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**WATER AND SANITATION
FOR HEALTH PROJECT**



**COORDINATION AND
INFORMATION CENTER**

Operated by CDM FIVE
for the U.S. Agency
for International Development

1611 N. Kent Street, Room 1002
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Telephone: (703) 243-8200
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Report On The

PERU RURAL WATER SYSTEMS

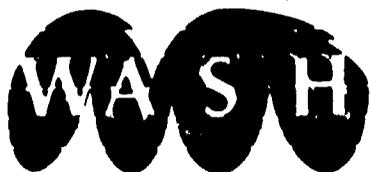
AND

ENVIRONMENTAL SANITATION

PROJECT

January 31, 1981

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February 6, 1981

**Mr. Leonard Yaeger
Mission Director
United States Agency for International Development
Lima, Peru**

Dear Mr. Yaeger:

I have the honor to transmit to you herewith twenty copies of a report on the Rural Water Systems and Environmental Sanitation Project. This report was written by Mr. Harold Shipman and is based on a visit to Lima by Mr. Shipman during the period January 17 to 25, 1981.

Very truly yours,

A handwritten signature in cursive script that reads "James Arbuthnot".

**James Arbuthnot
Project Director**

JA:jml

Report On The

PERU

RURAL WATER SYSTEMS

And

ENVIRONMENTAL SANITATION PROJECT

By

HAROLD SHIPMAN

JANUARY 31, 1981

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INTRODUCTION

This report presents information on the Peru Water and Sanitation Project * and is based on a visit to Lima from January 17 to 25, 1981. The observations made are supplemental to the various papers left with the AID mission in Lima for translation and referral to the government as aids in preparing the documentation which must be submitted before disbursements on the loan can begin. Copies of those papers are included as an annex to this report.

1. Terms of Reference for Assignment

1. This assignment was undertaken as the result of a request received from the WASH Project office in Washington, D.C. Before departure from Washington, D.C., agreement was reached with WASH that if more than one week was required for completion of the work, return would be delayed for such time as necessary to finish the assignment to the satisfaction of the AID staff in Lima. This commitment was made known to the AID staff on arrival and it was agreed that any decision on departure would be left until mid-week. It turned out that everything on which assistance might be effectively given, could be, and was completed by the end of the week.

2. 2.1 Status of the Project and Scope of the Consultant's Work

The government had not completed the actions required to permit disbursement of either the Grant or Loan funds at the time of my departure from Peru. My efforts were concentrated primarily on helping the SED ** engineers to prepare the documentation required for loan disbursement. Those actions of particular importance, as confirmed in a letter from the AID Mission Director to the Government, concern: an implementation plan which includes information on the administrative and managerial arrangements for the Project; a financing plan; a staffing plan; statements on first year's procurement needs and procedures as well as general requirements for the entire five years; a listing of criteria for community eligibility and selection; and a decision concerning the three regions to be selected for the first year's program. In each case actions during the first year needed detailed explanation.

- * Throughout this report reference is made to "Project" and to "Project Document". These refer to Project #527-0221, Loan #527-U-074, and to Project Report entitled "Peru, Project Paper, Rural Water Systems and Environmental Sanitation:
- ** SED - Sanitary Engineering Directorate

2.2 Information obtained from the Project document and from discussions with the Director of SED, his staff and with local AID personnel, led me to the view that the implementation plan including the first years detailed schedule, the technical assistance schedule, and the finance plan were the items on which emphasis should be placed and on which my services could be of the most use. A few other matters on which assistance was given, as noted below, were also included. These latter have a bearing on the items noted above since one concerned possible organizational changes in the national water section; one concerns procurement policy after the first year; and one, local assistance in project implementation.

3 3.1 The Implementation Plan

During the meetings with the staff of SED most of the principal actions which must be taken during the first years program were discussed and suggestions made as to the general content of the implementation plan which the government must submit to AID as one of the requirements for disbursement of the loan. To provide some guidance on how this plan might be presented, a schedule for year one and a narrative explaining the approaches and procedures surrounding the program, was prepared and left for translations with the AID office, and for transmittal to SED should this be found desirable. Copies of the draft of these documents are attached as annex 2, a and b.

3.2 It was only at the meeting with the Director of SED on the last day, that information was obtained indicating that SED believes it useless to staff the regions before arrival of transport in early September at the earliest. It is the Director's intention to begin operations under a temporary arrangement involving assignment of central staff and vehicles to the regions for short periods to begin preliminary work on community water system design and other activities which can be carried out prior to arrival of the resident staff. This development was not anticipated at the time the project was prepared, it being understood that there would be no delays in implementing the project. The implementation plan as prepared for guidance, annex 2,a, has been modified to show the period up to September 1, as a temporary arrangement. There is need for further discussion between the Primary Health personnel and those in SED to determine if ways can be found to avoid this temporary operations approach, and if not, to decide what changes in the implementation plan will be required by both groups.

4.1 The Finance Plan

Carlos Bernalen of SED is preparing the finance plan. Discussions with him and Eng. Valdavilla were for the purpose of clarifying certain questions and suggesting assumptions which might be used particularly for the first year disbursements. Essentially these involved agreement that all procurement except for trucks, vehicles, and certain specialized equipment, will be locally purchased. It was suggested that after costs for ten systems per region have been shown in the first year of the plan, and after costs of the imported items have also been included,

the balance could be broken down and shown for disbursement equally over the remaining years. No breakdown between foreign and local costs can be made after year one until a decision is taken on what, if anything, will be procured outside Peru in the remaining years.

5. 1. Staffing Plan

The staffing plan shown in the draft of the Implementation Plan in annex 2 b, will involve a number of uncertainties until the regions are established and personnel are in place. It was not possible from the information given to fully understand what the work load of the Regional Engineers will be. However, it appears from what some say that ongoing construction programs of rural water financed by the Interamerican Bank (IDB) and CARE coupled with such other duties as supervising maintenance operations on existing systems will place substantial responsibilities on most regional engineers. The staffing plan which is shown in annex 2 b, ought to provide personnel over and above that existing in each region if the AID project is to be built reasonably on schedule.

6. 1. Community Eligibility and Selection Criteria

The criteria set out in annex 2 b, and taken from the Project Document appears to pose no problems. In the last meeting with the Director of SED, it was stated that in all of the communities in the areas of Peru where the AID project would be operational, the people are poor and unable to make cash contributions involving 10% or 11% of the project cost. It was the view of the Director that 5% or 6% was about the maximum that could be assessed. This point was not discussed further but will need clarification before a decision is taken to proceed with construction of the first community water system.

6. 2. It is essential that the criteria in regard to community financial contributions are uniform for all rural settlements in Peru. If those where water supply is being financed by IDB adopt a 6% formula, it would seem desirable for AID to also accept this. On the other hand if the IDB communities hold to a 11% contribution, it would be desirable that the same figure be used in the AID communities.

7. 1. Organizational changes in the National Water Program

It is known that Engineer Alphonso Zavala has been granted a leave of absence by the World Bank to return to the Ministry of Housing of the Peruvian Government to take part in a re-organization of its water operations. A talk with Mr. Zavala confirmed his role in the water activities of the Ministry over the next one or two years but he made clear that his Ministry was concerned only with urban water supplies and that there was no need for concern that events in his Ministry would affect the rural water and sanitation activities of the Ministry of Health. He stated that rural is defined to mean communities of less than 2000 population.

8. 1. Cost of Imported Pipe

There is some reason to believe that locally produced plastic pipe and fittings may be more expensive than those imported from the U.S. Should this prove true and if the difference in cost is substantial, little justification would exist for local procurement of these materials after year one of the project. Engineer Carlos Cuneo, PAHO engineer assigned to Peru, has agreed to obtain price quotation on both local and imported pipe and will make this information available to AID's Lima office. At the same time, prices on U.S. manufactured PVC pipe (4" and smaller) and Polybutylene in 3/8" or 1/2" size for house connections, are being obtained by the WASH staff to permit further comparison of CIF figures with Peruvian quotations. An estimated quantity of various sizes of pipe and fittings representing roughly a one year's supply is the basis for the enquiry. For purposes of obtaining a comparable quotation in Peru, a list is shown in annex 3, which is the basis for the U.S. quotation.

9. 1. Local Assistance for AID

There has been a long history of rural water construction and operation in Peru much of which has had assistance of AID and its predecessor agencies. Knowledge of this experience as well as the engineers and officials involved in the water sector at all levels in government and outside will prove a valuable resource. To whatever extent this proves to be so, and also to the extent that more engineering attention is required to supervise this project than the local AID staffing will permit, attention is called to Engineer Luis Montilla, Lima, phone # 619867. Engineer Montilla was among the initial group of Sanitary Engineers trained under the Office of Interamerican Affairs in the early 1940's and started the engineering operation of the Sanitary Engineering Faculty at the University and has worked overseas for WHO and in Latin America for PAHO. He would probably be available for limited short time assignment if needed. His experience has included work on AID projects in the past.

10. 1. Technical Assistance and Studies

A schedule for Technical Assistance inputs has been prepared and a copy, see annex 4, can be translated and made available to SED if found desirable. In view of the T.A. requirements both for project assistance and studies, the two have been combined on the schedule. Studies to be made under the Project and described in the Project document are in need of review before finally deciding to proceed with them. The following comments are offered in this regard:

10. 2. Studies to be made

It will be noted in annex 2 b, that further studies on hand pumps should not be made. The World Bank project is the latest in a long series of such efforts. It would be far better to request the Washington AID office to send to Peru a couple of hand pumps of the type developed from their studies. If a local foundry or machine shop shows interest, WASH could be asked to send a specialist to help work out the details for local manufacture. (Although many such pumps may not be required on the AID rural project, at least in the first years, there will be other projects concerned with ground water which will. Peru should have a reasonably good market for handpumps which may be worth developing.)

10.3. There appears reasonable agreement in Peru that the latrine study should be consolidated with the so called "water efficacy" study. Both appear to have behavioral science implications and both are intended to be done through questionnaires and community attitude study techniques.

10.4. The water studies including appropriate technology, treatment, chlorination, and maintenance have been listed after some rewrite of objectives. It is not clear that any of these will, be too productive. The SED engineers looked rather blank when the topic was discussed. WASH should be asked to help review this aspect of the project before decisions are taken. Someone could be provided to meet with CHES and SED to decide on what studies are needed and how they might best be implemented.

10.5. A number of the studies mentioned in the Project document are briefly discussed in the annex document and technical assistance time is assigned on the assumption the studies will be done. In each case, as noted previously, there is need to restudy each before deciding on its justification.

11. Training

11.11.1 The staffing plan shown in annex 2 b, while possibly requiring some alteration for certain regions to reflect different requirements, nevertheless serves as a sound indication of the type of staff for which training needs can be evaluated.

11.2 The Ministry of Health has training programs for development of certain staff and it lays down professional requirements for recruitment for others. Together, there is some assurance that basic proficiencies for sanitary inspectors, engineers, designers, topographers, draftsmen and accountants/administrators will be in the

possession of those designated to staff the regions at the time they become operational. It does not appear either feasible or desirable at the outset of this project to attempt an evaluation of Peruvian subprofessional or professional schooling backgrounds which concern suitability of the staff to be assigned. It seems reasonable as the project moves into its second and later years to work out arrangements between the Project and the appropriate institutions to relate education and training activities to field operations and to introduce such changes and modifications as may be found desirable. At the outset, however, it is believed necessary to concentrate training on project orientation, objectives, methods, procedures, and relationships. In addition to initial sessions of three or four days for all staff including chauffeurs, warehouse men and workers, there will be need for repeat sessions after a period of three to six months following initial evaluations.

- 11.3 Sometime, early in the project, contact should be made with the faculty of the Sanitary Engineering School and with the training resource for sanitary inspectors to involve each in the field operations of the Project. Each should be made to feel that this Project can be used by them for field training.
- 11.4 The Sanitary Inspectors will probably be the group requiring the most intense scrutiny as soon as recruited for the project to determine adequacy of their training and background for the tasks to be performed. If these should prove completely inadequate, a crash training program may have to be set up at once.

It is therefore recommended that as soon as the first group of Sanitary Inspectors is under selection for the project, technical assistance be provided by someone competent to relate training to the Project needs. If inadequacies appear to exist which will not be ironed out through day to day work in the Project a training course should be established to fill in the most important voids. Decisions should also be taken then on the timing and nature of future training.

- 11.5 Advanced training and professional development programs should be looked at sometime late in the first year's program and decisions taken as to what these should be and how best they should be acted on. It is believed premature to go too far into questions of advance training until staff are on hand and operations begun. Then a better understanding of needs and opportunities will exist.

12. General Recommendations

The following recommendations relate to the discussions and observations above. It is recommended:

- 12.1 That as soon as the disbursement on the loan is approved, or sooner if this is possible, action should be taken on procurement of the trucks and vehicles to minimize the time required for placing all staff and for beginning operations in the regions.
- 12.2 That technical assistance be requested early in the project life to assist in preparation of the meeting (sometimes referred to as a seminar) between Regional Engineers, Medical Officers and Primary Health Leaders.
- 12.3 That the same source of assistance for the above meeting be used to prepare the orientation course for the other staff to work in the regions--either on temporary or permanent assignment.
- 12.4 That the same person as covers the above two functions, also be assigned the task of evaluating the Sanitary Inspector training and of designing any additional training considered as essential either prior to, or while on assignment in the regions.
- 12.5 That technical assistance be requested to assist in establishing the routine records, procedures, and operational format for the region. This assistance should be requested as soon as the officials having responsibility for establishing and monitoring regional units are designated.
- 12.6 That not later than June 1, of this year, arrangements be made to establish a "Study Review Committee with SED, CEPIS, and USAID represented. The Engineering Faculty and others might also be represented. This body should be charged with providing recommendations on the studies considered important to Peru and to the Primary Health Program.
- 12.7 Consideration should be given to using a competent, experienced local Sanitary Engineer to follow up on many of the details requiring attention during the early stages of this project.
- 12.8 Too much success from the latrine and water efficiency studies should not be anticipated. Such studies have been attempted on numerous projects in the past and by various methods. None have proven of great benefit to those charged either with the design or justification of future projects or in operation of existing ones. Nevertheless since little attention has been given to the cultural, social, and other behavioral aspects of latrine acceptance in the high altitude areas of Peru, the information may prove of interest. The health and other benefits from the water/sanitation facilities in the framework of primary health program, while of great interest, appears to have little hope for definitive measurement. It is not possible to suggest a study design

which would give hope of success under the conditions which must prevail.

12.9 The hand pump study should not be made.

12.10 Whenever problems occur requiring rapid attention, from specialists not available in the Mission, steps should be taken to obtain specialized services externally.

OFFICIALS MEETINGS

A series of meetings were held with the Director and staff of the Director of Sanitary Engineering,

Ministry of Health:

Carlos Marroquin - Director

Eng. Pablo Valdavilla - Construction Eng. - Probably will become
coordinating engineer for project

Carlos Bernaldes - Financial and Economic Specialist

Ministry of Housing:

Alphonso Zavala - Director of National Urban Water

Pan American Health Organization

Carlos Cuneo - Peru Country Engineer

Luis Mantilla - Private Engineer

USAID

Enrique Schroth - Engineer

Mary (Mitzi) Liker - Program Officer responsible for rural
water project

Other staff with various responsibilities related to the project
including Dr. Martinez, Ms. Balantyne, Mr. Davison

IMPLEMENTATION PLAN SCHEDULE - YEAR IDays After Loan
Disbursement:
Approved

	Grant fund disbursement conditions fulfilled
	Loan fund disbursement conditions met
2	Recruitment of regional staff initiated -- job description, etc.
2	Procurement action taken for trucks and vehicles laboratory equipment
5	Action begun on arrangements for regional procurement of certain supplies, equipment and materials
5	Preparation of Regional work and financial plans
5	Begin arrangements for establishing office space in regions
5	Prepare proposed policies, procedures to be followed in regions
15	Prepare training plans for regional staff
30	Hold meeting (seminar) between Reg. Engs. and Primary Health care heads and regional Med. Ofcs. -- Agree on policies, approaches, relationship, joint activities, objectives, etc.

(About 15 March)

Ad hoc arrange-
ments.
(until Sept. 17)

60	Begin work in regions suited to central office support Use selected villages for confirmation or rejection of criteria vis a vis self help and financial commitments
60	Begin preparation of community work schedules
60	Begin arrangements for joint meetings on studies to be undertaken
60	Design engineers and topographers assigned from headquarters
80	Agreements signed with communities, Complete regional work schedule, begin preparation of supply and equipment lists, schedule delivery and/or procurement
120	All regional staff recruited and ready for permanent assignment in regions

120 Prepare and hold series of regional meetings or
one central meeting between same participants as
15 March meeting to review all matters of mutual
concern, for adjustment and clarification.

180 Revisit by sanitary inspectors and engineer to all
selected villages to inform on plans, schedules and
arrangements. Discuss latrine program with school
and public officials and assess interest.

180 Storage facilities arranged for regions and communi-
ties.

180 Begin construction in communities where problems of
transport can be resolved

200 Trucks and vehicles arrive

Arrival of second engineer and other staff in region

230 Recording systems, accounting and procedural arrange-
ments in place and functioning,
including reporting.

260 Begin preparation of 1982 community selection process

275 Make evaluation of project and propose adjustments

300 Complete schedule of actions to be taken in 1982
including recommendations on procurement

IMPLEMENTATION ARRANGEMENTS

Areas Involved and Staffing

Three regions will be established in year 1 for initiation of the Project. Two are selected, Junin and Cajamarca. A regional engineer is already in place in Junin (also in Ancash if selected).

In view of the problems of transportation which will prevail until arrival of trucks and vehicles around September 1, it is anticipated that a number of key staff that will be selected for regional posts, will have no means of travel within the region. Consequently, the implementation arrangements for year one contemplate a period up to about September 1 in which a temporary state will prevail and where most of the work associated with water system design will be done by assignment of headquarters staff and transportation to the regions on temporary duty, to make designs, reach agreements with communities prepare for construction and arrange regional facilities for permanent occupancy on September 1, 1981.

The water and sanitation activities involved in this five year project are the responsibility of the Sanitary Engineering Department (SED) of the Ministry of Health with the Director and his Deputy designated as the Coordinating officials for the project.

For the first year, a schedule has been prepared (see Annex IIa) which lists the more important events with estimated dates when action on each should occur.

Initial discussions have been held with certain of the Primary Health Care officials to reach agreement on the regions and on the first year community selection process.

The Community Selection Process

The selection of communities to be included in any year's program including year one, will be made by use of a series of criteria which include the following:

A. Minimal eligibility criteria for communities:

- (1) The community must not have an adequate potable water system.
- (2) It must have an appropriate water source available.
- (3) The population to be served must be approximately 500 or less.
- (4) The community should be included in the region's primary health plan.

- (5) A strong community interest must exist among members who will benefit from the system.

B. Minimal selection criteria for communities

- (1) The relative density of the population to be served will be considered and preference given to those communities whose population concentration facilitates construction of a system with household connections.
- (2) Technical feasibility and complexity will be examined with preference given to project sites where the technical requirements are relatively simple.
- (3) The capacity of the community to pay for operating and maintenance costs of the intended system and to make the small monetary contribution required for system construction will be considered.
- (4) The estimated cost per capita to the population served for the type of system to be constructed will be considered.

For the first year's list, 15 communities have been selected which meet the above criteria except for the two concerned with per capita cost and community participation. These last two selection criteria will have to be determined after workers have visited the communities and have decided on the design, cost and village contributions, as determined by the communities.

Staffing of Regions

The initial staffing plan to be followed in each region is as follows:

- | | |
|---|---|
| 1 | Regional Engineer |
| 1 | Project Engineer - will also be the Design Engineer |
| 1 | Topographer - part time |
| 5 | Sanitary Technicians |
| 1 | Draftsman - part time |
| 2 | Skilled laborers |
| 2 | Common laborers |
| 1 | Warehouse attendant |
| 1 | Accountant/Administration Assistant |
| 2 | Chauffeurs |
| 1 | Watchman |

future experience this plan may be changed. It is expected that all staff should be in place by the time transport becomes available in September. The essential objective staff will be to insure that this project proceeds on following policies laid down and agreed to.

Procurement of Supplies and Equipment

In the first year, except for trucks and vehicles, and certain specialized equipment, all procurement will be local. An initial request will be made for ordering of the import items and after that, the balance will be purchased within Peru.

Currently, it is proposed that the Regional Engineer will be given authority and a budget for purchase of local material required in the project, other than that which can be most economically and more simply purchased centrally such as pipe, valves and fittings. These latter would be purchased in one package for the 1981 program (roughly a six month supply). Each region would draw on this for provision of these items. The Regions would then purchase directly the balance of the materials and supplies as needed. The exact arrangements on how this will be done has to be worked out to permit compliance with governmental auditing requirements. It is understood that such a procedure has been developed and employed on certain of the Inter-American Bank projects. If so, no delays should be encountered in adopting it.

Project Construction Procedures for Water Supply

Once the communities for the year's program have been listed, the regional design engineer assisted by the topographer will visit and prepare a preliminary design for each system which will permit an evaluation of costs related to alternate service levels. The village will then be asked to decide the type of service it wants and is prepared to support both in its initial contribution and annually for operation and maintenance. An agreement will then be discussed with the community by the Regional Engineer and the Community workers. If the agreement is signed, the community is placed on the year's construction list. If it does not wish to sign, the community is deleted from the year's program.

Upon being listed in the construction program, final designs will be prepared by the regional staff and the community is informed as to the approximate timing for construction. Supplies will be scheduled for delivery and the sanitary technicians will work out the time table for construction and community inputs.

Records on supplies issued for each village as well as labor inputs by the Region and the Community will be maintained by the Regional Office. Records will be in sufficient detail to permit accurate costing of each system upon completion.

The Latrine Program

Initially the latrine program will be concentrated on schools and public area where school and local officials express the desire for such units and where they agree to maintain the facilities in a clean and sanitary manner. Public washing and bathing

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facilities will also be included in this initial effort where interest exists.

A study is to be carried out in each region concerned with attitudes and cultural factors surrounding acceptance and use of private latrines. The approaches and policies to be adapted in the regions on the latrine program will be based on the findings of this study. Since the work of start-up in each region by both the Primary Health Care and Sanitary Engineering groups will occupy the time of all staff during the first year up to the time when weather prevents further construction in the field, it is proposed not to build any private latrine units in the year I program, confining such actions as time permits, to the public and school latrines. For year II and after, findings from the latrine study would be incorporated and policies laid down which, hopefully, will test national policies and approaches. Among the more important aspects requiring decision are the extent of financial cost to be borne by the householder and how costs are to be recovered. Current policies do not satisfactorily resolve these issues.

Coordination with Other Primary Health Personnel

Water and Sanitation are viewed as an important component of the Peruvian Government's effort to provide primary health services to all its people. While fairly clear operational lines exist between the various components of the primary health program, there are some which overlap and many where mutual support and collaboration can prove highly advantageous, if not essential. In particular, the provision and use of latrines represents an operation of mutual concern. Another is the need for personal hygiene and the use of water from safe sources and involves health education for people of all ages. All staff in the primary health program will need to emphasize these actions if the communities are to enjoy the maximum benefits from the investments to be made. The role of health promoters in the community and the role of sanitary technicians will require particular attention to insure that all are working together and providing mutual support.

An initial meeting between the key staff members of the regions, and the Ministry of Health has been scheduled as one of the early events after the regional people have been selected in order to permit all concerned to know the objectives of this project and the means to be employed for achievement.

A second meeting of the same personnel is scheduled for midway during the first year's program to evaluate the direction being taken and to introduce changes where needed.

At the end of the year, an evaluation of the first year's efforts is scheduled prior to finally adopting the second year program.

Funds included in the project for evaluation of health benefits will be made available to professionals in the primary health care

group to administer such studies, both base line and on-going, as are agreed.

Technical Assistance and Special Studies

For year one, needs for special studies and technical assistance are proposed as follows: (see attached Annex IV for technical assistance timetable and other needs)

1. Latrine Study - In broad terms this study would be carried out in each of the regions and would attempt to determine what the beliefs, habits, cultural factors, and constraints are which has limited acceptance and use of latrines in the rural areas of Peru. While previous programs will need to be reviewed, particularly those where evaluations have been made, emphasis will be on experiences and attitudes in the regions involved in the program. The objective of this study will be to attempt to find certain motivating factors or approaches which can be taken and which will lead to a greater acceptance of improved methods for disposal of human body wastes. Technical assistance will be needed to help design the study and in carrying it out. Also, evaluation and interpretation of the data will usefully involve specialist attention. Attention is called to a similar study done in Guatemala in 1977.

This study will require attention to sociological, anthropological as well as health, political, and economic factors. It will need to address questions of alternatives, community pressures, and motivating forces. The study needs to reach conclusion which can be translated into action, or it should conclude that under certain circumstances or in certain areas, programs should not be initiated at this time. Distinctions should be made between motivating factors leading to installation of home units and to those involving use and maintenance.

It is proposed that about one work month of technical assistance be provided initially followed by three months spread between the periods when the field studies are carried out and when the data is analyzed and the report is prepared. An additional month of assistance may be required later to advise on regional applications. Total five man months.

Water Supply Studies

Several components of a broad rural water supply study are noted below. These reflect areas of concern under Peruvian conditions which have not, so far as is known, been examined in any depth and are sufficiently involved in the regional programs covered by this project to justify early attention. In most cases, it will be noted that technical assistance will prove desirable both in designing the study and in its implementation and late analysis. The studies relate to maintenance mechanisms, rural water

treatment options, ground water technology options, and self help potential in water and sanitation for rural areas. None of these studies is considered of such urgency that it has to be initiated in year I of the project. It is expected, however, that the framework for certain of the studies can be established in year I for action in the next or succeeding years.

It is proposed that before any study is acted on, it should be submitted to and approved by a committee established by the SED and on which in addition to its own representative are those provided by the Primary Health Care Program, the Pan American Health Organization (Engineering), CEPIS, and USAID among others.

a) Maintenance of Water Systems Study

It is proposed to test in one or more regions, a water system maintenance program carried out under private contract. Without going into detail on this approach, the basic concept is that rural water systems are not complex and that any reasonably experienced garage mechanic can repair or maintain such systems with little training and that the task will be better done at a lower cost through private contracts between the communities of a region and the contractor. The contractor could visit each system at least four times a year and be on call (by telephone or postcard) for emergency reasons. Ideas of this type need to be tested against maintenance and repair procedures performed by government personnel stationed, for example, in the regional headquarters, or by other means.

One month of technical assistance would be required to explore various maintenance options under Peruvian conditions and to prepare a proposed test study. If the approach (s) appears suited to the test, five man months of study over two to three years for initiating and helping follow-up the test with the regional engineer(s) is visualized.

b) Water Treatment Options and Performance

Problems in use of chlorinators on rural water systems are well known. Yet there continues to be need for suitable ways to insure that water provided from surface sources meets reasonable sanitary standards. Effectiveness of underground filters, design factors applicable to infiltration galleries, and use of certain recently developed disinfectants are a few of the components of this study. Modification and change of existing designs would be tested on project installations where found desirable. Technical assistance is proposed to assist in designing the study and putting it into place in one or two regions. Three man months of technical assistance are needed.

c) Ground Water Technologies Options

Decisions will be required during the project life on what to do for villages where the "readily available source" criteria cannot be met. This study would evaluate the economics of alternative methods of serving these communities. Tested well types would be selected for the comparison as well as any other innovative approaches suited to the Sierra regions. In communities with demonstrated need and with only ground water options, introduction of the USAID developed hand pumps will be made for demonstration and testing purposes. Two man months of assistance is anticipated.

d) Self Help Potential Study

In view of the importance being placed on community participation in the construction of water systems and latrines for this project, and because of the substantial economic benefits that accrue to governments when system cost can be reduced through self help programs, it is proposed that an attempt be made as part of this project to determine the limitations and potential for self help. Factors which need attention under Peruvian conditions prevailing in the Sierra regions to insure the greatest chance of success should be identified. The limits beyond which self help should not be extended ought also to be examined. The design of such a study will likely prove difficult and the extent of the study requires some limitation. It would be of interest to determine whether maintenance of self help systems is better than on those where self help was not involved. Four man months of technical assistance will likely be necessary to design, initiate, and later, evaluate the study.

e) A System Efficacy Study

A System Efficacy Study is proposed in the project document to attempt an evaluation of the public health effects of the project. Distinctions would be made between communities where primary health services is provided in company with water and sanitation and those without such facilities. Questionnaire techniques would be the basis for collection of information. Consideration can be given to combining this study in part with that part of the latrine study which looks into people's attitudes and habits. The design details of this study will require the services of an expert in this field. It is likely that at least 5 months of assistance will be needed.

PLASTIC PIPE PRICE QUOTATION

Aside from difference in prices based on size and specification, pipe shipping costs can be affected by whether nesting for shipping of certain types is feasible. For rolled pipe, the latter factor is not, of course, of concern.

The accuracy of the following quantities of pipe and fitting while obviously highly inaccurate should not seriously change the conclusions to be reached on the differences in prices for one years supply between U.S. produced pipes delivered to Callao (Peruvia Port) and that quoted FOB factory in Lima. The estimates of quantity were made assuming 60 piped water systems for a year's program, 50% houses with house connections, and various sizes of PVC pipe for transmission and distribution. Fittings are required of appropriate sizes and types. Since the cost of fittings will likely not be large in comparison with the cost of the pipe, it is believed reasonable to disregard this item in reaching a decision on the merits of local and U.S. purchase of the pipe. The pipe specifications need to be reasonably the same for a meaningful comparison of prices. Since pressures will be low, pipe capable of operating under 30 p.s.i. can be quoted. AWWA standards or ANSI, to be used for potable water conveyance, or equal ought to be specified.

For comparison purposes costs estimates of pipe and fittings were obtained from Johns Manville on January 29, 1981. These are given below. They are C.I.F. Lima, Peru. The ENR Index was 3370 on that date.

PVC Pipe

30 PSI utilization/(120 PSI Test Pressure, 4:1 Factor of Safety)

Pipe meeting ASTM D2241

4 in dia.	PVC	"0" Ring	1,200 LF =	\$ 1,190.00
3 in dia.	"	"	24,000 LF =	14,780.00
2 in dia.	"	"	60,000 LF =	17,160.00
1 in dia.	"	Solvent Weld	60,000 LF =	6,600.00

Fittings	Tee	90° El	45° El	Cross
4" in PVC "0" Ring	\$18.70/ea	\$16.80/ea	\$14.10/ea	\$80.30/ea
3" in " "	11.60	12.90	8.90	44.50
2" in " "	5.70	6.50	5.20	35.20
1" in "Solvent Weld	2.20	1.70	2.10	3.30

Reducers PVC-"0" Ring

Tapping Saddles (Bronze)

4x3	" "	\$15.70/ea	4 x 3/4"	⊙	\$10.60/ea
3x2	" "	11.00/ea	3 "		8.90
2x1	" "	3.30/ea	2 "		7.40
1x.75	Solvent Weld	1.40/ea	1 "		7.20

3/4 in dia. Polyethylene

30,000 LF

\$7500

Technical Assistance ScheduleProject Resources for T.A.¹:

24 Work Months	\$ 192,000
Short Term	
Maint. oop. 5 w.m.	40,000
Sanitary Educ. Promotion 6 w.m.	<u>48,000</u>
	\$280,000

Resources for Studies and Evaluations

Latrine and Water Study	\$ 15,000
Appropriate Technologies	25,000
Evaluation and Results	70,000
Process Evaluation	<u>10,000</u>
	\$120,000

Likely Dates	Activity	Type of Assistance	Total Man Months
Jun '81 to Mar '82	Latrine Study (may be combined with Health Impact Study, system efficacy)	Sociologist/Anthropologist, Study Design Expert	5
Feb '81 to Feb '83	Regional Start-up Specialist	Engineer and/or Administrator	2
'82	Water System Maintenance Study	Engineer	5
'83	Water Treatment Options	Engineer	3
'82	Self Help Potential on Water/San. Prog. System Efficacy Study (see Latrine Study)	Eng./Sociologist	4
Jun '81 to Dec '85	Health Ed. Promotion Support to USAID-SED on Project	To be determined by Primary Health Care unit	5
Feb '81 to Feb '84		Health Educator	(6)
Feb 1, '81 to Feb 1		Engineer (part time)	4
		Total	28

¹From pages 2 and 3, Annex II, Exhibit H.1 of the Project Document.

²Part of T.A. funding included in studies.