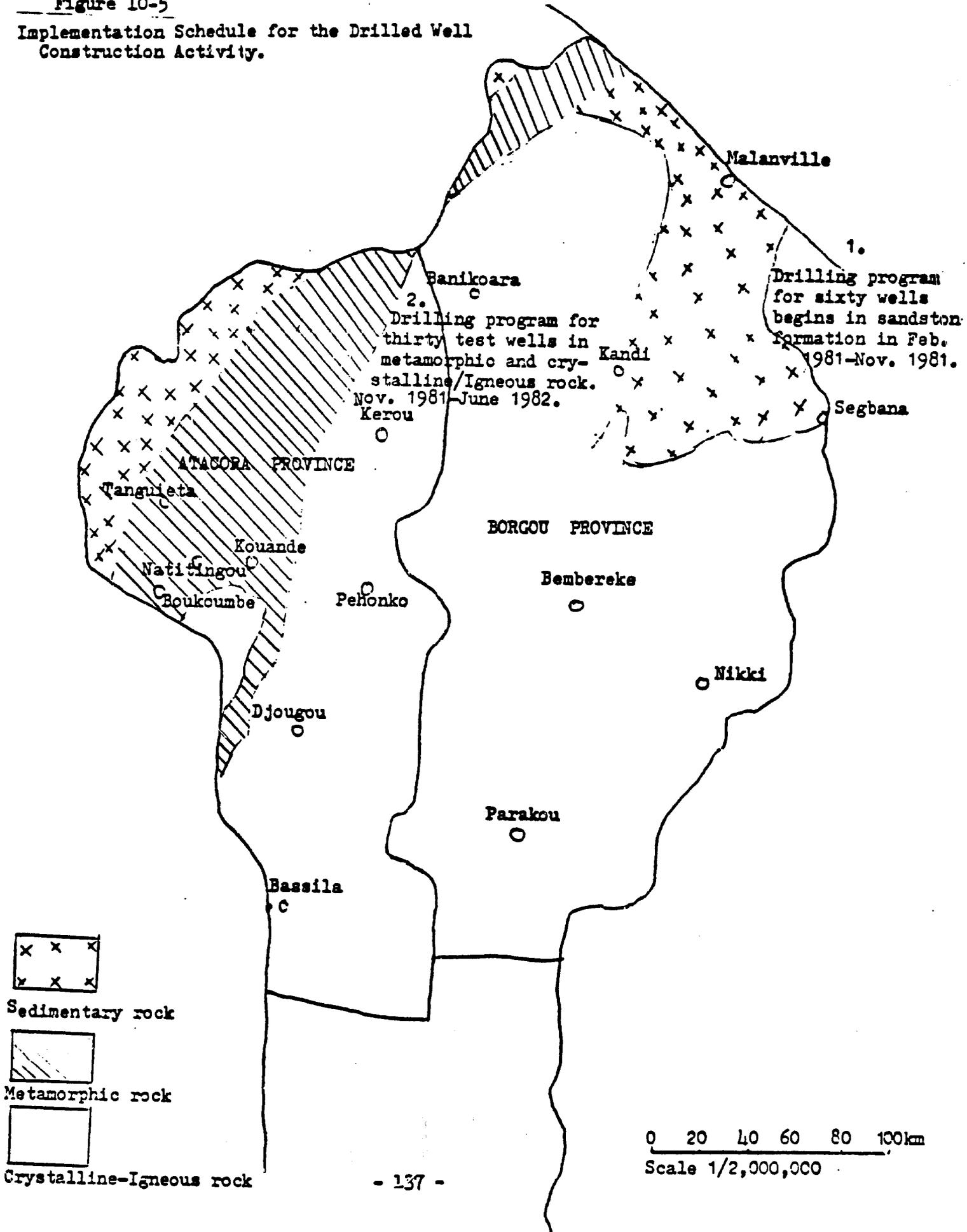
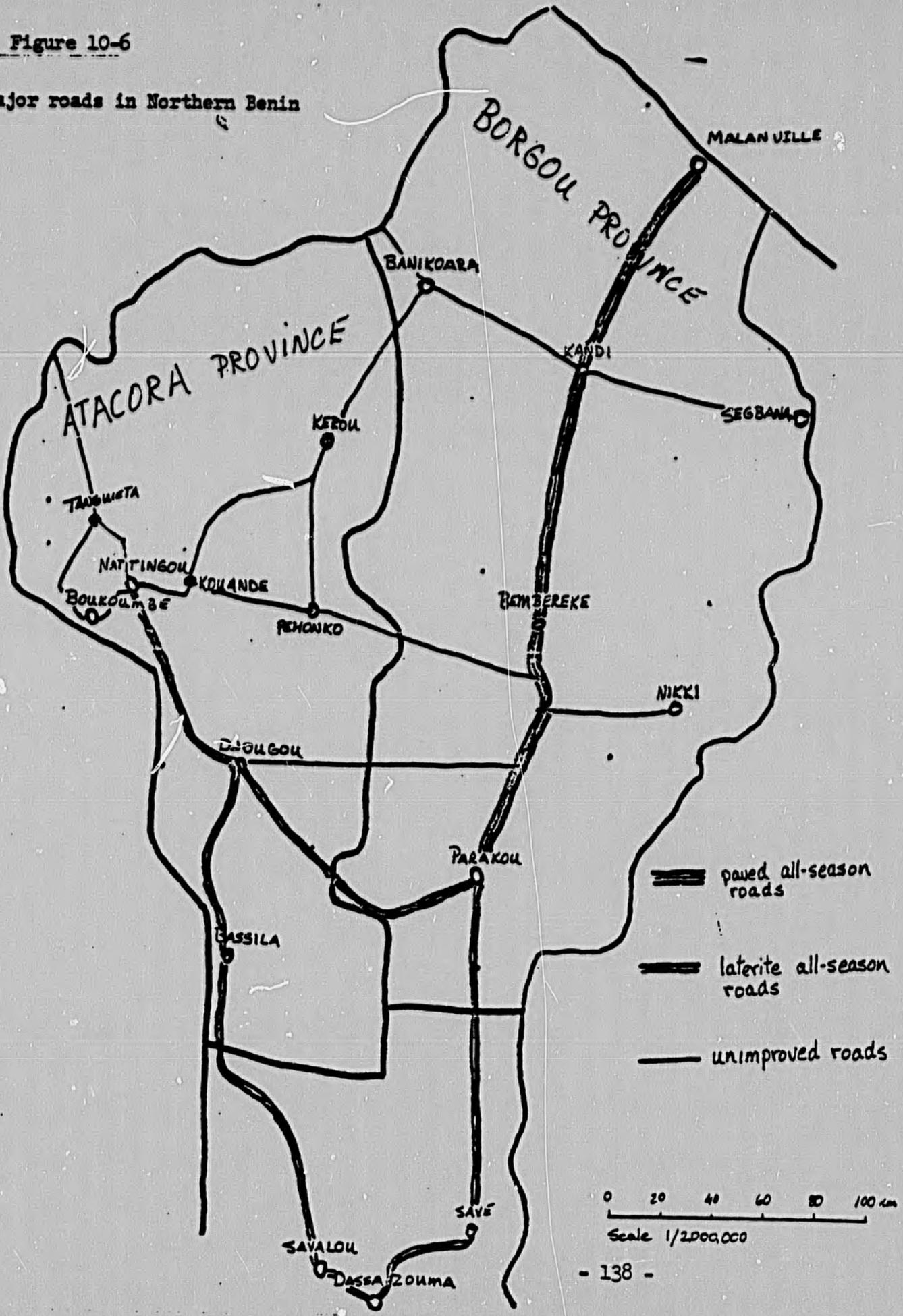


Figure 10-6

Major roads in Northern Benin



ANNEX ELEVEN

PUBLIC HEALTH EDUCATION AND VILLAGE SANITATION COMPONENT

(Benin Rural Water Supply and Sanitation Project)

**. Sarah K. Fry
December 1978**

BACKGROUND

The two northern provinces of Benin, Borgou and Atacora are Sahelian in climate and characterized by a comparatively thin population density, isolated villages and difficult terrain. The inhabitants are nearly all rural, sedentary subsistence farmers with some semi-nomadic cattle herders. The recent drought in the Sahel has affected the area: water is scarce, harvests are meager, and survival conditions for humans and livestock are difficult. From the time of French colonization which had its major impact on the south of the country, the coastal regions have seen the most development activity. The less accessible northern provinces have been more or less neglected, and infrastructure and service delivery are considerably below the standards of the rest of the country. The population in the north is 97% ~~illiterate~~, the highest rate for all of Benin.

HEALTH PROFILE

Available health statistics indicate that 54% of diseases seen in rural medical facilities are infectious and parasitic.¹ Among diseases endemic to the project area are malaria, shistosomiasis, onchocerciasis, cholera, typhoid, amebiasis, ascariasis and a variety of other parasitoses. Malnutrition, respiratory infections, malaria, diarrhea, parasites and anaemia are among the main causes of mortality for children under five and seriously affect pregnant women. A large percentage of the illnesses in the northern regions of Benin are water-borne or water related.

The incidence of water-borne and water-related diseases in a given area is in direct relationship to the condition of the water sources and sanitation practices of that area. In northern Benin, water is a scarce resource. Wells, usually hand-dug, are few and often miles away. They are uncovered and easily contaminated. In the rainy season or when other water sources are more convenient, the women fetch water from ponds, streams or marigots which are also used for bathing and laundry. Animals roam freely around these water sources and the rains wash garbage and fecal matter into them. It is the women's job to fetch water, and the scarcity of it makes the job a time-consuming and tedious one. In the home, water is stored mainly in open containers and dipped into freely, creating another potential for contamination. In the dry season when water is at a severe premium, use for bathing is superseded by cooking and drinking, and the occurrence of skin disease and infestations is high.

The most serious cause of water and food contamination is indiscriminate excreta and garbage disposal. There are virtually no latrines, and

¹ ~~Health Profile~~ of the People's Republic of Benin" prepared by Dr. Silou, Director of WHO/Benin

TABLE # 1

ATAKORA PROVINCE MEDICAL FACILITIES - JUNE, 1977

(From Health/Sanitation Report by Edward P. Michalewicz)

DISTRICT INFRASTRUCTURE	BASSILA	DJOUGOU	OUAKE	NATITINGOU	TANGUIETA	KEROU	KOANDE	BOUKOUMBE	TOTAL
Medical Center	1	1	1	1	1	1	1	1	8
Maternites	1	1	1	1	1	1	2	1	9
Dispensaries	7	1	3	0	2	0	0	4	17
Infirmaries	0	9	0	7	7	2	4	0	29
Hospital	0	1	0	1	1	0	0	0	3
Pharmacy	1	1	0	2	1	1	1	1	8
Leprosarium or Other Services	-	1	-	4	-	-	1	0	6

the ones that do exist are not regularly used, people preferring the privacy and distance of the outlying fields. Infected persons pass parasitic egg cysts in their stools, which are then transmitted to the village environment to continue the cycle of infection. Household garbage is tossed over the wall of the compound and the garbage heaps attract flies and scavenging animals. The food sold in the market is rarely protected from flies and dirt, and is often eaten with unwashed hands. The condition of the compounds in which people live also fosters the spread of disease: houses are poorly aerated, and not screened from insects, animals are not confined, and people (especially children) sleep close together, encouraging the spread of infection by droplet.

It should not be deduced from this description of village sanitary conditions and practices that the inhabitants are unconcerned about their own health and especially the health of their children. Quite to the contrary, mothers here as anywhere in the world give great importance to the well-being of their children, and would not willfully do anything to impair it. Traditional interpretations of the causes of illness prevail, unfortunately mostly erroneous, and more often than not, traditional cure is sought. Depending on accessibility, modern medical facilities are used in conjunction with traditional healers.

In essence, the interrelationship of environmental sanitation, water and disease is not known to the villagers. The need for a convenient water source will be expressed by all, and a new well welcomed, but no distinction made between safe and contaminated water. If the dangers of exposed excreta are not known, then the need for latrines won't be felt, and in this case there may even be resistance to the idea stemming from cultural reasons. It stands to reason that measures with visible beneficial results would be readily adopted by a community. The health benefits of having and using latrines, although proven beyond doubt in studies and projects, will not be particularly obvious to rural illiterate villagers in northern Benin since these benefits are not immediate and the connection between reduced incidence of disease and proper excreta disposal not highly visible. Villagers' receptivity to new ideas and change could depend on previous contacts with extension workers or volunteers and the presence of schools and health facilities.

To date, the government health services have not been very effective in combatting the ills of the rural population. A great proportion of these ills are preventable through education and sanitation, but health policies have heavily stressed curative medicine. Government monies for health services have mainly been spent on salaries for highly trained health personnel and upkeep of modern urban medical facilities. Considering that 80% of the country's population lives in rural areas, the imbalance is striking. There is currently 1 doctor per 36,000 inhabitants, 1 midwife per 12,900 inhabitants and 1 nurse per 3,200 inhabitants.

Rural dispensaries and maternities are understaffed, seriously under-equipped, and more often than not lacking in sanitary facilities and safe water supply. The staff receives little supervision and unsanitary practices go uncontrolled. In the north, the local pharmacies are only sporadically restocked. Health education may be dispensed by a few individuals, but is not required or institutionalized as such.

This is not to say that there aren't health education programs. There are, but they have been supported by the Ministries of Education and Rural Development, not Health, whose primary preventive action has been through immunization programs.

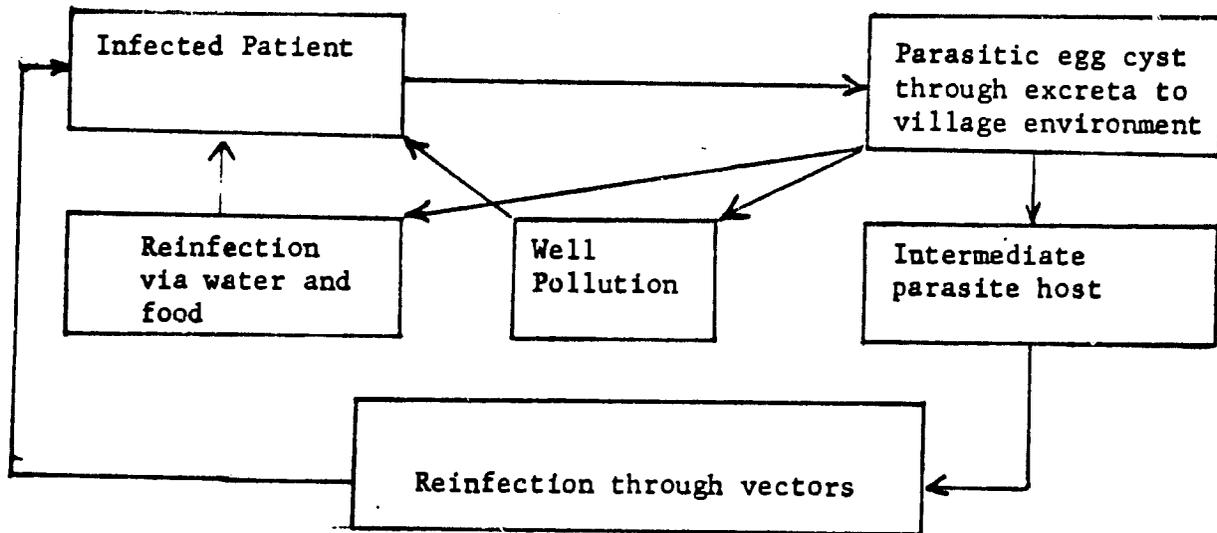
Health education courses have been mandatory in all primary schools in the country for several years. Teacher training in health education was done mainly by Peace Corps volunteers on a local basis and some teaching material was developed. Although a few schools have built latrines, most are without, and opportunities for the practical application of health education lessons are minimal. Medical teams make the rounds to schools about once a year to weigh and measure the pupils, and to check for obvious symptoms of illness.

Another ongoing rural health education program is supported by the Ministry of Rural Development and executed by animatrices rurales, young women recruited out of high school and trained at the Ouando Horticulture and Nutrition Training Center outside Porto Novo. The women are trained for about 9 months in all facets of rural health education with an emphasis on nutrition, but once out in the field they are attached to CARDER (MRD) and required to work mainly as agricultural extension agents with little opportunity to put their training to use. They have no clear program to work in, no backstopping and virtually no transportation -- a bicycle at most.

The future of the country's health infrastructure looks much brighter. The Ministry of Health very recently underwent a major structural reorganization which reflects a shift in priorities from urban curative medicine to rural preventative action. Authority has been decentralized, the Ministry itself broken up into thirteen divisions and long-term programs involving the remotest villages on a self-help basis planned (see Appendix B). These new plans are very ambitious and will require a considerable increase in funds and trained personnel.

PROJECT PURPOSE AND GOALS

In most villages in northern Benin, the cycle of parasitic, bacterial and viral infection, as shown in the following schema,² continues unimpeded:



Improvement on people's health depends on a strategic break-up of this cycle, keeping in mind that there are many sources for disease and a variety of physical and cultural factors which must be taken into consideration. A safe water supply system, while a necessary condition for improved health, is not a sufficient condition. Safe water for consumption and bathing must be accompanied by a sanitary excreta disposal system, proper waste disposal, sanitary food marketing, processing and preparation, and personal hygiene.

There is considerable empirical evidence that the provision of a safe, convenient water supply and sanitation system will significantly reduce the incidence of water-borne and water-related disease, up to 60% according to some estimates.³ Diarrhea, one of the main causes of infant

²Fred Awantung - Village Health Education Program for the USAID Upper Volta Rural Water Supply Project. July 1978.

³IBRD/IDA "Village Water Supply and Sanitation in LDCs". March 15, 1974

mortality, could be reduced by approximately two-thirds.⁴ Further potential health benefits from such a system are a reduction of parasites and anaemia in children and pregnant women. If more water is available for bathing and laundering, a reduction in the incidence of skin disease can also be expected. Improved health also means improved productivity. A convenient source of water would reduce the workload of women - the energy formerly spent on searching for and carrying water can be redirected to home and field activities, to cottage industries and various cooperatives. There is potential here for an increase in women's personal income, and this often means better food and care for their children as noted by Peace Corps volunteers working with women's cottage industry cooperatives in the Cameroons. On the other hand, the village's demand for water may increase when it is provided with a convenient source. If so, the women whose job it is to fetch the water may be making more trips to the well to meet this demand until a leveling-off period is reached.

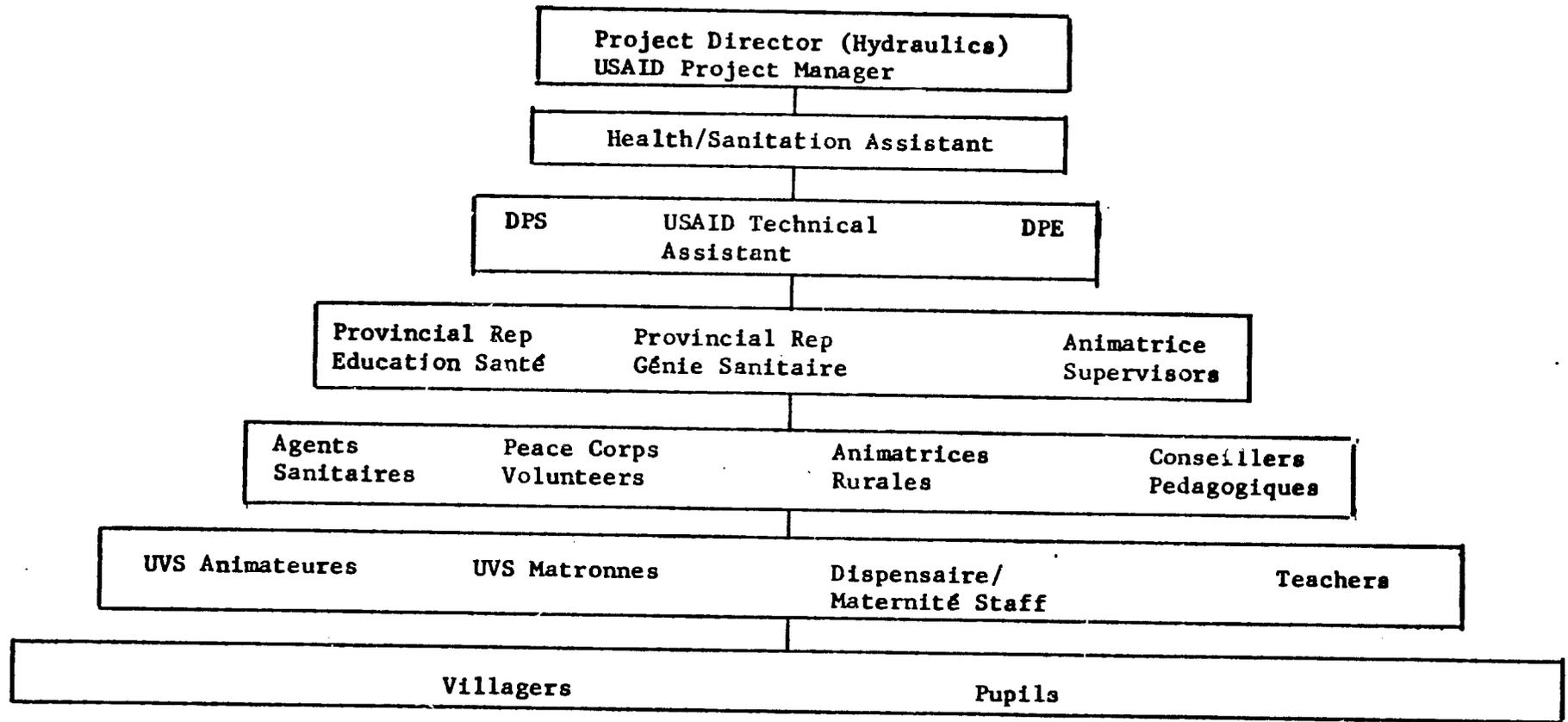
The Government of Benin, in its new plan to reduce the general morbidity of the country's population, has set as one of its goals a 50% reduction in the incidence of gastro-intestinal, infectious, and parasitic diseases by 1986, a figure which is compatible with the above estimates.

Within the Benin Rural Water Supply and Sanitation Project, the U.S. and Benin Governments propose to provide some 250 villages in northern Benin with permanent, safe water sources (see detailed project description in Project Paper). This activity will be synchronized with a public health and village sanitation program designed to fully exploit the potential health benefits of a safe water supply system by aiming at strategic points in the cycle of infection. The primary objective of such a program will be to promote the villagers' understanding of the interrelationship of various factors and practices such as exposed excreta and garbage, water pollution and personal hygiene on their own health, and thus create a felt need and demand for sanitation services. It will above all encourage village initiative and self-reliance in accordance with Ministry of Health objectives.

The overall objective of the project is to strengthen the infrastructure and technical capabilities of the Beninese Government and to leave it with enough trained and experienced personnel to be able to carry out similar development programs in the future with minimal outside aid. These

⁴Ibid.

TABLE # 2



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ORGANIZATIONAL PLAN

HEALTH EDUCATION AND VILLAGE SANITATION PROGRAM

(BENIN RURAL WATER SUPPLY AND SANITATION PROJECT)

objectives apply equally to each component of the project. To accomplish these objectives the health education and sanitation component proposes to work to the greatest extent possible through existing and/or planned government institutions (public schools, health centers) and to use to the greatest extent possible Beninese personnel (technicians, animatrices rurales, sanitation agents, nurses, midwives, teachers, village health leaders) with technical assistance provided by a USAID public health specialist and Peace Corps Volunteers. The program further proposes to strengthen training institutions, support pre- and in-service training of public health and sanitation personnel, and assist in the creation and production of teaching and training materials.

PROPOSED HEALTH EDUCATION/SANITATION PROGRAM

ORGANIZATION

The hierarchy of the Benin Government has a repetitive structure from the presidential/ministerial level down to the village level, passing through provinces, districts and communes, which will be closely followed by the health education/sanitation activity. The structure is designed to provide an optimum of supervision and back-stopping for those working in the field, and of coordination mechanisms for the various activities at the provincial project direction level. (See Table 2, Organizational Plan, of this report, and Table 6, Project Organizational Chart, in Part V, Implementation Arrangements, of the Project Paper.)

The following is a detailed examination of the current and/or projected roles of the health education and village sanitation program personnel. This is presented by administrative hierarchy.

National Level:

Directly under the Project Director provided by the Hydraulic Service and the USAID Project Manager will be a Health/Sanitation Assistant provided by the Ministry of Health. The Ministry of Health will have the most important input into the health education/village sanitation component of the project, but due to the very recent reorganization of the ministry and ensuing shifts in personnel, various roles and inputs have yet to be clearly defined. From preliminary discussions with Ministry officials, it has been possible to identify the following subdivisions as having potential involvement in the project:

- Direction des Etudes et de la Planification
- Direction de la Protection Sanitaire
- Direction de la Sante Scolaire
- Direction de l'Animation et de Recherche Operationelle,
du Recyclage et du Perfectionement Continu
- Direction du Genie Sanitaire et de l'Assainissement
- Direction de l'Education pour la Sante

The Ministry of Rural Development will be involved in the program since it supports the animatrices rurales, and so will the Ministry of Education since much of the program will be implemented in the schools.

Province Level:

Working at the provincial level will be the USAID health/sanitation specialist, the Directeur Provincial de la Sante with the collaboration of the provincial representatives of concerned Ministry of Health divisions, especially Genie Sanitaire and Education pour la Sante, the Directeur Provincial de l'Enseignement, and a supervisor for the animatrices specifically trained and assigned to the project by the Benin Government. Their role will be to backstop field personnel, coordinate the various activity components (latrine construction, school health, village health, training), participate in the coordination of the various project activities, and effectuate inspection tournees.

District Level:

District-level personnel, except for medical facilities staff, will be mobile supervisors and trainers for commune and village health/sanitation activities. They will include animatrices rurales, sanitation agents, conseillers pedagogiques and Peace Corps volunteers. In the well-drilling and digging activities the animatrices and sanitation agents will each have a Peace Corps volunteer counterpart. In the spring captation activity the Peace Corps volunteer member of the captation crew will also be counterpart to the animatrice and sanitation agent assigned to that area. (For details on the spring and well activities, see the Water Resource Development Technical Report.)

Sanitation Agents

The rural sanitation agents are new personnel which have been programmed by the Direction du Genie Sanitaire. Thirty-six agents have already been trained for urban work by Genie Sanitaire and 15 will be identified, retrained for rural work and assigned to the project area. They will

supervise latrine construction and provide technical assistance to village construction crews, the sanitation member of the village health unit, school directors and medical facilities staff.

Animatrices Rurales

The animatrices rurales already have a working program but since it is part of the Ministry of Rural Development, it has a heavy agricultural orientation, although the animatrices are trained in all aspects of health education. The first group to be assigned to the project will be chosen from already working animatrices in the project area and will receive in-service training for project purposes at Ouando. The next group will be given special pre-service training along with their regular training at Ouando. The animatrices rurales will train, supervise and collaborate with the birth attendant member of the village health unit and maternite/dispensaire staff in matters of public health education. They will also provide on-the-spot training and technical assistance to teachers in the execution of health classes.

Conseillers Pedagogiques

The conseillers pedagogiques are already institutionalized teacher supervisors. There are two to every district. Many have received training for the Ministry of Education's health education program and can be incorporated into the supervisory team without much extra training. They are, however, extremely busy individuals and ought not to be expected to take on many added responsibilities.

All supervisory personnel on the district level will be responsible for coordinating the different activities through regularly scheduled meetings. They will also be responsible as a team for organizing recyclages for teachers, village health unit members, medical facilities staff. All will require motorized transportation, probably molyettes.

Commune and Village:

By 1980 the Benin Government intends to create 2,800 village health units, each composed of one pharmacist, one birth attendant and one first aid person. The members will be chosen by the villages and trained by the government at the district level. The emphasis of the services to be provided by these health units is more on curative than preventive medicine. The addition of a fourth member to the village health units in project target villages is felt necessary. This fourth member will be the "animateur pour l'hygiene" and will be trained by the project at the district level. The trainers will be sanitary agents, Peace Corps volunteers and medical facilities staff.

This animateur will be responsible for organizing and heading latrine construction crews, controlling sanitary conditions in households, latrines, market places and around the water sources. She/he should not be a policeman, but rather will try to rectify unhygienic situations on a one-to-one basis or in group discussions. The animateur will also be in charge of organizing sanitation activities for the Saturday morning "campagnes de salubrite" or "construction nationale" program. The animateur will be supervised and backstopped by the sanitary agent, the Peace Corps volunteer, and the dispensary nurse.

The birth attendant member of the village health unit will also have an important role in the program, for she will have the most contact with the local women. After her primary training from the government, she will be given additional training by the project in health education and sanitation and will be able to give lessons to women on a formal or informal basis. She will have visual aids at her disposal in the maternite. She will be supervised and backstopped by the animatrice rurale, the Peace Corps health volunteer and the maternite staff.

The remaining members of the village health units (first aid; pharmacist) will receive brief recyclages in environmental sanitation before the actual start of the water resource activities and will be able to disseminate information on preventive health measures on a day-to-day basis in their villages.

Primary Schools:

Health education classes have been mandatory for several years. Peace Corps volunteers were very active in this program, giving teaching demonstrations, observing classes, providing technical information, holding seminars, and in some instances helping to improve the school environment by constructing latrines, wells and cisterns with U.S. Embassy Self-Help funds, and helping to organize pupil-run Comites de Sante. As a result of this program, many teachers, school directors and Ministry of Education authorities are well-versed in primary school health education. In the project area the school program will essentially be the same as the one established by the Ministry of Education. Teachers will be provided with more teaching aids to dispense health classes on a regular basis. They will participate in a seminar at the beginning of each school year and will receive on-the-job guidance and training. School directors, with the help of the conseillers pedagogiques, animatrices and health Peace Corps volunteers, will be expected to set up a Comite de Sante in their schools. They also will be expected to involve the PTA (Association des Parents d'Eleves) in school health and sanitation activities, especially latrine construction, as much as possible, thus establishing a channel of communication between the

school and the village. It is hoped that the president of the PTA will in turn involve the Comite de Sante leaders in village sanitation activities. Teachers are reassigned fairly frequently. Hopefully, the ones trained in health education and sanitation will continue to work and train others in their new schools.

One point which can't be stressed enough is that at any point in the project, local non-health authorities must be kept informed of activities in their area of jurisdiction. Construction activities, tournees, and seminars cannot be effectuated without their knowledge, approval and cooperation. These authorities will include the Chef de District, the Responsable du Developement Rural (RDR), the Responsable du District de la Division de l'Enseignement (RDDE), mayors, village delegates and village council members.

The effectiveness of the water supply and sanitation project will depend to a great extent on the close coordination of the well drilling and spring captation activities with the health education/village sanitation activities. At the provincial project direction level, activity directors will be expected to meet for formal coordination of activities on a quarterly basis. These meetings will coincide with the preparation of quarterly reports to the Project Director.

PROJECT IMPLEMENTATION

For project implementation purposes a distinction is being made between the sensitization phase and long-term health activities, though these are not mutually exclusive.

The sensitization plan for the villages receiving drilled wells must be highly organized in advance since it will require synchronization with the high-paced drilling schedule. Supervisory personnel (animatrices, sanitary agents and Peace Corps volunteers) should be trained, on-site and working before the project activities get underway, perhaps concentrating their efforts in the schools where the health education program will follow the regular school year (February - December).

Approximately three months before the scheduled arrival of the drilling crews, the district authorities will be contacted and a two-day meeting set up to verify and finalize the site selections of the wells. Two Health/Sanitation teams will make explanatory visits to target villages where they will discuss briefly the principles of disease transmission, environmental sanitation, the project program, and village participation requirements. These meetings will be held with key villagers such as the village delegate, men's and women's council members, teachers and

village people selected for pump maintenance training. The sensitization team will include Health/Sanitation and Hydraulics representatives, animatrice supervisors, animatrice rurales, sanitation agents, Peace Corps volunteers, agricultural extension workers. After the team visit and before drilling activities, all training and recyclages will take place. The animateur d'hygiene members of the village health units will be selected and trained at the district level by the district supervisory personnel. The village health unit birth attendants and medical facilities staff will be given recyclages in prevention and hygiene. Teaching and training materials should be in possession of the district trainers (animatrices, sanitary agents, Peace Corps volunteer counterparts). Around the scheduled drilling date, latrine sites will have been chosen, the type of appropriate technology latrine to be built decided upon, and latrine construction crews coordinated and ready to start. As soon as possible after the installation of the drilled wells, a follow-up visit will be made by Health/Sanitation and Hydraulics representatives to the target villages.

For the wide-diameter dug well activity, the process will essentially be the same, only the pace will be less accelerated due to the nature of the activity. The same careful planning will, of course, be necessary.

Since the spring captation teams will be on one site for as long as six months, the concurrent health and sanitation activities will have a slightly different aspect. The sensitization team visit will take place at around the same time the captation team arrives. During the first two months of the captation activities, training and recyclages will be done, and latrine construction will start as soon as crews are organized. The two volunteers assigned to each spring captation crew will also be trained in environmental sanitation and health education and will serve as counterparts to the sanitary agents and animatrices rurales. (For water resource development schedules, see the Hydrogeological Technical Report and the Implementation Schedule in the PP.)

The strategy for long-term health and sanitation activities in villages will be developed by the village health units and the villagers themselves, teachers, medical facilities staff and political authorities, with technical guidance supplied by the sanitary agents, animatrices rurales, Peace Corps volunteers and conseillers pedagogiques. Included in this strategy will be the choice of latrines best suited for the village. A latrine which serves the purpose of breaking up the cycle of disease transmission is a simple thing: A pit dug to a level which won't contaminate aquifers, a cleanable "dalle" made of concrete with a cover for the hole, and a superstructure. It will be up to the villagers and sanitation agents to decide how many holes, how deep the pit, what materials to use for the superstructure. If local material is used to

construct reasonably solid dwellings, it can serve equally well to build latrine superstructures.

Ongoing health classes will be expected in schools, dispensaries and maternites. The schools will begin health classes on an academic year schedule if possible, otherwise as soon as the teachers have participated in a training seminar. School latrine construction and comites de sante activities will be organized by the school director, PTA, animatrices and sanitation agents, and continued throughout the school year. Health classes will also be held at the dispensaries and maternites during group consultation hours. The staff will be assisted in this by the animatrices, sanitation agents and Peace Corps volunteers.

TRAINING ACTIVITIES

The following people involved in the proposed health education/sanitation program will require pre-service and/or in-service training:

- animatrices rurales
- agents sanitaires
- school teachers
- Peace Corps volunteers
- dispensaire staff
- maternite staff
- village health unit members

Animatrices Rurales

The animatrices are currently trained at the Ouando Center for Horticultural and Nutritional Training outside Porto Novo. The program runs from September to June and covers all aspects of health education with an emphasis on nutrition. Ouando has agreed to train the 15 animatrices required for the program with the project supporting the costs. The first group of five required for the first year of the project will be recruited from animatrices already working in the project area. They will be given a two-week recyclage at Ouando in health education, school health classes and environmental sanitation, and reassigned to project target districts. The next two groups of five will be recruited from the target population and trained by Ouando according to project specifications. Ouando will also train two animatrice supervisors to work one each at the province level, and will provide one-week training sessions for the Peace Corps counterparts to the animatrices.

Sanitation Agents

Eight per year for two years will be identified from a group of 36 urban sanitation agents already working in Benin. The project will retrain these 16 for rural sanitation work at the WHO Training Center in Lome, Togo. The program is 10 weeks long and held four times a year. The project will send two people per session for two years. Upon return they will immediately be assigned to project target districts according to the implementation schedule.

An alternative to the Lome WHO Center for the training of sanitation agents is the proposed multi-purpose training center in Parakou. Should this center be operational at the time that project training needs arise, it will be preferable to use these facilities than to send people outside the country.

Teachers

Teachers in target area schools will participate in a one-week seminar in technical and pedagogical aspects of health education with a focus on water and hygiene related disease. These seminars will be held at the beginning of each school year. It should be remembered that health classes are obligatory in Benin and teachers may have had some previous training. Animatrices, conseillers pedagogiques and Peace Corps volunteers will provide guidance to teachers on a routine basis.

Peace Corps Volunteers

The training of Peace Corps volunteers will be supported by Peace Corps but should have collaboration from the project for their technical training. As much as possible, the volunteers should be trained at the same facilities as their counterparts, or at least receive the same training in substance. They should finish training with a clear understanding of the project's purpose and goals, and of their own role in accomplishing these.

Dispensaire and Maternite Staff

There are approximately 90 infirmiers currently working in the two northern provinces who have received environmental sanitation training but aren't actively using it. These people can be identified to receive a brief recyclage for project purposes given by the sanitary agent, animatrice and Peace Corps volunteer. The recyclage will be longer (1 week) if the infirmiers in the target areas have not had the prior training.

The maternité staff will receive a recyclage in public health education methods to enable them to dispense classes geared to the women who attend consultations. A core of midwives and auxiliary maternity personnel has already benefited from the USAID/U Cal. Santa Cruz MCH Extension Project training program and is qualified to train others in health education methodologies. The participation of these persons in the project training activities would be highly desirable.

The recyclages will take place at the district level before water resource development activities start, and will be organized by the district supervisory personnel of the project.

Village Health Unit Members

The Benin Government plans on training the first aid person, pharmacist and birth attendant at local medical facilities. The fourth member (animateur d'hygiene) needed for the unit in project target villages will be trained by the project at the district level in basic disease transmission and prevention and environmental sanitation. The district supervisory personnel will organize and execute the training of the animateurs.

The birth attendants of the units in target villages will receive a short recyclage in disease transmission and prevention, and hygiene, in order to teach the women they come in contact with.

The first aid and pharmacist members of the units will participate in recyclages.

In-Service Training

Will be received by the animatrices, agents sanitaires and Peace Corps volunteer counterparts together once a year for a week. This training will be held in Parakou for personnel from both provinces and will be organized and executed by the Health Education Specialist and appropriate technicians and trainers. Peace Corps has a budget for in-service training and would be expected to provide personnel and/or material input.

The Direction de l'Education pour la Sante has a projected program for seminars in health education to be held at all levels (national, provincial, district and village) over the next few years. Care should be taken to coordinate project training activities as much as possible with these seminars.

TRAINING AND TEACHING MATERIALS

Training and teaching materials will be made available to the animatrices, sanitary agents, Peace Corps volunteer counterparts, teachers, dispensary and maternity staff, and village health unit members. A variety of such material has already been developed for Benin and Togo. Project and government leaders will review it and select the appropriate materials for reproduction for project use.

Materials already available:

- A complete set of health education lesson plans for use by primary school teachers developed by Peace Corps volunteers
- A complete set of visual aids to accompany these lesson plans developed by Peace Corps volunteers
- Visual aids on environmental and food hygiene, latrines, disease transmission developed by Ouando for use by the animatrices rurales
- Health education visual aids developed by Peace Corps volunteers in Togo available in Benin
- "Conseils de Sante a la Famille Africaine" - book of lesson plans for use by maternite personnel developed by Peace Corps volunteers in Togo available in Benin
- "Causeries" dealing with all aspects of public health education developed by the U. of Cal. Santa Cruz MCH Project available on stencil from the Cotonou MCH Center
- Four short health films at the American Cultural Center and some at the French Cultural Center
- Health education booklet in Bariba developed by Dr. Agboton Yves, Directeur de l'Education pour la Sante, Ministry of Health
- Four projected health films, two by Togo, two by Benin

Projected funds for teaching and training materials should be used mostly for editing and reproducing existing materials in sufficient quantity. The possibility of translating manuals into northern languages such as Dendi and Bariba should be explored since the literacy program has been very successful in the Borgou.

EVALUATION AND RECORDS

One of the purposes of the health education and village sanitation program will be to develop and implement an adequate system for evaluating the different aspects of this program. An important evaluation required will be on the acceptance and use of latrines in areas receiving public health education and improved water supplies as compared to those which aren't.

Another purpose will be to train field personnel in the use of standardized health records. Where a system of standardized records is already in use, it can be expanded by the project. Systems for keeping standardized records should be developed as needed for aspects of the health/sanitation program where no such system exists. Field personnel will be expected to have considerable input into the development of these. Ideally, standardized records systems developed by and for the project should be useful not only for the life of the project but for any continuation and expansion of the program undertaken afterwards by the GPRB.

It should be noted that the USAID/U. Cal. Santa Cruz MCH extension project has developed a system of standardized record keeping which the Ministry of Health is considering adopting for all its MCH programs.

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District

Mr. Richard BILHEIMER, Director, Peace Corps/Benin, Cotonou

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Dr. SANOUSSI Hamidou, Director, Sante Scolaire, MOH Cotonou

Dr. RADJI, Ministry of Education, Porto Novo (Started school health program)

Mme. Renee LABROUCHE, Teacher, Institut National de Formation et de
Recherches pour l'Enseignement, B. P. 200, Porto Novo (has worked with
health V.A.s)

Mme. ASSIATA Nassirou, Responsable Nationale des Animatrices Rurales,
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ANNEX TWELVE

Administrative Analysis

The hydraulic service (Direction Hydraulique) will be in charge of project implementation and coordination. This service will establish coordinating and cooperating linkages with several other governmental institutions namely, the Beninese Bureau of Mines, Topographical service, Sanitary Engineering and Public Health Education divisions of the Ministry of Public Health. These linkages must be established at both the national and provincial levels to ensure adequate implementation coordination.

Benin's hydraulic service was established in 1967 and charged with the responsibility of developing water resources, researching these resource and the production/utilization of energy resources. At the time of its creation it was the policy making body of the government directing both urban and rural water and electricity distribution systems. In 1972 Benin created a parastatal organization to take over responsibility of these distribution systems in urban areas. This transfer of responsibilities from the Hydraulic Service removed the bulk of its program out of its authority along with a considerable part of the service's upper level managerial and technical staff. The transfer created a very healthy parastatal organization but left the hydraulic service in a void. The hydraulic service is currently responsible for water supplies in rural areas where water users cannot be expected to fully capitalize the operations. With the parastatal organization fully operational and on sound managerial and financial footing, the GPRB is concentrating on revitalizing the hydraulic service and strengthening it to the point where it can undertake its mandate.

The "Direction Hydraulique" (DH) is located within the Ministry of Equipment (roughly equivalent to a Public Works Ministry) with several other public services and parastatal agencies (see figure 1). Some consideration is currently being given to the creation of a parastatal agency within the Ministry of Equipment in charge of drilling small diameter wells. If such reorganization takes place, the hydraulic service would retain policy-making, research and planning responsibilities. Such a reorganization of the Hydraulics Service would not jeopardize this project's operations nor the attainment of the project's objects.

The hydraulic service contains a direction responsible for policy matters, budget allocations and general supervision of the service's operations, both programmatic and administrative. The Director of DH is an electrical engineer trained in Canada who has held this post since 1975. The major responsibilities of the office are administrative and managerial rather than strictly technical. Incumbents of this office represent the GPRB on several regional councils concerning water resources in West

Africa, notably River Niger Commission and CIEH. Attached to the Direction of DH are the warehouse, the accounting, secretarial, graphics and library offices which provide services for the entire organization. Located in close physical proximity to the Direction of DH and attached to that office are three technical offices which provide technical inputs into the Direction's decision-making process and supervise and backstop field operations. Also answering directly to the Direction of the Hydraulics service are the four regional field offices (see organizational chart - figure 2). The Direction of the Hydraulic service is momentarily headquartered in Cotonou while physical facilities are being constructed for a new Direction 200 kms north of Cotonou at Dassa Zoume. This new location is more centrally located for the country at large and was made to improve the accessibility of the service to its target population.

The three technical "arrondissements" provide technical input to the Direction of the Hydraulic service and are responsible for the implementation of projects falling within their technical domaine as described below. The technical division (arrondissement) attached to the Direction of the Hydraulic service are specialized by technical function and tend to be managed by well trained young engineers lacking in-depth field experience. These engineers average about 4 years experience in quasi-administrative positions. The regional division heads tend to be exactly opposite, in that they have less formal training but considerably more field experience.

"Arrondissement" of Hydraulics: This office by statute is responsible for the installation and maintenance of rural water distribution systems. The office is headed by a Swiss-trained rural engineer. This engineer is responsible for overseeing the four sections of the "arrondissement".

(a) Garage and vehicle fleet of about 15 vehicles. Personnel includes 1 chief mechanic, 1 welder, 4-5 mechanics and several welder's aides.

(b) Water distribution systems: This section designs, implements and maintains water distribution systems such as those financed by AID Loan No. 680-H-002. The section has several plumbers, masons, and carpenters plus unskilled workers (ditch diggers).

(c) Pumps: This section is responsible for the installation and maintenance of various models of pumps which the DH is using. Personnel includes several pump repairmen, a plumber and helpers. This section also maintains a separate warehouse for pump parts and specialized equipment for their repair and maintenance.

(d) Water Chemical Control Laboratory: The lab section analyzes water samples of the major public water works before they are put into operation. The analysis performed determines the chemical content of the water but not the bacteriological aspects of the water. At times, bacteriological analyses are performed on water samples, but by the Cotonou Hospital, which has the necessary equipment. The laboratory is staffed by a chemist and two assistants.

"Arrondissement" of Hydrology: This office is responsible for the execution of all projects and studies relative to surface water development. The office evaluates various surface water resources, and studies dam sites which have a potential interest for agricultural production, generation of electrical energy or human consumption. Much of this office's activities are studying stream flows of the major rivers in Benin. The office is headed by a hydraulics engineer assisted by a hydraulics technician. A third person is responsible for managing and supervising the data collection network for the surface water/stream flow studies. About 40 observers are hired on a part-time basis.

"Arrondissement" of Hydrogeology: The office is in charge of all projects and studies dealing with the exploration and evaluation of groundwater. At present the position of chief of the "Arrondissement" is vacant. The rural engineer in charge of the Hydraulic "Arrondissement" acts as head of the hydrogeology division as well. This hydrogeology "arrondissement" executes test drilling operations for construction sites, well sites and dam sites and currently is using a Craelius AB 50 rig that was brought into the country as part of a FED well construction project in the mid-1960s. Personnel of this "arrondissement" include two drill rig operators and several assistants.

In addition to the three technical "arrondissements" the DH maintains four regional offices. These regional offices are an extension of the Director's office in geographical zones. Each of these four subdivisions has a subdivision chief, small secretarial staff and well digging crews which dig, repair and deepen wells.

1. The Southern subdivision is headed by a Belgian-trained Public Works engineer and covers the three southernmost provinces. The office has four well digging crews.

2. The Zou Subdivision is headed by a technical agent (less formal training than an engineer but more in-service experience) and has three well digging crews.

3. The Borgou Subdivision is headed by a technical agent and has three well digging crews each of which has about five to seven persons. The Borgou subdivision also has the equipment necessary to clean and maintain large diameter open wells but because of the limited budget has not pursued this important activity.

4. The Atacora subdivision is headed by a technical agent and normally has a single well drilling crew. At present, given the limited possibilities of digging wells in the Atacora province because of the geological formations, this well digging crew has been attached to one of the other regional subdivisions. The Atacora subdivision is located in Djougou while the Administrative seat of the province is located presently in Natitingou.

The DH is one of the technical services in the Ministry of Equipment (see Fig. 1). The Minister's cabinet which functions as the policy making body for the Ministry is formed by the Minister, the Director General, the Direction of Planning and Studies and the Direction of Financial and Administrative Affairs. Implementation responsibilities are given to the technical services of the Ministry. At the policy making level, the Minister's principal council is the direction of Planning and Studies which contains a director and a person who represents each of the technical services of the Ministry. This representative with the director of the technical division, counsels the Minister on matters regarding the plans, projects and programs of the technical service they represent. These representatives of the various technical services grouped together in the planning and studies division are for the most part very competent technicians with considerable administrative experience. The DH is ably represented in the Planning and Studies group by a hydraulic engineer of considerable experience both in the DH and in the SBEE.

The Direction of Financial and Administrative Affairs coordinates budget preparation and submission, defends the Ministry's budget before the Ministry of Finance and supervises the expenditures made by each of the technical services of the Ministry. This group also handles routine personnel actions.

Current leadership within the DH is stable and in the past has tended to come up through the ranks. Normally a person is assigned as chief of the technical arrondissement, progresses to one of the regional subdivisions and then to the position of director. However, there is some doubt whether such advancement patterns are still valid, and it is felt that were the leadership to change in the near future the new director would be transferred in from outside the service itself. It appears to be an informal requirement that the director of DH have an engineering degree.

Policy recommendations concerning the technical aspects of water resource development is normally drafted by the Director of the Hydraulic service in conjunction with the Direction of Planning and Studies and is approved by the Minister. For problems have an impact on several ministries,

interministerial meeting are frequently called. Considerable interministerial coordination is evident in the daily affairs of the Hydraulic service. Decision making at the policy level is at times slow but most generally well thoughtout and discussed before a decision is made. Implementation of policy-making is decentralized to the technical service level and also within the Hydraulic service. The service does have a rather encumbered financial management system for certain operational funds held in common for the Ministry.

The Hydraulic service presently has a staff of 177 people employed full-time. In addition, at work sites, they often hire local unskilled labor on a short term basis. Of this total, 10 persons can be considered professional technicians, possessing considerable experience and/or specialized training outside of Benin. Four of these 10 are engineers, one is a chemist and five are technical agents trained in ~~several~~ technical schools established to fulfill training needs of hydrological technicians of Francophone West Africa. Most of these technical agents were trained either at Bamako or Ouagadougou. The four engineers have an average length of service of four years while the technical agents average 15 years with the Hydraulic service or its predecessor agency.

An additional 25 employees of the Hydraulic service can be considered having semi-professional skills such as accountants, office managers, draftsmen, surveyors, welders, mechanics and drillers. The remaining personnel are semi-skilled or un-skilled.

Professional employees tend to be stable in their positions and there is no evidence of a rapid turnover of personnel within the Hydraulic service. It is noted, however, that there is a considerable difference in the salary scales of employees of the Hydraulic service and similarly trained personnel employed by one of the state owned companies. Salaries in these latter are often considerably higher than persons employed in the various ministries of the government. Since recruitment and hiring procedures are controlled for both the parastatal organizations and the government bureaucracies, personnel transfers between the two are infrequent and only taken with approval of the concerned ministries. It has been noted, however, that new university graduates who were not trained for a specific position, usually try to gain employment first at one of the parastatal agencies.

In sum, the Beninese officials in charge of village water supply development are limited in number, but competent technicians, able administrators realistic in their approaches to problems and, most importantly, highly motivated in regards to being responsive to the needs of the rural poor. They are accustomed to working under severe budgetary constraints and have shown considerable aptitude in maintaining and repairing the equipment they have available. In general they have shown an awareness of the institutional, financial and managerial requirements of a nationwide village water supply program and are close to finding a suitable

arrangement to assure the Hydraulic service has an adequate financial and management base necessary to launch such a program. These same governmental officials are actively soliciting coordinated donor assistance and are keenly interested in developing a nationwide village water supply program with representatives of interested international donors.

The design team was informed of a planned restructuring of the Beninese Health Ministry and as a result did not attempt an analysis of the Ministry. Since the departure of the design team, the Ministry has indeed been reorganized. Both the Sanitation and Public Health Education services were subdivisions of a "Direction" before the reorganization. Now each of these services form a "Direction" themselves. It is also interesting to note that in the process of reorganization the smaller "Directions" dealing with preventive health have drafted long term plans and programs which are being used to allocate manpower, physical and financial resources. Both of the services with which the project proposes to work have completed and submitted long term plans and programs for their service to the Health Minister. Further information on proposed organization, manpower levels and program responsibilities are contained as an annex to the Fry Health/Sanitation Report.

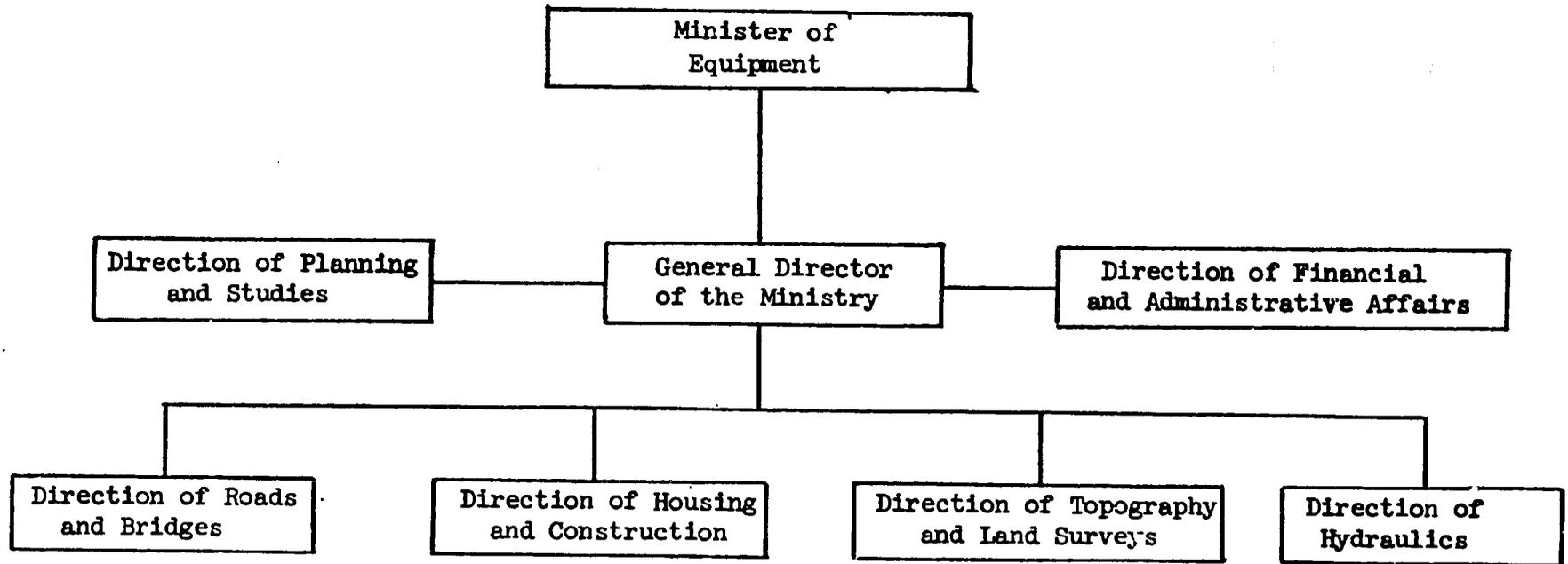
The immediate problems facing both the Public Health Education service and the Sanitation Service is lack of trained manpower. The Public Health Education service has more professional personnel available for the purposes of this project but their past training may not be specifically what is required by this project. A large percentage of the implementation staff of the Public Health Education service has been trained by the University of Santa Cruz. This university trained health trainers but mostly with the maternal and child health care field. Some portions of their training program could be applicable for training health trainers within this project as well.

The sanitation service has recently been upgraded from a small subdivision to a full "direction". As a "direction", its position is considerably strengthened in regards to budget and manpower allocations within the ministry. As a subdivision, the service employed about thirty people. The upper-level management of the service was provided by two individuals - a sanitary engineer and a male nurse - turned-sanitarian. The sanitary engineer also holds a degree in civil engineering from a Canadian university. As a consequence, most of his time is spent in preparing building plans for the Health Ministry or inspecting buildings for the GRPB. The trained sanitarian who acts as the assistant to the sanitary engineer is in charge of all on-going

sanitation programs, inspection of foodstuffs entering Benin's ports or airports, and inspections of facilities processing or handling beverages and foodstuffs. The existing sanitarian also devotes part of his time to teaching nurses environmental sanitation. The existing sanitation programs are limited primarily to urban areas firstly, because sanitation conditions are aggravated by population concentrations and secondly, because providing these services to urban areas gains revenues for the sanitation department. However, in the past two years, an experimental school sanitation program has been carried out in several large southern schools. The remaining personnel of the sanitation subdivision are for the most part garbage and solid waste collectors, people operating tank trucks to dispose of excreta, and food inspectors. Other trained sanitarians do exist in-country but because of the low priority attached to sanitation programs have been assigned to work in administrative or curative health positions. Part of the reorganization of the Health Ministry will regroup these few trained technicians in the Direction of Sanitary Engineering and Sanitation. A detailed description of the responsibilities of this new "direction", its organization and manpower plan is contained as an appendix to the Health and Sanitation report.

Figure 12-1

Organization Chart of
The Ministry of Equipment



Organizational Chart of the
Hydraulics Service within the
Ministry of Equipment

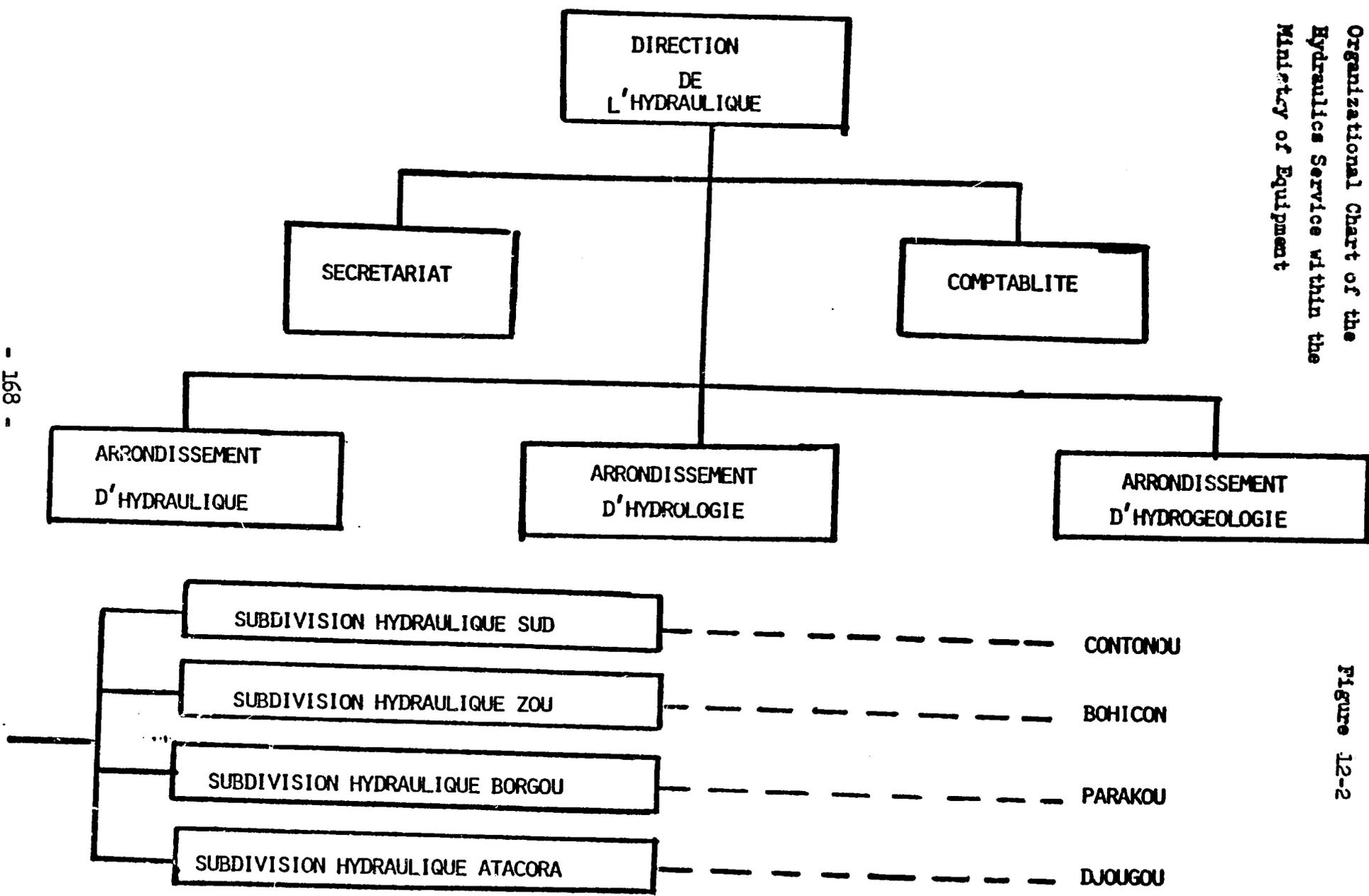
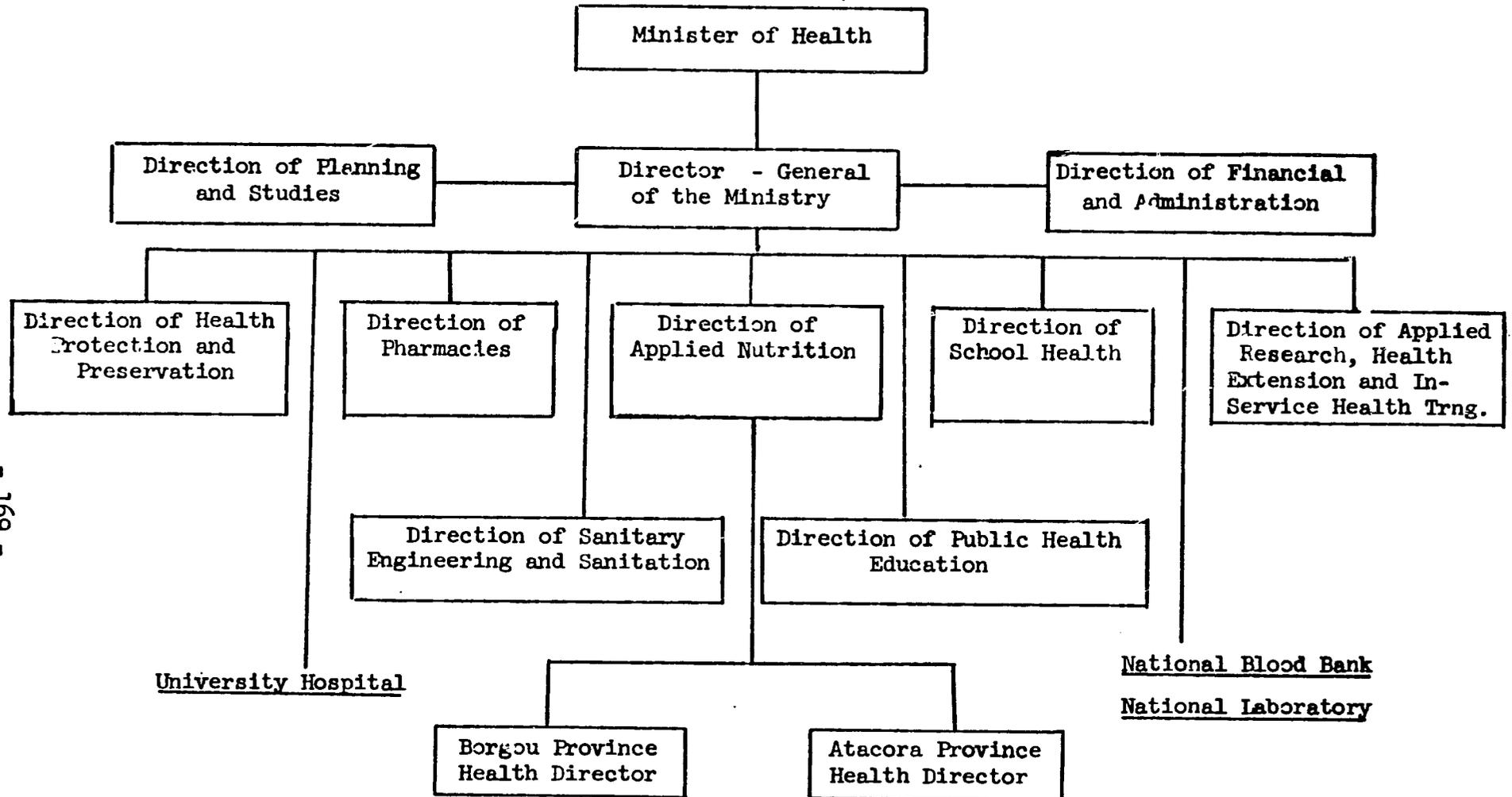


Figure 12-2

Figure 12-3

Organizational Chart for the Ministry
of Health - (GPRB)



Proposed Organizational Chart for National Service
of Sanitary Engineering and Sanitation

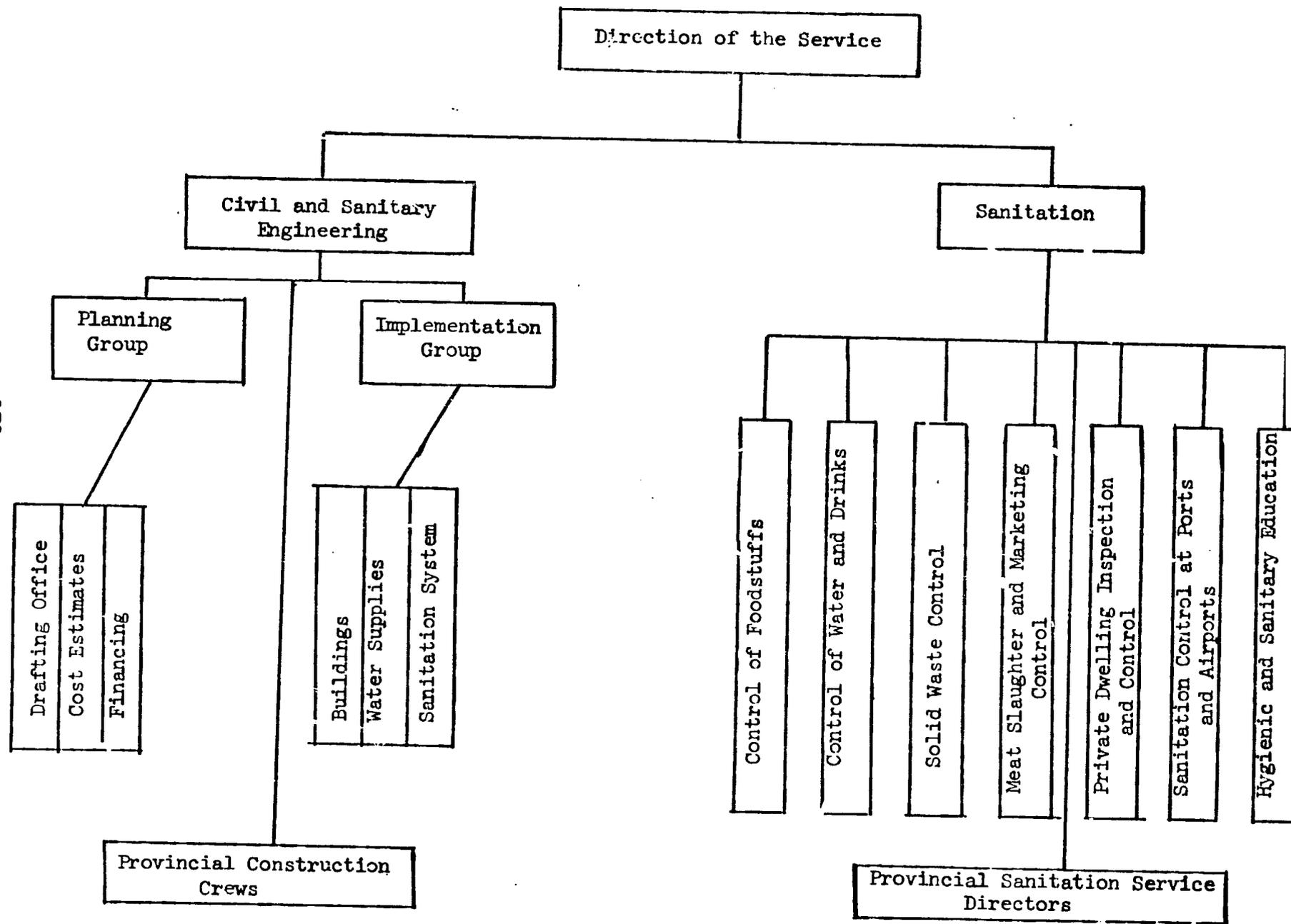
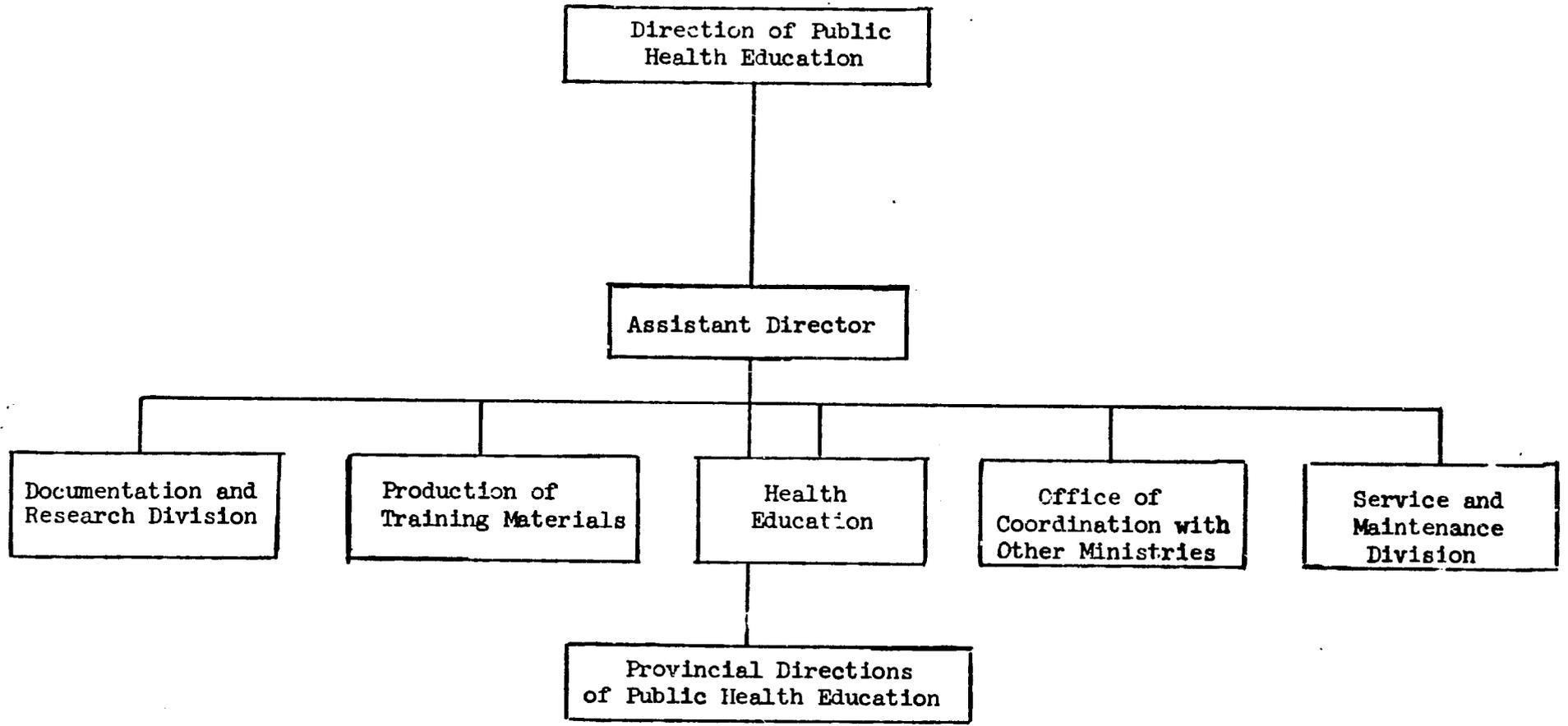


Figure 12-5

Proposed Organizational Chart for the Public Health Education Service



- 171 -

Borgou

Atacora

ANNEX 13

**"Waivers and Justification for
Project Procurement"**

ANNEX

JUSTIFICATION FOR WAIVERS FOR PROJECT PROCUREMENT

a. Pumps

Amount: \$250,000

Requested Waiver: Proprietary Procurement

Justification: The project will drill and equip the 225 wells with a pump for drawing water. A successful pump is critical (particularly for the drilled wells) if villagers are to be able to take advantage of the improved water supply provided by the new wells. Any piece of equipment with moving parts will eventually break down if proper maintenance is not undertaken. It is precisely on the issue of pump maintenance that a proprietary source waiver is justifiable.

It is recommended that the Moyno hand pump for rural water systems be used exclusively as the project pump. The Moyno pump is manufactured by Robbins and Myers, Inc. of Springfield, Ohio. The 1979 cost per pump is estimated at \$550 (including discharge head and gear box, 2 stage stator-rotor assembly, pipe, and shaft with bearing). Pumps at this price, adjusted to include 15 percent spare parts, transportation from the United States (50 percent) procurement agency commission (7 percent) and 10 percent inflation compounded annually which gives a total of \$290,000.

The down the hole stator-rotor assembly of the Moyno pump has no valves, gasket, or leathers to wear out, thus greatly reducing the necessity of pulling the pump for maintenance or repair. The rotor has been constructed from a high grade stainless steel and is chrome-plated for protection against any abrasive materials. The stator is constructed with a heavy duty high grade steel outer shell and with an interior of specially compounded rubber, molded to form the helical design for constant use when submersed in water. The stator is suspended in the well to a depth which puts the suction hand below the expected pumping water level on 10 ft. lengths of 1 1/4" galv. pipe. The rotor is suspended on 7/16" solid steel drive shaft with a centralizer bearing each 1.0 ft. The upper end of the drive shaft is supported by two tapered roller bearings to assure proper positioning at all times of the rotor within the stator and to insure non-binding while in operation.

Above the support bearing, a 20 tooth beveled gear is positively attached to the rotor drive shaft. This gear is driven by a 40 tooth beveled gear mounted on a drive shaft at right angles to the stator shaft. The shaft which has the 40 tooth gear is mounted by use of two tapered roller bearings, one for each end, mounted in a steel casting for support. Both gears are packed in homogenized hi-temp. grease. Two operating handles 1 ft. long are mounted 180° from each other, one on each end of the shaft. This gear box arrangement is known as a right angle gear box. It uses the same principle, except on a smaller scale, that has been used successfully on larger supply wells for municipal, industrial and irrigation application for over 85 years.

Other pumps

Over 12 standard reciprocating pumps were studied by use of available reports and literature along with actual field observation of most of the 12 types utilized in Upper Volta and Ghana.

The names of the reciprocating pumps considered were Monarch, Sholapur, ABI, Godwin, UST, Thyssen, Monitor, Beatty, Dempster, AID/Battelle, Lucky, Uganda, and the Brian.

The AID/Battelle reciprocating hand pump designed through an AID grant to the Battelle Research Laboratory, Columbus, Ohio, received special consideration for this project. The Battelle pump design is satisfactory for pumping from water levels of moderate depths and was first designed for use in Central America where these conditions exist.

However, it is anticipated that in the northern region of the project pumping water levels will exceed 140 ft. which exceeds the design capability of the AID/Battelle pump. Certainly there will be areas with moderate pumping water levels, but use of the two or more project pumps is not a recommended procedure. Standardization enables all training programs to be more effective while repair parts stocked are kept to a minimum.

All the above pumps require pulling the pumps cylinder completely out of the well for changing the plunger bucket leathers or for repair of the check valves. This must be done on a regular schedule of 6 to 12 months to keep the pump in operation. All the down the hole cylinder and plunger parts are known to break without previous indications because the strain and stressing caused from the reciprocating motion which is necessary for their operation.

The above grade handle and attached parts are also subject to the same strain and stressing plus the friction at all pivot points and are subject to many failures. A lot of the above grade assembly designs have been greatly improved, but even the best, which appears to be the Monarch, still has trouble with broken fulcrum castings and handles.

b. Mopeds and Motorcycles

Amount: \$25,000 (19 mopeds, 8 motorcycles)

Requested Source/Origin: Code 899

Justification: The project will provide women extension agents, sanitarians and Peace Corps volunteers with 12 mopeds and 8 motorcycles to enable them to undertake a village health education program throughout the project area. Road conditions are such that during parts of the year much of the project area is inaccessible for four-wheeled vehicles. On the other hand, the distances these extension agents (animatrices, sanitarians, PVC's alike) must travel are such that bicycles are inadequate. Hence, the project has budgeted mopeds and motorcycles. Mopeds (generally of French manufacture) and motor cycles (generally of Japanese manufacture) are among the major means of transportation in Benin. Both are found throughout the country, including the remote villages included in the project area. The success of the village health education program is dependent upon the ability of the animatrices, sanitarians, and PCV's to get around frequently in the project area. The request for Code 899 is based on the long time familiarity with these mopeds and trail bikes in Benin and upon the crucial ability to maintain these bikes in the bush. No American mopeds of 125 cc trail bike manufacturer (if they exist even) has ever been represented or sold bikes in Benin.

c. Spare Parts for Rig and Vehicles

Amount: \$50,000

Requested Source/Origin: Code 941/899

Justification: The Community Development Fund of the United Nations (UNCDF) will contribute 1.5 million dollars for drilling equipment and vehicles which may not be of U.S. origin. It will be necessary to purchase the spare parts from the same source/origin. This holds true for the portion of spare parts that the AID project is financing for the above equipment and vehicles.

d. Aerial Photo Interpretation

Amount: \$15,000

Request Waiver: Proprietary Procurement from Code 935

Justification: Before beginning a test-drilling program in the hard rock formation found in the Boni Koara area, a aerial photo interpretation study will be performed in limited geographical areas to determine approximately 25 drilling sites having the greatest potential of producing adequate quantities of water. A French research company already has possession of aerial photos of the proposed project area. This company also has laboratories in Orleans, France and technicians experienced in photo interpretation. In neighboring Togo, this company has been very successful in selecting drilling sites with adequate water potential. Because of this company's success, its facilities, and technicians presently operating in adjacent Togo, the Government of Benin proposes to sign a host country contract with the Bureau de Recherches Geologiques et Minieres (BRGM). It is evident that American companies would not be interested in competing for the small contract.

AC/-

REPUBLIQUE POPULAIRE DU BENIN

COTONOU, LE

19

MINISTERE
DES AFFAIRES ETRANGERES
ET DE LA COOPERATION

DIRECTION GENERALE DU MINISTERE

DIRECTION DE L'AMERIQUE

N° 2897 MAEC/DGM/DAM/D

Le Ministère des Affaires Etrangères et de la Coopéra-
tion de la République Populaire du Bénin présente ses compliment
à l'Ambassade des Etats-Unis d'Amérique et faisant suite à sa
propre note verbale n° 2412/MAEC/DGM/DAM/D du 14 Juillet 1979, a
l'honneur de lui faire parvenir ci-jointe en complément, la fich
technique sur les projets d'approvisionnement en milieu rural
dans les Provinces du Borgou et de l'Attacora.

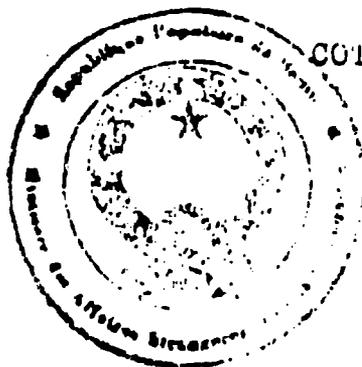
Le Ministère des Affaires Etrangères et de la Coopéra-
tion de la République Populaire du Bénin remercie l'Ambassade
des Etats-Unis d'Amérique de sa coopération accoutumée et saisi
cette occasion pour lui renouveler les assurances de sa haute
considération.

P.J. : 1

AMBASSADE DES ETATS-UNIS D'AMERIQUE

C O T O N O U

COTONOU, le



File: Raqueti pour BRPD au Diplomat Note

**MINISTÈRE
DES AFFAIRES ÉTRANGÈRES
ET DE LA COOPÉRATION**

DIRECTION GÉNÉRALE DU MINISTÈRE

DIRECTION DE L'AMÉRIQUE

N° 2254 / M.A.E.C./D.G.M./D.A.M./D-

Le Ministère des Affaires Etrangères et de la Coopération de la République Populaire du Bénin présente ses compliments à l'Ambassade des Etats-Unis d'Amérique et faisant suite à sa demande, a l'honneur de lui communiquer la liste des projets pour lesquels la République Populaire du Bénin souhaiterait l'intervention des Etats-Unis d'Amérique

Il s'agit des projets suivants :

- 1- Plantation d'Etat de tecks (SNAFOR) 128 millions
- 2- Embouche bovine 587 "
- 3- Retenues d'eau pour le bétail dans le Borgou et l'Atacora 95 "
- 4- Construction de 100 écoles de 3 classes dans cadre financement Self Help 1 019,4 "
- 5- Construction de 10 centres de Santé 1 300 "
- 6- Hydraulique villageoise (unités de forage) 200 "
- 7- Bourses d'Etudes, de stage et de perfectionnement 200 "

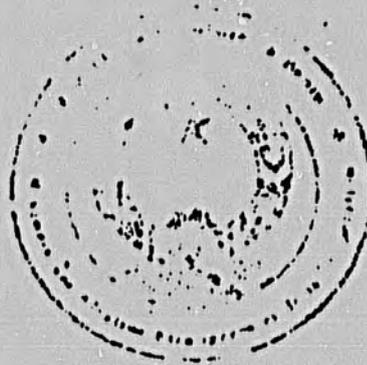
Le Ministère fera parvenir à l'Ambassade les fiches signalétiques des projets sus-mentionnés dès qu'elles seront en sa possession.

.../...

Le Ministère voudrait par ailleurs exprimer à l'Ambassade l'intérêt particulier que la Partie Béninoise attache à l'aboutissement, dès l'année 1979, du projet d'hydraulique villageoise déjà retenu pour le Borgou et l'Atacora.

Le Ministère des Affaires Etrangères et de la Coopération de la République Populaire du Bénin remercie l'ambassade des Etats-Unis d'Amérique de son aimable coopération et saisit cette occasion pour lui renouveler les assurances de sa haute considération!/-

COTONOU, le 20 JUIL 1979



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Department of State

INCOMING
TELEGRAM
4733

PAGE 01 COTONO 01019 3011572
ACTION AID-31

INFO OCT-01 550-00 AF-10 /042 W
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O R 301125Z JUL 79
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TO SECSTATE WASHDC IMMEDIATE 1797
INFO AMEMBASSY LOME
AMEMBASSY ABIDJAN
AMEMBASSY NIAMEY

UNCLAS COTONOU 1019

AIDAG

E. O. 12865: N/A
SUBJECT: BENIN RURAL WATER SUPPLY, 680-0201, PROJECT PAPER REVIEW

REF: STATE 191530

THOUGH GOVERNMENT OF BENIN HAS BEEN RELUCTANT TO MAKE FORMAL WRITTEN REQUEST FOR ASSISTANCE IN RURAL WATER SUPPLY BECAUSE OF ITS REPEATED PREFERENCE TO MAKE A FORMAL REQUEST ONLY AFTER IT RECEIVES A CONCRETE PROPOSAL FROM EACH DONOR ON WHICH IT MIGHT BASE A FORMAL REQUEST, IT HAS MADE AMPLY CLEAR IN MANY MEETINGS AND IN A RECENT DIPLOMATIC NOTE THAT IT IS ESPECIALLY INTERESTED IN HAVING USAID ASSISTANCE IN THIS AREA. THE NOTE, WHICH INCLUDED A NUMBER OF REQUESTS FOR AID ASSISTANCE, EXPRESSED THE GOVERNMENT'S INTEREST AS FOLLOWS: " LE MINISTRE VOUDRAIT PAR AILLEURS EXPRIMER A L' AMBASSADE L' INTERET PARTICULIER QUE LA PARTIE BENINOISE ATTACHE A L'ABOUTISSEMENT, DES L' ANNEE 1979, DU PROJET D' HYDRAULIQUE VILLAGEOISE DEJA RETENU POUR LE BORGOU ET L' ATACORA"

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PAGE 01
ACTION AID-35

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INFO OCT-01 /036 W

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R 140645Z DEC 79
FM AMEMBASSY COTONOU
TO SECSTATE WASHDC 2049
INFO AMEMBASSY ABIDJAN
AMEMBASSY LOME

UNCLAS COTONOU 1644

AIDAC

AID/W FOR JMCCABE, AFR/DR/SFWAP

E. O. 12065: N/A

SUBJECT: BENIN RURAL WATER SUPPLY PROJECT (680-0201)

REF: STATE 314724

ON 13 DEC, AID REP PUT INTO SEPARATE ENVELOPES, FOR DISPATCH TO AFR/DR/SFWAP BY INTERNATIONAL MAIL AND POUCH, COPIES OF TWO DIPLOMATIC NOTES EACH INDICATING GPRB EXPECTATION THAT AID WILL FINANCE SUBJECT PROJECT, ONE NOTE EXPLICIT THE OTHER IMPLICIT.

DAVISON

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