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DEPARTMENT OF STATE
AGENCY FOR INTERNATIONAL DEVELOPMENT
Washington, D.C. 20523

PROJECT PAPER

Proposal and Recommendations For the Review of the Development Loan Committee

BOLIVIA - RURAL SANITATION

AID-DLC/P-2220

UNCLASSIFIED

DEPARTMENT OF STATE
AGENCY FOR INTERNATIONAL DEVELOPMENT
WASHINGTON, D.C. 20523

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AID-DLC/P-2220
March 18, 1977

MEMORANDUM FOR THE DEVELOPMENT LOAN COMMITTEE

SUBJECT: Bolivia - Rural Sanitation

Attached for your review is the recommendation for authorization of a loan to the Republic of Bolivia of not to exceed Four Million United States Dollars ($4,000,000) to assist in financing certain foreign exchange and local currency costs of goods and services of a rural sanitation program for the provision of potable water supplies at the village level in approximately 200 villages in southeastern Bolivia (the "Project").

No meeting is scheduled for this loan proposal. However, please advise us of your concurrence or objections as early as possible, but in no event later than close of business on Tuesday, March 29, 1977. If you are a voting member, a poll sheet has been enclosed for your response.

Development Loan Committee
Office of Development Program
Review

Attachments:
Summary and Recommendations
Project Analysis
Annexes I - V

AGENCY FOR INTERNATIONAL DEVELOPMENT

PROJECT PAPER FACESHEET

1. TRANSACTION CODE: [ ] A ADD, C CHANGE, D DELETE — **PP**

2. DOCUMENT CODE: **3**

3. COUNTRY ENTITY: Bolivia

4. DOCUMENT REVISION NUMBER: [ ]

5. PROJECT NUMBER (7 digits): 511-0458

6. BUREAU OFFICE: A. SYMBOL: LA; B. CODE: 5

7. PROJECT TITLE (Maximum 40 characters): Rural Sanitation

8. ESTIMATED FY OF PROJECT COMPLETION: FY 82

9. ESTIMATED DATE OF OBLIGATION: A. INITIAL FY 77; B. QUARTER 2; C. FINAL FY 80 (Enter 1, 2, 3, or 4)

10. ESTIMATED COSTS ($000 OR EQUIVALENT $1 -)

A. FUNDING SOURCE	FIRST FY B. FX	FIRST FY C. L C	FIRST FY D. TOTAL	LIFE OF PROJECT E. FX	LIFE OF PROJECT F. L C	LIFE OF PROJECT G. TOTAL
AID APPROPRIATED TOTAL						
GRANT	54	0	54	200	-	200
(LOAN)	1,562	400	1,962	2,067	1,933	4,000
OTHER U.S. 1.						
OTHER U.S. 2.						
HOST COUNTRY		95	95		2,500	2,500
OTHER DONOR(S)						
TOTALS	1,616	495	2,111	2,267	4,433	6,700

11. PROPOSED BUDGET APPROPRIATED FUNDS ($000)

A. APPROPRIATION	B. PRIMARY PURPOSE CODE	PRIMARY TECH. CODE C. GRANT	PRIMARY TECH. CODE D. LOAN	E. 1ST FY 77 F. GRANT	E. 1ST FY 77 G. LOAN	H. 2ND FY 78 I. GRANT	H. 2ND FY 78 J. LOAN	K. 3RD FY 79 L. GRANT	K. 3RD FY 79 M. LOAN
(1) PH	510	550	550	54	4,000	-	-	74	-
(2)									
(3)									
(4)									
TOTALS				54	4,000	-	-	74	-

A. APPROPRIATION	N. 4TH FY 80 O. GRANT	N. 4TH FY 80 P. LOAN	Q. 5TH FY R. GRANT	Q. 5TH FY S. LOAN	LIFE OF PROJECT T. GRANT	LIFE OF PROJECT U. LOAN
(1)	72	-			200	4,000
(2)						
(3)						
(4)						
TOTALS	72	-			200	4,000

12. IN-DEPTH EVALUATION SCHEDULED: MM 10, YY 78

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

[1] 1 = NO, 2 = YES

14. ORIGINATING OFFICE CLEARANCE

SIGNATURE: Frank B Kimball

TITLE: Frank B. Kimball
Mission Director

DATE SIGNED: MM 02, DD 21, YY 77

15. DATE DOCUMENT RECEIVED IN AID/W, OR FOR AID/W DOCUMENTS, DATE OF DISTRIBUTION: MM 02, DD 23, YY 77

AID 1330-4 (3-76)

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PART I. PROJECT SUMMARY AND RECOMMENDATIONS

Section A. Face Sheet

Section B. Recommendations

The following action is hereby submitted for AID approval:

- Loan		$4,000,000
(Loan Terms:	40 years, 10 year grace 2% interest during grace period 3% thereafter)	
- Grant		200,000
	Total New AID Obligation	$4,200,000

Section C. Description of the Project

1. Borrower

The Borrower will be the Government of Bolivia (GOB); the Ministry of Health's (MOH) Division of Environmental Sanitation (DSA) will serve as the Project's principal executing agency. The MOH Divisions of Epidemiology and Human Resources will provide support to the DSA in the execution of the Project.

2. Summary Project Description

The proposed Project is designed to create an institutional capacity in the DSA that will enable it to carry out future rural sanitation programs on a scale that will make a significant impact on the need for potable water in rural Bolivia. The Mission anticipates that by developing a functioning institutional base in DSA it will become an attractive, effective vehicle through which future resources of other international donors can be channelled.

To achieve this objective, USAID/Bolivia is proposing to assist DSA with the resources (equipment, materials and technical assistance) necessary to strengthen their institutional base and demonstrate, through the construction of approximately 200 sanitation systems, the ability to use significant amounts of resources effectively.

During the proposed four and one-half year loan disbursement period, the Project will help to finance a DSA program to construct approximately 200 potable water supply systems and 7,600 latrines, as well as provide health and hygiene education and instruction in systems maintenance to the estimated 11,000 families who will be the direct beneficiaries of the Project. The target communities will be located in the Departments of Cochabamba and northern Chuquisaca.

It is anticipated that the activities contemplated under the project will strengthen the institutional capacity of DSA and the Division of Human Resources and Epidemiology in the Ministry of Health to construct water and sanitary systems, to provide basic community education in hygiene and water use to measure the health impact of rural water, and to evaluate internally DSA's capacity to carry out the aforementioned activities through the establishment of a Management Information System.

The AID assistance will include funds for training, technical assistance, equipment, materials and construction support. The GOB will make available funds to support the operation of DSA and procure construction materials. The participating communities will provide manual labor and materials for construction.

Procedurally, the field staff of DSA -- the sanitary technicians located in the target departments -- will collect basic data in communities of 800 or less than do not presently have an adequate supply of potable water. The data will be included in an application showing potential water sources, community configuration, capacity to pay monthly maintenance fees and some indication of community interest in obtaining and maintaining a system. To ensure that sub-projects reach the neediest communities and that resources are utilized as efficiently as possible, potential projects will be subject to a three tier system of ascending analysis. The first test will screen all proposals and reject those that do not meet minimum general criteria. The second test will eliminate those sub-project proposals which do not meet certain technical and cost criteria. The third test will serve to rank potential systems from among the list of eligible sub-projects.

DSA will then sign contracts with the highest ranked "priority groups" of communities and make the necessary construction arrangements. Based on an analysis of a representative numbers of communities (See Annex II, Exhibit F), it is anticipated that 150 of the systems will be constructed in the Department of Cochabamba and 50 systems in the northern provinces of the Department of Chuquisaca.

Using that same information, it is anticipated that approximately one-half the systems will use surface water sources (95) while the other half will rely on ground water sources (105). Four differente types of systems are contemplated: deep well ground water (Type A), pumped surface water (Type B), gravity flow surface water (Type C) and hand-dug wells (Type D). The Mission anticipates that the majority of surface water systems will require treatment.

Assuming an average community size of 380, system costs will range from $19 to $68 per capita (See Economic Analysis, Table 3). Maintenance costs will range from $0.85 to $1.33 per month per family (See Annex III, Exhibit D).

A basic underlying assumption of the Project is that the target communities will appreciate the benefits associated with an adequate supply of potable water and therefore will pay for the operation, maintenance and replacement costs of the systems. This ability to assume these costs will be a factor in the selection of communities.

Section D. Summary Findings.

The Capital Assistance Committee has determined the proposed activities to be technically and financially feasible for completion within the proposed loan disbursement period of four and one-half years. Each sub-project will be individually investigated for technical and financial viability. The implementing GOB institutions have been thoroughly examined and are believed to have the capacity to carry out their respective responsibilities under the Project. There appear to be no financial constraints to prevent the GOB from providing the required funding for Project implementation. The social analysis identifies no obstacles to project implementation and, in fact, indicates that the Project will help to integrate lower socio-economic groups into the mainstream of Bolivian society. Sufficient experience has been gained in the past few years to assure the mission that sufficient voluntary labor is available and is willing to participate as required.

On the basis of the analysis contained herein, the USAID Mission to Bolivia concludes that the Project is technically, economically and financially sound and recommends that a loan be authorized to the GOB in an amount not to exceed $40 million and a grant be authorized in an amount not to exceed $200,000.

Section E. Financial Summary

The following is a financial summary of the source and application of Project funds.

Table 1

SUMMARY COST ESTIMATE AND FINANCIAL PLAN (US$ 000)

Components	AID LOAN FX	AID LOAN LC	AID Grant FX	GOB LC	Community Contribution	Total
1. Training/ Education	101	74				175
2. Technical Assistance (82 w/m)	358		182			540
3. Systems Construction	1,293	1,565		867	750	4,475
4. Support Costs				883		883
Subtotal	1,752	1,639	182	1,750	750	6,073
Inflation factor 8%	140	130	-	-	-	270
Contingency 10%	175	164	18	-	-	357
TOTAL	2,067 (4.000)	1,933	200	1,750	750	6,700
Contribution (%)		63%		26%	11%	100%

Section F. Conditions and Covenants.

The conditions precedent and covenants are described in Annex I.B.

Section G. Composition of the Capital Assistance Committee

Laurence Hausman	Chief, Development Resources Office, USAID/Bolivia.
Douglas T. Kline	Loan Officer, Project Coordinator, USAID/Bolivia.
Gonzalo Medina	Deputy Director, Rural Water Supply Program, Bogotá, Colombia.
Benjamin Severn	Economist/AID/W.
George Hoover	Deputy, Engineering and Transportation Division, USAID/Bolivia.
Thomas Fallon	Assistant Controller, USAID/Bolivia.
Robert Adams	Chief, Engineering and Transportation Division,USAID/Bolivia.
Helen Soos	Agricultural Economist, USAID/Bolivia.
Edward Kadunc	Health Officer/USAID/Bolivia.
Manuel Crespo	Engineer/USAID/B.
Drafted by:	Douglas T. Kline and Laurence Hausman.
Reviewed by:	Frank B. Kimball Charles J. Stockman
Approved by:	Frank B. Kimball

PART II. BACKGROUND AND DETAILED DESCRIPTION

SECTION A. PROJECT BACKGROUND

1. Priority and Relevance

a. Health Status of the Bolivian Population

The health status of the Bolivian population is one of the poorest in Latin America. Health indicators show Bolivia's estimated crude death rate to be the highest in South America (18.4 deaths per 1,000), the estimated infant mortality rate (147/1,000) 1/ to be the second highest in Latin America, and estimated life expectancy (47 years) to be the lowest in South America. 2/

Available health statistics are far from complete, but there is enough data available for a general assessment of the health situation as it relates to sanitary conditions. The Ministry of Health and Social Welfare (MOH) national health plan indicates that in 1975, mortality due to reducible illnesses was approximately 33 percent of total reported deaths. Within this group, deaths from intestinal and parasitic diseases attributable to unsanitary conditions arising from the lack of safe water supply and inadequate waste disposal amounted to 12 percent of total deaths. Data from the National Water Supply Plan attributes 45% of the mortality rate to unsanitary conditions.

As shown on Table 1, dysentery and gastroenteritis ranked sixth among the 19 principal causes of morbidity based on hospital discharges in 1974. Digestive ailments, many of which relate to poor sanitary conditions, ranked first among the 19 principal diseases. Other diseases listed which indirectly relate to sanitary conditions include typhoid and para-typhoid fever, nutritional deficiencies, and skin diseases.

When causes of morbidity are broken down by age and department, dysentery and gastroenteritis rank second only to undefined causes for morbidity among children in both the less than one year age group and the one to four year age group in Cochabamba. In Chuquisaca, dysentery and gastroenteritis ranks third in the 20 principal causes of morbidity for children under one year and second for children under four years. For all age groups, dysentery/gastroenteritis ranked 7th and 8th, respectively, in Cochabamba and Chuquisaca. 3/

1/ Some estimates are as high as 250/1,000.
2/ Figures taken from the National Five Year Plan page 267.
3/ For more detail see Annex II.4 for major causes of morbidity broken down by Department.

TABLE 1

MAJOR CAUSES OF MORBIDITY BASED ON HOSPITAL DISCHARGES

BOLIVIA: 1974

Rank	Cause	1974 Total	%
1	Complications of Childbirth	7,712	16.67
2	Digestive Ailments	7,177	15.51
3	Accidents, Trauma, Burns	6,981	15.09
4	Respiratory Illness	3,577	7.73
5	Tuberculosis	2,601	5.62
6	Dysentery and Gastroenteritis	2,534	5.48
7	Genitourinary	2,324	5.02
8	Poorly Defined	2,770	4.69
9	Heart and Circulatory	1,981	4.28
10	Skin Diseases	1,547	3.34
11	Nervous System	1,334	2.88
12	Tumors, all forms	1,174	2.54
13	Typhoid, Paratyphoid Fevers	924	2.00
14	Mental Disorder	773	1.67
15	Nutritional Deficiencies	362	0.78
16	Trypanosomiasis	151	0.33
17	Typhus	9	0.02
18	Other	2,944	6.36
	All Causes	46,875	100.00

SOURCE: Based on data from the Ministry of Health, 1974.

The above data reflects an urban bias because it is compiled from hospital discharges and sanitary units in the Departmental capitals. However, since sanitary conditions among the urban population and the socio-economic groups which utilize health facilities are generally better, it does establish that gastroenteritis, dysentery and other diseases which relate to poor sanitary conditions are among the principal causes of morbidity and mortality in Bolivia, and that these diseases most severely affect children four years of age and under. If adequate health data were available for rural areas it would, given the lack of potable water and sanitary facilities and lower educational and socio-economic levels, most likely reflect an even higher incidence of disease related to poor sanitary conditions. 1/

b. Potable Water Coverage

When compared with the rest of Latin America and the Caribbean, Bolivia ranks very low in the percentage of the population served by potable water and sewerage facilities. World Health Organization statistics indicate that slightly over 4% of the rural population have access to potable water and 3% have access to pit privies. In both Latin American and the Caribbean, only Haiti has lower rates of coverage, with less than 1% of the rural population having access to potable water and sanitary facilities.

As shown in table 2, there are currently some 2,472 communities in Bolivia having between 50 and 800 inhabitants. Only 98 of these communities or approximately 40,000 people currently have easy access to public standpipes or house connections. The remaining 900,000 people or 96% of the rural population in communities of less than 800 have no access to potable water facilities. Taking into account those which for reasons of dispersion are unreachable (some 180,000 people, or 20% of the rural population under 800), 720,000 rural Bolivians in communities of less than 800 lack a readily accessible source of potable water, but could be

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1/ Because of the lack of adequate data available for rural areas, the Mission visited 5 rural health posts in Cochabamba in an effort to develop a preliminary impression of rural health as it relates to sanitary conditions. Discussions with health officials in these areas indicated that an average of 50% of the cases treated were gastro-intestinal in nature. Furthermore, officials estimated that some 18% to 95% (depending on the community) of the rural population for which they were responsible suffered from some form of gastro-intestinal disease but that most went untreated.

TABLE 2

NATIONAL POTABLE WATER COVERAGE OF COMMUNITIES

MADE UP OF 800 OR FEWER INHABITANTS 1/

	No. of Communities	Estimated Total Population
No. of Communities of less than 800	2,472	940,000
No. of Communities of less than 800 which have a source of potable water	98	40,000
No. of Communities which because of dispersion are unreachable given current resource constraints (est.)	494	180,000
No. of Communities reachable	1,880	720,000

1/ A community is made up of a minimum of 50 inhabitants.

provided services under a potable water program.

The lack of adequate potable water coverage in the rural areas is clearly a major factor contributing to the poor health status of the Bolivian population. At present, because most communities have no public water supply, the inhabitants resort to water from rivers, creeks, or private vendors. More often than not, these sources of water are contaminated and transmit waterborne and water-based diseases to community inhabitants. Even in cases where water is not contaminated, it is generally not available in sufficient quantities to allow community members to practice even the most basic hygienic practices.

c. National Commitment to Rural Sanitation

The GOB has acknowledged the need for an increase in safe water supply and waste disposal facilities, and adopted the goal of increasing the number of people receiving these services to 50% of the rural population. More recently, these goals have been scaled down and the GOB now proposes in its Five Year Plan to increase rural coverage of potable water and sewerage systems from the current 4.5 and 3.0 percent levels to 17.2 and 21.6 percent, respectively.

Investment in rural water supply and sanitation in communities of less than 2,000 averaged about $200,000/year during the last five year period. During the next five years, the GOB intends to increase this investment by about 20% to approximately $250,000 per year. The IBRD estimates that at the present rate of investment the 4.3% of the rural people currently with an assured water supply and the 3.2% with waste disposal facilities would only be increased to 7 and 6 percent, respectively, by 1980. Thus, only through additional outside resources will the GOB be able to make significant progress toward meeting its targets.

d. GOB Strategy in Rural Water Supply

Although at present there are some 16 government agencies, autonomous authorities, and municipalities having responsibilities for the planning, monitoring, and execution of water supply projects, only two of these entities deal with rural water supply and both of these are national level entities. The National Water Corporation (CORPAGUAS), located in the Ministry of Housing and Urbanism, constructs water systems in communities of up to 10,000 people. The Department of Environmental Sanitation (DSA) in the Ministry of

Health constructs water systems in communities as large as 2,500 people.1/ In spite of the population overlap, CORPAGUAS until recently worked almost exclusively in communities in the 2,000 to 6,000 population range, while DSA activities centered in communities which ranged in size from about 200 to 1,000 inhabitants. Thus, no real institutional duplication of responsibility existed in project activities until the signing of the IBRD loan in October 1976. With the increased activities contemplated for CORPAGUAS in the rural areas, it quickly became apparent that most larger communities in the 3,000 to 10,000 range had been covered under previous CORPAGUAS/GOB and CORPAGUAS/IBRD programs. Thus, under the IBRD program, CORPAGUAS' population focus has been scaled downward, although communities are still larger, on the average, than those with which DSA deals.

Given the tremendous need for potable water and sanitation facilities in the smaller rural communities (some 1,880 "reachable" communities of less than 800 are in need of coverage), the GOB is less concerned at the present time with an institutional overlap (which has only recently surfaced) than with building an institutional capacity to deal with the tremendous needs in rural water supply. Accordingly, the current emphasis of the GOB is to strengthen both of these organizations to serve rural needs with a view toward a possible merging of the two institutions in the future. This merger, as currently envisaged, would capitalize on the engineering expertise of CORPAGUAS and on the social/community oriented approach of DSA.

e. Mission Strategy

The acute need for rural water and sanitation is a factor which adversely affects a wide range of development activities. In turn, this factor has a negative influence on the potential for achieving the objectives of a number of USAID projects. Specifically, a majority of the Mission's activities are concentrated in a geographic zone encompassing the Departments of Cochabamba, northern Chuquisaca and western Santa Cruz. To complement those activities, the Mission has determined to support a rural sanitation project that will provide potable water to a significant percentage of the rural community members in the two former departments. It is anticipated that this will positively influence and effectively complement the other ongoing AID activities in those areas.

After considerable prolonged discussion regarding the selection of an agency to implement the program, the Mission determined that the DSA, located in the Ministry of Health, was

1/ In addition to these two entities, the National Urban Development Service (SENDU) provides funds for medium sized communities to build public utility type projects. Of the 15 on-going projects, six deal with water purification or sewage control.

the more attractive of two national water supply institutions to undertake the project. The reason for this determination lies in the focus and methods of operation of the DSA. The other institution, CORPAGUAS, located in the Ministry of Urbanism, has been a recipient of previous AID assistance and has an acknowledged engineering capability. However, until very recently it has had a strictly urban/large community focus. Although CORPAGUAS is now working in somewhat smaller communities, its approach to water systems installation has not been modified accordingly. DSA, on the other hand, has a very strong rural focus and field orientation. In addition, DSA incorporates a health education and training component into all of its activities, an element that the Mission finds very appealing and in consonance with its general development approach. Although DSA has not previously undertaken a project of the size proposed under this loan, it does appear to have the institutional elements necessary to properly implement the program.

The Mission was initially concerned with the minor institutional overlap that exists between the proposed AID/DSA loan and the World Bank/CORPAGUAS program. However, as indicated in the previous section, the very acute need for rural potable water and sanitation facilities is a factor that clearly overshadows this concern. There is simply too large an unmet need for potable water in rural Bolivia, a need neither of the two institutions can fill independently and one which will keep both institutions fully occupied during the coming years.

Agreement in principle has already been reached between the Mission and the Minister of Planning and Coordination that the GOB will seek to rationalize its approach to the problems of the rural water sector in the near future. 1/ In addition, there have been tripartite discussions involving the USAID, the World Bank and the GOB on the question of overlap. An understanding exists that the necessary steps will be taken to ensure that whatever overlap exists at present (systems in three communities in Cochabamba with populations under 800) will be limited to that number for the future. In view of the urgent needs of the target group and the favorable attitude of the GOB towards rationalizing its approach to rural water, the Mission feels fully justified in proceeding with this program.

2. Relationship to Current AID Programs

One of the primary motivating factors underlying the Mission's desire to work in the rural health area is to increase the efficiency of U.S. and other international donor assistance. That is

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1/ See Annex II, Exhibit J, for a letter from the Ministry of Planning and Coordination on the GOB's intention to rationalize its approach to rural sanitation.

to say, poor health is a drain on human energy and financial resources. This drain precludes the most efficient utilization of technical/financial inputs (Bolivian or other donor) into the agricultural, educational and industrial sectors of Bolivia. Thus, there is a clear relationship between the proposed project (and its areas of focus) and several ongoing AID projects in Bolivia.

In education, improved health status of students, e.g. reduction in both the incidence and degree of malnutrition, 1/ should increase both student attendance and retention rates. Therefore, the Rural Education I program in Cochabamba could benefit more members of the target group as a result of the proposed program. Also, one of the rural normal schools located in Chuquisaca will be upgraded and expanded under the proposed Rural Teacher Training loan. The sanitation program could very likely benefit those rural normal school graduates by improving their attendance and efficiency.

With regard to agriculture, improved health status should help to increase small farmer productivity through decreasing the amount of time a farmer and his family are unable to work due to illness. Thus, increases in agricultural production contemplated as a result of the Agricultural Sector I loan, the Small Farmer Organizations loan, the Basic Foods loan, and the Rural Access Roads I loan may be even further augmented as a result of the positive impact of the proposed program on the health status of target area campesinos.

Finally, this program will serve as a critical element among other health programs planned by the Mission over the next several years. Because the disposition of potable water will have a significant health impact and because the lack of such facilities can undermine the benefits of other services provided, the Mission's strategy in health includes a sanitation program as one of four related factors necessary to improve rural health. The remaining three factors, "a lower incidence of communicable disease, reduced maternal/child morbidity and better nutritional levels" are being addressed on a pilot basis within the framework of the Mission's Nutrition and Rural Health Delivery Services Grant Projects. It is anticipated that the results of both projects will be used to prepare larger more comprehensive loan programs in the same geographic area as the proposed project. However, the timing of this project is to precede the health and nutrition loans so that a

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1/ It is estimated that 40% of school age students in rural areas suffer from malnutrition.

number of systems are installed and operative when the other two health-related programs begin.

3. Other Donor Activities in Rural Sanitation

a. World Bank Project

In October 1976, the GOB signed an $11.5 million loan with the IBRD for both urban and rural water supply: $1.7 million is being lent to the Sanitary Works Administration of Potosí (AAPOS), $5.0 million to the Water Supply and Sewerage Corporation (ELAPAS) of Sucre and $4.8 million to the National Water and Sewerage Corporation (CORPAGUAS). The Sucre/Potosí component of the program is strictly urban oriented and therefore neither conflicts with nor complements the proposed program. The CORPAGUAS program, however, is also providing potable water facilities to rural communities. This project is currently in the early stage of implementation and it is anticipated that approximately 20 systems will be constructed during CY 1977.

In total, CORPAGUAS is constructing some 70 systems in communities ranging in size from 300 to 3,500 in the Departments of Cochabamba, Oruro, Potosí, and La Paz. Presently, there are three systems proposed for Cochabamba in communities of less than 800 to be completed under the project. Thus, there is a slight geographic/population overlap between the focus of the CORPAGUAS/IBRD program and the DSA/USAID program (which includes communities of 800 or less in Cochabamba and northern Chuquisaca).

In spite of this slight institutional duplication the Mission proposes to move forward with the program because: (1) the needs in smaller communities both nationally and in Cochabamba are so great that the involvement of two institutions in the provision of rural water supply at the present time would not create any noticeable duplication of effort but, rather, would ensure greater coverage 1/; (2) the government's strategy over the short-term is to strengthen the institutional capacities of both DSA and CORPAGUAS to better serve the needs of rural communities. Over the long-term it is anticipated that the expertise of both institutions will be

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1/ As discussed in Section B.4 , there are some approximately 1,900 communities of less than 800 which are "reachable" but which do not now have a source of potable water. In Cochabamba alone (see table 2) there are some 460 communities which do not presently have systems but which could be served under a potable water program.

utilized to create an institution at the national level dealing in rural water supply and; (3) there are substantial differences between the two programs to confirm the fact that both are necessary within the context of the GOB's strategy to rationalize the sector. The seven major differences between the two programs are enumerated below:

(1) Community Participation

Under the DSA program, the involvement of the community in all phases of the project will be stressed. During the promotion phase, the community will form a water committee responsible for organizing the volunteers for systems construction. After the systems construction phase, the committee will continue to function for purposes of maintenance, education and tariff collection. Community involvement will be greatly facilitated by DSA's regional office structure and the location of DSA technicians in the field. It is these technicians, familiar with the problems of the communities with which they work, who have borne and will continue to bear the primary responsibility for fostering community involvement. To date, their efforts have been largely successful.

The CORPAGUAS program also proposes to foster community involvement. However, its highly centralized office structure precludes the monitoring of this involvement to ensure its continuation during all project phases. During the construction phase, laborers will be paid as they were when CORPAGUAS was working in larger communities. In the opinion of the Mission, the consequences of paid labor in smaller communities will be detrimental for the long run operation of the system. Experience in Bolivia with Indian cultures has shown that communities take an active interest in the maintenance of public works projects only if they have been involved directly in construction and/or upkeep.

(2) Maintenance

Ensuring adequate maintenance is probably the most crucial element contributing to the success of a rural water project. The proposed project includes the institutionalization of a maintenance capacity within DSA. Communities will be organized and instructed by DSA technicians located in rural areas to accomplish most preventive and minor maintenance tasks. Additionally, systems will be inspected on a bi-monthly basis. Finally, a referral system will be instituted so that major maintenance problems which occur between inspection visits can be attended to quickly. Spare parts (motors, pumps) will be procured so that equipment down time

will be kept to a minimum. The CORPAGUAS program, on the other hand, contemplates no institutionalized maintenance program. Instead, maintenance will be handled by the regional development corporations in a manner to be determined by them.

(3) Socio-economic level

The socio-economic level, albeit difficult to quantify, appears to be higher for communities included under the IBRD/CORPAGUAS program than those communities under USAID's proposed program. The IBRD program requires on the average direct cash contribution of 12% or approximately $50 per family. Because this contribution is one of the criteria used for selecting participating communities, CORPAGUAS tends to select wealthier communities (e.g. those communities with the ability to pay). These communities generally have some source of income, in addition to agriculture, such as proximity to a rural industry or transportation network. This makes them generally wealthier than the average small rural Bolivian community. By contrast, the USAID program will require voluntary labor and a very small contribution for latrine flooring. It will focus on poorer and more remote communities. The ability to pay will only become a factor when communities are required to pay a tariff of up to 26 pesos per month for systems maintenance.

(4) Level of Service Provided

Throughout its existence, CORPAGUAS has worked in larger communities and has provided levels of service commensurate with the perceived needs of those communities. Although more recently CORPAGUAS has begun to focus on smaller communities, the levels of service provided have not been adjusted downward to meet the more rudimentary needs of these communities. Accordingly, it is providing in-house connections (with sinks and drainage systems) to even the smallest communities, resulting in a per capita cost which averages about $65.00. By contrast, DSA will provide simple in-yard connections (with a hand-dug gullet to serve as the drainage system) or community taps. Per capita costs under this project should average approximately $45.

(5) Provision of Sanitary Facilities

The CORPAGUAS program does not contemplate the provision of latrines nor does it require that such latrines be constructed prior to the provision of the system. The USAID Mission feels that the installation of latrines is an integral part of any comprehensive water supply project if the health benefits of such a project

are to be maximized. Thus, the DSA project will include a latrine installation component which will ensure that each participating family has such a facility. This component will help avoid water and waste contamination and thus ensure that the potential health impact of the program is not undermined.

(6) Community Education

CORPAGUAS program does not include an education component. Because CORPAGUAS until recently dealt with larger communities, it was felt, with justification, that such a program was not necessary. By contrast, DSA has always included a community education element in its projects because of its small community focus. DSA sanitary technicians, stationed in rural areas, have designed their own education programs using available materials and their knowledge of local communities to ensure that appropriate sanitary practices are used in conjunction with newly provided water facilities. Under the proposed project, the education program will be organized, standardized, and given even greater emphasis.

(7) Evaluation

Under the IBRD program neither an internal nor an external evaluation system is contemplated. By contrast, the DSA program contemplates a program to evaluate the health impact of the program through the collection of data on infant mortality. Additionally, an internal self-evaluation procedure will be introduced to help ensure that bottlenecks in the program are identified and, where possible, avoided.

b. UNICEF

DSA is currently implementing a $1.0 million grant project sponsored by UNICEF. This project, which was scheduled to begin in 1973, began its real phase of implementation about one year ago. The equipment and materials procured with grant funds have arrived and DSA will use these to install some 50 systems nation-wide over the next two years. Some technical assistance is being provided in administration, and warehousing is being built to provide storage facilities for equipment.

This project provides an excellent complement to the project being proposed by USAID. The timing of the UNICEF project is such that it will be terminating when equipment under the AID program is scheduled to arrive and construction is scheduled to begin. The UNICEF program includes the full-time services of an administrative

advisor. This advisor has been working on improvements in DSA's administration and planning activities. These improvements in their institutional capacity will enable DSA to be better prepared to undertake the more ambitious program sponsored by USAID. The Mission has worked closely with UNICEF personnel to ensure that the proposed AID activities will properly complement the UNICEF/DSA program.

c. CARE - Rural Water Systems Project.

USAID is awaiting approval of a three-year $450,000 Private Voluntary Agreement (PVO) with CARE to build 38 rural water systems in communities up to 2,000 in the southern region of the Department of Chuquisaca and the Department of Tarija. In addition to the AID contribution, CARE, the Regional Committees of Chuquisaca and Tarija and the local communities will contribute approximately $1,800,000 to the project. The PVO project is composed of two phases: (1) the construction of potable water systems; and (2) educational activities to upgrade the general health status of the 15,200 people who are expected to benefit from the project.

Three types of water systems will be constructed, depending upon the sources of water and the distance to the source: (1) ten systems using deep wells, mechanized pumps, and storage facilities, costing approximately $31,500 each; (2) twelve gravity flow systems utilizing treatment and storage tanks, costing approximately $31,000 each; and, (3) sixteen gravity flow systems without storage or treatment facilities, costing approximately $26,500 each.

In comparison with the costs of systems under the proposed Rural Sanitation Project, the construction costs of CARE sub-projects are higher because of two related geological factors, either (1) because the areas are generally drier, the water source often is located further from the community, or (2) the level of the ground water source is at a much greater depth than that usually found in the project area in the Rural Sanitation Project. Per capita costs therefore will also be higher, ranging from $66 to $98.

SECTION B. Detailed Project Description

1. Goal

The general health sector goal, as described in the Mission's Health Sector Assessment and to which this and other AID assistance programs are being directed, is to improve the health status of the rural poor. In addition, a sub-goal of the Project is to reduce the incidence of enteric and parasitic diseases among community members participating in the program. The Project will contribute toward the accomplishment of the objectives by addressing one of the major constraints to improved health status, namely, the lack of adequate potable water and sewage disposal facilities in rural areas. Furthermore, it is anticipated that as a result of institutional improvements in the executing agency brought about by the program, the benefits of potable water and sewage disposal facilities will be extended to additional communities both within and outside of the geographic focus of this program.

2. Purpose

The purpose of the Project is to create within the DSA the institutional capacity to enable it to carry out future rural sanitation programs on a scale that will significantly impact on the demands for potable water in rural Bolivia. The Project proposes to build up DSA's capacity to construct potable water and sewage facilities, to educate participant communities in improved health and hygiene practices, and to collect data in order to evaluate the health impact of the provision of water related facilities on participating community residents. By utilizing the inputs provided under the Project, DSA will be in a position to demonstrate its ability to use significant amounts of resources effectively.

3. End of Project Status

At the end of the Project it is anticipated that DSA will have developed a sound, effective institutional base that will make it an attractive vehicle through which the future resources of other international donors can be channelled. Assuming that DSA's capability has been demonstrated, and given the interest of the World Bank and the IDB in lending for rural water projects, it is reasonable to expect that DSA (or its eventual organizational successor) will be the recipient of additional resources to expand the activities supported under this loan.

In addition, it is anticipated that approximately 200 water systems and 7,600 latrines will be completed and serving a target population of 11,000 families. All families participating in the program will have received health/hygiene instruction, and selected community representatives will receive instruction in systems operation and maintenance.

By the end of the third year of the project, preliminary results of the ongoing evaluation program will be available. These results will measure both project impact (effects on health status as a result of potable water/latrines/health education) and process evaluation (efficiency, cost and organizational outputs of DSA).

With regard to the institutional capacity of DSA to direct a comprehensive program in rural water supply, it is anticipated it will have improved considerably. The capacity of personnel at the departmental and national levels will have been upgraded through a series of seminars and on-the-job training courses offered under the proposed program, sponsored jointly by DSA and the Division of Human Resources in the MOH. The administrative structure, through increased staffing, training and technical assistance will be capable of providing adequate logistical support to field offices. The core of DSA sanitary technicians at the regional level will be increased and upgraded. They will be provided with sufficient transportation, audio-visual aids, and simple maintenance equipment to generate community interest, assist in the installation and maintenance of the systems, and provide community education on a regularized basis. Additionally, DSA's Office of Promotion and Education will have been upgraded through the provision of additional personnel, technical assistance and materials to coordinate these components of the overall potable water program. Finally, a separate Division of Maintenance will have been established to assure that preventive routine and major maintenance duties are efficiently organized.

4. Project Focus

a. Geographic Focus

The project will focus on communities ranging in size from approximately 50 to 800 inhabitants in the five northernmost provinces of Chuquisaca and throughout the Department of Cochabamba. 1/ Communities within that population range will be selected on the basis of current accessibility to potable water.

1/ DSA has regional offices located in the capital cities of both these departments.

The geographic focus of the Project is designed to reflect an understanding between AID and the GOB with respect to providing significant financial and human resource commitments to support areas where other USAID development efforts are being concentrated.

With the exception of Santa Cruz, the concentration of construction activities under this Project in Cochabamba and northern Chuquisaca largely coincides with the "Phase I" geographic focus of a variety of other AID programs. 1/ These programs will complement and overlap with this Project. They include loan projects in the agricultural sector (Agriculture Sector I loan, the Small Farmer Organizations loan, and the Rural Access Roads I loan), the rural infrastructure sector (Rural Electrification I and II), and the rural education sector (Rural Education I). Additionally, the geographic focus of the proposed project is the same as the focus proposed for the FY 78 Rural Health Delivery Services and National Nutrition Improvement loans. This overlapping geographic focus will help ensure that the potential beneficial effects of reduced communicable diseases, improved maternal child health and improved nutritional status will be advanced through adequate environmental sanitation and community awareness of health measures and programs.

b. The Target Group

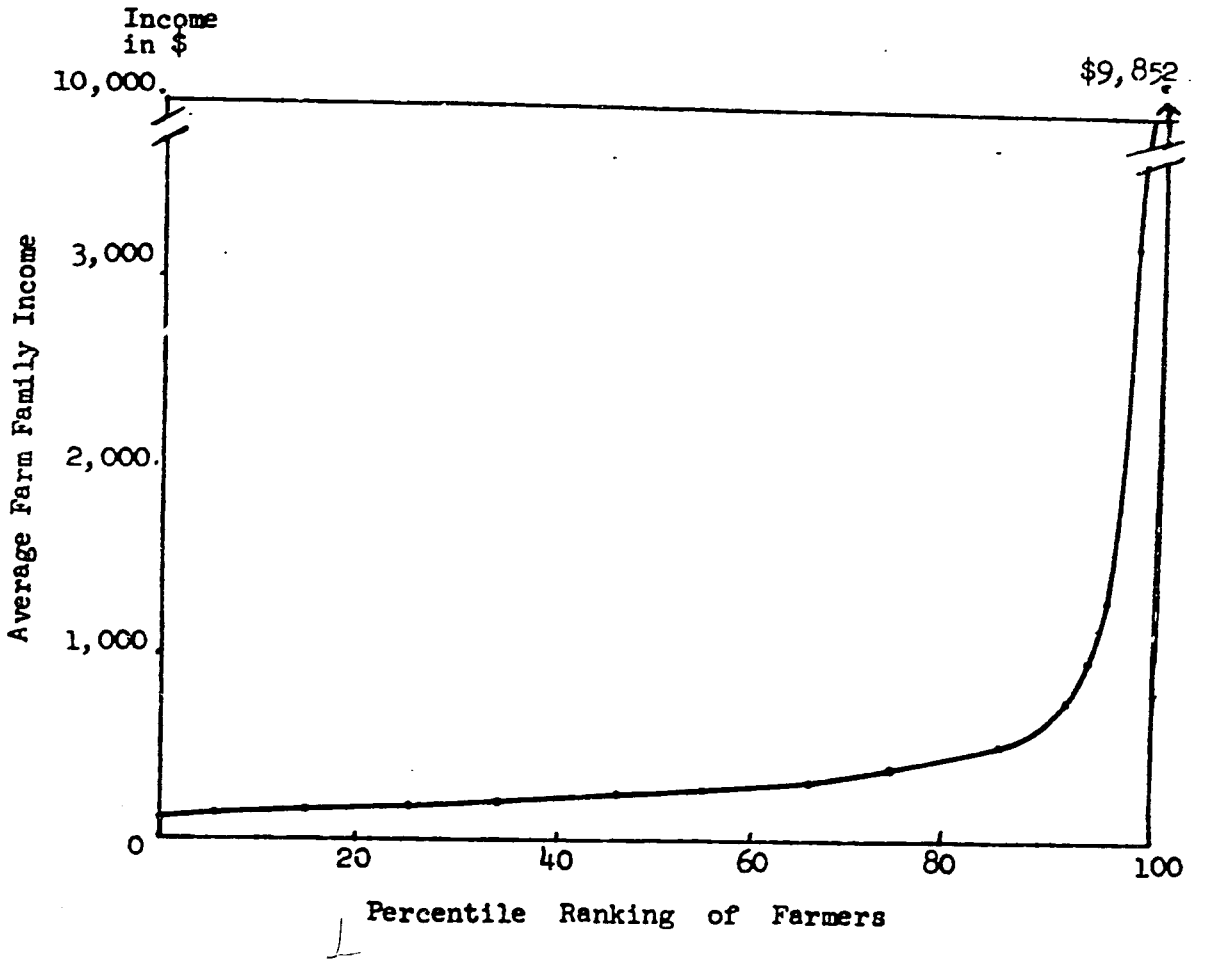
The primary beneficiaries of the Project will be the estimated 76,000 rural Bolivians who will be provided with potable water and sewerage facilities during the four-year life of the project. It is estimated that another 76,000 rural Bolivians will benefit from systems constructed under the institutional mechanism improved by this project before the equipment procured with loan funds is fully depreciated.

In 1975, an estimated 3.8 million persons, or some two-thirds of Bolivia's population, lived in rural areas, e.g. in communities of less than 2,000 inhabitants. The average on-farm income of these persons was $79 per capita, or about $500 per farm family of six persons. Because it is well known that averages conceal important variations, the Project Committee has developed a modified Lorenz Curve analysis (see Figure 1) which shows the distribution of farm family income by percentile. The data on which this analysis is based show that per capita on-farm income does not exceed $100 until after the ninth decile group. Even in the highest decile, only the top two percent of farmers earn significantly high incomes, exceeding the average per capita income of an estimated $300 in 1975.

1/ Santa Cruz was originally considered for inclusion in the program; however, because of the very active efforts of the Regional Development Corporation a majority of all rural communities are expected to have potable water by 1979.

Figure 1

Farm Income Distribution in Bolivia - 1975 1/



Key:

Estimated Average Farm Income

% Farmers	Family Income	Per Capita Income
1- 10	$ 217	$ 34.50
11- 20	225	35.70
21 - 30	233	37.00
31 - 40	242	38.40
41 - 50	283	45.00
51 - 60	316	50.00
61 - 70	367	58.25
71 - 80	450	71.40
81 - 90	583	92.50
91- 95	833	132.20
96-100	3333	529.00
96-97	$ 1090	$ 173.00
98	1350	214.30
99	3284	521.30
100	9852	1563.80

SUMMARY OF INCOMES

	Farm	Per Capita
Average for Bolivia:	$500	$79
Average for lowest 50%:	240	38
Average for lowest 80%:	292	46
Average for lowest 90%:	324	51

1/ Includes only income earned on the farm. Total farm family income is often considered to be 10% to 20% more.

The project will randomly affect the lowest 90% of the rural population who live within the target region, based on the assumption that those rural residents in the higher income brackets are much more likely to already possess potable water and sewerage disposal facilities. Nonetheless, it is possible that a few rural villagers in the top decile may also benefit from the provision of potable water facilities by virtue of the fact that they live in the poorer communities to be serviced under this program.

Within the target region of the Departments of Cochabamba and Chuquisaca, the target group has been further delineated in Table 2. Of the estimated 620 rural communities of under 800 inhabitants in the target area, the Project Committee estimates that about 30 already have adequate potable water and sewage disposal facilities. About 120 communities are considered to be economically "unreachable" under this Project owing to the lack of a water source which can be utilized at an acceptable economic cost, or because of a highly dispersed population, or as a result of topographical conditions which preclude the movement of equipment and materials. Eliminating those families who already have potable water facilities or who are "unreachable", approximately 470 communities are included in the target areas.

Table 1

Number of Farms by Geographical Region According to Income defined as the Contribution to Gross Sector Product

Departments:	Altiplano	Valleys	Yungas	Oriente	Total
Percentile Income Ranking					
Lowest 40%	126,000	80,000	10,000	24,000	240,000
41-80th%	108,000	85,000	16,000	31,000	240,000
81-95th%	18,000	30,000	13,000	29,000	90,000
96th-100%	2,000	10,000	4,000	14,000	30,000
Total	254,000	205,000	43,000	98,000	600,000

Table 2

Communities of Less than 800 in Cochabamba and Northern Chuquisaca

	Cochabamba Valleys (incl. Chapare)	Chuquisaca Valleys (5 Northern provinces)	Total No. of Communities in Target Areas of 800 or less	Estimated total population of communities in target areas of 800 or less
No. of Communities 1/ less than 800	460	160	620	240,000
No. of Communities 2/ less than 800 which have a source of potable water	20	10	30	10,000
No. of Communities less than 800 which are unreachable	90	30	120	45,000
No. of Communities reachable under the Project	350	120	470	175,000
No. of Communities to be served under the Project	150	50	200	76,000
% of Target Population served by the Project	43%	42%	43%	43%

1/ A community is made up of a minimum of 50 inhabitants.

2/ Population with access is defined as those served by house connections, public standpipes, or easy access.

5. Project Design

The following activities will take place under the project: (1) the design, installation and maintenance of approximately 200 potable water and sewage disposal systems in rural villages ranging in size from 50 to 800 in the Departments of Cochabamba and Northern Chuquisaca; (2) educational instruction (prior to, during, and after system installation) on health practices related to potable water usage and on systems maintenance and operation; (3) evaluation of the health impact of the program through measuring changes in the rate of infant mortality incidence of diarrheal disease in the 0 - 5 year age group and water use attitudes and practices; (4) institutional reinforcement through technical assistance to assure that DSA has the capability to carry out the aforementioned activities.

a. Executing Agency

The Mission has selected the Department of Environmental Sanitation (DSA) as the project's executing agency because: (1) DSA has had experience in project promotion and in the organization of voluntary labor (DSA has 126 para-professional sanitary technicians who specialize in this type of activity);(2) DSA has a decentralized regional office structure which will greatly facilitate project promotion, execution and maintenance elements as well as permit supervision of ongoing educational and evaluation programs; and (3) the DSA is located within the Ministry of Health which will facilitate the coordination of the proposed program with on-going and proposed health-related programs directed by the MOH and establish a basis for replication in other geographic areas.

b. Systems Design

DSA, jointly with USAID, has developed four standard designs (see Part III, Section A for more detail) which employ, as far as possible, local materials to facilitate maintenance.[1] Using the standard designs, DSA will tailor systems to meet the needs of each individual community. The four types of systems to be constructed under the proposed program are:

Type A - This system will use ground water sources with a deep drilled well averaging about 90 feet in depth. The system will include a sealed source, pumping, storage tank, main line and distribution system. It is not anticipated that chlorination will be used in Type "A" systems unless the ground water source should become contaminated. Water will be tested for potability by DSA technicians during their regular maintenance visit. Should water become contaminated, a simple chlorination system such as the one described in Annex III will be installed.

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[1] Maintenance costs will range from $.85 to $1.33 per month per family, depending on size of community and type of system.

Type B - This system will use surface water as its source with a pumping, storage tank, main line, and distribution system. Because of the surface source, intake, sedimentation and treatment facilities will be used in all cases.

Type C - This type of system is based on a surface source found at a sufficient elevation above the community such that gravity flow alone will have sufficient hydrostatic head to provide necessary pressure to the community for adequate water distribution. Intake sedimentation and treatment facilities will be used in all cases.

Type D - Where a community is too small to justify a distribution/treatment system or where the community cannot afford the monthly maintenance charge and no surface source of water is available, wells will be dug and hand pumps and public taps provided.

For systems of Types A, B and C, yard connections will be provided where the incremental cost is no greater than $5.00 per capita over public taps. As shown in the economic analysis (Part III.C), the incremental benefits of yard connections are held to be greater than the benefits that would accrue from providing only a public tap system. Easy accessibility apparently leads to greater use of water which, when combined with proper instruction on the uses of water, leads to a reduction in enteric diseases. This is one objective of the program. According to cost data developed by DSA and the Mission, the cost differential for installing yard connections (vice public taps) is approximately $1.75 per capita for each of the three types of distribution systems. This $1.75 cost figure is based on an average village size of 380 and a typical village configuration of houses clustered along two to four roads. These conditions are believed to represent at least 50 percent of the villages that will participate in the program. An additional expected benefit that is difficult to quantify is that community members will show a greater interest in properly maintaining systems that provide more individualized service.

The choice of which type of system to be constructed in a given village will be done on a modified lease cost basis. Given the problems associated with system upkeep and replacement, the community should have the ability to pay a monthly water fee equivalent to the annual administrative, operating, general maintenance and major equipment replacement costs associated with the type of system selected. Mission cost data indicates that with the exception of communities with populations of less than 150, all villages will probably be able to pay the necessary fee, regardless of the type of system installed. In ranking systems on a modified least cost basis,

a determination will be made as to how many alternative systems are open to a village within the context of their ability to pay. Assuming that all three choices (Types A, B, and C) are open to the village and that it can afford all three, the least cost analysis will be used to select the appropriate system.

However, if the village cannot afford all three systems; if, for example, it cannot affort Type A, then the least cost analysis will be based only on Types B and C. This allows for the possibility that the least expensive of the three will be eliminated from consideration. Both DSA and the Mission are convinced (and this is supported by the experience in other countries) that over the long term, installing a system for which the community cannot afford the monthly tariff mentioned previously will result in a system which is poorly maintained and one which will not provide the regular service for which it was intended. While not using that criteria might provide short-term benefits (until the system became inoperative), it would not appear to be an appropriate use of scarce resources and is accordingly not supported by the Mission. Once the maintenance capability issue is resolved and the number of choices available to a village have been determined, systems can be rank ordered in terms of least cost (for more detail see the Economic Analysis).

Although hand-dug pump systems and shallow drilled hand pump systems are the cheapest systems to install on a per capita basis, they will only be considered for villages with dispersed populations or in cases where villages cannot afford to maintain a distribution system. It is possible, however, that they will be considered in cases where they lie within close proximity to villages that are having distribution systems installed. These two alternatives have not been considered in the least cost strategy for all the reasons discussed in Annex IV, and in addition because the Mission finds the relatively high probability of eventual well contamination to be an unacceptable risk, and as population grows, the cost of adding yard connections to an existing distribution system is about the same per capita cost as installing additional hand pumps.

One additional factor will be taken into account when ranking systems are on a least cost basis. In obtaining the cost data for each of the systems, it is implicitly assumed that each will provide the same amount of service, i.e. that the amount of "up time" of each system is the same. However, experience indicates that deep well systems (Type A and surface systems with pump (Type B) have more "down time" than the gravity flow system (Type C), due to the incidence of mechanical failures. Therefore, the Mission has concluded that Types A and B have an extra cost that is not included in the conventional financial analysis. This extra cost occurs when the distribution system breaks down and villagers are forced to resort to traditional, and presumably

less potable sources of water. In such a case, the positive health impact of potable water is absent and the prevalance of diseases associated with impure water is likely to rise. To account for this reduced benefit, the Mission has assigned a $10.00 per capita value to the Type C systems (or added a $10 cost to Types A and B systems). This represents the value assigned to reduced health impact (90 percent) and probable loss of convenience (10 percent).

Based upon cost estimates which include this extra $10, given a choice between deep well or surface with pump and a surface gravity flow system, the latter is the least costly up to approximately 2,000 meters distance from the water source.

c. Systems installation

As discussed in Section G the selection of systems to be constructed with project funds will be based on a series of objective criteria taking into account cost criteria, the presence of a potable water source and community interest/enthusiasm, e.g. the willingness of the community to contribute voluntary labor for the construction of the system and to dig and bear a portion of the expense of outfitting pit-type latrines.

Once the initial design has been completed and the community has been selected, the first phase of the education program will begin. Before system construction commences, however, each family will be required to dig a pit-type latrine. The location and specifications for the latrine will be clearly explained by the DSA technician 1/. Additionally, each family will purchase a cement slab which will serve as flooring for the latrine. Once the latrines are complete, actual construction will commence. The DSA sanitary technician will be responsible for assisting the Village Water Committee in the organization of voluntary labor for systems construction. Additionally, he will be responsible for ensuring that all materials are on site prior to the construction phase 2/. The DSA Regional Engineering Supervisor will accompany the delivery of materials to ensure that the technician is adequately briefed on the design and execution of the project.

1/ For more detail on latrine specifications see Engineering analysis.

2/ When the latrines are completed, the DSA technician will notify the Central Office that materials are to be delivered and that equipment (as needed) is made available for the construction phase, in accordance with the timetable included in the contract signed by DSA.

The "least cost - plus"[1/], technically acceptable system will be selected in each case. In each case, a decision will be made whether to proceed based on an assessment of the financial capacity of the village to cover costs of maintenance and depreciation.

The source will be developed as close to the center of usage as practicable, thus minimizing the length of the supply main. This main, together with the distribution network, will consist mainly of polyvinyl chloride (PVC) plastic tubing, and/or galvanized steel pipe. Type of pipe to be determine on a cost comparison basis. Experience has shown that, in the operating pressure ranges of the project (below 60 pounds per square inch), locally manufactured PVC pipe has performed well. However, the use of galvanized iron pipe also will be necessary under certain conditions, particularly where the pipe may be exposed or where damage or stress is possible.

The distribution network will be limited to that needed to supply every family in a typical community with a yard connection. Cost analyses for design models A, B and C in Annex III are based on this assumption. They include a buried PVC 1/2 ∅ line into the yard, 1/2" ∅ galvanized iron pipe with a faucet, a concrete splash block under the faucet, and a drainage pit. For those cases where yard connections are not feasible, a selected number of communal water taps will be installed. Cost data showing the difference between these two approaches is shown in Annex III - Exhibit

Closed storage and distribution tanks of reinforced or masonry concrete are proposed. Where topography permits, a ground-level reinforced concrete reservoir will be located at a point near the center of consumption. Where this is not practical, the tank will be installed on a reinforced-concrete elevated structure. Prefabricated, modular forming will be utilized wherever possible.

Hand-Pump Water Supply Systems

Some of the smallest rural population centers in the

1/ This is intended to include a Mission derived $10.-- per person construction factor which is added to pump system costs to account for reduced benefits of such systems because of expected increases in down time and greater maintenance problems.

project area (50 to 200 inhabitants), with a dispersed housing layout, may not warrant a complete system with distribution and storage. Under these conditions, wells will be built for hand pumps at an average distance of about 150 feet from users. In these cases, appropriate drainage for spillage will be provided. All wells will be sealed to prevent the entrance of surface water or other contaminating materials. See Annex III - Exhibit A .

3. Engineering and Construction

The implementation of the engineering planning and design, construction and operation phases of the water supply projects will be based on the procedures established in the previous domestic water supply activities of DSA. These have been reviewed by the Mission Engineering Division and found adequate.

An early 1976 reconnaissance survey developed preliminary feasibility data on which project design models and other criteria are based. DSA has prepared a list of some 275 communities of which approximately 120 are included in Annex II - Exhibit E and sketches of four typical systems are included in Annex III - Exhibit A . It has also prepared complete design documentation for 35 systems for AID review, it is expected that well before the loan-financed equipment arrives, 50 system designs will be completed. The remainder will be designed at a rate of up to 75 per year during the four year loan disbursement period. This is not within the present capability of the DSA; however, the GOB is committed to supplementing present staff sufficiently to fulfill these goals. Furthermore, the loan contemplates the acquisition of sufficient equipment and tools so that the DSA capabilities will be commensurate with the tasks envisioned under the loan.

Prior to commencing the program, the DSA will prepare and submit to USAID, for its review and approval, a detailed project work plan for the first year and a more general plan for the remaining three years of the four-year planning and construction program. This plan will include proposed project scheduling, personnel staffing, and a list of quantities for all required materials and equipment, delineated by source of origin and financing.

Thereafter, a quarterly summary report will be prepared and submitted to USAID for its review and approval, to include community project agreements, construction plans, listing of materials and cost estimates, together with appropriate bar progress charts and sufficient narrative, to delineate accomplishment during the reporting period and projected accomplishment for the coming quarterly period.

It is envisioned that construction of a typical system will proceed along the following lines, after the target communities have been identified, scheduled in the work plan, and their water systems designed.

a) As soon as the pertinent conditions precedent have been fulfilled, DSA will embark on the construction of the latrines and then the pump house (where necessary), distribution network and supply lines for sub-projects which have passed the selection process and been rank ordered. The bulk of the materials required for the above work are readily available and will be purchased locally. All unskilled manual labor and local materials will be furnished by the communities. All plumbing work and most masonry related to the installation will be contracted by the DSA.

b) Once the loan-financed equipment (pumps, motors) and materials (PVC) are procured, these systems will be completed.

The expected division of work is as follows:

a) Manual labor and local materials by villagers.

b) Skilled labor for pipe fitting, carpentry and other trades by DSA through contract.

c) Pump houses, forming and finishing tanks, setting and connecting pumps, and installing chlorinators by DSA through contract with assistance from community members.

d) Drilling of wells, testing and purification of system by DSA regular personnel using DSA equipment.

e) Supply and transport of other than local materials, by DSA.

f) Regular supervision of all work by DSA personnel.

4. Equipment Maintenance

The DSA at present has limited equipment maintenance capability. The present average down time for repairs is about 48 hours per month. Although some of their equipment is relatively new (received under the UNICEF program), most of it is old and past its normal life expectancy. DSA has no organized preventive maintenance program although it does have some in-house corrective maintenance capability.

One of the conditions precedent to disbursement will address itself to this problem and will require that the DSA submit a preventive and corrective maintenance plan for all vehicles which it will acquire. Funds for this maintenance will be budgeted and furnished by the GOB. DSA has indicated that it will sign long-term maintenance contracts with the equipment manufacturers' representatives. Where such facilities are not conveniently located (as may be the case in Sucre) a separate maintenance contract with a qualified garage will be signed. The Mission has examined and rejected the alternative of sharply upgrading DSA's own personnel and facilities to do this work during the project period.

5. Systems Maintenance

DSA is acutely aware of the importance of a sound maintenance program for the water systems it proposes to build under the loan. In order to maintain all the systems contemplated, the following series of actions are planned:

1. During the first year of the loan, the DSA will create within its structure a maintenance division that will be devoted full-time to system maintenance. Technical assistance will be available for the creation of this unit.

2. During the first year after a water system is turned over to a community, this DSA division will be directly responsible for executing any required maintenance.

3. During the first year actual maintenance is expected to be minimal. Therefore, the activities of the Maintenance Division will be directed to training selected individuals within each community to form a semi-skilled maintenance cadre which will be able to attend to preventive and minor maintenance matters.

4. In the procurement of equipment, 10% is included for an initial spare parts stock to be administered by DSA. These parts will be sold to the communities by DSA at cost as required. The communities will make payment from the tariffs which each family will be paying for the water service obtained. Illustrative tariffs are shown in Annex III.D.

5. DSA will also procure 10 replacement pumps that will be used to test wells and to temporarily replace those that may unexpectedly break down, to minimize down time while the regular pump is being repaired.

6. The DSA maintenance van will visit the villages

on a scheduled basis to perform maintenance according to requirements projected by periods of pump usage. They will also respond on call for emergency needs. After the first year of the system, all service to communities will be on a cost reimbursable basis.

6. Technical Feasibility

Based on previous field experience, the Ministry has developed preliminary planning and cost data for the construction to be financed with the loan. The water supply system construction will be implemented in accordance with these established and accepted standards and practices. Cost data, prepared by the Ministry, is based on previous experience and includes a 10% escalation factor for equipment and materials procurement. Quantities will be subject to possible variation of up to of 25% depending on the final selection of system types.

7. Cost Estimate

The DSA will provide the drilling and support equipment and also procure and furnish all pumps, casing, pipe, and related materials. Sand and gravel generally are available locally and will be furnished by the community.

Annex III E summarizes materials and construction costs for the projected 200 systems. Costs are further proportioned between the Ministry and the community to identify each party's participation. These data are based on analysis of existing programs. Sketches of typical installations to be employed for the various systems, are included in Annex III.A. Basic equipment and materials needs to accomplish the planning and construction phase of the water supply program are summarized in Annex III,- Exhibit B . These will be operated, maintained, and administered by the DSA.

This equipment represents requirements to achieve project objectives (construction of 75 systems annually), but will also provide a base for continuation of the program at reduced levels.

The equipment list for the water supply programs was based on the following: the number of wells to be drilled and water systems constructed over the project period and the geographic dispersal of the work, and the limitations of manpower available to operate and maintain equipment given the limits imposed by the schedule of use of the well digging rigs. The list assumes a fairly high rate of use for most equipment, especially vehicles; most equipment will be used on a 6-day per week basis.

8. Latrines

As indicated, an important component of the program

SUMMARY OF TOTAL CONSTRUCTION COSTS W/YARD CONNECTIONS

(Direct Costs Only) in US$.

Water Systems:

Type A	15,225	x 80		1,218,000
Type B	15,835	x 50		791,750
Type C	18,210	x 45		819,450
Type D	7,370	x 25		184,250
			$	3,013,450

is the construction of pit latrines for every dwelling that presently does not have one. Such disposal is the general minimum technical solution adopted by world health authorities. It is roughly estimated that 70% of the dwellings in the area of program focus do not have such latrines. They will consist of:

a) Hole about 2'10" square and about 6' to 8' deep, to be dug by the home owner.

b) A concrete slab built by DSA and provided to the home owner on a cost basis as summarized below.

c) Three adobe walls, a baffle entrance wall and a roof built by the home owner at this own expense. (See Annex III, Exhibit A .

TABLE LATRINES COST CONSTRUCTION
($US)

Cost of Latrines	DSA	Owner	Sub-Total
a. Hole excavation	-	2.50	2.50
b. Concrete slab	5.00	2.50	7.50
c. Adobe walls and roof	-	10.00	10.00
d. Commode	5.00	-	5.00
Totals	10.00	15.00	25.00

The home owner will receive detailed instruction and guidance by DSA sanitary technicians before and during latrine construction. Should any of the residents be unable to defray all their modest contribution, DSA will absorb such cost.

9. Procurement Procedures

In procuring materials and equipment with AID loan funds, AID procurement procedures will be followed. Letters of Commitment/Credit will be used for all procurement from sources other than Bolivia. Procurement of local materials will be in accordance with local law and practice insofar as compatible with AID procurement regulations.

10. Water Treatment

It is axiomatic that all communities already have some source of water. However, in arriving at a decision as to the system source to be used, DSA will usually have more than one option. The preferred water source under this program will be a reliable, naturally potable source within a reasonable distance from the community. In some cases, perennial springs or surface

source are available with sufficient discharge during all periods of the year. In those instances, DSA's standards indicate that the flow of water must be roughly twice the requirements of the community during the dry season, or 50 liters per capita per day.

There will probably be some cases where the quality of the spring or surface water will be such that no chemical treatment of the water will be required. In these instances, the only requirement will be protection of the source and the supply system.

In more likely situations there will be unprotected surface sources (streams, lakes, etc) at higher, lower or similar elevation to that of the community. These sources will require desedimentation and treatment. Physical elements in suspension can be reduced or eliminated by means of sedimentation and/or filtration, and bacteriological purity can be obtained by the use of oxidizing chemicals.

It is expected that the purification problem most often encountered in this program will be bacteriological/viral in nature. The preferred method to deal with this problem is to introduce a dosage of calcium hypochloride i.e. chlorination. This compound will be introduced in a pre-mixed and measured solution. The methods and apparatus for chlorination of rural systems are already known to DSA and the MOH. DSA will make a considerable effort in the instruction and supervision of villagers to ensure that proper use and storage of the chemical is well understood. This will be checked on a periodic basis during the visits of the DSA sanitary technician. In addition, the regional DSA technical supervisor will review the procedures for use and storage with the communities during his visits.

11. Environmental Analysis

This project has two basic components, community water systems and latrine construction. The former consists of:

Providing potable water for domestic uses to approximately 200 communities with an average population of about 380 persons each in the Departments of Cochabamba and northern Chuquisaca.

These communities by and large now obtain water for domestic purposes from surface sources (generally small rivers and streams) with the consequent risk of contamination from upstream sources. The program envisions construction of systems using the following order of preference: potable surface water

source, treated surface water source, potable ground water source, and treated ground water source. The order of preference was decided on the basis of relative ease of operation, maintenance and replacement. The potability of either (ground or surface) water source will be tested before a decision is made on the system to be employed. In the case of potable surface water sources, great care will be taken to test the source at regular intervals. If the source should become contaminated, a simple chlorination system will be introduced. In either event, the surface source will be checked to insure that the water "take off" is such that it will not adversely affect other downstream users. In the case of ground water sources, this will consit of drilling of wells with pumps and elevated storage tanks from which unpolluted water will flow into a distribution net by gravity. Well, piping and tanks will be disinfected prior to being put into service. Quantities extraced will be only about 50% of normal recharge of the aquifers, and no undesireable intrusions or deteriorations of aquifers are anticipated. All wells will be sealed against entry of surface waters or other materials. Sub-surface absorption or drainage will be provided for the small amounts of household waster water in order to suppress pest insects and odors. Pumps will be located at the outskirts of the villages and run for only a few hours during each day as indicated elsewhere. The noise of the pumps is not expected to be a nuisance factor.

Ground water sources will be checked periodically to ensure potability. DSA will have the capacity to undertake such checks. In the event that ground water systems should become contaminated, a simple chlorination system will be installed, e. g. batching. In all cases where chlorination will be required, care will be taken and instruction provided by DSA field technicians in the use and storage of chlorine to avoid accidents or contamination.

No negative effects on the environment from these systems are anticipated. From the standpoint of the effect on human beings, the effect will be beneficial, since the degree of possible contamination of water for domestic or culinary purpose will be greatly reduced.

The second component of the loan, the installation of pit latrines within every home area, is a condition prior to installation of the village water supply. This will have a beneficial impact from an ecological point of view. No water-borne waste disposal system are contemplated. Latrine seepage will recuperate to an acceptable state into aquifers prior to passage to any water wells or springs. By concentrating human excreta in a pit latrine the spreading of parasitic and gastro-enteritic disease vectors from

rain run-off will be greatly reduced.

In summary, the combined effect of both components of this loan will enhance the positive impact of these sub-projects on local com ity health standards. Even though it is anticipated that the lau and personal bathing patterns of the community will not change dramatically by making water more accessible, it is expected that within a short period of time villagers will use more water for personal hygiene and cleanliness. The introduction of potable water and controlled waste disposal into many of the small villages will not be without problems in accomplishment. For this reason, an anthropologist has identified certain factors that will be addressed in the educational component of the loan. Historically, the rural Bolivian Indian women have used the river as a gathering point to discuss personal matters. This social pattern is not likely to change to any significant degree since project system capacity will generally provide sufficient water only for cooking, drinking and body washing. Therefore, this project is not expected to adversely affect, the social patterns of target beneficiaries.

12. 611 Certification

It is considered that the requirements of Section 611 of the Foreign Assistance Act have been satisfied and that the program is technically and economically feasible.

1. Technical Planning

Chronologically, the technical planning of this program began with a 3 week visit to 100 communities by personnel from USAID, DSA and other GOB entities. Of these communities 26 were eliminated for a variety of reasons. The remaining 74 were analyzed in some depth. A questionnaire was prepared for each community in which all the data relevant to the proposed water system was recorded. These forms were classified and used for the classification of design models A, B, C and D. In addition, DSA has visited over 275 communities to provide an initial indication of their needs. From among that group DSA has already designed 15 systems and studied an additional 32. There is ome overlap between the two analyses; however, taken together, they represent a sufficiently large sample to offer assurances of representative cost data and provide a basis for extrapolating the number of systems of each type that is expected to be built.

The cost data used represent valid present day costs in Bolivia. In addition a 10% factor has been introduced to cover reasonable price escalation.

2. Financial Planning

In arriving at the final loan figures and per capita costs, an analysis has been made of the benefit/cost ratio as required by FAA Section 611(b) and Section 101 of the Appropriations Act. The President's Memorandum of September 5, 1973, was used for purposes of analysis. Major benefits are most difficult to quantify but provide important social benefits of improved public health. It is considered that provision of potable water is an important enough basic health benefit to give a favorable benefit/cost ratio.

As a necessary alternative to quantifiable benefit/cost ratios, a least cost method has been adopted. The Mission has assumed that there is no viable alternative to providing water. Using that assumption, in any given community the least costly of the four basic models will be utilized given the physical characteristics of village location and water source.

3. Least Cost Method

The DSA, will have all the information necessary to assure that the modified least cost solution will be chosen. As used in this paper, the term least cost means the least cost in terms of installation cost. Since maintenance costs over time are not significantly different among systems, only installation costs are considered.

4. Resource Utilization

Attention has been given to insuring that water resources utilized do not detract from other possible uses of those resources. Underground aquifers are expected to comprise a significant percentage of the water sources utilized. Normal recharge is believed to be sufficient for project use. In cases where surface sources will be tapped, these generally will be the same sources presently utilized by the communities for domestic purposes.

In view of the above it is considered that the requirements of Section 611 have been satisfied.

SECTION B. Social Analysis

1. Socio-Economic Characteristics of the Target Group

Representative socio-economic characteristics of the target group are described in Table 3 . Average farm income for the target group is estimated at $345 or $48 per capita while median farm income averages $300, ranging from $285 in Chuquisaca to $315 in Cochabamba. Family size in both regions averages about 7.2 persons per farm, although the recent census casts considerable doubt on the accuracy of these statistics.

Average cultivated area is only slightly above 2 hectares per family both Chuquisaca and Cochabamba, with land in the Chuquisaca area being of slightly lower quality.

Land tenure conditions reflect the sweeping effects of the Agrarian Land Reform Program undertaken in 1952-1953. The average size of rural properties awarded under the land reform varies from 4.4 to 110 hectares, depending on the region. Even within the short time frame, however, average farm sizes have become somewhat smaller owing to inheritance practices. This has also led to the fragmentation of land holdings. Most severely affected by increasing population pressure on the limited base are the Valley regions of Cochabamba and Chuquisaca which are included in the focus of this project. Farms of less than one hectare in these areas are not uncommon, and are farmed intensively to provide a livelihood.

Although income and farm-size data are available in sufficient quantity to adequately describe the target group, health statistics are far from adequate. This is due to the lack of a regular system to collect such statistics. The only health related data collected on a systematic basis nationally is that for morbidity and mortality which includes only cases reported by government-run health units in the urban areas. The result is that an estimated 20% of the country's mortality is recorded, and over 80% of the total incidence of disease is left unrecorded. The quality of existing data suffers accordingly. Unfortunately, the types of diseases linked with contaminated water supplies and unsanitary conditions are those most unlikely to be reported by GOB health units, which tend to be located in urban areas. The data available on the incidence of gastroenteritis is detailed in the project background (Section II.A)

In anticipation of the inadequacy of this data, Mission personnel visited ' medical posts in rural Cochabamba to discuss with rural health officials their understanding of the incidence of gastro-intestinal disease in their respective communities. None of these

Table 3

SOCIO-ECONOMIC CHARACTERISTICS OF TARGET GROUP

	(1) Chuquisaca Valleys	(2) Cocha-bamba	Total Average
1. Direct Project Beneficiary Families	2,715	8,135	
2. a) Average Farm Income of Target Group 1/	325	365	345
b) Median Farm Income of Target Group 1/	285	315	300
3. Number of persons per farm	7.2	7.2	7.2
4. Total cultivated land (hectares)	174,119	219,015	196,567
5. a) Population Density/ Square Km inhabited	13.6	13.6	13.6
b) Hectares per person	.71	.57	.64
6. a) Average farm size (hectares)	4.0	7.0	5.5
b) Median farm size (est.)	2.7	2.9	2.8
7. a) Average cultivated area per farm (est.)	2.3	2.1	2.2
b) Median cultivated area per farm (est.)	1.5	.86	1.18

1/ On-farm income in 1975, in US dollars

communities has a source of potable water. In all five communities visited, gastro-enteritis ranked as one of the principal clinical diagnoses of illnesses of the community residents. In all five posts visited, at least 50% of those treated suffered from some form of gastro-intestinal disease. Estimates by these officials of those who suffered from the disease but went untreated ranged from 18% to 80% of the population and averaged about 50%. The Mission assumes that these communities are representative of the rural population in the target Departments and that the seriousness of the problem of gastro-enteritis is evident throughout the region.

2. Social Benefit Incidence

a. Target Group Profile

The areas in which this Project will focus presently include approximately 34,000 rural families residing in communities of 800 inhabitants or less in the Cochabamba and Chuquisaca valleys. At present, only approximately 4% of these rural families live in areas already adequately served by potable water and sewerage systems. An additional group (approximately 18%) live in remote, frequently inaccessible areas and/or in dispersed population clusters where the cost and feasibility of providing water systems is presently prohibitive and beyond the resource capability of the government. These families, probably among the poorest and most deprived in Bolivia, are so isolated and dispersed that substantial investments beyond the scope of the project would be required to address the lack of potable water facilities in these areas. These rural families have been excluded from the project. However, since each proposal must pass certain economic and financial criteria, it is not anticipated that the less accessible and more highly dispersed populations will be reached in this phase of the project. Thus, the specific target group consists of an estimated 26,500 rural families who do not now have potable water facilities but who could be "reachable" under the project.

The project beneficiaries will be selected on the basis of: (1) willingness of the community to contribute voluntary labor for systems construction, (2) health status of the community, (3) cost criteria and (4) maintenance considerations.

b. Nature of Benefits to Target Group

The primary benefit to the target group can be defined in terms of anticipated improvements in health status resulting from access to potable water and sanitary waste disposal facilities. 1/

1/ According to WHO: "It is universally accepted that in small towns and villages, more health benefits can be gained from money spent on a water supply program than in any other way". Water Supply for Rural Areas and Small Communities, WHO Monograph Series No. 42.

With little or no additional investment in the health sector in these areas, the incidence of parasitic and enteric diseases should decline markedly. Ancillary benefits which will accrue to rural families who participate in the program may include increased income arising from a reduction in time loss due to illness, outlays for curative services and decreased time spent hauling water, an increased capacity to endure longer hours of work and reduced nutritional requirements as a result of fewer episodes of intestinal disease. Additionally, the communal organization and construction activities necessary for the implementation of a water supply program and its maintenance can serve as a catalyst for further development of the communities involved.

c. Other Direct Beneficiaries

Approximately 34 new technicians, administrators, and engineers will be hired by DSA on a permanent basis. In addition, the skills of approximately 25 DSA technicians will be upgraded and 200 community financed maintenance personnel will be hired on a part time basis.

d. Benefits to Women

Within the cultures where the majority of this project will be focussed, women provide a significant proportion of the manual labor related to agricultural and other subsistence activities. Accordingly, it is expected that the contribution of women to the actual construction of facilities will be important in this effort.

Since women have the principal child rearing role, they will serve as the major target for education and development programs related to improved sanitation practices. Such improved practices will raise the consciousness level of women and should promote increased concern about the health habits of the entire family. Significant attention will be directed toward educational and promotional strategies which are relevant to women. Thus women will not only benefit from this project as much as other segments of the population, but will also receive special attention as a group which can spread the benefits inherent in the project.

e. Spread Effects

Given the predicted impact of sanitary facilities on health status and the over-all rural standard of living, the project is likely to create some demand by communities for the GOB to expand the program to other zones as well as in the current geographic area of emphasis. Although the extent of this demand is difficult to

estimate, the Mission feels that the demand will serve as a positive factor in influencing the GOB to continue and possibly expand the program within the Government's resource limitations.

3. Social Acceptability

To determine the social acceptability of the project, USAID/Bolivia commissioned the National Institute of Anthropology to study a series of aspects related to the social feasibility of initiating a potable water program in Bolivia's rural areas. Nine communities were studied - three in each of the Departments of Cochabamba, Chuquisaca, and Santa Cruz. Quechua speaking anthropologists of Indian descent lived in each of the communities for a ten day to two week period to observe community organizational structure, sanitary habits and forms of comunal cooperation. In each of the three departments, communities were selected on the basis of their degree of modernity - one community being isolated and very traditional, one in transition, and one in close proximity to an urban center.

Communities averaged 358 inhabitants and ranged in size from 650 to 210. Average income for the nine communities was approximately $275 per family or $39 dollars per capita. Of those interviewed, 62% had family incomes of $250 or less per year, and only 22% exceeded $500 per year. Higher income groups tended to be closer to urban centers, particularly in Santa Cruz. All six communities in Cochabamba and Chuquisaca were predominantly Quechua, while the three in Santa Cruz were predominantly mestizo. At the time of the investigation none of the communities had a source of potable water.

a. Sanitary Habits

In seven of the nine communities a river in close proximity served as the primary water source. The remaining two communities used water from a nearby stream. In 62% of families studies, water was carried to the home in cantaros or earthen jugs; the remaining 38% used water directly from its source. All sources of water were contaminated; the effects of this contamination were exacerbated by the use of contaminated jugs and by the absence of appropriate sanitary habits. The National Institute observed that the washing of hands before meals is not practiced, that latrines are virtually non-existent, that frequent bathing is unusual, and that food, if cleaned, is washed in contaminated water. When questioned directly about sanitary practices, however, most respondents stated that they bathed frequently and washed their hands before eating. When questioned about health status, most respondents indicated that one of the principal problems, particularly among the young, was diarrhea. The National Institute concluded that most community members somehow had been made cognizant of correct sanitary practices but neglected to use them. Thus, the education component of the project

is being designed not only to expose the community to good health practices but also to stress the tremendous negative health impact of not adhering to these practices.

b. Community Interest

Despite negative experiences by four of the nine communities with organizations which had promised to provide potable water, all nine communities considered the provision of water facilities to have a very high priority. All nine of the communities indicated that they would provide hand labor and five of the nine indicated they would be willing to make a direct cash contribution in support of the construction of a water facility project.

The project has been designed to take into account this information. Voluntary labor will be used for several aspects of project construction. However, communities will not be asked for any direct financial contribution to the project other than the purchase (below cost)of latrine flooring because of the low incomes of farm families in these areas.

c. Importance of Self-Help in Systems Construction

The National Institute noted in its report that projects which have not involved community participation are generally viewed as "works of the State". Accordingly villagers feel that the government should be responsible for the maintenance of these systems. Among Quechua cultures, the importance of a communal work effort in the construction of any project intended to benefit the community cannot be underestimated. Self-help among these communities is a tradition which dates back some 1,000 years.

4. Social Consequences

a. Changes in Power, Participation and Equity

Since the target communities will be largely homogenous campesino groupings, no conflicts or problems of a regional or ethnic nature are anticipated.

b. Rural Displacement and Migration

The construction or potable water systems in the target area is not expected to cause rural displacement or urban migration. Instead, because it will aid in improving the health status and general wellbeing of the community, the project may, in fact, serve as a factor to decrease rural migration to urban areas.

SECTION C. Economic Analysis

1. State of National Economy.

a. Current Economic Situation 1/

Bolivia's economy continued its strong performance in 1976, with a real GNP growth rate of about 7%, slightly above that of the previous year. Despite a continuation of the mild recession into the first quarter of 1976, the economy picked up in subsequent quarters. Higher prices for Bolivia's mineral and hydrocarbon exports were a major reason for the economic resurgence. Disbursements on foreign loans and credits, particularly to the public sector, estimated at some $244 million in 1976, lent further impetus to the economy. Domestic economic indicators were also favorable: the construction boom in major urban areas continued; the official cost of living figure was down to less than 10% per annum compared with 12% in 1975; domestic time and savings deposits were up 52%; and, overall inflation remained at about 12% despite the economic upturn, mild expansionary measures, and import restrictions on consumer goods. Finally, there was a substantial improvement in foreign exchange reserves resulting from increased export earnings and foreign credit transactions. A balance of payments deficit in 1975 (approximately $60 million) is expected to change to a small surplus in 1976. Reserves climbed to $185 million by the end of April 1976, and continue to fluctuate at that level. This is equivalent to about four months of imports at FOB costs.

A combination of improvements in the balance of payments and foreign exchange reserve holdings, plus continued political stability under President Banzer's government, continue to stimulate public and private sector confidence. This is reflected by increased domestic savings deposits and rising foreign credits, especially to the public sector. The GOB contracted over $400 million in foreign loans in 1976, of which slightly over half was from private sources. Financial indicators, such as money supply, government domestic revenues, export taxes and foreign credits, showed improvements over the

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1/ Based on Quarterly Economic Reports, U.S. Embassy, La Paz, Bolivia.

previous year. On balance, industrial indicators were also up, indicating continued investments in the mining and hydrocarbon sectors.

Although the growth rate of real GNP in 1976 was only slightly higher than of 1975, the year 1976 witnessed a reversal of several of the negative trends which emerged in 1975. The most serious of these trends were the decline in export earnings and foreign exchange reserves. The government has also demonstrated its ability to ease its wage freeze policy without increasing the rate of inflation. Wages were increased for miners and teachers, but these were off-set by increased savings within the economy. As recovery from the mild recession of 1975 continues, the picture for 1977 appears generally favorable. An analysis of the effects of the latest OPEC petroleum price increase has not yet been completed. However, although export earnings are likely to increase, it is expected that the accompanying rise in prices of capital goods imports and services will nullify those gains.

On a less optimistic note, Bolivia is beginning to show the strains of dealing with a rapid rise of foreign debt. The GOB is attempting to follow an external debt policy which will not jeopardize the future growth of the economy. In 1975, Bolivian public entities contracted for external financing totalling $455 million. This represents a five-fold increase since 1973. Although accompanied by equally impressive export earnings during this period, the Bolivian economy is still relatively fragile and dependent upon a limited number of export products. According to official sources, the debt service was $82 million in 1975, representing a debt service coefficient (defined as debt service divided by the FOB value of exports) of 18.2% compared to 12.5% in 1974. Debt service figures for 1976 are not yet available, although new contracted debt declined somewhat to $403 million. Given the trend in GNP growth rates and assuming continued growth in export earnings, no immediate problems are foreseen. Discussions with Finance Ministry Officials indicate that they hope to keep more of a lid on new borrowings in 1977.

Bolivia continued its program of improving rural infrastructure with the assistance of foreign donors. Foreign assistance loan disbursements accelerated in 1976, and implementation of development projects should be one of the economy's more dynamic features in coming years. The GOB's

new public sector commitments contracted in 1976 include $58.9 million from the World Bank, $73.7 million from the IDB; $8.8 million from the Andean Development Corporation; $16 million from AID; $42 million from supplier's credits, and $177 million from foreign private banks.

b. Justification of AID Loan Terms

Although Bolivia's economic growth rate and foreign exchange earnings have been favorable in recent years, Bolivia remains among the poorest countries in Latin America, with an estimated per capita income of about $300 in current 1975 prices. Increased foreign exchange earnings have been necessary to finance higher costs of imports and long-term investments in the mining and petroleum related sectors. Bolivia's need for concessional assistance remains great, especially if the assistance is channeled towards socially targeted groups who benefit only marginally from the nation's overall economic growth. Although this project will provide considerable benefits to the Bolivian economy, particularly in some rural areas, the benefits will not provide any direct financial return to the government. Hence the project is fully justified for concessional financing at the proposed terms.

2. Economic Analysis of Water Systems

a. Use of Incremental Benefit/Cost and Least Cost Analysis in Lieu of Traditional Benefit/Cost Analysis

Three different types of water systems have been identified as most likely to be installed in any given village.[1/] For such capital projects the normal procedure would be to perform benefit/cost analysis to determine which system, if any, should be installed in a village and to rank order the villages on the basis of benefit/cost ratios. There may be

1/ It is anticipated that approximately 10% of the systems to be constructed will consist of a fourth type of water system, hand-dug wells. These will only be installed if village configuration or water source is such that none of the other three systems are feasible alternatives. This is so because of the more limited health benefits associated with hand-dug wells; i.e., greater distance from user housing to water source.

cases where benefits from a water system can be directly measured and quantified, as would be the case where an improved water supply allows for the growing or processing of agricultural produce. However, in most instances the benefits are difficult to measure adequately. Hence, village water supplies are considered to belong to the realm of social sector improvements owing to the difficulty of quantifying benefits such as improved public health, better hygiene practices, greater convenience and increased productivity.

The World Bank assembled a group of water experts[1/] who concluded that the cost of quantifying the benefits was generally prohibitive, that the provision of at least some minimal amount of potable water was a governmental responsibility, and that if the benefits could be quantified, the benefit/cost ratio would be an acceptable one. This conclusion has come to be the accepted wisdom.

Generally when benefit/cost analysis cannot be performed, least cost analysis is resorted to. But as we will show below, it too, has its shortcomings and difficulties. As subsequently explained, our analysis will consist of three parts: (1) an incremental benefit/cost analysis to establish the distance outlets should be from individual homes; (2) least cost analysis to determine the least expensive system for a given village; and (3) the development of a list, beginning with the least costly and ending with the most costly, of the village systems analyzed and costed.

b. Distance to Water Source and Effects on Economic Analysis

The least cost approach assumes that the different alternatives provide the exact same service or output. An example would be comparing two different methods (capital intensive vs. labor intensive) of building a finite length of road. If two water systems, one that delivered water to each household and one that delivered water only to a few public taps, could be said to have the same impact on health, then we could claim that because they both deliver the same

1/ Measurement of the Health Benefits of Investments in Water Supply, P.U. Report No. PUN 20, January 1976.

service one could apply least cost analysis and choose the cheaper system. However, distance from the source of water does have an impact (see Annex IV, Exhibit D, for further discussion).

In an excellent study that examines the state of the art with respect to rural water systems, Saunders and Warford (Village Water Supply, page 39), summarize the conclusions that can be drawn from 28 representative diarrheal studies by stating: "--- diarrheal disease studies provide some empirical evidence that the closer a family is to protected water, the lower will be the incidence of diarrhea. Other things being equal, those families with water inside the house tend to have the lowest infection rates, those with water very close outside the house have the next lowest, and those with the water source further away have the highest." Thus the facility with which reasonably good water can be obtained by users seems to be a key factor. Unfortunately, studies to date provide little help "--- in determining exactly how much improvement in health can be expected from a specific water supply --- improvement in any particular area." (Saunders and Warford, pages 42-43.)

Somehow the issue must be resolved. The usual approach, such as with the World Bank, is an a priori decision to build house connection systems and to ignore other possibilities. Other development agencies take the position that as many villages as possible should be covered with inexpensive public tap type systems. Neither a priori approach is intellectually nor theoretically satisfactory.

To overcome this shortcoming we introduced an incremental benefit/cost analysis that examines the incremental cost needed to go from a system of public outlets to house connections. We then examined the health data to determine if such an incremental cost could be justified.

Prior to doing the incremental analysis, we established a maximum distance of 150 feet for any one family to walk to an outlet, or five to seven families per outlet, depending on the geographic configuration of the village and system installed. This maximum distance and usage figure clearly affects the cost relationship between public outlets and yard connections. Conventional wisdom had held that one hand pump or public tap could serve up to 100 people, or approximately 15 families. However, given all the maintenance difficulties described in Annex IV, Exhibit A, with

public tap systems, professionals are now suggesting that one hand pump or public tap should serve from five to seven families. It is believed that a smaller number of families per outlet will instill pride of ownership which will impact directly on the use of the outlet, resulting in minimal maintenance difficulties. In addition, there is some reduction in distance from source to house which may be sufficient to insure that certain health benefits are realized.

c. Use of Incremental Benefit/Cost Analysis to Determine Location of Outlets

The previous discussion developed the argument that: (1) the closer water is to the house, the greater the reduction in diarrheal diseases; (2) the increased benefits of improved health due to a specific reduction in distance cannot be quantified; (3) when specific distances are set, as they have to be in developing a system, an implicit incremental benefit/cost analysis occurs based upon a priori assumptions that may or may not be valid; (4) it is possible to make the incremental benefit/cost analysis explicit, however crude it may be.

The procedure we follow in the incremental benefit/cost analysis is first to determine the costs of the public tap system and the yard connection system and then obtain the incremental cost figure. This figure is then divided by the village population to give the per capita incremental cost. From the model 380 population village we have used as an illustrative example of the "average" village to be encountered under the project, we found that the per capita incremental cost is less than $2 for all of the systems (as shown in Table 1). Because the administrative, operating, maintenance and major equipment replacement costs are nearly the same and occur at the same points in time for all systems, conducting a present value analysis comparison over time will not substantially affect the relative cost differences. Hence, the per capita cost figures used here are based on installation costs only.

Table 1

PER CAPITA COST DIFFERENCE BETWEEN PUBLIC TAP AND YARD CONNECTION SYSTEMS 1/

Water System	Yard Connection	Public Tap	Difference in per capita cost
Deep Well System	$43	$41.30	$1.70
Surface System with Pump	$44	$42.25	$1.75
Surface System Gravity Flow	$49	$47.25	$1.75

1/ Based on Model 380 Population Village.

See Annex IV, Exhibit B, for details. Water source is 400, 800, and 2,000 meters distant from distribution point, respectively. Costs do not include voluntary labor and donated materials.

To justify the additional $1.75 per capita cost on economic grounds, the present value of the stream of per capita benefits over the life of the project must equal $1.75. Applying present value techniques, we found that a per capita present value of $1.75 implies that the corresponding benefit over the 15-year life of the project would be $0.30, or $2.10 per family per year, assuming an opportunity cost of capital of 15%.

In Annex IV, Exhibit D, where we quantify incremental health benefits, we arrive at a conservative annual incremental benefit figure of $1.16 per capita, or $8.13 per family per year. Clearly, the $1.75 incremental cost can be justified since incremental benefits are estimated to be almost four times larger than necessary to justify the $1.75 expenditure.

If we then use the present value technique to determine the incremental per capita cost that could be justified by the $1.16 annual incremental health benefit, we obtain the figure of $6.78.

However, since the possibility exists that the conservative incremental benefit estimates are still too high, we have determined that yard connection systems will be installed as long as the per capita incremental cost does not exceed $5.00. At a cost of $5.00, the per capita incremental benefits over the life of the system would have to be $0.86, allowing for margin of error of 35% (($1.16 - $0.86) ÷ $0.86).

As noted earlier, the cost difference is a function of the number of public taps or the maximum distance that each family must walk to get water. However, even if we doubled the distance, thereby reducing the number of taps by half, the increase in per capita incremental costs for the 380 population model would be $1.18 ($90 x 5 = $450 ÷ 380), giving a total incremental cost difference of $2.93, which is well within the $5 maximum cost differential set earlier ($1.75 + $1.18 = $2.93).

The implication of the strategy to install yard connections whenever the per capita incremental cost is no greater than $5 is that the incremental benefits accruing to the village receiving yard connections are greater than the incremental benefits that would accrue to another community which installed a public tap system.

By limiting the maximum incremental cost to $5, and given that the average incremental per capita cost appears to be less than $2, and that our estimate of $1.16 per capita incremental benefits per year due to the yard connection system is conservative, there is reason to believe that the benefits per dollar of expenditure are greater for the incremental portion of the yard system than for the public tap system. We conclude, therefore, that yard connection systems provide more benefits per dollar expenditure than public tap systems and should therefore be installed in preference to public tap systems as long as the per capita incremental cost does not exceed $5. When the per capita incremental cost exceeds $5, DSA will opt for public tap systems.

In addition to this incremental benefit/cost argument based on distance, as Annex IV, Exhibit A, discusses in detail, the difficulty of collecting maintenance type fees, and the high maintenance needs of public tap systems are compelling reasons for opting for yard connections.

d. Rank Ordering of Villages on Least Cost Basis

(1) Ability of a Community to Maintain a Given System

The first step in developing a rank order list is to determine whether or not a community can afford the system choices available to it. DSA will have estimated the annual administrative, operating, general maintenance and major equipment replacement costs associated with each type of system for various population ranges. With these cost data and the precise village size, the necessary monthly per family water fee can be calculated. Our preliminary cost data indicate that except for populations below 150, all villages should be able to afford all types of water systems (see Annex III.D).

The procedure will be first to determine how many of the system choices open to a village can be afforded by that village. Assuming that all three choices (Types A, B and C) are open to the village and that it can afford all three, the least cost analysis will consider all three systems. If the village cannot afford all three systems, then the least cost analysis will be based on those systems remaining. This obviously allows for the possibility that the least costly of the three will be eliminated from

consideration. However, it is not really the least costly in terms of service provided because the assumption that it cannot be afforded by a village implies that the system will not be repaired properly and thus the length of time it actually will operate, and hence the amount of service it will provide per dollar of expenditure, is less than for the other two.

(2) Least Cost Analysis

Once the maintenance capability issue is resolved, and the number of choices available to a village have been determined, the next step is to select the least expensive system on a per capita basis for each village.

Based upon the previous incremental benefit/cost analysis, the choice of the system to be installed in a given village will be based on least cost with yard connections as long as the difference in per capita cost between the yard and public tap systems is no greater than $5. When the per capita cost of an in-yard system is greater than $5 more than the public tap system, public taps will be installed. The three systems that can provide either public taps or yard connections are: type A - deep drilled well; type B - surface water with pump; and type C - surface water with gravity flow.

Based upon the analysis of existing data, it would appear that a system with yard connections will be the norm for each village, and that, hence, the village rank order list will generally consist of systems with yard connections. However, when a village situation is such that the public tap system is: (1) more than $5 per capita cheaper than yard connections; and (2) more than $5 per capita cheaper than another village with yard connections, this village is placed in the appropriate least cost position on the list. As an example of this procedure, consider the following three villages:

	Per Capita Cost	
Village	Public Tap	In-yard
1	30	31
2	25	32
3	33	39

On the basis of least cost, the ranking would be as follows:

1. $25 (Public Tap) - Village 2
2. $31 (Yard) - Village 1
3. $33 (Public Tap) - Village 3

In the above manner, the final step of the selection process, which calls for ranking villages on the basis of least cost, will be prepared. As indicated, the list has the potential of including systems with public taps, though it is anticipated that there will be few in that category. To avoid the high cost of moving equipment between ranked villages based solely on least cost considerations, the villages will be consolidated into priority groups. With a least cost list that exhausts the loan funds, such a procedure will not negate the least cost optimization technique.

With regard to manual pump systems, they will only be considered for villages with dispersed populations or in cases where villages cannot afford to maintain a distribution system. Nevertheless, these will only be considered after all the villages that can afford distribution systems have been considered, or in cases where they lie within close proximity to villages that are having distribution systems installed. The main reason for adopting this strategy is because: (1) the Mission finds the relatively high probability of eventual well contamination to be an unacceptable risk; and (2) as population grows, the cost of adding yard connections to an existing distribution system is about the same per capita cost as installing extra hand pumps.

e. Shadow Pricing Community Contribution

Shadow pricing of volunteer labor can be accomplished by applying some discount factor (as done in the Rural Roads Loan) which reflects income foregone, or by simply pricing labor at the prevailing wage. This latter approach is reflected in the figures of Annex IV, Exhibit C. The purpose of shadow pricing is to attempt to reflect real or opportunity costs to the economy.

While it is important to consider the economic cost of each system, in practice it is somewhat arbitrary and difficult to calculate the exact amount of donated time needed, and the value of the labor and materials. As Parts I and II of Table 3 indicate, both financial and economic per capita cost data will lead to essentially the same least cost decisions. Hence, in doing the cost analysis, donated labor and materials will not be included in the cost estimates, though, of course, the villages will be responsible for most excavation and back filling and for the provision of materials. This amounts to shadow pricing donated labor and materials at zero. From an economic standpoint, a zero shadow price does not seem unreasonable because it does not appear that any significant amount of community income will be foregone due to the construction work given: (1) the communal nature of most of the communities to receive systems; (2) that, on the average, the systems will not be constructed during peak earning periods; and (3) the short period needed to perform excavation and back filling.

f. Cost Adjustment for Anticipated Down Time

In obtaining the cost data for each of the three systems, types A, B, and C, it is implicitly assumed that each will provide the same amount of service, i.e., that the amount of "up time" of each system is the same. However, experience indicates that deep well systems and surface systems with pump (types A and B) have more "down time" than the gravity flow system (type C), due to occasional mechanical failure. Types A and B then have a cost that is not included in the conventional costing. When a distribution system breaks down people return to their traditional, more distant, and less pure, water source. Therefore, we have arbitrarily assigned an extra $10 per capita cost to both types A and B to account for the probable loss in convenience, reduced level of health, etc. This extra $10 cost is included in Part III of Table 3. Part III indicates that when there is a choice between pumped or surface with pump, and a surface gravity flow system, the latter is the least costly up to approximately 2,000 meters distance from the water source.

g. Summary of Least Cost Analysis Procedure to be Followed by DSA in Selecting Villages for Water Systems

(1) A complete survey of potential villages will be made within the first year which will provide the cost data for the various choices of water systems for each village.

(2) The cost data will not include village contributions of labor and materials.

(3) The cost figures for type A (deep drilled wells) and type B (surface system with pump) will include an extra $10 per capita cost to reflect the extra cost due to greater "down time" of these systems relative to type C (surface, gravity flow system).

(4) Prior to conducting a least cost analysis for system selection, DSA will determine how many of the system choices open to the village can be maintained by it.

(5) Once the financially feasible systems have been determined, the least costly system is selected based on d.(2) above (Least Cost Analysis).

(6) A least cost list will be constructed based on d.(2) above.

(7) Where appropriate, the villages on the least cost list will be grouped and construction will be done on a priority grouping basis in order to avoid excessive movement of equipment (see d.(2)).

h. Analysis of Cost Data for Types A, B, and C Water Systems for Several Illustrative population Sizes.

Field surveys of some 200 rural villages in the provinces of Cochabamba and Chuquisaca indicate that the average village size most frequently encountered is 380, with a physical configuration consisting of houses clustered along a few streets. We have thus developed for illustrative cost purposes a model based on this "average" village.

There generally will be three distribution water systems that could be installed in a given village: type A - deep drilled system; type B - surface system with pump; and type C - surface gravity flow system. Obviously,

most villages will not have all three choices, but for least cost illustrative purposes we provide a comparison of all three.

When comparing the relative distances of water sources by type water system, experience indicates that the water source for deep-drilled wells will be closest to the village, that surfact systems with pumps will be the next closest, and that surface gravity flow systems will be the farthest away. For our Model 380 village we have assumed that the deep well system's source is 400 meters, that the surface system with pump system's source is 800 meters, and that the surface gravity flow system's source is 2,000 meters from the point of distribution to the village respectively. The costs for types A and B include the $10 "down time" cost figure discussed earlier and assume yard connections. For public tap systems the costs would be approximately $2.00 per capita less. See Annex IV, Exhibit C.

Table 2

PER CAPITA COST OF WATER SYSTEMS FOR MODEL 380 VILLAGE 1/

Water System	Per Capita Cost (in U.S. $)
Type A - Deep Well System	53
Type B - Surface System with Pump	54
Type C - Surface System Gravity Flow	49

1/ Water source is 400, 800 and 2,000 meters from point of distribution for types A, B and C respectively. Costs are net of voluntary labor and donated materials. Types B and C include a $10 per capita extra cost element to account for greater amount of "down time" than type C. See Annex IV.B for calculations.

Per capita cost data for three village sizes and four distances from the water source are summarized in Table 3. These data clearly indicate that the gravity flow system should be chosen if possible.

Table 3

SUMMARY OF PER CAPITA COSTS OF WATER SYSTEMS

Distance from water source in meters	Village Population Size 200 A	200 B	200 C	380 A	380 B	380 C	760 A	760 B	760 C
I. Including Village Contribution and Donated Labor									
400	62	48	41	48	46	39	39	36	34
800	71	57	50	53	50	43	42	38	36
1,000	76	59	55	56	53	46	43	40	38
2,000	99	82	78	68	65	58	49	46	44
II. Excluding Village Contribution and Donated Labor									
400	55	40	36	43	40	33	34	31	29
800	63	48	44	47	44	37	36	33	31
1,000	67	52	47	49	46	39	37	34	32
2,000	86	71	67	59	56	49	42	39	37
III. Including Additional Cost Element of $10 to Types A and B.									
400	65	50	36	53	50	33	44	41	29
800	73	58	44	57	54	37	46	43	31
1,000	77	62	47	59	56	39	47	44	32
2,000	96	81	67	69	66	49	52	45	37

SECTION D. Financial Analysis and Plan

Introduction

The total cost of the Project is $6,700,000. Of this amount, the estimated cost of activities to be financed by AID is $4,200,000. The AID loan will provide $4,000,000, and the grant will provide $200,000. The disbursement period of the loan will be 4 - 1/2 years. The grant will be disbursed in 3 years.

Loan funds will be used to procure equipment, materials, technical assistance and contract labor. Grant funds will finance one long-term advisor.

The GOB will contribute $1,750,000 to the project in the form of salaries, materials, construction and operating expenses and fuel. The annual obligation represents an average of 32% of the DSA budget.

The local community contribution is $750,000 and is made up of materials and labor. The total of this input will be "in kind".

1. Financial Plan/Budget Tables

Below is an estimate of the total financing necessary to complete the Project analyzed by source and use of funds.

TABLE 1

SUMMARY COST ESTIMATE AND FINANCIAL PLAN (US$ 000)

Components	AID Loan FX	AID Loan LC	Grant FX	GOB LC	Community Contribution LC	Total
1. Training/Education	101	74				175
2. Technical Assistance (82 w/m)	358		182			540
3. Systems Construction						
a. Equipment						567
(i) Vehicles/Drilling	405					
(ii) Engineering/Drafting	142					
(iii) Office	20					
b. Project Materials/Parts (pipe, casing, pumps, cement, gravel)	726	1,079		379	383	2,567
c. Contract Labor		486				486
d. Skilled Labor/Equipment operators				488		488
e. Unskilled Labor					367	367
4. Support Costs						
a. Fuel and Lube				18		18
b. Operating Expenses				98		98
c. DSA Personnel & Per Diem						
(i) Engineering				502		502
(ii) Office Support				186		186
d. Warehouse Construction				79		79
Subtotal	1,752	1,639	182	1,750	750	6,073
Inflation factor 8%	140	130	-	-	-	270
Contigency 10%	175	164	18	-	-	357
Total	2,067	1,933	200	1,750	750	6,700
Contribution (%)		63%		26%	11%	100%

TABLE 2

ACCRUAL AND PROJECTED DISBURSEMENTS
SUMMARY ALL FISCAL YEARS
(In US Dollars)

COMPONENTS	PROJECTED EXPENDITURES									
	FISCAL YEAR 1978									Total All Years
	1st.Qtr.	2nd.Qtr.	3rd.Qtr.	4th.Qtr.	Total	FY79	FY80	FY81	FY82(6 mo)	
LOAN										
1. Equipment		15	512	40	567	0	0	0	0	567
2. Materials and Parts			1,124	3	1,127	671	3	3	1	1,805
3. Contractors and Skilled Labor						140	140	140	66	486
4. Technical Assistance	25	22	21		68	94	89	107		358
5. Training			20	70	90	68	7	7	3	175
Subtotal	25	37	1,677	113	1,852	973	239	257	70	3,391
Inflation Factor	2	2	100	6	110	78	30	39	14	271
Contingency								200	138	338
Total Loan	27	39	1,777	119	1,962	1,051	269	496	222	4,000
GRANT										
5. Technical Assistance		6	15	27	48	68	66			182
Contingency								18		18
Total Grant		6	15	27	48	68	66	18		200
Total Grant and Loan	25	45	1,792	146	2,010	1,119	335	514	222	4,200

2. Recurrent Budget Analysis of Implementing Agency

During the disbursement period of the Project, DSA will construct approximately 200 water systems. In order to achieve this goal, DSA's staff and operating budget will be enlarged. The following table shows an estimate of the DSA Project cost.

Table 3

DSA PROJECT COSTS
(US$ 000) 1/

	CY 1977 2/ (6 mos.)	CY 1978	CY 1979	CY 1980	CY 1981	CY 1982 (3 mos.)	Total
Cash Outlays							
Salaries:							
Personnel		73	78	82	85	22	340
Materials		35	95	101	104	44	379
Travel and per diem		64	68	71	75	20	298
Fuel and oil		4	4	4	5	1	18
Operating expenses		27	21	21	24	5	98
Construction (Warehousing)	69	10					79
Total cash	69	213	266	279	293	92	1,212
"In Kind" Contribution							
Salaries:							
Personnel (DSA, part-time)	26	109	119	123	127	34	538
Total cash and "In Kind"	95	322	385	402	420	126	1,750

1/ See Financial Annexes for supporting schedules.
2/ GOB will begin contributing to Project upon signing Loan Agreement.

USAID has been assured by the GOB that sufficient funds will be allocated to the Project from regular GOB revenues. The loan application letter, signed by the Minister of Finance, commits the GOB to provide adequate financial and personnel support to achieve the goals of the Project. A covenant will be included in the Loan Agreement by which the GOB will also commit itself to support DSA operations after the disbursement period of the loan.

GOB costs have also been estimated for a period of 6 years after disbursement of the Project. The USAID Engineering Office has estimated that the drilling equipment will have depreciated some 50% after the disbursement period of the loan. It has therefore been calculated that up to 200 additional systems may be constructed with loan purchased machinery. A construction rate of approximately 33 systems per year has been assumed to calculate the GOB after project costs.

Table 4

DSA AFTER PROJECT COSTS
(US$ 000) 1/

	CY 1982 (9 mos)	CY 1983	CY 1984	CY 1985	CY 1986	CY 1987	CY 1988 (3 mos)	Total
Cash Outlays								
Salaries: Personnel	166	234	246	258	271	285	75	1,535
Materials	328	437	437	437	437	437	107	2,620
Travel and per diem	62	65	68	71	75	79	21	441
Fuel and Oil	3	5	5	5	6	6	2	32
Operating expenses	15	19	19	28	20	21	5	127
Contract Labor (skilled)	61	81	81	81	81	81	20	486
Total	635	841	856	880	890	909	230	5,241

1/ DSA's after project costs are considerably higher than during project costs since DSA will assume expenses previously financed with loan funds such as sub-project materials and contract labor.

In the following Table, annual budgets for the DSA and the Ministry of Health have been estimated. These budgets have been compared with DSA Project and After Project Costs. Its purpose is to demonstrate that only a small percentage increase in the MOH budget is needed for the DSA to carry out its responsibilities during and after the Loan. It is recognized, however, that a more substantial increase in the DSA budget will be necessary which the GOB has agreed to supply.

Table 5

RECURRENT BUDGET ANALYSIS
(US$ 000)

Years	Estimated MOH Budget (1)	Estimated DSA Budget (2)	Annual GOB Contributions to Project	% of Contribution to MOH Budget	% of Contribution to DSA Budget
CY 1975	28,731	509	-	-	-
76	33,503	550	-	-	-
77	39,198	971	95	.24	10
78	42,334	1,049	322	.76	31
79	45,720	1,132	385	.84	34
80	49,378	1,223	402	.81	33
81	53,328	1,321	420	.78	32
82	57,595	1,427	761	1.32	53
83	62,202	1,541	841	1.35	55
84	67,178	1,664	856	1.27	51
85	72,552	1,797	880	1.21	49
86	78,357	1,941	890	1.14	46
87	84,626	2,096	909	1.07	43

(1) Source: Presupuesto General de la Nación 1975-1977 (Ministry of Finance). Assumes an 8% increase compounded annually in MOH budgets after 1977.

(2) Source: DSA Administrative Office - years 1975-1977; this assumes an 8% compounded increase in DSA budgets after 1977.

Summary Opinion

The financial plan attempts to include all costs applicable to the project. Inputs and their costs have been reviewed by GOB officials and Mission project personnel. The disbursements schedule was prepared using estimates of the Engineering and Controller Offices of when the equipment, parts and materials will be purchased and work on the project can begin. Estimates of GOB costs to continue the program after the project were prepared using the best possible estimates. In our judgement the figures shown in this financial section are the best possible estimates of cash and "in kind" contributions.

PART III.

SECTION E. INSTITUTIONAL ANALYSIS

1. Analysis of Recipients and AID's Administrative Arrangements

The Departamento de Saneamiento Ambiental (DSA), a Division within the Ministry of Social Security and Public Health, will be responsible for the implementation of the proposed loan. The DSA will design and construct water systems in the rural areas of the Department of Cochabamba and Northern Chuquisaca and assist in maintaining those systems after installation. Systems will be built in towns with populations of 800 and below.

a. History

The Departamento de Saneamiento Ambiental (DSA) is a department within the Ministry of Social Security and Public Health charged with the control of rural and urban sanitation in Bolivia.

The DSA has been legislated responsibility for rural sanitation control in all towns with populations of less than 2,000. Their work in this area was begun with an agreement signed in 1968 with the Pan American Health Organization and UNICEF, through which funds, materials and equipment were provided to aid in the construction of potable water and sanitation systems in rural Bolivia. With this assistance, the DSA began work in the Department of Cochabamba in 1969, and later expanded its activities to include Tarija and Santa Cruz. Although this initial program was not a large-scale operation, it demonstrated DSA's potential to handle a larger program. DSA now has regional offices in the Departments of Cochabamba, Tarija, Santa Cruz, Chuquisaca, Beni (Riberalta and Trinidad), Oruro, La Paz, Pando and Potosi (Potosí and Tupiza) with a central office in La Paz that directs, orients, administers and supervisesthe national sanitation program.

b. Organization of DSA

The proposed DSA organization chart is attached as Annex II Exhibit I. Below is a brief description of the duties and responsibilities of the major DSA departments:

Director

The Director is responsible for the overall administrative direction of the DSA, which includes policy formation, implementation and supervision. He reports to the Minister of Health.

Technical Supervisor

The Technical Supervisor is responsible for the technical design and implementation of all DSA projects and operating plans. He also coordinates and directs the activities of the technical and administrative departments. He reports to the Director.

Project Office

This office will consist of an engineer and a secretary. The engineer will supervise all studies, promotional activities and construction performed under the Project.

Administrative Office

This office performs the accounting, purchasing and warehousing for DSA that is not performed directly by the Ministry of Social Security and Public Health.

Unit of Studies and Designs

This office is responsible for conducting studies to establish where the sanitation needs lie and later designing adequate systems to fulfill community requirements.

Construction Unit

This office is responsible for overseeing construction of all systems.

Unit of Promotion of Communities and Administration of Services

This office aids and directs the regional offices in their promotional activities within the communities.

Regional Offices

Responsible to the Technical Supervisor are 11 regional offices located in La Paz, Cochabamba, Santa Cruz, Oruro, Chuquisaca, Potosí, Tupiza, Tarija, Trinidad, Riberalta and Cobija. They are responsible for supervising and coordinating all DSA activities related to sanitation control in their department.

c. USAID's Past Experience with DSA

USAID Bolivia has had no previous loan or grant experience with DSA.

Retype

d. Other Donor Experience with DSA

The only organization with experience with DSA has been UNICEF. Under their grant of $1,000,000, UNICEF is providing material and equipment and some technical assistance and training. They expect to build 70-80 water systems with project funds. Although DSA is recognized as a weak organization by UNICEF, they nevertheless are content with progress to date and feel that their program will be a success both in the physical construction of systems and in the organizational improvement which accompanies it. UNICEF estimates that their project will be completed in April 1979.

e. DSA Prior Experience

Since 1969 DSA has drilled 295 wells, 1,010 hand-dug wells and 23 water systems. In the areas of waste disposal, 29,899 latrines and 1,537 septic tanks have been constructed to date. Of these totals, 91 drilled wells, 431 dug wells, and 8 water systems have been built in the Departments of Cochabamba and Chuquisaca; in addition, they have built 11,716 latrines and 533 septic tanks. Below is a list of the eight water systems and the communities benefited.

Dept. and town	Inhabitants benefited
Cochabamba	
Sauce Rancho Alto	300
Sutticollo	500
Iduelo	400
Molle Molle	300
Iquicollo Moro	300
Villa Gracrela	300
Sauce Rancho Bajo	320
Sucre	
Cororo	800
Total	3,220

As can be seen from the list above, DSA's experience in the construction of complete water systems has been somewhat limited.

1/ DSA has constructed some seven additional systems in Cochabamba for a variety of organizations including the NCDS, the National Association of Teachers and the Ministry of Education. Because these have not been constructed with MOH funds, DSA does not assume responsibility for their maintenance.

f. Management Capability

To improve the operations of DSA and enable them to handle the increased workload required by the project, DSA plans to substantially increase the size of its staff. At the national level thirteen new personnel will be hired. In Chuquisaca eleven new positions will be created and filled and in Cochabamba eleven additional positions will be created. These positions are detailed in Annex . Thus, by the time the first disbursements are made, both regional offices will be staffed and able to operate independently, with their own equipment, warehousing and repair facilities. Over time, the DSA central office in La Paz also plans to assign some of its engineers and draftsmen/surveyors to the field offices. At present, DSA's field administrative operations are handled by an administrator physically located in each distric hospital or "Sanitary Unit". Procurement and accounting functions are all handled by MOH personnel. As a result, the DSA regional offices have very little control over their own funds and are often not aware of the amount of funding available for construction and operations at any given time.

Under the proposed project, DSA will be staffed to handle its own administrative procedures and financial accounting with the assistance of both long and short-term. The new MIS system will help assure that these systems function effectively by identifying bottlenecks in these procedures.

At the present time the DSA organization lacks a separate maintenance division and maintenance has been handled through the Operations Division. The DSA's maintenance record, albeit limited, has been impressive (all but one water system in the Cochabamba/Chuquisaca departments were functioning when visited by Mission personnel). However, a separate maintenance division will be established in order that maintenance will receive the necessary attention and budget support.

As shown in the staffing pattern in Annex II.1., nine additional personnel will be hired to support the newly established division. Additionally, the project will include a loan-funded maintenance advisor for a 30 month period to assist in institutionalizing the maintenance system.

Two problems exist within the DSA which seem to limit their hiring or retaining of competent personnel. One is the very low salaries paid to certain employees and the other is that the sanitary technicians in the field do not receive travel money or per diem, thereby discouraging visit to projects in the areas of

their responsibility. To gauge the extent of the problem concerning salaries, the Financial Analysis Office compared the salaries of personnel in similar jobs for similar periods of time among GOB agencies. Two agencies were chosen for the comparison of salaries with DSA; the Ministry of Agriculture and the National Community Development Service (NCDS). These agencies have a similar organizational structure with regional offices and personnel in the field. The salaries of the NCDS were recently increased by the GOB in preparation for the Small Farmer Loan, See Annex II,F for a listing of the salary increases proposed to the Ministry of Finance. Increases in salaries for DSA personnel to a level equivalent to those in similar jobs in other ministries will be included as a CP to loan disbursement. Also as a CP, the DSA will be required to submit a plan to provide travel and per diem allowances, possibly fixed amounts, to the sanitary technicians in the field.

g. Disbursement Period

Because it will take some time to effect improvement in DSA administrative capacity, the Mission has thought it adviseable to request a 4 1/2 year loan disbursement period to assure that sufficient time exists within the project to both construct the water systems planned and to make permanent improvements in the administration capabilities of the DSA.

PART IV - IMPLEMENTATION PLANNING

SECTION A. Schedule of Major Events

The PPT network, Annex II, Exhibit 2 shows the major events which will take place during the project implementation period. The implementation plan as contemplated follows:

1. The Project Paper will be reviewed and approved by the DAEC on February 28, 1977 and will be authorized by March 30, 1977.

2. While awaiting authorization, the DSA with the assistance of the Mission, will begin to prepare a list of equipment and materials, including their specifications to be procured with loan funds. In addition, the Mission will complete Implementation Letter No. 1 and a draft of the Loan Agreement in preparation for negotiation with the GOB.

3. During the months of April and May 1977, the Mission will negotiate the Loan Agreement. The loan agreement will be signed no later than June 30, 1977. It is anticipated that the IFB's for major procurement will be issued no later than September 30, 1977.

4. Immediately following signature of the loan agreement, DSA will be presented with Implementation Letter No.1

5. Bids for equipment, materials and the long-term administrative advisor will be awarded by January 30, 1978 and the Administrator will be in country no later than March 30, 1978.

6. Equipment should arrive in Bolivia no later than October 30, 1978 with construction beginning about 30 days later.

7. The results of the first impact evaluation will be complete by January 30, 1980.

8. All 200 water systems to be constructed with project funds will be completed by the estimated terminal disbursement date of March 30, 1982.

SECTION B. Disbursement Procedures

The Project Committee has investigated the possibility of applying the fixed amount reimbursement system (FARS) to the proposed project and has concluded that its application is not feasible given the structure of the project. The FARS requires prior agreement on a fixed cost per unit of work with subsequent reimbursement for a percentage of the cost for each unit completed. Although calculating a cost per unit of work is feasible, the GOB will finance primarily

operating expenses while the AID loan will finance the procurement of equipment and materials. The AID costs are therefore a prerequisite to the initiation of water systems construction. Therefore, neither the project nor any of its components are suitable for financing using the FARS approach.

No deviation from AID established disbursement procedures for the loan funded components of the program is anticipated. Materials and equipment procured in the United States or other AID geographic Code 941 countries as well as costs for technical assistance contracts will be paid through standard letter of commitment/credit procedures. Disbursements for local currency costs will be made from a U.S. government owned RDO account held in the Central Bank of Bolivia.

SECTION C. Procurement Procedures

Equipment and material procured with loan funds will have as their source and origin in the U.S., Geographic Code 941 countries and Bolivia. However for the grant component of the program, USAID is requesting a waiver (included in the loan authorization) to permit procurement from 941 countries. Grant funds will finance an administrative advisor to assist DSA with the non-engineering aspects of the program. Accordingly, the Mission is requesting that it be granted the flexibility to also consider non-U.S. personnel who have had extensive experience in the non-engineering aspects of rural water supply. To date, several such candidates have been identified for consideration.

SECTION D. USAID Monitoring Requirements

Monitoring will be performed by a Mission Project Committee whose members will have the following responsibilities.

1. The primary monitoring task will rest with the Engineering and Transportation Division and the Humanitarian Assistance Divisions. One member each from the two divisions will serve as the co-project managers. The engineering co-manager will be responsible for monitoring the procurement of major equipment and materials and the design and construction of water system. The Humanitarian Assistance Division co-manager will monitor the non-engineering aspects of the project including the preparation and implementation of the health impact evaluation, community education, and management information system components of the project.

2. The Development Resources Office will be responsible for drafting the provisions of the AID Loan Agreement and Implementation Letters as well as general monitoring of the project.

3. The Mission's Office of the Controller will review all disbursement requests for conformity with AID regulations, and will ensure that adequate financial and inventory control methods all followed by DSA.

SECTION E. Reports

The submission of the following reports would be required of the DSA.

1. An annual audit report prepared either by the GOB Office of the Controller or an independent auditor acceptable to the Mission.

2. Shipping reports to be presented quarterly.

3. Quarterly summary progress report which will include community project agreements, construction plans, listing of materials and cost estimates, together with appropriate bar progress charts and sufficient narrative, to delineate accomplishments during the reporting period and projected accomplishment for the coming quarterly period.

SECTION F. Evaluation

In the second set of conditions precedent to disbursement the GOB will be required to submit a detailed implementation and evaluation plan broken down by year for the life of the project. It is anticipated that schedules for three types of evaluations will be included in the plan. All three evaluations will take place annually. The first impact evaluation will take place 12 to 14 months from the completion of the first 60 systems. The first evaluation emanating from the Management Information System will take place one year from the meeting of initial CP's and yearly thereafter for the life of the project. The overall project evaluation which will measure progress against the logical framework indicators will also take place one year after meeting initial CP's and yearly thereafter.

SECTION G. Conditions and Covenants

Conditions and covenants are included in the loan authorization, Annex I, A.

MINISTERIO DE FINANZAS
BOLIVIA

Cite: INDEF N° 243, 77

La Paz, 24 FEB. 1977

Señor
Frank B. Kimball, Director
USAID/Bolivia
Presente

Señor Director:

Ref.: Solicitud de Ayuda Financiera Externa de AID para la provisión de agua en las areas rurales.

1. El Gobierno de Bolivia bajo los auspicios del Ministerio de Previsión Social y Salud Pública (MSSP) ha desarrollado un programa para instalar sistemas de agua y letrinas en las áreas rurales de Bolivia. Se anticipa que tal programa tendrá un impacto significativo en la salud de aquellas comunidades rurales que participen del programa. Más aún, el programa ayudará a desarrollar una capacidad institucional en la División de Saneamiento Ambiental (DSA) del MSSP para continuar con la instalación de sistemas de agua después de que el proyecto para el que se solicitan fondos haya concluído.

   Los objetivos del proyecto son:

   a) Reducir la incidencia de enfermedades gastroentéricas y parasitarias entre los residentes de las comunidades participantes a través de la provisión de agua potable y facilidades de alcantarillado.

   b) Desarrollar una capacidad dentro del MSSP para construir facilidades para agua potable, educar a las comunidades participantes en prácticas mejoradas de salud y evaluar el impacto en la salud por la provisión de agua y facilidades relacionadas en los residentes de las comunidades participantes.

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MINISTERIO DE FINANZAS
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El proyecto consistirá en la construcción de aproximadamente 200 sistemas de agua potable en comunidades de menos de 800 habitantes de los departamentos de Cochabamba y norte de Chuquisaca. Además, con la asistencia de DSA, cada familia participante en el programa construirá letrinas. El proyecto será ejecutado por la División de Saneamiento Ambiental del MSSP e involucrará a las Divisiones de Epidemiología y Recursos Humanos del MSSP.

2. Para respaldar el programa, el Gobierno de Bolivia tomará las siguientes medidas:

   a) Suministrar fondos adicionales al presupuesto de la División de Saneamiento Ambiental para cubrir los siguientes gastos relacionados con el proyecto:

      i) Sueldos para el personal profesional y personal de planta que realice los estudios, prepare planes, supervise y se haga cargo de la construcción y lleve a cabo adiestramiento de personal y evaluación de programas.

      ii) Costos de mantenimiento de todo el equipo adquirido para el proyecto y para todos los sistemas construídos bajo el proyecto.

      iii) Costos de todos los materiales necesarios para las actividades de construcción no financiadas por USAID.

3. El equipo adquirido para el proyecto permanecerá en la División de Saneamiento Ambiental después de la conclusión del proyecto y será usado en el futuro solamente para el mantenimiento de los sistemas existentes y la construcción de nuevos sistemas.

4. El costo total del proyecto que se realizará en un período de 4 años se estima en $us. 6,700,000.-- de los cuales el Gobierno de Bolivia contribuirá $us. 1,750,000 para salarios de personal, materiales, gastos de viaje y viáticos, lubricantes y combustible, gastos de operación y construcción de depósitos.

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MINISTERIO DE FINANZAS
BOLIVIA

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Las comunidades participantes contribuirán $. 750,000 en materiales y mano de obra.

Por lo tanto, el Gobierno de Bolivia solicita un préstamo de $us. 4,000,000 y una donación de $us. 200,000. Se entiende que el préstamo será amortizado en 40 años, incluyendo un período de gracia de 10 años con un interés anual de 2% durante el período de gracia y 3% de ahí en adelante.

Con este motivo, nos es grato saludar a usted muy atentamente.

Carlos Calvo
MINISTRO DE FINANZAS

FAA/RV/Gaa.

D R A F T
LOAN AUTHORIZATION

Bolivia: Rural Sanitation

Provided from: FAA Section 104
(Population Planning and Health)

Pursuant to the authority vested in the Assistant Administrator for Latin America, Agency for International Development ("A.I.D.") by the Foreign Assistance Act of 1961, as amended (the "Act") and the delegations of authority issued thereunder, I hereby authorize pursuant to Part I, Chapter 1, Section 104 of the Act and in furtherance of the Alliance for Progress a loan in an amount not to exceed Four Million United States Dollars ($4,000,000) (the "Loan") and a grant in an amount not to exceed Two Hundred Thousand United States Dollars ($200,000) (the "Grant") to the Republic of Bolivia ("Cooperating Country") to assist in financing certain foreign exchange and local currency costs of goods and services of a rural sanitation program for the provision of potable water supplies at the village level in approximately 200 villages in southeastern Bolivia (the "Project").

The entire amount of the A.I.D. financing herein authorized for the Project will be obligated when the Project Agreement between A.I.D. and the Cooperating Country (the "Project Agreement") is executed. I hereby authorize the negotiation and execution of the Project Agreement by the officer to whom such authority has been delegated in accordance with A.I.D. regulations and delegations of authority, subject to the following essential terms, covenants and major conditions together with such other terms and conditions as A.I.D. may deem appropriate:

1. Interest Rate and Terms of Repayment

The Cooperating Country shall repay the Loan to A.I.D. in United States Dollars within forty (40) years from the date of first disbursement of the Loan, including a grace period of not to exceed ten (10) years. The Cooperating Country shall pay to A.I.D. in United States Dollars interest from the date of first disbursement of the Loan at the rate of (a) two percent (2%) per annum during the first ten (10) years, and (b) three percent (3%) per annum thereafter, on the outstanding disbursed balance of the Loan and on any due and unpaid interest accrued thereon.

2. Source and Origin of Goods and Services

Except for ocean shipping, goods and services financed by A.I.D. for the Project under the Loan shall have their source and origin in countries included in A.I.D. Geographic Code 941 or in the Cooperating Country except as A.I.D. may otherwise agree in writing. Ocean shipping financed for the Project shall be procured in any eligible source country except the Cooperating Country.

3. Conditions Precedent to Initial Disbursement

Prior to any disbursement or to the issuance of any commitment documents under the Project Agreement, the Cooperating Country shall furnish to A.I.D. in form and substance satisfactory to A.I.D.:

(a) A legal opinion of the Attorney General of Bolivia or other legal counsel acceptable to A.I.D. to the effect that the loan agreement has been duly authorized and/or ratified by the Borrower and executed on its behalf and that it constitutes a valid and legally binding obligation of Borrower in accordance with all its terms;

(b) A certified statement of the name of the person(s) authorized under the loan agreement to act as Borrower's representative under the agreement, with authenticated specimen signatures of said representatives;

(c) A financial plan for the project, which shall include increases in staff and salary levels for DSA personnel sufficient to meet its responsibilities under the project, accompanied by a letter from the Minister of Finance detailing the GOB's contribution during the life of the project.

4. Conditions Precedent to Subsequent Disbursements

Prior to any disbursement or the issuance of any commitment documents under the Project Agreement to finance other than technical assistance, the Cooperating Country shall furnish to A.I.D. in form and substance satisfactory to A.I.D.:

(a) A detailed implementation and evaluation plan covering the first year of Project activities which shall include a system for selection and ranking by priority of individual sub-projects;

(b) A time-phased plan from the Ministry of Planning and Coordination for the rationalization of the rural water supply sub-sector which delineates the respective jurisdiction and functions of DSA and CORPAGUAS;

(c) A time-phased plan for the completion of warehouse storage facilities for Project materials in Cochabamba, Chuquisaca and La Paz; and

(d) A vehicle maintenance and storage plan for vehicles purchased with loan funds.

5. Special Covenants

The Cooperating Country, except as A.I.D. shall otherwise agree in writing, shall covenant that:

(a) The GOB will continue to provide budgetary support to the DSA at a level which is adequate to continue the system of regular maintenance of water facilities established under the Project and to cover any costs of maintenance which have not been assumed by the benefited communities;

(b) The GOB will provide funds necessary to continue the construction and maintenance of rural water systems by DSA in the same geographic focus as the Project for a minimum of five years after Project completion;

(c) The GOB shall utilize all equipment and materials obtained with loan funds only for purposes of the Project during the life of the Project and for similar purposes thereafter.

6. Waivers

Goods and services financed by A.I.D. for the Project under the Grant shall have their source and origin in countries included in A.I.D. Geographic Code 941.

STATUTORY CHECKLIST

I. COUNTRY CHECKLIST

A. GENERAL CRITERIA FOR COUNTRY

1. FAA Sec. 116. Can it be demonstrated that contemplated assistance will directly benefit the needy? If not, has the Department of State determined that this government has engaged in consistent pattern of gross violations of internationally recognized human rights?	Yes, project is specifically designed to benefit the rural poor.
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(a). Does recipient country furnish assistance to Cuba or fail to take appropriate steps to prevent ships or aircraft under its flag from carrying cargoes to or from Cuba?	No.
4. 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.

5. 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 constested by such government?	No.
6. 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 its obligations toward such citizens or entities?	No.
7. FAA Sec. 620(f); App. Sec. 108. Is recipient country a Communist country? Will assistance be provided to the Democratic Republic of Vietnam (North Vietnam), South Vietnam, Cambodia or Laos?	No.
8. 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?	No.
9. 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.

10. 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?

Bolivia has instituted the investment guaranty program.

11. 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,

a. has any deduction required by Fishermen's Protective Act been made?

b. has complete denial of assistance been considered by AID Administrator?

Bolivia has taken no such actions.

12. FAA Sec. 620(q); App. Sec. 504. (a) is the government of the recipient country in default 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, unless debt was earlier disputed, or appropriate steps taken to cure default?

No.

13. FAA Sec. 620(s). What percentage of country budget is for military expenditures? How much of foreign exchange resources spent on military equipment? How much spent for the purchase of sophisticated weapons systems? (Consideration of these points is to be coordinated with the Bureau for Program and Policy Coordination, Regional Coordinators and Military Assistance Staff (PPC/RC).)

The CY 1976 Budget for military purposes represents approximately 19.4% of total budgeted expenditures of the GOB. Approximately $1.3 million has been budgeted for the purchase of non-sophisticated military equipment.

14. 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.
15. FAA Sec. 620(u). What is the payment 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?	Bolivia is not in arrears.
16. FAA Sec. 620A. Has the country granted sanctuary from prosecution to any individual or group which has committed an act of international terrorism?	No.
17. 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.
18. FAA Sec. 669. Has the country delivered or received nuclear reprocessing or enrichment equipment, materials or technology, without specified arrangements on safeguards, etc.?	No
19. FAA Sec. 901. Has the country denied its citizens the right or opportunity to emigrate?	

B. FUNDING CRITERIA FOR COUNTRY

1. Development Assistance Country Criteria

a. FAA Sec. 102(c), (d). 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.

Yes.

b. FAA Sec. 201(b)(5), (7) & (8); Sec. 208; 211(a)(4), (7). Describe extent to which country is:

(1) Making appropriate efforts to increase food production and improve means for food storage and distribution.

Bolivia is making appropriate efforts with respect to food production, storage, and distribution. AID Loans 511-L-042, 511-T-050, 511-T-052, 511-T-053, 511-T-056 and this loan will contribute to these efforts.

(2) Creating a favorable climate for foreign and domestic private enterprise and investment.

The GOB program emphasized creation of a favorable climate for selected foreign and domestic private enterprise and investment. It is seeking special exemption within the Andean Economic Market for certain investments.

(3) Increasing the public's role in the developmental process.

The GOB continues to take in active role in the development process and in so doing to increase popular participation.

(4) (a) Allocating available budgetary resources to development.

The GOB appears to be allocating as much as it is able to development.

(b) Diverting such resources for unnecessary military expenditure and intervention in affairs of other free and independent nations.

The GOB is not interferring in the affairs of other free and independent nations.

(5) Making economic, social, and political reforms such as tax collection improvements and changes in land tenure arrangements, and making progress toward respect for the rule of law, freedom of expression and of the press, and recognizing the importance of individual

The GOB is making these efforts.

freedom, initiative, and private enterprise.

(c) Otherwise responding to the vital economic, political, and social concerns of its people, and demonstrating a clear determination to take effective self-help measures.

The GOB appears to be doing this in an increasing effective manner.

c. FAA Sec. 201(b), 211(a). Is the country among the 20 countries in which development assistance loans may be made in this fiscal year, or among the 40 in which development assistance grants (other than for self-help projects) may be made?

Yes.

d. FAA Sec. 115. Will country be furnished, in same fiscal year, either security supporting assistance, or Middle East peace funds? If so, is assistance for population programs, humanitarian aid through international organizations, or regional programs?

No.

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.

b. FAA Sec. 531. Is the Assistance to be furnished to a friendly country, organization, or body eligible to receive assistance?

N.A.

c. 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.

II. PROJECT CHECKLIST

A. GENERAL CRITERIA FOR PROJECT

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

(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 plus 10%)?

(a) Committees have been notified in the FY 1977 Congressional Presentation

(b) Yes.

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?

Such planning has taken place and cost estimates made.

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?

Ratification of loan agreement by GOB will follow shortly after signature as in all cases of past loan agreements.

4. FAA Sec. 611(b); App. Sec. 101. If for water or water-related land resource construction, has project met the standards and criteria as per Memorandum of the President dated Sept. 6, 1973 (replaces Memorandum of May 15, 1962; see Fed. Register, Vol 38, No. 174, Part III, Sept. 10, 1973)?

Yes.

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?	Yes.
6. FAA Sec. 209, 619. Is project susceptible of execution as part of regional or multilateral project? If so why is project not so executed? Information and conclusion whether assistance will encourage regional development programs. If assistance is for newly independent country, is it furnished through multilateral organizations or plans to the maximum extent appropriate?	No.
7. FAA Sec. 601(a); (and Sec. 201(f) for development loans). 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.	Local organizations will be responsible for ordinary maintenance of systems. Greater supply of water will be available also for agriculture and commerce.
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).	Project will have limited effect in this area except for sales of goods by private U.S. suppliers.

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.

Bolivia will make contribution in excess of 25% of project costs.

10. FAA Sec. 612(d). Does the U.S. own excess foreign currency and, if so, what arrangements have been made for its release?

The U.S. does not own excess foreign currency in Bolivia

B. FUNDING CRITERIA FOR PROJECT

1. Development Assistance Project Criteria

a. FAA Sec. 102(c); 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?

Project is specifically designed to involve small rural communities in development of water supplies and self maintenance of village systems.

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;	N.A.
(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;	Project will use least-cost method in all villages; health aspects related to potable water included in project.
(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;	N.A.
(4) (106) for technical assistance, energy, research, reconstruction, and selected development problems; if so, extent activity is:	N.A.
(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. — **N.A.**

c. FAA Sec. 110(a); Sec. 208(e). Is the recipient country willing to contribute funds to the project, and in what manner has or will it provide assurances that it will 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)? — **Bolivia has agreed to provide at least 25% of the costs of the project and agreed project budget so reflects.**

d. 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? — **N.A.**

e. FAA Sec. 207; Sec. 113. Extent to which assistance reflects appropriate emphasis on; (1) encouraging development of democratic, economic, political, and social institutions; (2) self-help in meeting the country's food needs; — **Local community organizations to play important role in project implementation.**

(3) improving availability of trained worker-power in the country; (4) programs designed to meet the country's health needs; (5) other important areas of economic, political, and social development, including industry; free labor unions, cooperatives, and Voluntary Agencies; transportation and communication; planning and public administration; urban development, and modernization of existing laws; or (6) integrating women into the recipient country's national economy.	Project is designed to meet basic health need for potable water.
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-government.	Use of local cooperative organizations is responsive to participation in processes essential to self-government.
g. FAA Sec. 201(b)(2)-(4) and -(8); Sec. 201(e); Sec. 211(a)(1)-(3) and -(8). 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; or of educational or other institutions directed toward social progress? Is it related to and consistent with other development activities, and will it contribute to realizable long-range objectives? And does project paper provide information and conclusion on an activity's economic and technical soundness?	Yes, provision of potable water supply is basic to productive capacities of the rural population.

h. FAA Sec. 201(b)(6); Sec. 211 (a)(5), (6). Information and conclusion on possible effects of the assistance on U.S. economy, with special reference to areas of substantial labor surplus, and extent to which U.S. commodities and assistance are furnished in a manner consistent with improving or safeguarding the U.S. balance-of-payments position.	U.S. suppliers will be eligible to supply commodities for the Project.
2. Development Assistance Project Criteria (Loans only)	
a. FAA Sec. 201(b)(1). Information and conclusion on availability of financing from other free-world sources, including private sources within U.S.	No other financing sources available for this Project in this area of Bolivia.
b. FAA Sec. 201(b)(2); 201(d). Information and conclusion on (1) capacity of the country to repay the loan, including reasonableness of repayment prospects, and (2) reasonableness and legality (under laws of country and U.S.) of lending and relending terms of the loan.	Lending terms are legal under U.S. and Bolivian law. Loan is within debt-carrying capacity of Bolivia.
c. FAA Sec. 201(e). If loan is not made pursuant to a multilateral plan, and the amount of the loan exceeds $100,000, has country submitted to AID an application for such funds together with assurances to indicate that funds will be used in an economically and technically sound manner?	Yes.
d. FAA Sec. 201(f). Does project paper describe how project will promote the country's economic development taking into account the country's human and material resources requirements and relationship between ultimate objectives of the project and overall economic development?	Yes.

e. FAA Sec. 202(a). Total amount of money under loan which is going directly to private enterprise, is going to intermediate credit institutions or other borrowers for use by private enterprise, is being used to finance imports from private sources, or is otherwise being used to finance procurements from private sources?	More than three million dollars is expected to be used to finance procurements from private sources.
f. FAA Sec. 620(d). If assistance is for any productive enterprise which will compete in the U.S. with U.S. enterprise, 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?	Not Applicable.
3. Project Criteria Solely for Security Supporting Assistance	
FAA Sec. 531. How will this assistance support promote economic or political stability?	N.A.
4. Additional Criteria for Alliance for Progress	
(Note: Alliance for Progress projects should add the following two items to a project checklist.)	
a. FAA Sec. 251(b)(1), -(8). Does assistance take into account principles of the Act of Bogota and the Charter of Punta del Este; and to what extent will the activity contribute to the economic or political integration of Latin America?	Yes. Integration effect is minimal.
b. FAA Sec. 251(b)(8); 251(h). For loans, has there been taken into account the effort made by recipient nation to repatriate capital invested in other countries	Yes.

by their own citizens? Is loan consistent with the findings and recommendations of the Inter-American Committee for the Alliance for Progress (now "CEPCIES," the Permanent Executive Committee of the OAS) in its annual review of national development activities?	Yes.

III. STANDARD ITEM CHECKLIST

A. Procurement

1. FAA Sec. 602. Are there arrangements to permit U.S. small business to participate equitably in the furnishing of goods and services financed?	Yes, loan agreement and implementation procedures will so provide.
2. FAA Sec. 604(a). Will all commodity procurement financed be from the U.S. except as otherwise determined by the President or under delegation from him?	Yes.
3. FAA Sec. 604(d). If the cooperating country discriminates against U.S. marine insurance companies, will agreement require that marine insurance be placed in the U.S. on commodities financed?	Bolivia does not so discriminate.
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?	Not Applicable.
5. FAA Sec. 608(a). Will U.S. Government excess personal property be utilized wherever practicable in lieu of the procurement of new items?	Yes.

6. FAA Sec. 901(b). (a) Compliance with requirement 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.	Yes, loan agreement will so provide.
7. FAA Sec. 621. If technical assistance is financed, will such assistance be furnished to the fullest extent practicable as goods and professional and other services from private enterprise 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?	Yes.
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?	Yes.
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?	Yes.
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?	Yes.

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? — Yes.

C. Other Restrictions

1. FAA Sec. 201(d). If development loan, is interest rate at least 2% per annum during grace period and at least 3% per annum thereafter? — Yes.

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? — Not Applicable.

3. FAA Sec. 620(h). Do arrangements preclude promoting or assisting the foreign aid projects or activities of Communist-Bloc countries, contrary to the best interests of the U.S.? — Yes.

4. FAA Sec. 636(i). Is financing not permitted to be used, without waiver, for purchase, long-term lease, or exchange of motor vehicle manufactured outside the U.S. or guaranty of such transaction? — Yes.

5. Will arrangements preclude use of financing:

a. FAA Sec. 114. to pay for performance of abortions or to motivate or coerce persons to practice abortions? — Yes.

b. FAA Sec. 620(g). to compensate owners for expropriated nationalized property? — Yes.

c. FAA Sec. 660. to finance police training or other law enforcement assistance, except for narcotics programs?	Yes.
d. FAA Sec. 662. for CIA activities?	Yes.
e. App. Sec. 103. to pay pensions, etc., for military personnel?	Yes.
f. App. Sec. 106. to pay U.N. assessments?	Yes.
g. App. Sec. 107. to carry out provisions of FAA Sections 209(d) and 251(h)? (transfer to multilateral organization for lending).	Yes.
h. App. Sec. 501. to be used for publicity or propaganda purposes within U.S. not authorized by Congress?	Yes.

CERTIFICATION PURSUANT TO SECTION 611(e) OF
THE FOREIGN ASSISTANCE ACT OF 1961, AS AMENDED

I, Frank B. Kimball, the principal officer of the Agency for International Development in Bolivia, having taken into account, among other factors, the maintenance and utilization of projects in Bolivia previously financed or assisted by the United States, do hereby certify that in my judgment Bolivia has both the financial capability to effectively maintain and utilize the capital assistance project for the provision of village level potable water systems titled: RURAL SANITATION.

Frank B. Kimball
Director, USAID/Bolivia

INTERNATIONAL BANK FOR RECONSTRUCTION AND DEVELOPMENT

1818 H Street, N.W., Washington, D.C. 20433, U.S.A.

Area Code 202 · Telephone Extension 3-6360 · Cable Address INTBAFRAD

December 1, 1976

Mr. C. B. Weinberg
Associate Assistant Administrator
Latin America - AID
New State Department - Room 2248-NS
Washington, D. C.

Re: BOLIVIA - Summary of Meetings on AID and IBRD Projects

Dear Mr. Weinberg:

We are pleased to send you a note summarizing the results of the discussions which our Project Officers, Messrs. J. Freedman and E. Pogson recently had with your mission staff in Bolivia and headquarters staff in Washington.

We have found these talks very useful and hope we may continue to cooperate together in this manner.

Sincerely yours,

Alfonso Zavala
Chief, Water Supply and Sewerage Division
Latin America and the Caribbean Regional Office

Summary of Discussions
On Cooperation Between
AID and IBRD

1. The objectives of the IBRD loan and the proposed AID loan are quite different and aim at different target populations.

2. The main differences are:

(a) Type of Community

The program being financed by IBRD is part of an urban water supply loan for the cities of Potosi and Sucre. The part to be executed by Corporación de Agua Potable y Alcantarillado (CORPAGUAS) will be for communities where the houses are sufficiently close to one another to make a community water system practicable. These systems are designed to provide individual house connections to at least 60% of the properties. These conditions usually occur in communities over 800 people.

The AID program is for more dispersed communities and may consist of hand pumps, wells or standpipes.

(b) Geographical Location

The area of the CORPAGUAS program is largely to the north of the area of the AID program. The only area of overlap is in the department of Cochabamba, where CORPAGUAS plans to build six systems for communities with more than 800 people and three for communities under 800.

(c) Type of Program

The CORPAGUAS program is solely for water supply systems. The program, to be carried out by the Ministerio de Salud (División de Ingenieria Environmental) 1/ is a combined health program including the provision of water delivery points, latrines, and education.

The Bank has already indicated in its letter of April 8, 1976 to AID that it is not interested in financing the program of DIE.

3. There is a very great need for the provision of drinkable water in the rural areas of Bolivia, where only about 16% of the population have acceptable service. The two Bolivian agencies which have responsibilities for water supply outside the cities have worked together without duplication for many years, and we believe they can do so in the future.

1/ More commonly known as DSA (Departamento Saneamiento Ambiental)

ANNEX F

INITIAL ENVIRONMENTAL EXAMINATION

Project location :	Bolivia, specifically the Departments of Cochabamba and northern Chuquisaca.
Project Title :	Rural Sanitation
Funding :	FY 1977. $4,000,000
Life of Project :	Four years (FY 1977 to FY 1981)
IEE Prepared by :	Helen Soos
Date :	20 February 1977
Environmental Action Recommended :	Negative Determination

Frank B. Kimball
Mission Director, USAID/Bolivia

Date : 21 February 1977

Assistant Administrator's Decision : Approved _____

Disapproved _____

_____

Date : _____

INITIAL ENVIRONMENTAL EXAMINATION

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

A. Description of Project

See Section II of Project Paper.

B. Identification and Evaluation of Environmental Impacts

The Project includes the construction of water systems in approximately 200 rural communities of 800 persons or less. These water systems will be combined with improved waste disposal systems, in particular latrines, and are expected to improve the health environment of beneficiary communities. Training and technical assistance are included in the Project to assist the Ministry of Health in helping these communities to improve their sanitary practices.

The communities to be served have been largely selected. These communities now obtain water for domestic purposes from surface sources, generally small rivers and streams with their consequent risk of contamination. The principal method to be used in the project will be the drilling of wells with pumps and elevated storage tanks from which unpolluted water will flow. Wells, piping and tanks will be disinfected prior to installation. No undesireable intrusions or deteriorations of aquifer are anticipated. Sub-surface absorption or drainage will be provided for household waste water in order to suppress pest insects and odors. The noise of the pumps is not expected to be a nuisance factor.

It is considered that there will be no negative effects on the environment from these systems, and that, from a standpoint of the effect on human beings, the effect will be beneficial, since the degree of possible contamination of water for domestic or culinary purposes will be greatly reduced.

A second component of the loan, the installation of pit latrines within every home area as a condition to the installation of the domestic water supply, will be a beneficial factor from an ecological point of view. No water borne waste disposal systems are contemplated. Latrine seepage will recuperate to an acceptable state in aquifers prior to passage to water wells or springs. By concentrating human excreta in a pit latrine, the spreading of parasitic and gastro-enteritic diseases from rain run-off will be greatly reduced.

IMPACT IDENTIFICATION AND EVALUATION 2/

Impact Areas and Sub-areas 1/

A.	LAND USE	
	1. Changing the character of the land through:	
	a. Increasing the population	N
	b. Extracting natural resources	N
	c. Land clearing	N
	d. Changing soil character	N
	2. Altering natural defenses	N
	3. Foreclosing important uses	N
	4. Jeopardizing man or his works	N
	5. Other factors	
B.	WATER QUALITY	
	1. Physical state of water (positive)	H
	2. Chemical and biological states (positive)	M
	3. Ecological balance	N
	4. Other factors	
C.	ATMOSPHERIC	
	1. Air additives	N
	2. Air pollution	N
	3. Noise pollution	N
	4. Other factors	

1/ See Explanatory Notes for this form.
2/ Use the following symbols: N- No environmental impact
L- Little environmental impact
M- Moderate environmental impact
H- High environmental impact
U- Unknown environmental impact

D.	NATURAL RESOURCES	
	1. Erosion, altered use of water	N
	2. Irreversible, inefficient commitments	N
	3. Other factors	
E.	CULTURAL	
	1. Altering physical symbols	N
	2. Dilution of cultural traditions	N
	3. Other factors	
F.	SOCIOECONOMIC	
	1. Changes in economic/employment patterns	N
	2. Changes in population	N
	3. Changes in cultural patterns	N
	4. Other factors	
G.	HEALTH	
	1. Changing a natural environment (positive)	H
	2. Eliminating an ecosystem element	N
	3. Other factors	
H.	GENERAL	
	1. International impacts	N
	2. Controversial impacts	N
	3. Larger program impacts	N
	4. Other factors	
I.	OTHER POSSIBLE IMPACTS (not listed above)	

AID 1020-25 (11-72)
SUPPLEMENT I

PROJECT DESIGN SUMMARY
LOGICAL FRAMEWORK

(INSTRUCTION: THIS IS AN OPTIONAL FORM WHICH CAN BE USED AS AN AID TO ORGANIZING DATA FOR THE FAR REPORT. IT NEED NOT BE RETAINED OR SUBMITTED.)

Life of Project:
From FY 77 to FY 82
Total U.S. Funding $4,200,000
Date Prepared 2/21/77

PAGE 1

Project Title & Number: RURAL SANITATION 511-0458

NARRATIVE SUMMARY	OBJECTIVELY VERIFIABLE INDICATORS	MEANS OF VERIFICATION	IMPORTANT ASSUMPTIONS
Program or Sector Goal: The broader objective to which this project contributes: (A-1)	Measures of Goal Achievement: (A-2)	(A-3)	Assumptions for achieving goal targets: (A-4)
To improve the health status of the rural poor. Sub-goal: To reduce the incidence of enteric and bacterial diseases among participating community members.	Reduction in reported incidence in enteric, parasitic and related diseases at rural health posts.	Medical records from hospitals MOH/DSA data Consultants visits and report.	That the GOB and MOH will continue to support a program of improving the level of health in rural areas; That a positive correlation exists between the overall health status of rural people and the provision of potable water, i.e., more water is "first best" and proximity to water source is conducive to greater usage of water

AID 1020-28 11-73)

PROJECT DESIGN SUMMARY
LOGICAL FRAMEWORK

Life of Project:
From FY _____ to FY _____
Total U. S. Funding _____
Date Prepared: _____

Project Title & Number: _____

NARRATIVE SUMMARY	OBJECTIVELY VERIFIABLE INDICATORS	MEANS OF VERIFICATION	IMPORTANT ASSUMPTIONS
Program or Sector Goal: The broader objective to which this project contributes: (A-1)	Measures of Goal Achievement: (A-2)	(A-3)	Assumptions for achieving goal targets: (A-4)
Project Purpose: (B-1)	Conditions that will indicate purpose has been achieved: End-of-Project status. (B-2)	(B-3)	Assumptions for achieving purpose: (B-4)
Project Outputs: (C-1)	Magnitude of Outputs: (C-2)	(C-3)	Assumptions for achieving outputs: (C-4)
Project Inputs: (D-1)	Implementation Target (Type and Quantity) (D-2)	(D-3)	Assumptions for providing inputs: (D-4)

AID 1020-25 (1-73)
SUPPLEMENT 1

PROJECT DESIGN SUMMARY
LOGICAL FRAMEWORK

Life of Project:
From FY _____ to FY _____
Total U.S. Funding _____
Date Prepared: _____

Project Title & Number: _____

NARRATIVE SUMMARY	OBJECTIVELY VERIFIABLE INDICATORS	MEANS OF VERIFICATION	IMPORTANT ASSUMPTIONS
Project Outputs: (C-1)	Magnitude of Outputs: (C-2)	(C-3)	Assumptions for achieving outputs: (C-4)

AID 1020-28 (1-73)
SUPPLEMENT 1

PROJECT DESIGN SUMMARY
LOGICAL FRAMEWORK

Life of Project:
From FY 77 to FY 82
Total U.S. Funding $4,200,000
Date Prepared: 2/21/77

Project Title & Number: RURAL SANITATION 511-0458

NARRATIVE SUMMARY	OBJECTIVELY VERIFIABLE INDICATORS	MEANS OF VERIFICATION	IMPORTANT ASSUMPTIONS
Project Purpose: (B-1)	**Conditions that will indicate purpose has been achieved: End-of-Project status. (B-2)**	(B-3)	**Assumptions for achieving purpose: (B-4)**
To build an institutional capability within the MOH and the DSA: (a) to build new potable water and sewage facilities; (b) to educate participating communities in improved health practices and (c) to collect data in order to evaluate the health impact of water related facilities on participants.	(1) DSA's share of the MOH budget will have risen from .24 percent in 1977 to 1.32 percent in 1982. (2) All of DSA's Sanitary Field Technicians in the Departments of Cochabama and Chuguisaca will have received additional training in promotion, maintenance and simple accounting procedures. (3) DSA staff will receive salaries equivalent those paid to other personnel in GOB agencies involved in implementing similar USAID programs. (4) DSA will have introduced a Management Information System to evaluate its organizational outputs (efficiently carrying out activities related to the provision of rural water) and will be utilizing that system to improve its operations. (5) DSA will have introduced a fully functioning Division of Maintenance that will service participating communities and provide instruction in preventive and minor maintenance to selected members of those communities.	(1) GOB Budget (2) DSA Records (3) DSA and Ministry of Finance Records (4) Annual evaluations and reports by the long-term administrative advisor. (5) Joint USAID/DSA visits to participating communities and reports by the long-term administrative advisor (6) Field visits and annual joint DSA/USAID evaluations (7) Results of the baseline data survey and changes in DSA philosophy. Annual evaluation (6) Sanitation Committees will have been established and functioning in approximately 200 communities, i.e. will have obtained community support in constructing the systems and collecting the monthly maintenance fees. (7) Baseline data will be used by DSA to determine the health impact of water usage and water-related facilities on participants.	That GOB resources will be adequate to provide on-going support to the MOH as programmed. That no GOB salary or personnel freezes will be initiated affecting DSA's hiring or salary policies. That if DSA demonstrates its ability to use funds effectively and efficiently, it will be an attractive channel for the resources of other donors. That a positive correlation exists between improved health status and reduced infant mortality.

AID 1020-28 (7-71)
SUPPLEMENT I

PROJECT DESIGN SUMMARY
LOGICAL FRAMEWORK

Life of Project:
From FY 77 to FY 82
Total U.S. Funding $4.200.000
Date Prepared: 2/21/77

Project Title & Number: RURAL SANITATION 511-0458

PAGE

NARRATIVE SUMMARY	OBJECTIVELY VERIFIABLE INDICATORS	MEANS OF VERIFICATION	IMPORTANT ASSUMPTIONS
Outputs:	Magnitude of Outputs:		Assumptions for achieving outputs:
(1) 200 water systems and 7,600 pit latrines installed in communities of less than 800 inhabitants.	1. existence of facilities	1. Visits to sites	Inputs will be provided as scheduled.
(2) educational courses providing instruction in the proper utilization of potable water system operation and maintenance, tariff collection procedures and health sanitation prior to, during and after the completion of construction activities prepared and offered by DSA.	2. presentation of courses	2. (a) visits to courses, (b) consultants reports	
(3) a system to evaluate the impact of rural water on community health status designed .	3. evaluation design manuals	3. MOH/DSA records	
(4) seminars on water system installation, maintenance and evaluation, as well as health education, given for DSA personnel.	4. presentation of seminars.	4. (a) Consultants reports (b) Visits to seminars	

AID 1020-25 (1-73)
SUPPLEMENT 1

PROJECT DESIGN SUMMARY
LOGICAL FRAMEWORK

Life of Project:
From FY 77 to FY 82
Total U.S. Funding $4,200,000
Date Prepared: 2/21/77

Project Title & Number: RURAL SANITATION 511-0458

NARRATIVE SUMMARY	OBJECTIVELY VERIFIABLE INDICATORS	MEANS OF VERIFICATION	IMPORTANT ASSUMPTIONS
Project Inputs: (D-1)	Implementation Target (Type and Quantity) (D-2)	(D-3)	Assumptions for providing inputs: (D-4)
1.AID:(a) Resources for water system construction, maintenance and evaluation. (b) Technical assistance to DSA. (c) Training (in-country and foreign) of DSA personnel. 2.GOB:(a) Materials, equipment, and labor for water system construction, maintenance and evaluation. (b) Salaries of DSA personnel and operating costs. (c) Increased DSA staff. 3.Participating communities. (a) (a) Community labor to assist in water system construction. (b) Materials	1. (a) $3,400,000 (b) (i) long-term administrative advisor-30wm ($200,000-grant) (ii) long-term maintenance advisor-30wm ($200,000-loan) (iii) short-term assistance 22wm ($225,000 loan) (c) (i) training equipment and materials - $90,600 (ii) media time-$14,400 (iii) training (211 wm) - $70,000 (a) foreign - 36wm (b) in-country - 175wm 2. (a) $476,000 (b) $1,274,000 (c) 34 new staff positions as follows: Administrative Office - 7 Technical Supervision - 1 Project Assistant Engineer - 1 Construction Unit - 2 Central Maintenance Office - 2 Chuquisaca Office - 7 Chuquisaca Maintenance Office - 4 Cochabamba Office - 7 Cochabamba Maintenance Office - 3	AID and DSA records and reports Consultants reports 3. (a) $367,000 equivalent (b) $383,000 equivalent	1. Required technical assistance is available 2. Required additional personnel to staff DSA are available. 3. Required GOB resources will be forthcoming. 4. Community labor will be willing provided throughout project.

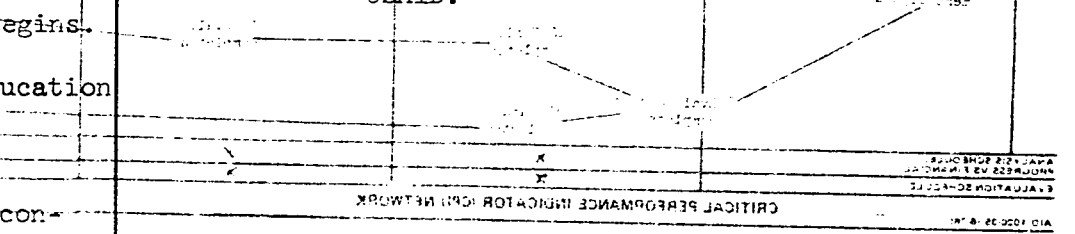
COUNTRY	PROJECT NO.	PROJECT TITLE	DATE	ORIGINAL / REVISION #	APPROVED
Bolivia	511-0458	Rural Sanitation	2/21/77	☐ ORIGINAL ☐ REVISION # ____	

PROJECT PURPOSE (FROM PRP FACESHEET)

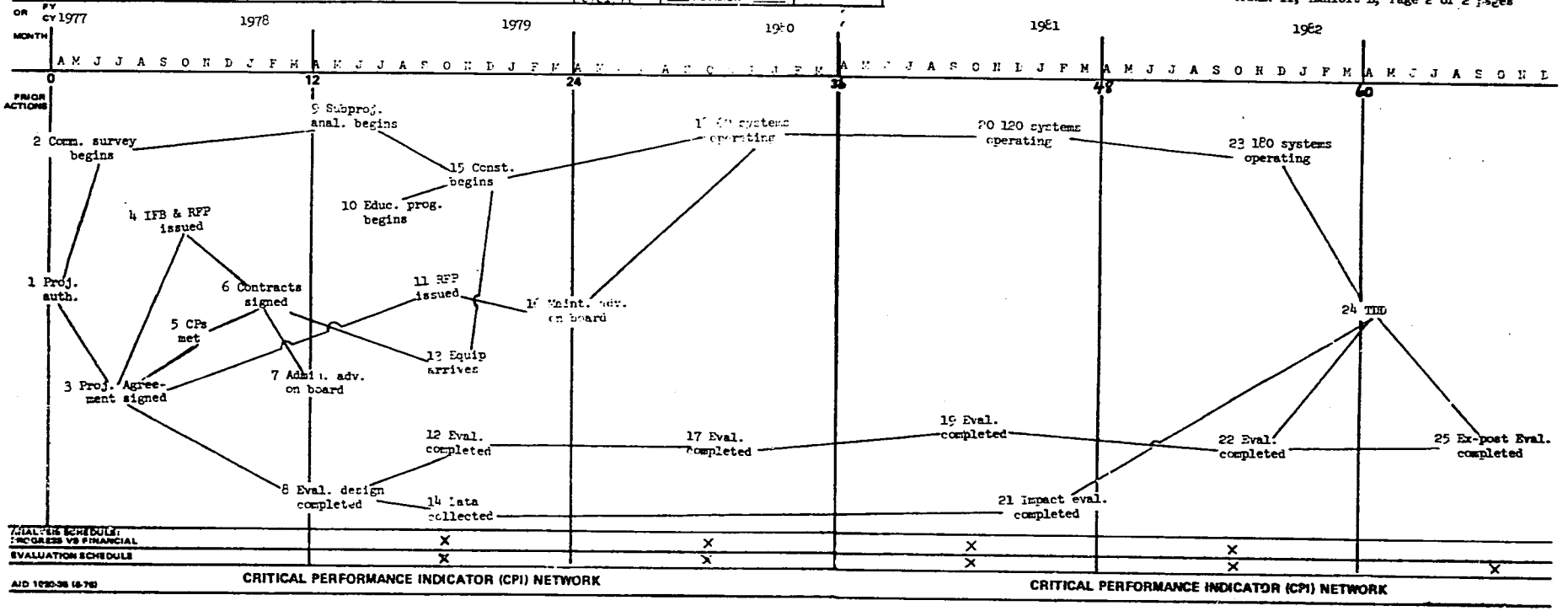
(1) To reduce the incidence of enteric and parasitic diseases among participating villagers; (2) to build an institutional capability within the MOH and the DSA: (a) to build new potable water and sewage facilities; (b) to educate participating communities in improved health practices; and (c) to collect data in order to evaluate the health impact of water related facilities on participants.

CPI DESCRIPTION

1. 3/31/77 Project authorized. Action: AID/W
2. 5/31/77 Initial community survey begins. Action: DSA.
3. 6/30/77 Project agreement between AID and GOB signed. Action: USAID, GOB
4. 9/30/77 IFB for all project equipment and RFP for long-term administrative advisor issued. Action: USAID, DSA.
5. 10/31/77 Initial conditions precedent met. Action: DSA.
6. 1/31/78 Bids awarded and contracts signed and approved for project equipment and long-term administrative advisor. Action: DSA, USAID
7. 3/31/78 Long-term administrative advisor on board. Action: DSA, USAID, advisor.
8. 4/30/78 Final design and format for project evaluation completed. Action: DSA, Division of Epidemiology.
9. 5/31/78 Analysis of individual subprojects begins. Action: DSA
10. 7/31/78 Education trials completed and an education program begins. Action: DSA
11. 9/30/78 RFP issued for long-term maintenance advisor. Action: DSA, USAID.
12. 10/31/78 First annual evaluation of program, concentrating on Management Information System (MIS) and process of project conducted and report written. Action: DSA, USAID.
13. 10/31/78 All project equipment arrives in Bolivia. Action: Suppliers.
14. 10/31/78 Baseline data collected for impact evaluation. Action: DSA, Division of Epidemiology.
15. 11/30/78 Water system construction begins. Action: DSA, communities.
16. 3/31/79 Long-term maintenance advisor on board. Action DSA, USAID, Advisor.
17. 10/31/79 Annual project evaluation conducted (See # 12) Action: DSA, USAID.
18. 11/30/79 At least 60 water systems completed and in operation. Action: DSA.
19. 10/31/80 Annual project evaluation conducted (see # 12) Action: DSA, USAID.
20. 11/30/80 At least 120 water systems completed and in operation. Action: DSA.
21. 1/31/81 First evaluation of project impact completed and report written. Action: DSA, USAID, Advisors
22. 10/31/81 Annual project evaluation conducted (see # 12) Action: DSA, USAID.
23. 11/30/81 At least 180 water systems completed and in operation. Action: DSA.
24. 3/31/82 TDD 200 water systems completed and in operation and second evaluation of project impact completed and report written. Action: DSA, USAID, Advisors.
25. 10/31/82 Ex-post evaluation completed. Action: DSA, USAID.



COUNTRY	PROJECT NO.	PROJECT TITLE	DATE	ORIGINAL / REVISION #	APPROVE
Bolivia	511-0458	Rural Sanitation	2/21/77	X /	



CRITICAL PERFORMANCE INDICATOR (CPI) NETWORK

CRITICAL PERFORMANCE INDICATOR (CPI) NETWORK

AID 1020-36 (6-70)

ACTION: f UNCLASSIFIED STATE 5293

TELEGRAM

Foreign Service of the United States of America

INCOMING

FILE DS ACTION IO: 2

INFO DIR/DD
AD
RAD
ETD
REDD
SP
RF
C
EMB 5

Control:

Recd:

Reply 1/14

Action NAN 1/12

Classification

F 192344Z JAN 77
FM SECSTATE WASHDC
TO AMEMBASSY LA PAZ PRIORITY 1159
INFO
UNCLAS STATE 005293

AIDAC

E.O. 11652: N/A

TAGS:

SUBJECT: RURAL SANITATION INTERIM REPORT

1. UPON REVIEW BY LA/DR STAFF, JUDGEMENT WAS MADE THAT DAEC REVIEW OF SUBJECT INTERIM REPORT NOT REQUIRED AND THAT PREPARATION OF PP SHOULD MOVE FORWARD SUBJECT TO THE POINTS RAISED DURING THE STAFF REVIEW, WHICH ARE OUTLINED BELOW.

2. OTHER DONORS. DEVELOPMENT OF WORLD BANK PROJECT SIMILAR TO PROPOSED PROJECT IS MOST SIGNIFICANT CHANGE TO OCCUR SINCE PREPARATION OF IRR, AND THE SIMILARITY BETWEEN THE TWO PROJECTS IS A MAJOR CONCERN. ALTHOUGH THE INTERIM REPORT PRESENTED PRELIMINARY INFORMATION INDICATING A SUFFICIENT DIFFERENCE EXISTS BETWEEN THEM TO ARGUE THAT BOTH PROJECTS ARE NECESSARY, THE PP MUST CLEARLY DISTINGUISH THE PROPOSED PROJECT FROM THAT BEING UNDERTAKEN BY THE WORLD BANK. IN ADDITION, THE PP SHOULD DISCUSS THE POTENTIAL EFFECT ON THE RELATIONSHIP BETWEEN THE TWO PROJECTS SHOULD A DETERMINATION BE MADE THAT DSA ASSIST CORPAGUAS WITH CERTAIN ELEMENTS (E.G., EDUCATION AND COMMUNITY ORGANIZATION) OF WORLD BANK PROJECT.

3. HEALTH SECTOR STRATEGY. AS MISSION IS AWARE, CONGRESS HAS RAISED QUESTIONS CONCERNING APPROPRIATENESS OF USING FOREIGN ASSISTANCE FUNDS FOR WATER AND SANITATION PROJECTS WHICH, IF CARRIED OUT COMPLETELY AND EFFECTIVELY (I.E., REPLICATED COUNTRY-WIDE), COULD COST HUNDREDS OF MILLIONS OF DOLLARS. THE PP SHOULD DEMONSTRATE (A) THAT THE AID PROJECT WILL DEVELOP THE INSTITUTIONAL CAPABILITY OF DSA, TRAIN ITS PERSONNEL AND WORK OUT OPERATING PROCEDURES WHICH WILL EQUIP IT TO CONTINUE PROJECT REPLICATION COUNTRYWIDE AFTER AID INPUTS TERMINATE; AND (B) THE VALIDITY OF AID SUPPORT FOR THIS TYPE OF PROJECT WITHIN THE CONTEXT OF THE GOB OVERALL HEALTH SECTOR

Classification

FORM FS-412
8-1-55

POST ACTION COPY

STRATEGY. A SPECIFIC SECTION OF THE PP SHOULD INDICATE HOW AID, WORLD BANK AND OTHER PROJECTS FIT WITHIN THE GOB'S STRATEGY TO RATIONALIZE THE SECTOR, AND DESCRIBE THE RATIONALE FOR BOTH THE AID AND WORLD BANK INPUTS. THIS SECTION SHOULD CLEARLY DEMONSTRATE WHY THE AID PROJECT CANNOT BE FINANCED BY ANOTHER INTERNATIONAL AGENCY. (MISSION SHOULD BE ADVISED THAT THIS PROJECT MAY BE CHALLENGED BY CONGRESS AND OUR CONGRESSIONAL NOTIFICATION WILL HAVE TO CLEARLY INDICATE WHY WE BELIEVE THAT THIS PROJECT MUST BE FUNDED BY AID.)

4. FUNDING LEVEL - THE INTERIM REPORT INDICATES THAT A LOAN OF 6.5 MILLION DOLS WILL BE PREPARED BY THE MISSION. GIVEN THE TIME-FRAME OF THE PROJECT AND DSA'S LIMITED ABSORPTIVE CAPACITY SUCH A LOAN LEVEL MAY NOT BE JUSTIFIED. WE RECOMMEND THAT THE MISSION CONSIDER A LOAN THAT DOES NOT EXCEED 4.5 MILLION DOLS.

5. PROJECT SITES - THE INTERIM REPORT INDICATES THAT DEVELOPMENT OF WATER SUPPLY AND WASTE DISPOSAL SYSTEMS WILL BE LIMITED TO COMMUNITIES WITH 600 INHABITANTS OR LESS AND THAT THE GEOGRAPHIC AREA OF COVERAGE AND THE NUMBER OF SUB-PROJECTS HAVE BEEN REDUCED SINCE SUBMISSION OF THE IEE. IN FURTHER IDENTIFYING THE TARGET GROUP AND LOCATION OF COMMUNITIES EXPECTED TO PARTICIPATE IN THE PROJECT, FIFTY PERCENT OF THE PROJECT SITES SHOULD BE SPECIFICALLY IDENTIFIED IN THE PP.

6. WATER PURIFICATION - THE INTERIM REPORT INDICATES GROUND WATER WILL BE USED AS THE WATER SOURCE WHENEVER POSSIBLE WITH WELLS BEING CAREFULLY LOCATED, CONSTRUCTED AND MAINTAINED IN ORDER TO AVOID NEED FOR WATER PURIFICATION. EXPERIENCE HAS SHOWN, HOWEVER, THAT SUCH PRECAUTIONS DO NOT ELIMINATE POSSIBILITIES OF CONTAMINATION. CONSEQUENTLY, THE NEED FOR A PURIFICATION OR DISINFECTION PROCESS SUCH AS CHLORINATION SHOULD BE CONSIDERED FOR ALL WATER SYSTEMS UNDER THE PROJECT. IF MISSION DETERMINES THAT PURIFICATION PROCESS NOT REQUIRED, PP SHOULD INCLUDE DETAILS OF ALTERNATIVE METHODS CONTEMPLATED TO MINIMIZE WATER CONTAMINATION.

7. SYSTEMS MAINTENANCE - PROPER AND EFFECTIVE MAINTENANCE OF THE WATER AND SANITATION SYSTEMS IS VIEWED AS A KEY ELEMENT TO SUCCESS OF PROJECT. FINAL PROJECT DESIGN SHOULD PLACE CONSIDERABLE EMPHASIS ON THIS COMPONENT TO ASSURE PROPER TRAINING IS GIVEN TO ALL INDIVIDUALS (DSA STAFF AND COMMUNITY MEMBERS) EXPECTED TO BE RESPONSIBLE FOR THE SYSTEMS.

8. EDUCATION - HEALTH EDUCATION PROGRAM FOR PARTICIPATING COMMUNITIES IS ANOTHER KEY ELEMENT TO PROJECT SUCCESS. PP SHOULD DETAIL CONTENTS OF ANTICIPATED PROGRAMS AND ALSO

E

EXAMINE ABILITY OF LOCAL SANITARY TECHNICIANS AND AUXILIARY NURSES TO PROVIDE INSTRUCTION. IN ADDITION, PP SHOULD DISCUSS TRAINING PROGRAM ANTICIPATED FOR INSTRUCTORS.

9. EVALUATION - FINAL PROJECT DESIGN SHOULD INCLUDE AN EVALUATION COMPONENT SIMILAR TO THAT CONTEMPLATED IN THE INTERIM REPORT BUT WHICH HAS BEEN SCALED DOWN SO THAT PROJECT RESOURCES WOULD NOT BE DISPROPORTIONATELY COMMITTED TO EVALUATION.

10. SUBMISSION SCHEDULE - A DAEC REVIEW FOR THIS PROJECT HAS BEEN TENTATIVELY SCHEDULED FOR FEB. 23, 1977. THE PP SHOULD BE IN AIDW NLT FEB. 16, 1977, TO FACILITATE REPRODUCTION AND DISTRIBUTION.

KISSINGER

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ANNEX II
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SUBJECT: DAFC REVIEW OF FY 76 RURAL SANITATION AID RURAL HEALTH DELIVERY SERVICES IRR'S

1. THE SUBJECT PROJECTS ARE APPROVED FOR INTENSIVE REVIEW. THE RURAL HEALTH DELIVERY SERVICES (RHDS) LOAN WILL APPEAR IN THE FY 1976 CONGRESSIONAL PRESENTATION AT A LEVEL OF DOLS 5.3 MILLION AND THE RURAL SANITATION LOAN WILL APPEAR AS A SHELF FY 1976 LOAN AT A LEVEL OF DOLS 8.0 MILLION. SUBMISSION OF THE RHDS PROJECT PAPER (PP) IS TENTATIVELY SCHEDULED FOR MARCH, 1975. RESULTS OF THE AID/W REVIEW OF THE HEALTH SECTOR ASSESSMENT ARE BEING TRANSMITTED BY SEPARATE CABLE WHICH INCLUDES GUIDANCE ON THE FY 75 EDP PROP.

2. RURAL SANITATION

IN DEVELOPING THE CAP, USAID SHOULD GIVE PARTICULAR ATTENTION TO THE FOLLOWING POINTS:

(A) PROJECT PURPOSE

(1) ANTICIPATED HEALTH BENEFITS (E.G. REDUCED MORBIDITY AND MORTALITY) SHOULD BE DESCRIBED FOR THE LEVELS OF TECHNOLOGY AND INVESTMENT CONTEMPLATED UNDER THE PROJECT.

(2) IN ADDITION TO GEOGRAPHIC LOCATION, THE TARGET GROUP SHOULD BE DEFINED IN TERMS OF THE ROLE COMMUNITY INITIATIVE AND ABILITY TO PAY WILL PLAY IN SELECTION OF SUB-PROJECTS. EQUITY IMPLICATIONS OF ABILITY TO PAY SHOULD BE CONSIDERED, AND A RATIONALE DEVELOPED FOR SELECTIVE SUBSIDIZATION BASED ON EXPECTED HEALTH IMPACT AND/OR RELATIONSHIP OF THE SUB-PROJECT TO RHDS ACTIVITIES.

(3) THE PROJECT SHOULD BE DESIGNED TO INSTITUTIONALIZE GOB CAPACITY FOR RURAL WATER AND SEWERAGE INSTALLATION AND MAINTENANCE, INCLUDING EXPANSION OF OUTREACH TO MORE ISOLATED RURAL INHABITANTS BY REGIONAL WATER AUTHORITIES TO ASSUME MINISTRY OF PUBLIC HEALTH (MOH) RESPONSIBILITIES IN RURAL AREAS OVER THE NEXT FIVE YEARS.

(B) TECHNICAL FEASIBILITY

(1) THE CAP SHOULD IDENTIFY, BOTH LOCAL AND IMPORTED

AND AVAILABILITY.

(2) A WATER RESOURCE SURVEY SHOULD BE CARRIED OUT AS A MEANS FOR SELECTING POTENTIAL SITES AND ESTIMATING THE COST OF SYSTEMS TO BE INSTALLED. THE SURVEY SHOULD BE AS THOROUGH AS POSSIBLE, WITHIN LIMITS OF TIME AND REASONABLE COST. IT IS SUGGESTED THAT USAID AND THE MOH UTILIZE ERTS SATELLITE DATA, DATA AVAILABLE FROM THE NATIONAL STATISTICS OFFICE, SELECTED FIELD RECONNAISANCE OF EXISTING AND POTENTIAL GROUND WATER RESOURCES, AND THE RESULTS OF TWO WATER RESOURCE SURVEYS NOW UNDERWAY IN BOLIVIA.

(3) A DETAILED IMPLEMENTATION PLAN SHOULD BE INCLUDED (JOINTLY DEVELOPED BY USAID AND THE MOH) WITH SPECIFIC TARGETS AND BENCHMARKS FOR SUB-PROJECT SELECTION, DESIGN, AND CONSTRUCTION. POTENTIAL CAUSES OF DELAY, E.G. LONG LEAD TIMES FOR DELIVERY OF U.S.-MADE WELL CASTINGS, SHOULD BE TAKEN INTO ACCOUNT.

(4) THE CAP SHOULD CONTAIN A SPECIFIC PLAN FOR MOH MONITORING AND ASSISTANCE IN COMMUNITY SELF-HELP MAINTENANCE. MEDIUM AND LONG-RANGE INCENTIVES SHOULD BE DEVISED TO INSURE ADEQUATE MOH AND/OR REGIONAL WATER AUTHORITY INVOLVEMENT IN LOCAL MAINTENANCE.

(5) INNOVATIVE AND CULTURAL ADAPTATION ASPECTS OF THE PROJECT, REFERRED TO IN THE IRR, SHOULD BE FULLY DESCRIBED. CAP SHOULD ADDRESS RURAL COMMUNITY ACCEPTANCE OR REJECTION OF PROJECT CONCEPTS, AND ALTERNATIVE APPROACHES.

(C) INSTITUTIONAL CAPACITY

(1) THE CAP SHOULD ANALYZE MOH CAPACITY TO CARRY OUT UP TO 365 SUB-PROJECTS, INCLUDING TYPES AND NUMBERS OF STAFFING REQUIRED FOR EACH ASPECT OF PROJECT IMPLEMENTATION. THE CAP SHOULD INCLUDE A DETAILED DESCRIPTION OF THE SYSTEM BY WHICH THE MOH WILL IDENTIFY, CARRY-OUT, AND EVALUATE SUB-PROJECTS BASED ON AID-APPROVED SELECTION, DESIGN, CONSTRUCTION, AND EVALUATION CRITERIA. USAID MONITORING AND APPROVAL RESPONSIBILITIES SHOULD BE DEFINED FOR EACH OF THESE PHASES.

(2) THE SEPARATE NATIONAL COMMUNITY DEVELOPMENT SERVICE (NCDS) EVALUATION SHOULD BE EXPANDED TO INCLUDE A DESCRIPTION OF NCDS ADMINISTRATIVE AND STAFFING ARRANGEMENTS FOR THIS PROJECT AT THE NATIONAL, REGIONAL, AND LOCAL LEVELS, AS WELL AS MECHANISMS FOR ACTIVE COORDINATION BETWEEN NCDS AND THE MOH.

(3) THE CAP SHOULD IDENTIFY SPECIFIC TYPES AND INSTITUTIONAL SOURCES OF COMMUNITY PROMOTION, EDUCATION, AND MOTIVATION REQUIRED TO INSURE PROJECT SUCCESS. THIS WOULD INCLUDE THE TIMING OF ESSENTIAL INPUTS FROM THE RHDS PROJECT, SUCH AS LOCAL EDUCATION AND PROMOTIONAL EFFORTS BY MOH AND NCDS PERSONNEL, OUTREACH WORKERS, AND HEALTH PROMOTERS. THE HEALTH SECTOR ASSESSMENT SHOULD PROVIDE A BASIS FOR IDENTIFYING COMMUNITY

MOTIVATIONAL FACTORS AFFECTING DEMAND FOR WATER AND SEWERAGE SYSTEMS, EFFECTIVE UTILIZATION, AND ON-GOING MAINTENANCE. WITH RESPECT TO MAINTENANCE, PREVIOUS EXPERIENCE WITH COMMUNITY MAINTENANCE ON SMALLER NCDS WATER SYSTEMS PROJECTS SHOULD ALSO BE CONSIDERED IN THE PROJECT DESIGN.

(D) FINANCIAL VIABILITY

(1) ANALYSIS OF PROJECT FINANCIAL VIABILITY SHOULD INCLUDE ASSESSMENT OF PROPOSED USER CHARGES, I.E. WHAT FEE SCALE WOULD MAXIMIZEDEMAND FOR WATER SYSTEMS, AND INSURE AN ADEQUATE FINANCIAL BASE FOR COMMUNITY MAINTENANCE AND POSSIBLE EXPANSION OF THOSE SYSTEMS. USAID SHOULD CONSIDER FINANCIAL ALTERNATIVES, E.G. APPLYING USER CHARGES PRIOR TO INSTALLATION TO INSURE COMMUNITY COMMITMENT, AND SERVE AS A CASH CONTRIBUTION TO CONSTRUCTION.

(2) THE FINANCIAL PLAN SHOULD INCLUDE A LONG-RANGE (5 YEAR) ANALYSIS OF DOLLAR AND MANPOWER IMPLICATIONS FOR THE GOD (INCLUDING REGIONAL WATER AUTHORITIES) OF CONTINUING SUCH RURAL SANITATION PROJECTS WITH THEIR OWN RESOURCES. AS ACCURATE A VALUATION AS POSSIBLE SHOULD BE PLACED ON COMMUNITY SELF-HELP LABOR AND MAINTENANCE. THE CAP SHOULD CONSIDER WAYS AND MEANS OF INCREASING THE GOD CONTRIBUTION TO THE PROJECT.

(3) RURAL HEALTH DELIVERY SERVICES PROJECT

(A) COST EFFECTIVENESS

THE PROPOSED RHDS SHOULD BE EXAMINED IN COMPARISON WITH OTHER COST EFFECTIVE ALTERNATIVES, SUCH AS THE LEAST-COST DELIVERY SYSTEM DESIGN APPROACH CHOSEN FOR THE DOMINICAN REPUBLIC. THE PROJECT PAPER SHOULD JUSTIFY THE PROPOSED INVESTMENT IN DISTRICT (DCH) AND HEALTH CENTER (HCH) HOSPITALS IN TERMS OF ACTUAL BENEFITS OF REFERRAL SERVICES. THE RATIONALE FOR SELECTED INVESTMENT LEVELS SHOULD BE PRESENTED FOR EACH COMPONENT OF THE RHDS, E.G., THE BASIS FOR DETERMINING MINIMUM DRUGS AND EQUIPMENT FOR THE SANITARY POSTS, HCH'S, AND DCH'S.

(B) GEOGRAPHIC FOCUS

THE DAEC ACCEPTED THE GEOGRAPHIC FOCUS OF THE PROPOSED LOAN. HOWEVER, MISSION SHOULD: (1) STRUCTURE PROJECT DESIGN, IMPLEMENTATION, AND EVALUATION TO FACILITATE NATIONWIDE REPLICATION; AND (2) CONSIDER INCLUDING UNDER THIS PROJECT SOME EXPERIMENTAL ACTIVITY IN HEALTH DELIVERY SYSTEMS IN ONE OR MORE ALTIPLANO LOCATIONS, E.G. OPERATING OUT OF THE AYO-AYO FP CLINIC.

(C) INSTITUTIONAL CAPACITY

THE PROJECT PAPER SHOULD PRESENT A THOROUGH ANALYSIS OF OF THE MINISTRY OF HEALTH'S (MOH) OVERALL ADMINISTRATIVE CAPACITY, AND ABILITY TO IMPLEMENT THE PROJECT. GRANT AND LOAN-FUNDED CONSULTANTS SHOULD BE IDENTIFIED TO

CORRECT SPECIFIC MOH ADMINISTRATIVE DEFICIENCIES. CONSIDERATION SHOULD BE GIVEN TO POSSIBLE TECHNICAL ASSISTANCE NEEDED IN ADDITION TO THAT PROPOSED IN THE PROJECT REVIEW PAPER, AND POSSIBLE LOAN FUNDING OF OPERATIONAL TECHNICAL ADVISORS (E.G. INSTRUCTORS AT THE DCH AND HCH LEVELS) AS WELL AS ADVISORY PERSONNEL FOR THE CENTRAL MOH STAFF. PARTICULAR EMPHASIS SHOULD BE GIVEN TO STRENGTHENING MOH PLANNING AND BUDGETING CAPACITY. MOH MECHANISMS FOR FUNDS CONTROL AND MONITORING SHOULD BE SPECIFIED. CAP SHOULD EXPLORE FEASIBILITY OF INCREASING REGIONAL ADMINISTRATIVE OFFICE BUDGET AUTHORITY; USAID FOCUSING PROJECT FUNDS AT LOCAL LEVEL; AND GOB FUNDS BEING COMMITTED TO THE DISTRICT AND HEALTH CENTER HOSPITAL LEVELS.

(D) IMPLEMENTATION MECHANISMS.

(1) THE PROJECT PAPER SHOULD SET FORTH IN SOME DETAIL THE INTENDED ROLE (E.G. SERVICES AND INFORMATION DELIVERY, EDUCATION, AND ADVOCACY) OF THE PROPOSED HEALTH PROMOTERS AND OUTREACH WORKERS. THIS SHOULD INCLUDE FEASIBLE MEANS OF IDENTIFYING AND TRAINING THESE AND SANITARY POST PERSONNEL TO CARRY OUT THEIR FUNCTIONS BOTH DURING AND AFTER THE RHDS PROJECT. LA/DR WILL PROVIDE USAID WITH ADVANCE INFORMATION ON THE GUATEMALA PROJECT TO TRAIN PARAMEDICAL FIELD PERSONNEL. USAID SHOULD CONSIDER SENDING REPRESENTATIVE(S) TO OBSERVE GUATEMALA'S ACTIVITIES AND RESULTS FOR POSSIBLE ADAPTATION UNDER THE RHDS PROJECT. AID/W WILL TRANSMIT DATA ON DELIVERY SYSTEMS BEING IMPLEMENTED IN OTHER COUNTRIES AND EXPERIENCES WITH TRAINING HEALTH PERSONNEL ON A COST-EFFECTIVE BASIS. PARTICULAR ATTENTION SHOULD BE GIVEN TO MAKING RHDS FIELD PERSONNEL EFFECTIVE AGENTS OF CHANGE IN RURAL HEALTH PRACTICES. MECHANISMS FOR REGULAR, ADEQUATE SUPERVISION OF THESE LOCAL LEVEL PERSONNEL SHOULD ALSO BE DESCRIBED IN DETAIL. USAID MAY WISH TO INVESTIGATE THE CANDELARIO PROJECT IN COLOMBIA AS A POSSIBLE SUPERVISORY MODEL FOR A HEALTH REFERRAL SYSTEM.

THE PROJECT PAPER SHOULD ESTABLISH HOW AND WHEN TRAINED PROFESSIONAL AND SEMI-PROFESSIONAL MANPOWER (PHYSICIANS, NURSES, LAB TECHNICIANS) WILL BE PROVIDED FOR RURAL DCH'S AND HCH'S, AS WELL AS FOR DCH'S AND HCH'S CREATED AS THE MOH EXTENDS THE RHDS TO OTHER AREAS. THE CAP SHOULD EXAMINE CURRENT PROFESSIONAL ATTITUDES AND THE EXTENT TO WHICH TRAINING OR OTHER EDUCATIONAL MEASURES MAY BE NECESSARY TO INSURE PROFESSIONAL SUPPORT FOR PROJECT OBJECTIVES. MOH COMMITMENT TO PROPER MANPOWER UTILIZATION NATION-WIDE SHOULD ALSO BE DEMONSTRATED, E.G., PROVIDING ADEQUATE INCENTIVES TO ATTRACT AND RETAIN SUFFICIENT RURAL HEALTH PERSONNEL AT ALL LEVELS. MECHANISMS FOR TRAINING, EQUIPPING, AND SUPERVISING RHDS PERSONNEL AT ALL LEVELS SHOULD BE RELATED TO ACHIEVEMENTS EXPECTED AT THE LOCAL

RURAL LEVEL, E.G., SPECIFIC OBJECTIVES FOR VACCINATION, NUTRITION EDUCATION, AND MALARIA CONTROL.

(2) NO A.I.D. FUNDS WILL BE ALLOCATED TO PURCHASE OF DRUGS ON THE INTERNAL BOLIVIAN MARKET, UNLESS THE GOB AGREES TO IMMEDIATE STEPS TO RATIONALIZE LOCAL DRUG PRODUCTION AND PRICING PRACTICES. PURCHASE AND DELIVERY MECHANISMS MUST BE PROVIDED TO INSURE A DEPENDABLE SUPPLY OF DRUGS TO THE DCH, HCH, AND SANITARY POST LEVELS. AS THIS MAY WELL REQUIRE REFORM OF THE MOH DRUG MANAGEMENT SYSTEM, ADDITIONAL TECHNICAL ASSISTANCE NEEDS SHOULD BE CONSIDERED.

(3) THE EVALUATION OF THE NATIONAL COMMUNITY DEVELOPMENT SERVICE (NCDS) SHOULD BE SUPPLEMENTED BY A DETAILED ANALYSIS OF CAPACITY TO CARRY OUT COMMUNITY ORGANIZATION REQUIRED UNDER THIS PROJECT, AS WELL AS TO PROVIDE THIS SERVICE FOR THE MOH ON A NATION-WIDE BASIS LATER.

(4) THE PROJECT PAPER SHOULD RELATE THE MALARIA CONTROL COMPONENT OF THE RHDS PROJECT TO THE KNOWN LOCATION AND SCOPE OF CURRENT MALARIA PROBLEMS IN BOLIVIA.

(E) FINANCIAL VIABILITY

(1) THE PAPER SHOULD CALCULATE THE TIME, COST, AND MANPOWER IMPLICATIONS OF ALTERNATIVE PLANS FOR MOH EXPANSION OF THE RHDS TO THE OTHER RURAL AREAS OF BOLIVIA, INCLUDING AN ESTIMATE OF PARTICIPATION BY DONORS OTHER THAN A.I.D.

(2) THE SALARY STRUCTURE OR OTHER COMPENSATION PLAN FOR FIELD PERSONNEL SHOULD BE DESIGNED TO ENCOURAGE SANITARY POST WORKERS, HEALTH PROMOTERS, AND OUTREACH WORKERS TO EMPHASIZE PREVENTIVE RATHER THAN CURATIVE MEDICAL PRACTICES, TO THE EXTENT POSSIBLE.

(3) THE FINANCIAL PLAN SHOULD BE REVISED, WITH THE GOB FUNDING ANY MOTORCYCLES AND OPTICAL EQUIPMENT NOT ELIGIBLE FOR A.I.D. FINANCING DUE TO SOURCE AND ORIGIN.

(F) PROJECT EVALUATION

THE PROJECT PAPER SHOULD INCLUDE A LOGICAL FRAMEWORK COVERING BOTH LOAN AND GRANT ACTIVITIES. EVALUATION OF THE RHDS PROJECT SHOULD EMPHASIZE MEASUREMENT OF THE INSTITUTIONALIZATION OF A RURAL HEALTH DELIVERY SYSTEM FEASIBLE FOR MOH EXPANSION TO THE REST OF BOLIVIA'S RURAL AREAS. THE EVALUATION PLAN SHOULD INCLUDE INDICATORS TO MEASURE COMMUNITY-LEVEL IMPACT AGAINST SPECIFIC TARGETS FOR REDUCTION OF MORBIDITY AND MORTALITY RATES, REDUCED BIRTH RATES, AND IMPROVEMENTS IN RURAL HEALTH PRACTICES. A MECHANISM SHOULD BE PROVIDED TO INSURE CONTINUING MOH CAPACITY TO EVALUATE

ITS OWN HEALTH DELIVERY COST-EFFECTIVENESS AND IMPACT ON RURAL HEALTH PROBLEMS AS THE SYSTEM IS EXTENDED NATION-WIDE. THE PROJECT PAPER SHOULD PROVIDE FOR EARLY INSTALLATION OF A MECHANISM TO COLLECT ADEQUATE BASELINE DATA AT ALL LEVELS. BASELINE DATA SHOULD INCLUDE STARTING CONDITIONS, WHICH ARE PROJECT-SPECIFIC AND SOCIO-ECONOMIC, SPECIFIC TARGETS (QUANTITATIVE AND QUALITATIVE) BY YEAR, AND IF AT ALL POSSIBLE PROGRAM INDICATORS BY YEAR, AND SPECIFIC PLANNING ASSUMPTIONS. THE LATTER ARE THOSE EXTERNAL FACTORS OUTSIDE THE SCOPE OF THE PROJECT DESIGN BUT IMPORTANT TO THE SUCCESS OF THE PROJECT.

(G) TDY ARRANGEMENTS

SEPTEL FOLLOWS ON TENTATIVE RECOMMENDATIONS FOR TDY ASSISTANCE TO BE SCHEDULED OVER THE NEXT YEAR FOR DEVELOPMENT OF THE RURAL SANITATION AND RHDS PROJECTS, TO INCLUDE RECOMMENDATIONS FOR CULTURAL ANTHROPOLOGIST SERVICES ON THESE AND OTHER PROJECTS.

b. GAO CONSIDERATIONS

IN A RECENTLY ISSUED GAO REPORT, RECOMMENDATION WAS MADE THAT, "FUTURE U.S. ASSISTANCE LEVELS SHOULD BE RELATED TO SPECIFIC POSITIVE STEPS THAT THE BOLIVIAN GOVERNMENT SHOULD TAKE TO INCREASE ECONOMIC GROWTH. ALSO, U.S. ASSISTANCE FUNDS SHOULD BE RELEASED IN INCREMENTS BASED ON BOLIVIAN PERFORMANCE IN TAKING NEEDED DEVELOPMENT MEASURES."

IN LIGHT OF A.I.D.'S PRIOR EXPERIENCE, AND ANALYSIS OF GOB DEVELOPMENT PLANS, REQUEST MISSION CONSIDER HOW A.I.D. ASSISTANCE (LOAN AND GRANT) COULD BE INCREMENTALLY PHASED BASED ON SPECIFIC BOLIVIAN PERFORMANCE IN TAKING SECTORALLY RELATED DEVELOPMENT MEASURES TO ASSURE PROJECT SUCCESS, AND INCLUDE RECOMMENDATIONS IN PROJECT PAPERS ON FY 75 AND 76 PROJECTS RECENTLY APPROVED BY THE DAEC. INGERSOLL

BT
#0008

LIST OF CANDIDATE PROJECT COMMUNITIES (1977)

COCHABAMBA

No.	Status	Community	Population	Distance to Cochabamba	Proposed source
1		Sorata	389	24	Flowing water
2		Jayata	156	18	" "
3		Marquina	686	19	" "
4	S	Linde	176	6	" "
5		Molle Molle	150	23	" "
6		Chapasirca	800	120	" "
7		Coca Paja	300	80	" "
8		Cruzani	280	78	" "
9		Liriuni	190	40	" "
10		Taquiña	250	19	" "
11		Bella Vista	200	24	" "
12		Chimore	800	186	" "
13		Santa Fé	120	171	" "
14		Paredones	325	90	" "
15		Rodeo	200	98	" "
16	D	Piusilla	155	78	" "
17	D	Liriunicochi	65	76	" "
18	D	Puente Lopez	92	70	" "
19	D	Puente Pata	90	72	" "
20		Irpa Irpa	400	65	" "
21		Orcoma	350	80	" "
22		Sicaya	200	85	" "
23		Isata	350	83	" "
24		Epizana	620	127	" "
25	S	Habana	400	188	" "
26	S	Villa Esperanza	150	204	" "
1		Irvirsa	300	175	Hand-Dug Well
2	S	Lauca	100	169	" "
3		Cañadas	200	78	" "
4		Leon Rancho	250	86	" "
1		Anocaraire	473	21	Spring
2		Candelaria	215	50	"
3		Ucuchi	789	40	"
4	S	Paracti	140	151	"
5	S	San Rafael	100	149	"
6	S	Central Busch	250	165	"

No.	Status	Community	Population	Distance to Cochabamba	Proposed source
1		Llauquenquiri	200	25	Infiltration gallery/existing well
2	S	Cota	300	12	" " " "
3		Calvario	450	12	" " " "
4		Purgatorio	450	12	" " " "
5		Chipiriri	140	162	" " " "
6		Villa 14	200	172	" " " "
7		4 Esquinas	100	170	" " " "
8	S	Paracti	100	170	" " " "
9		Valle Hermoso	250	177	" " " "
10		Cristal Maya	125	152	" " " "
11		Eterazana	200	202	" " " "
12		Agrigento B	80	152	" " " "
13		Playa Ancha	140	62	" " " "
14	S	Kaporaya	250	30	" " " "
15		Achacollo	403	68	" " " "
16		Kichi Marca	90	45	" " " "
17	S	Arque	600	95	" " " "
18		Colcha	100	110	" " " "
19		Tacopaya	150	120	" " " "
1	D	Montenegro	153	24	Drilled well
2	D	Sauce Rancho "C"	162	20	" "
3	D	Mallco Chapi	107	20	" "
4	D	San Jorge	197	20	" "
5	S	Vinto Chico "B"	268	19	" "
6	D	Zanja Pampa	250	16	" "
7	D	Antofagasta	312	14	" "
8	D	Piñami Chico	119	11	" "
9	D	Piñami Grande	272	11	" "
10	S	Sirpita B	236	12	" "
11	S	Cana Rancho	400	11	" "
12	S	Caporaya	300	26	" "
13	S	Collpa Pampa A	320	30	" "
14	S	Collpa Pampa B	280	38	" "
15	D	Totorcagua	350	18	" "
16	S	Collpa	800	28	" "
17	S	Payacollo	420	20	" "
18	S	Arachaca	195	52	" "
19	D	Villa Flores	180	50	" "
20	S	Charamoco	449	177	" "

No.	Status	Community	Population	Distance to Cochabamba	Proposed source
21	S	Poquera	200	155	Drilled well
22	S	San Benito	800	40	" "
23		Santa Ana 1	120	48	" "
24		Santa Ana 2	150	45	" "
25		Chilli,Ichi	280	300	" "
26	S	Quiroga	250	370	" "
27		Villa Granado	650	375	" "
28		Pasorapa	500	390	" "
29		Tintin	300	397	" "
30		Sacabamba	600	130	" "
31		Huayculi	447	48	" "
32	S	Tolata	600	30	" "
33		Ana Rancho	400	48	" "

CHUQUISACA

No.	Status	Community	Population	Distance to Chuquisaca	Proposed source
1	D	Chuqui Chuqui	570	60	Flowing water
2	S	Surima	250	75	" "
3		Hornillos	180	105	" "
4		Rancherio	140	99	" "
5	S	El Villar	500	228	" "
6		San Antonio	182	225	" "
1	S	Tinteros	180	17	Spring
2	S	Campo Redondo	360	188	"
3		Sala Pampa	165	191	"
1	S	El Chaco	450	45	Infiltration Gallery/exist. well
2		Tuero	270	45	" " " "
3	S	Conchupata	200	170	" " " "
4		Padre Mayu	180	215	" " " "
1	S	Cochis	500	15	Drilled well
2		Mujocoya	280	225	" "
3		Lumbato	315	68	" "
4		Mendoza	250	230	" "
5	S	Limabamba	334	201	" "
6		Tarabuquillo	240	172	" "
7		Chorro	145	263	" "

**LEGEND: D = Fully designed; S = Studied (all data gathered);
Blank = Preliminary data gathered.**

DSA PERSONNEL AND SALARY LISTING (*)

Offices and Positions	Current Employees	New Employees	DSA Present Sal. Per mo. ($b)	MACAG Salary per Month ($b)	MCDS Salary per Month ($b)	% Working within Project
La Paz Central Office						
Office of the Director						
National Director	X		11,040	12,100	15,000	50
Secretary	X		2,630	2,300	3,000	50
Administrative Office						
Administrator	X		3,890	12,000	9,000	80
Accountant	X		-	7,500	7,000	80
Accounting Asst.		X	-	3,800	5,000	80
Procurement in charge		X	-	5,500	5,500	80
Warehouseman	X		2,847	3,500	4,000	70
Admin. Assistant		X	-	3,700	4,300	80
Two Laborers		X	-	-	-	80
Messenger-Janitor	X		1,454	-	-	50
Driver	X		1,740	2,300	3,000	50
Two drivers		X	-	2,300	3,000	80
Secretary		X	-	2,300	3,000	80
Technical Supervision (Urban and Rural)						
Chief of Division	X		9,390	10,000	10,000	70
Secretary		X	-	2,300	3,000	70
USAID Project						
Project Manager	X		7,735	8,000	9,000	100
Asst. Eng.		X	-	3,800 (1)	5,000 (1)	100
UNICEF Project						
Project Manager	X		7,735	8,000	9,000	

* Excluded Urban Sanitary Staff
(1) Asst. Acct. Salary

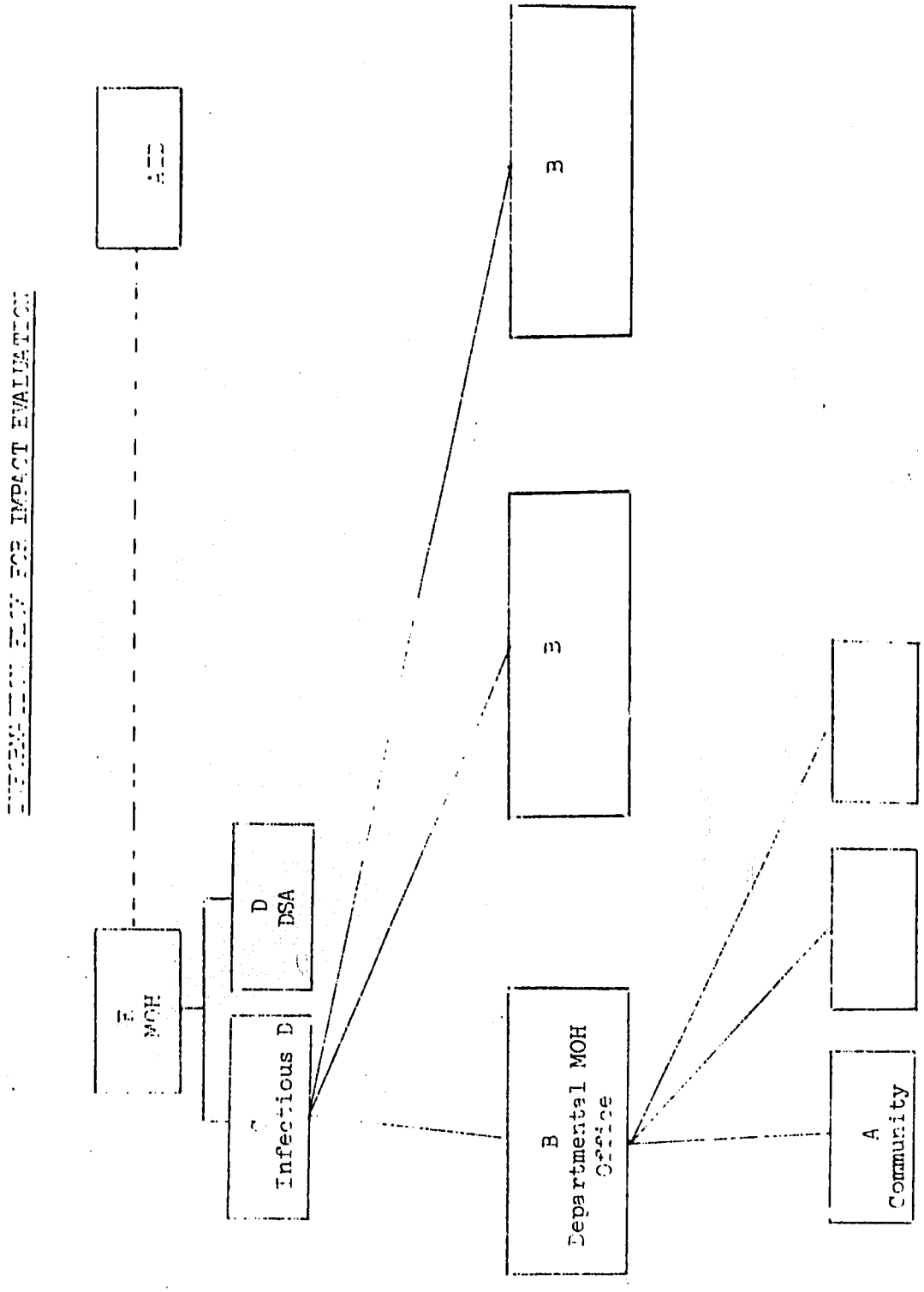
Offices and Positions	Current Employees	New Employees	DSA Present Sal. Per Mo.	MACAG Salary per Month	NCDS Salary per Month	% Working within Project
Designing & Study Unit						
Office Engineer	X		7,735	8,000	9,000	70
Draftsman-Topographer	X		2,540	3,000	4,000	70
Construction Unit						
Office Engineer	X		7,735	8,000	9,000	70
One Office Engineer		X	-	8,000	9,000	70
Draftsman-Topographer	X		2,540	3,000	4,000	70
One Draftsman-Topographer		X	-	3,000	4,000	70
Promotion Education and Evaluation						
Office Engineer	X		7,735	8,000	9,000	70
Tec. Supervisor	X		3,740	3,800 (1)	5,000 (1)	70
Maintenance						
One Systems Mechanic		X	-	4,500	6,000 (3)	100
One Assistant Mechanic		X	-	3,800 (1)	5,000 (1)	100
Chuquisaca DSA Office USAID Project						
District Chief	X		7,735	8,000	9,000	80
Two Building Supervisor		X	-	4,000	6,000	80
Sanitary Supervisor	X		2,430	4,500 (2)	6,000 (3)	80
Ten Sanitary Technicians	X		2,105	4,000	4,000	100
Administration						
One Administr/Acct.		X	-	3,000	8,000	70
One Administ/Asst.		X		1,700	4,000	70
One Secretary		X	-	1,800	2,500	70
Warehouseman	X		1,285	-	4,000	70
Driver	X		1,365	1,600	2,500	70
Two drivers		X	-	1,600	2,500	70
One Watchman-Janitor		X	-	1,400	2,000	70
One Asst. Warehouseman		X	-	1,700	4,000	70

(1) Asst. Acct. Salary (2) Tech. Extentionist (3) Building Supervisor

Offices and Positions	Current Employees	New Employees	DSA Present Sal. Per mo.	MACAG Salary per Month	MCDS Salary per Month	% Working within Project
Operation and Maintenance						
One Systems Mechanic		X	-	4,500	6,000 (1)	80
One Mechanic Helper		X	-	1,700	2,500	80
One Drilling Operator		X	-	1,900 (2)	4,000 (2)	80
Two Drilling Helpers		X	-	1,700	2,500	80
Mason	X		1,055	1,400 (3)	2,000 (3)	80
Cochabamba DSA Office (USAID Project)						
District Chief	X		7,735	8,000	9,000	80
Three Building Supervisor		X	-	4,000	6,000	100
Sanitary Supervisor	X		2,105	4,500 (4)	6,000 (1)	70
Forteen Sanitary Techs.	X		2,105	4,000	4,000	100
Administration						
One Administr/Acct.		X	-	3,000	8,000	80
One Administr/Asst.		X	-	1,700	4,000	80
One Secretary	X		1,769	1,800	2,500	80
One Warehouseman		X	-	-	4,000	80
One Driver	X		1,165	1,600	2,500	80
Three Drivers		X	-	1,600	2,500	80
One Watchman-Janitor		X	-	1,400	2,000	80
One Asst. Warehouseman		X	-	1,700	4,000	80
Operation and Maintenance						
Two Systems Mechanic		X	-	4,500	6,000 (1)	80
Two Mechanic Helpers		X	-	1,700	2,500	80
Two Drilling Operators	X		1,805	1,900 (2)	4,000 (2)	80
One Drilling Helpers	X		1,285	1,700	2,500	80
Three Drilling Helpers		X		1,700	2,500	80
One Mason	X		1,165	1,400 (3)	2,000 (3)	80

(1) Building Supervisor
(2) Tractor Operator
(3) Janitor
(4) Tech. Extentionist

Information System Outline and Interface points for Impact Evaluation. Examples of data collection instruments



A. Community Level

As part of initial site selection sanitary technician takes household census in which

1. Infant mortality over last year is collected
2. Total population is estimated
3. Other factors (individual and community) are considered (see site selection criteria).

The information is delivered in its raw form to regional supervisory personnel. Assuming an average of 60+20 households per community time should be 2-4 days per site for one person. Half that if group travels in teams.

4. If site selection has already taken place ongoing projects then only infant mortality (one year) and total population should be collected.

B. Regional Level

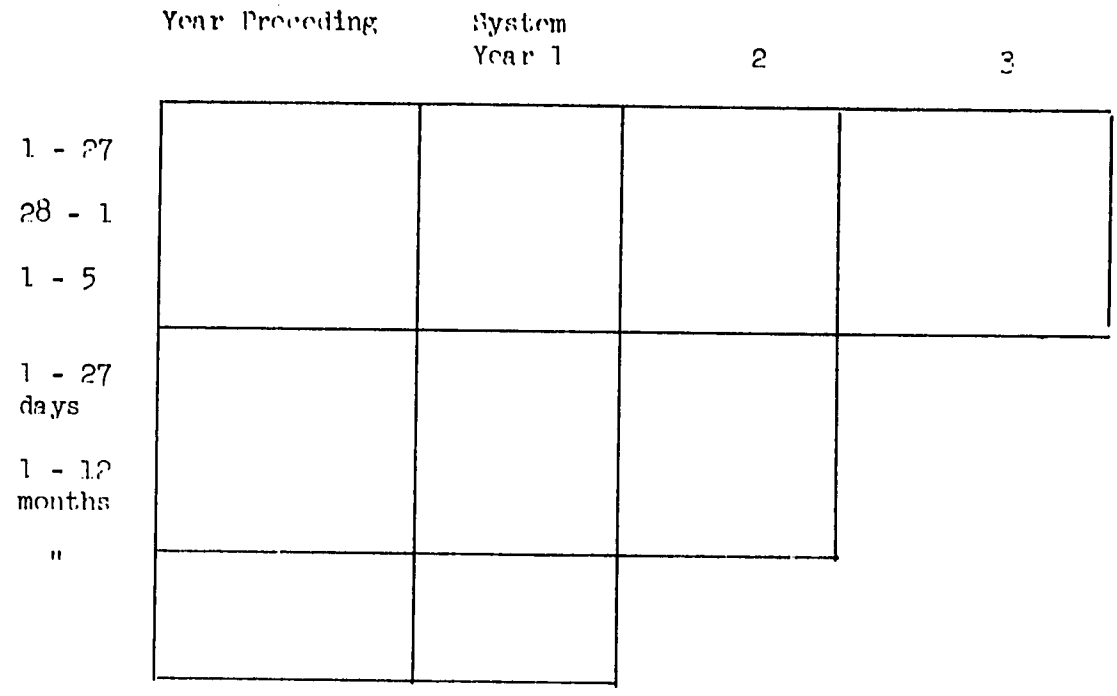
Here data gathered by D.S.A. field representatives is tabulated with information needed for site selection earmarked for Regional and La Paz consumption. Infant mortality data and denomination figures are sent on worksheets directly to MOH - epidemiological officer. Regional officers have copies of all original documents kept in their offices (departmental level).

C. Information is tabulated in MOH epidemiological offices on a yearly basis and fed to D (DSA) assuming that a 3 year project with a total of 200 systems installed might break down like this, the following information would be generated:

Total estimated systems: Year 1 40 Year 2 60 Year 3 80

Mortality	Year Preceding	System Year 1
1 - 27 days		
28 d - 1 yr.		
1 - 5 yrs.		

Table A could be generated at the end of the first year for 40 systems by community or groups of communities classified by - water system type, cost, location, etc. A 14,000 total population would be covered which would be subsequently followed for 3 years total offering a final evaluative table as such (with all three years included).



Total numbers for charges over 3,2, and 1 year of system operation could then be compared with the year immediately prior for an evaluation of short and long term impact on the areas served. If recall as to exact age of death proves difficult (as expected) groupings could be expanded.

D. On a yearly basis the information generated by Epidemiological surveillance with the MOH would be transmitted to D.S.A. personnel as well as A.I.D. etc. Field validity checks on a small random sample of communities would be routinely carried out in order to assure data quality. Further, more sophisticated analysis may also be attempted.

A Sample Information Gathering Instrument per Household

Note: This is for illustrative purposes only and is in no way a final logical format

Census: How many people live in this house?

Arbitrary groupings to be changed according to final information needs in conjunction with MOH Epidemiologists.

	Female	Male
Under 5		
6 - 10		
11 - 15		
16 - 20		
21 - 30		
31 - 40		
41 - 50		
51 +		

Impact Evaluation:

For each female over 12:

who has had sexual relations
1 = yes
2 = no

Have you had a child in the last year
1 = yes
2 = no

Have you had an: aborto (abortion) in the last year
1 = yes
2 = no
mortinato (stillbirth)

child die under 5

At what age did he die 1 - 27 days
27 days - 1 yr
1 - 5 yrs.

1	2	3	4	5	6

MAJOR CAUSES OF MORBIDITY BY AGE (excluding childbirth)

COCHABAMBA

Rank	Cause	<1	1 - 4	5 - 14	15 - 44	45+	S/D	%	Total
1	Accidents, Trauma, Burns	7	37	115	1,064	211	47	20.47	1,481
2	Complications of Childbirth	-	-	4	1,107	22	120	17.32	1,253
3	Senility and Undefined Causes	78	185	157	290	79	66	11.82	855
4	Digestive Problems	9	5	32	490	258	33	11.43	827
5	Respiratory	14	61	113	231	86	25	7.33	530
6	Heart and Circulatory	-	2	18	111	160	16	4.24	307
7	Dysentery and Gastroenteritis	58	66	19	28	28	30	3.17	229
8	Tuberculosis	2	12	9	134	63	5	3.11	225
9	Genitourinary	2	3	12	133	57	8	2.97	215
10	Nervous System	5	3	19	101	76	5	2.89	209
11	Tumors	1	1	3	75	96	5	2.50	181
12	Typhoid, Paratyphoid Fevers	-	4	40	109	20	7	2.49	180
13	Skin Disease (subcutan)	3	4	12	82	50	10	2.23	161
14	Mental Disorders	1	-	6	62	16	11	1.33	96
15	Measles	4	26	18	15	-	6	0.95	69
16	Hematopoetic Ailments	3	8	8	26	14	2	0.84	61
17	Other Bacterial Diseases	3	10	13	22	2	8	0.80	58
18	Tripanosomiasis	-	-	-	10	18	-	0.39	28
19	Typhus	-	-	-	1	-	-	0.01	1
20	Others	13	29	21	120	76	[illegible]	3.70	268
	All Causes	203	456	619	4,211	1,332	413	100.00	7,234

SOURCE: Based on data from Ministry of Health

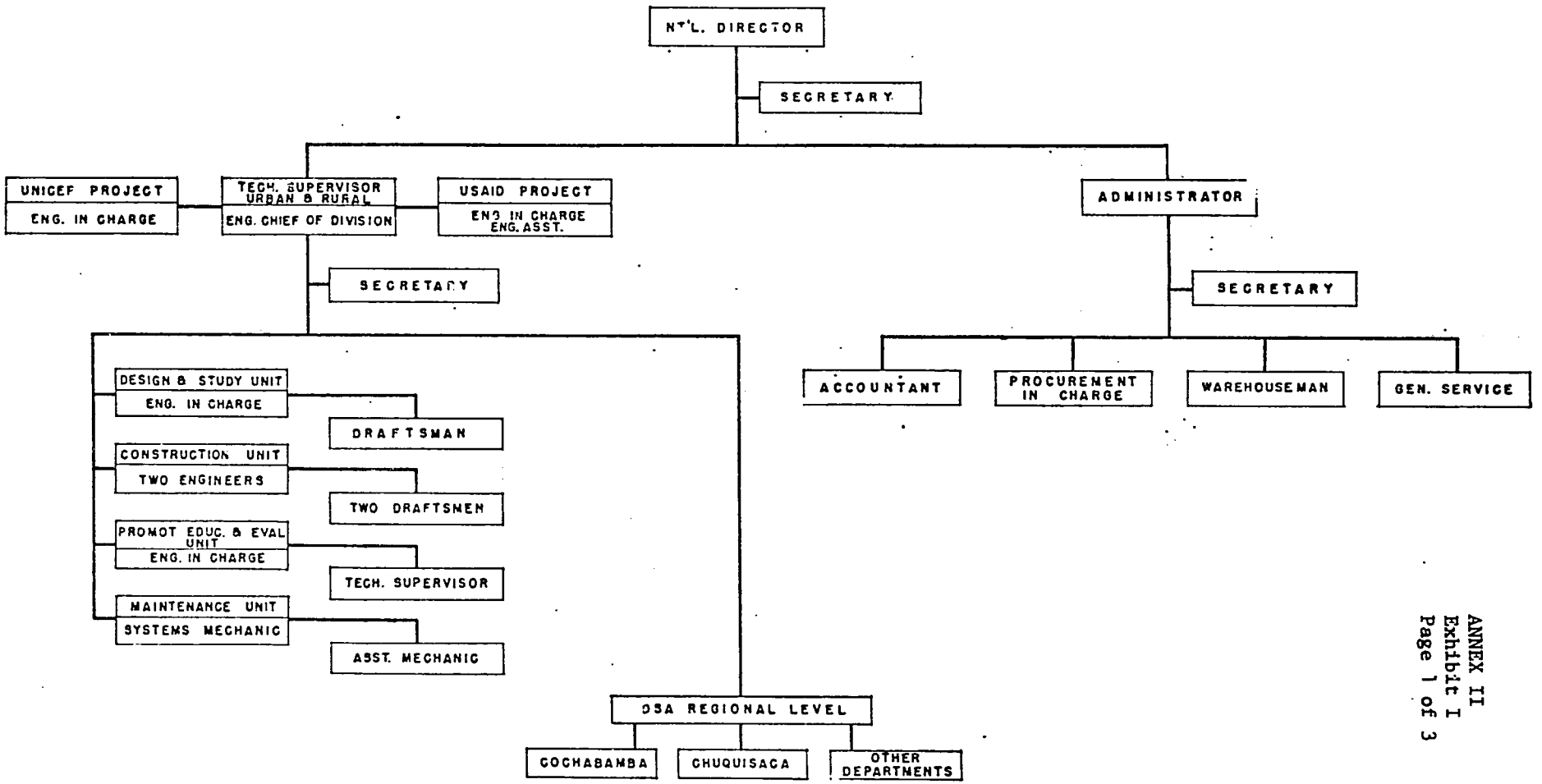
MAJOR CAUSES OF MORBIDITY (excluding childbirth, certifications)
BY AGE -
CHUQUISACA

Rank	Cause	<1	1 - 4	5 - 14	15 - 44	45+	S/D	%	Total
1	Nervous System	128	218	506	1,352	1,577	152	17.52	3,933
2	Respiratory	513	662	602	1,024	488	21	14.75	3,310
3	Accidents, Burns, Trauma	15	238	625	1,542	451	24	12.89	2,895
4	Tumors, all forms	6	27	177	875	1,332	32	10.91	2,449
5	Digestive Ailments	152	377	150	716	387	8	7.97	1,790
6	Skin Disease (subcutan)	103	130	193	539	382	12	6.05	1,359
7	Goiter	-	26	308	575	89	-	4.44	998
8	Dysentary and Gastroenteritis	241	402	74	92	32	9	3.81	850
9	Tuberculosis	7	30	123	490	162	4	3.63	816
10	Senility and Undefined Causes	58	83	106	305	154	59	3.41	765
11	Measles	67	353	274	49	-	1	3.31	744
12	Genitourinary	3	29	26	401	172	4	2.83	635
13	Other Viral Diseases	6	59	109	125	48	2	1.55	349
14	Hematopoetic Ailments	2	32	31	155	108	-	1.46	328
15	Other Skin Disease	17	41	51	73	42	4	1.02	228
16	Nutritional Deficiencies	40	114	14	15	10	-	0.86	193
17	Syphillis	5	4	4	130	11	2	0.69	156
18	Typhoid, Paratyphoid	4	36	44	42	10	-	0.61	136
19.	Trypanosomiasis	0	0	1	12	1	3	0.08	17
20	Other	20	61	68	271	74	6	2.23	500
	Total All Causes	1,387	2,922	3,486	8,783	5,530	343	100.00	22,451

SOURCE: Based on data from Ministry of Health

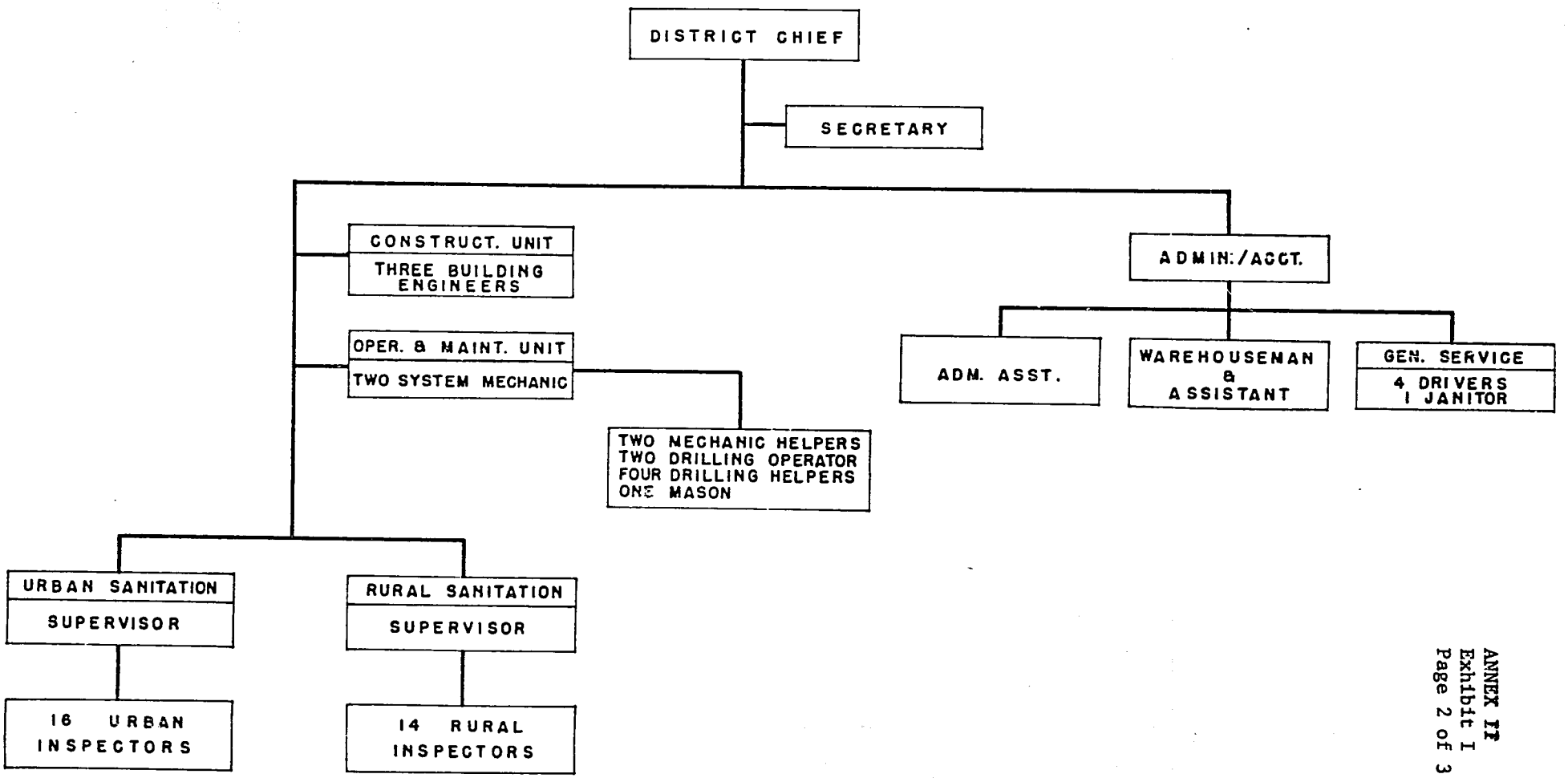
RURAL SANITATION PROJECT

DSA ORGANIZATION CHART

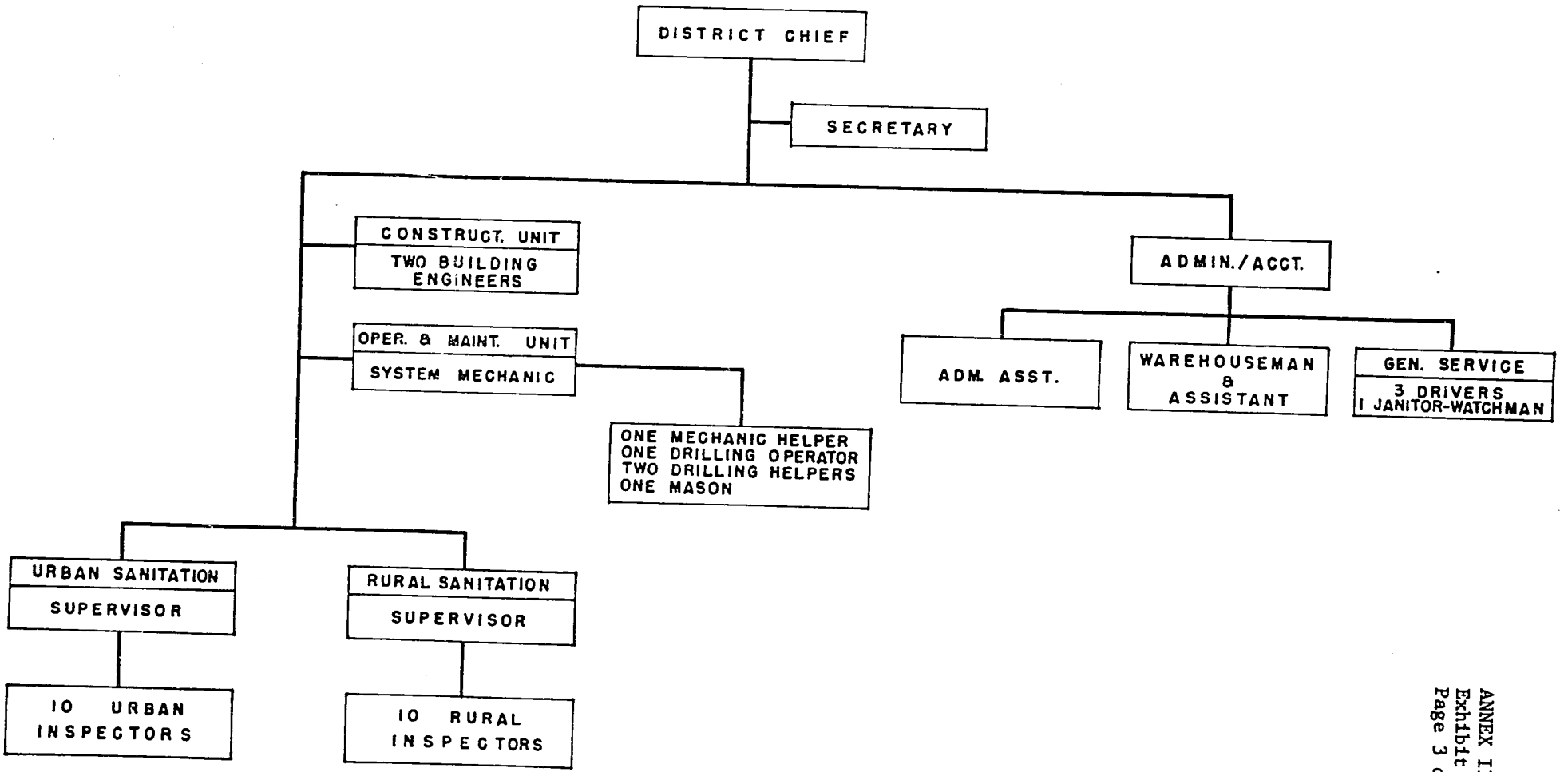


ANNEX II
Exhibit I
Page 1 of 3

RURAL SANITATION PROJECT
DSA-COCHABAMBA REGIONAL OFFICE



RURAL SANITATION PROJECT
DSA-CHUQUISACA REGIONAL OFFICE

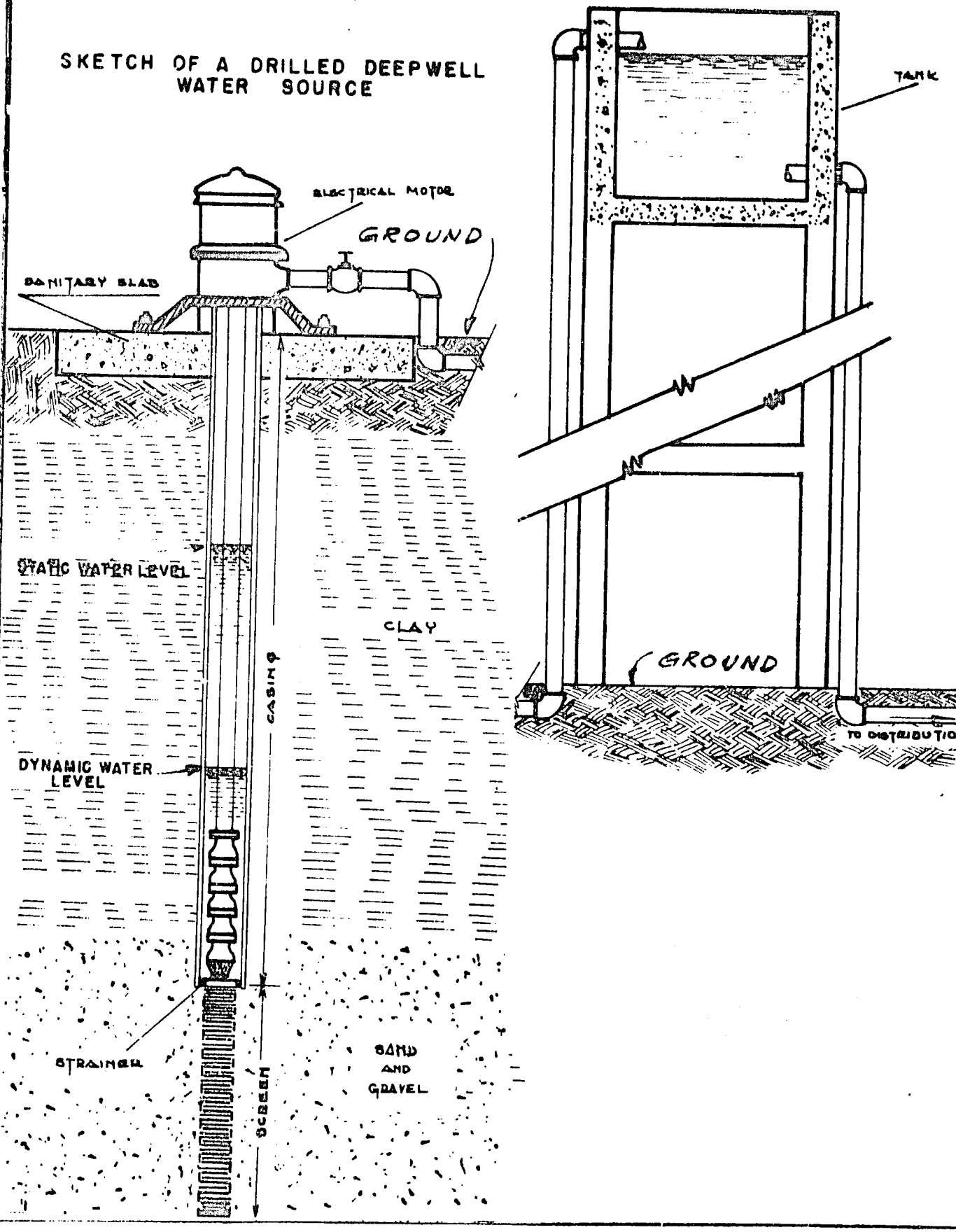


ANNEX III EXHIBIT A

TYPE A (62)

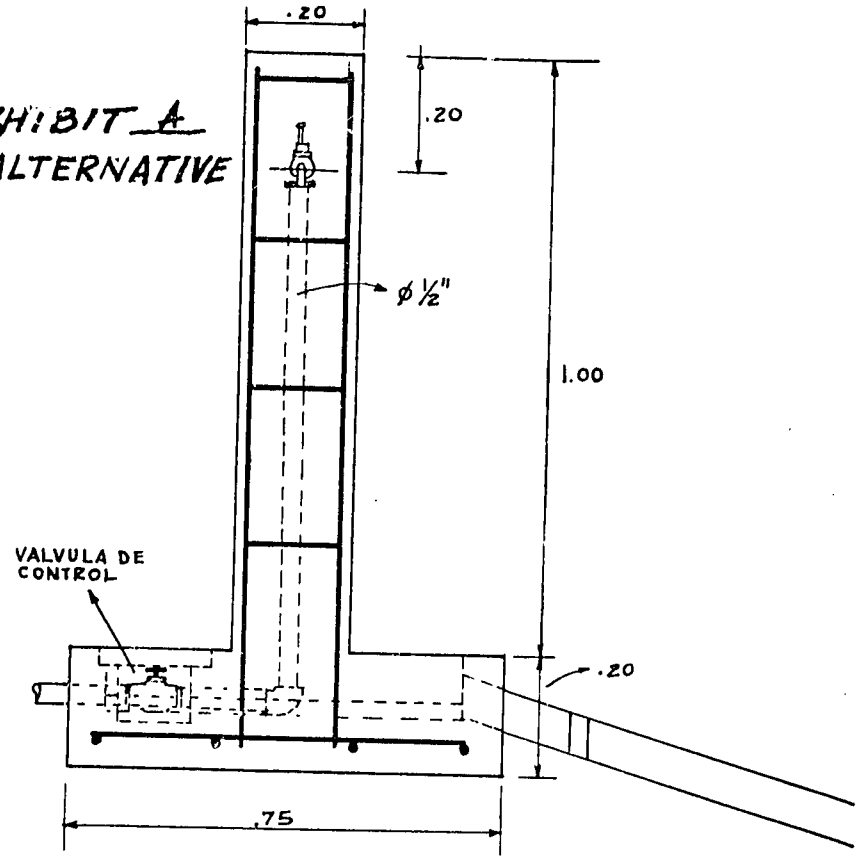
DIVISION DE SANEAMIENTO AMBIENTAL

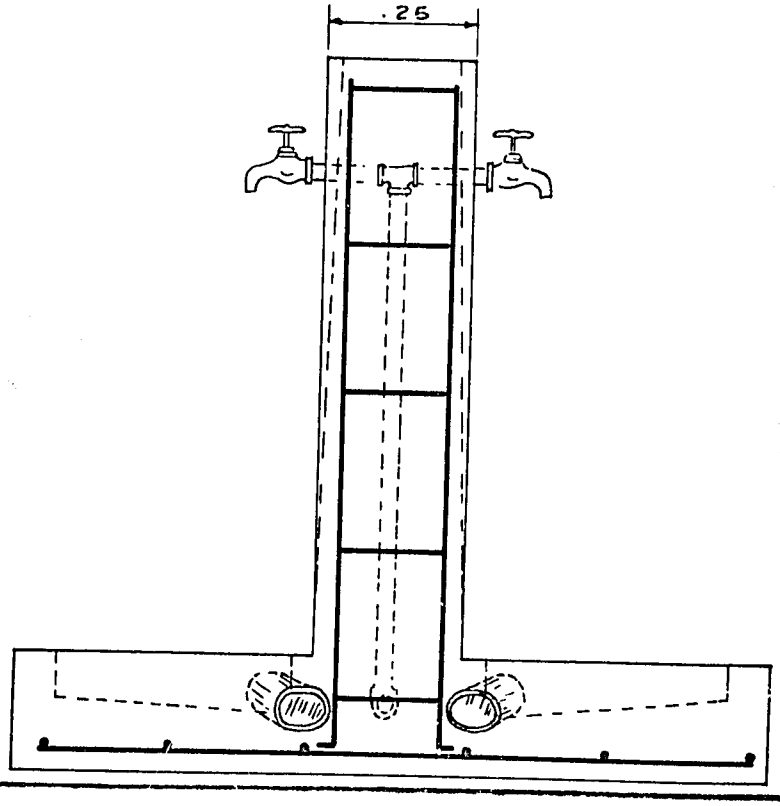
SKETCH OF A DRILLED DEEPWELL WATER SOURCE



PUBLIC TAP. TWO FAWCETS
PILETA PUBLICA TIPO 2

ANNEX III EXHIBIT A
DISTRIBUTION ALTERNATIVE

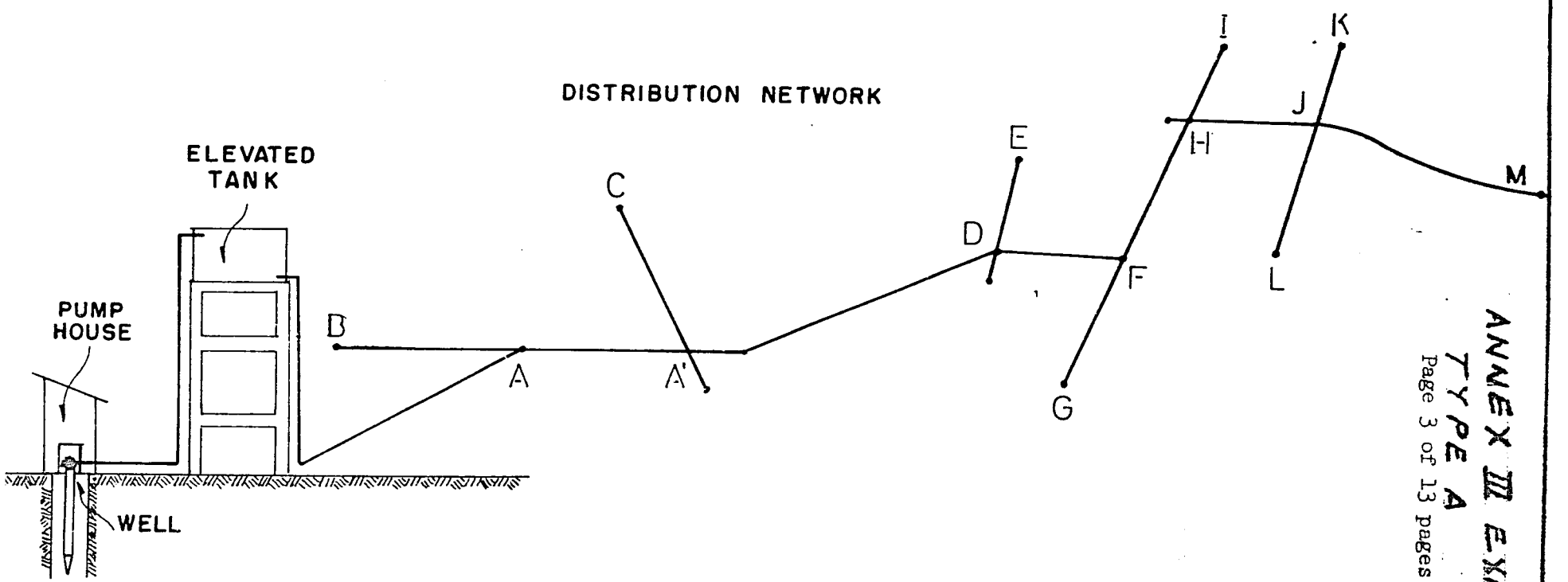




SKETCH OF WATER SUPPLY SYSTEM
FOR "MALLCO RANCHO" VILLAGE

DEPARTMENT OF COCHABAMBA

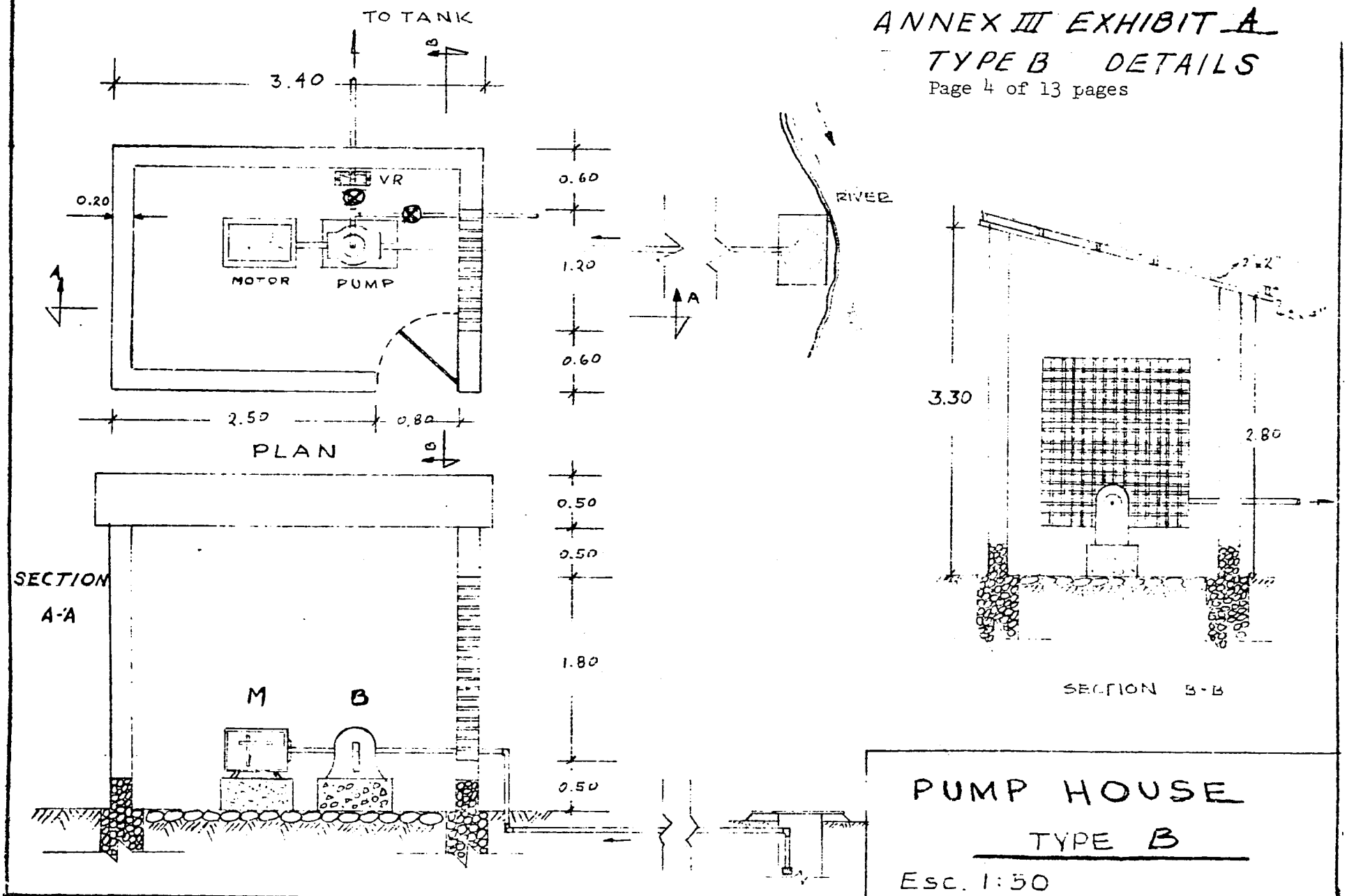
OVER ALL SKETCH TYPE A
INCLUDING NET WORK



ANNEX III EXHIBIT A
TYPE A
Page 3 of 13 pages

ANNEX III EXHIBIT A

TYPE B DETAILS



PUMP HOUSE

TYPE B

Esc. 1:50

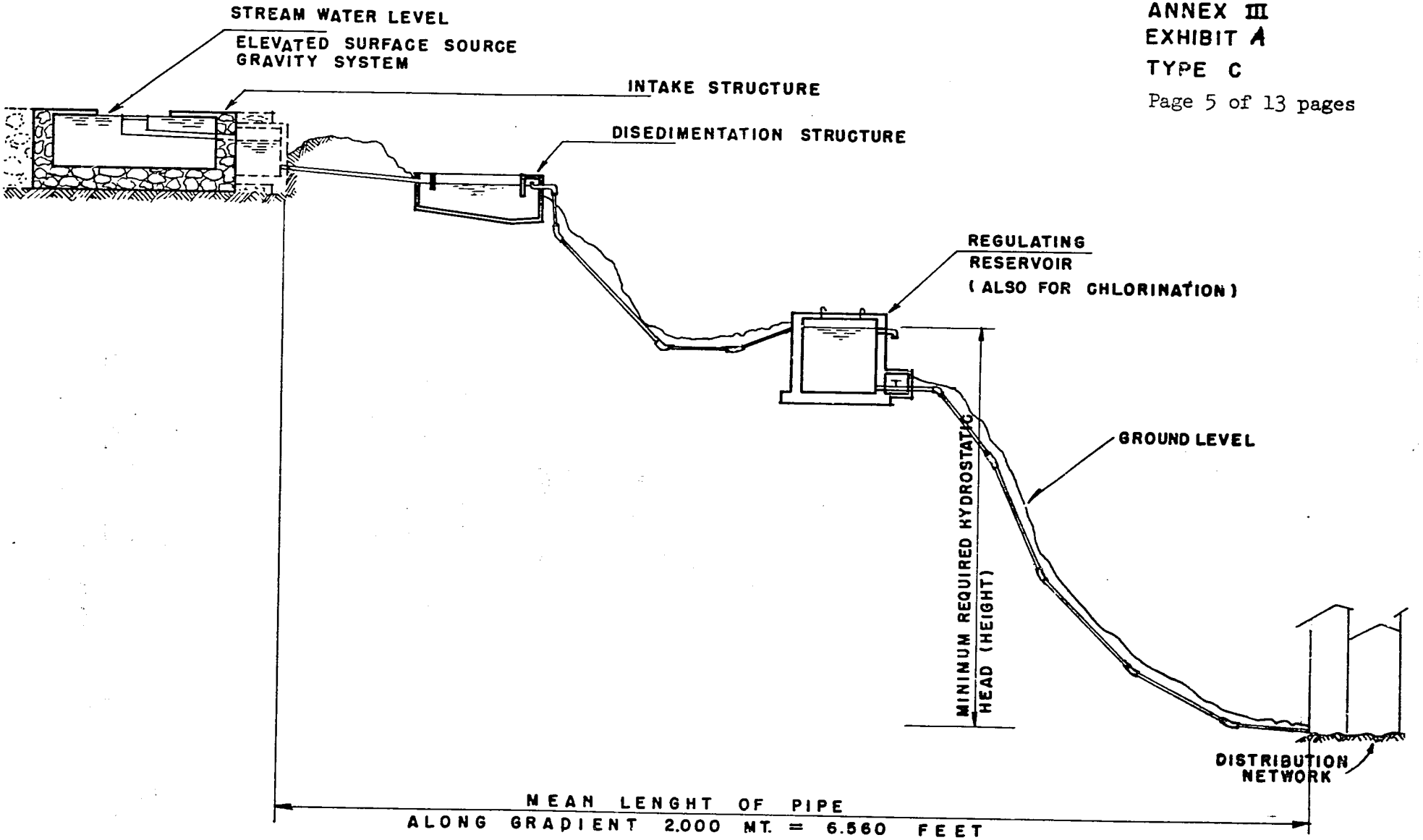
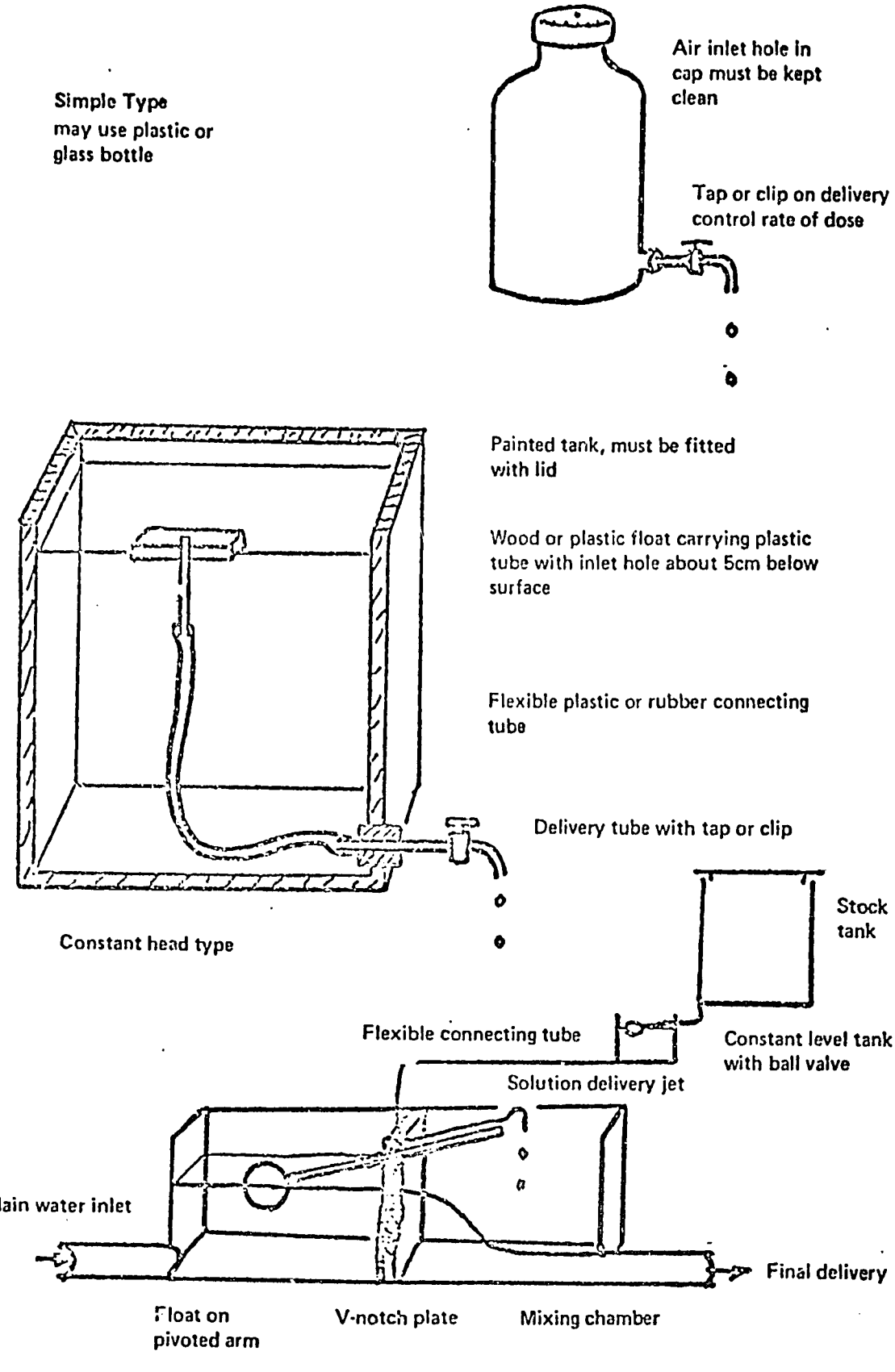

STREAM WATER LEVEL
ELEVATED SURFACE SOURCE
GRAVITY SYSTEM
INTAKE STRUCTURE
DISEDIMENTATION STRUCTURE
REGULATING
RESERVOIR
(ALSO FOR CHLORINATION)
GROUND LEVEL
MINIMUM REQUIRED HYDROSTATIC
HEAD (HEIGHT)
DISTRIBUTION
NETWORK
MEAN LENGHT OF PIPE
ALONG GRADIENT 2.000 MT. = 6.560 FEET

Fig. 19. DOSERS FOR SOLUTIONS OF COAGULANTS OR CHLORINE

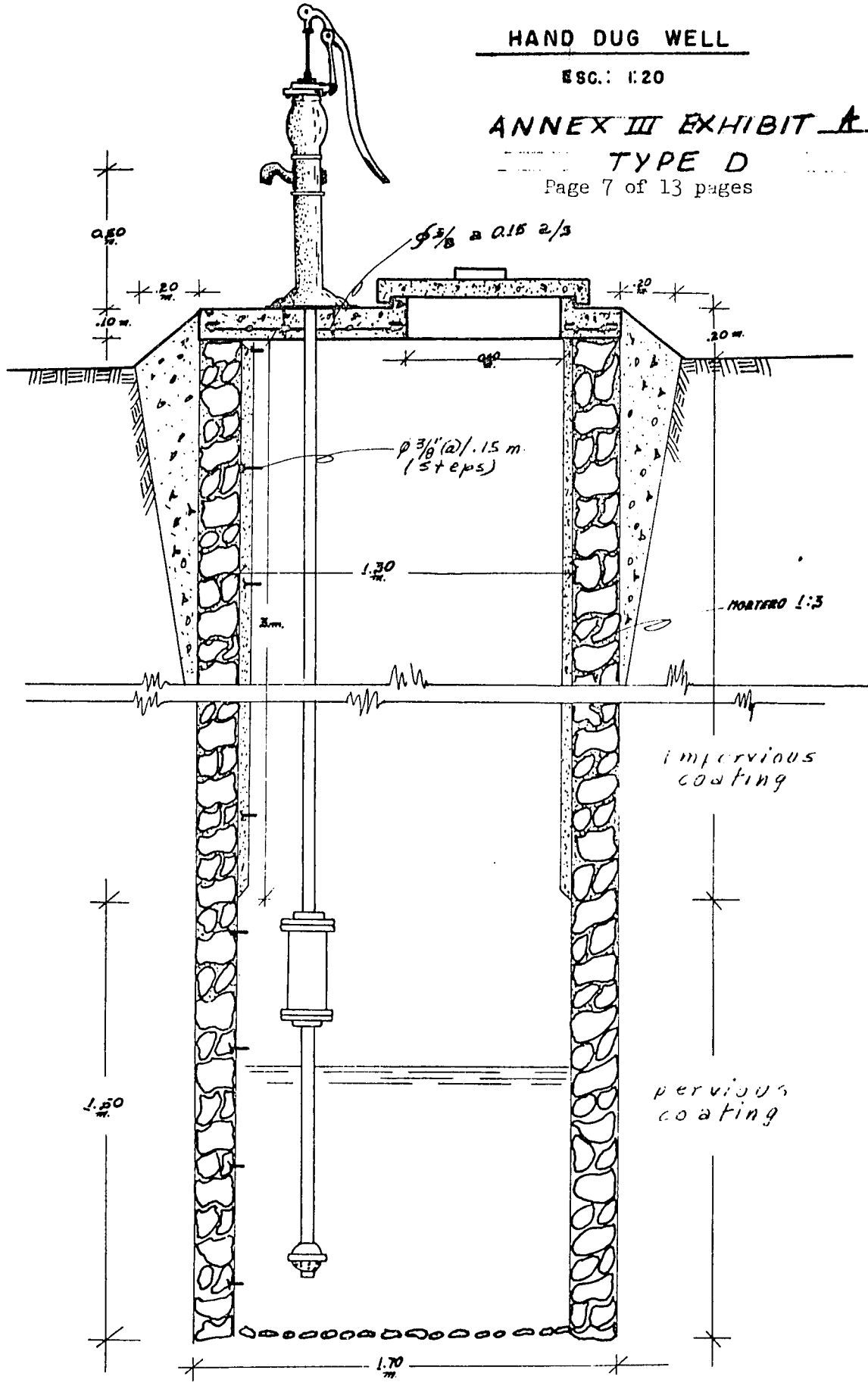


HAND DUG WELL

ESC.: 1:20

ANNEX III EXHIBIT A

TYPE D

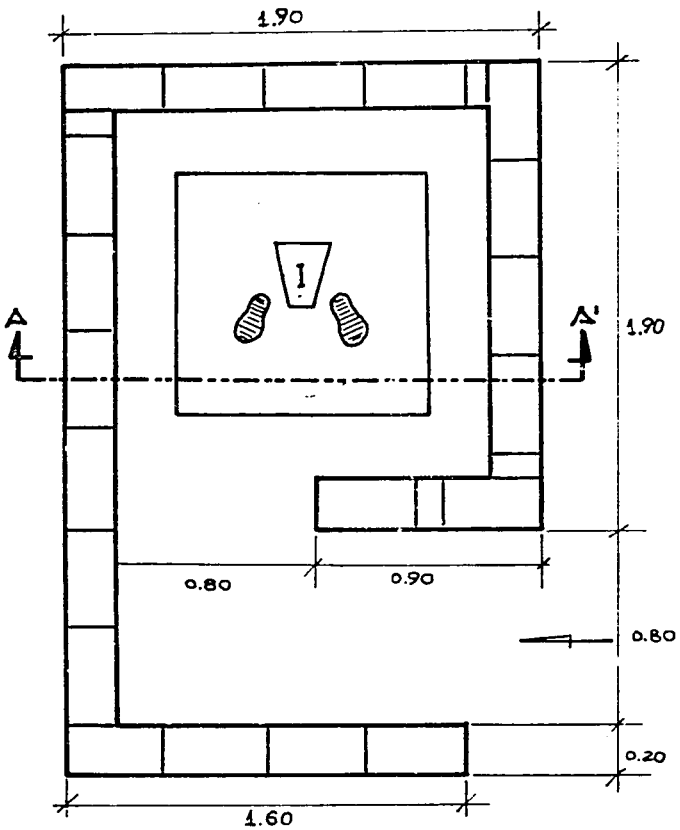


DIVISION DE SANEAMIENTO AMBIENTAL

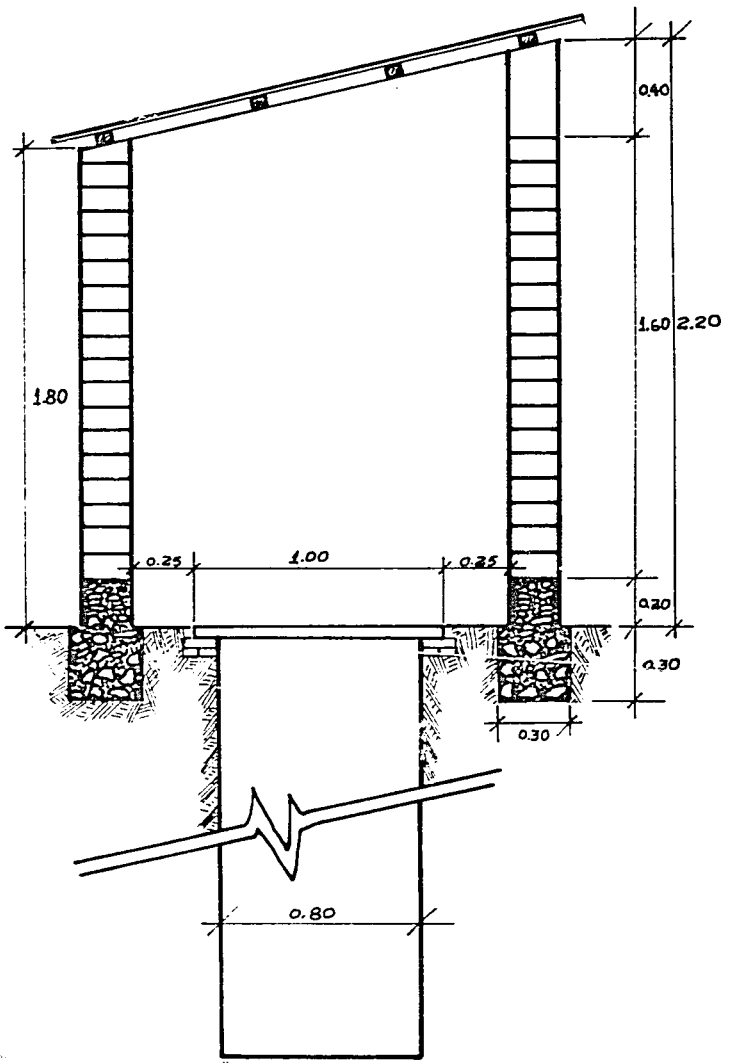
TYPICAL SANITARY LATRINE

DIMENSIONS IN MTS.

ESC. 1:30



PLAN



SECTION A'-A

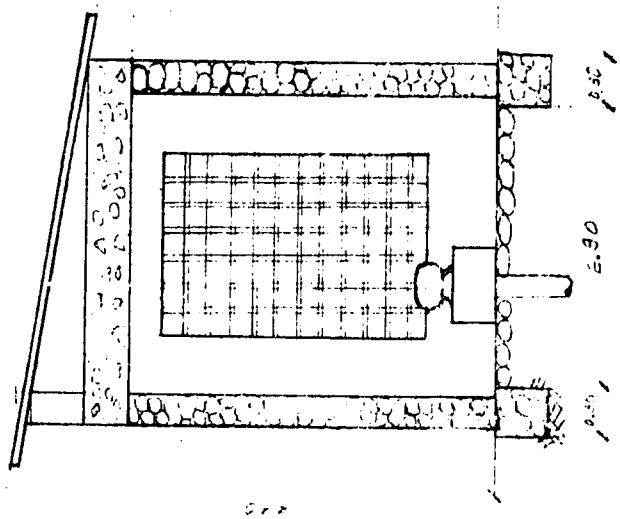
ANNEX III EXHIBIT 4

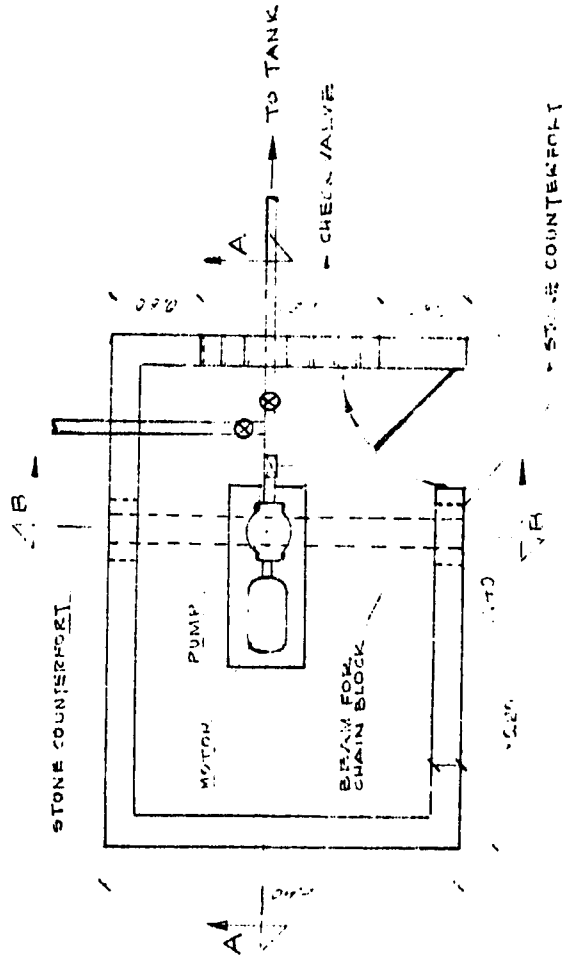
TYPICAL LATRINE

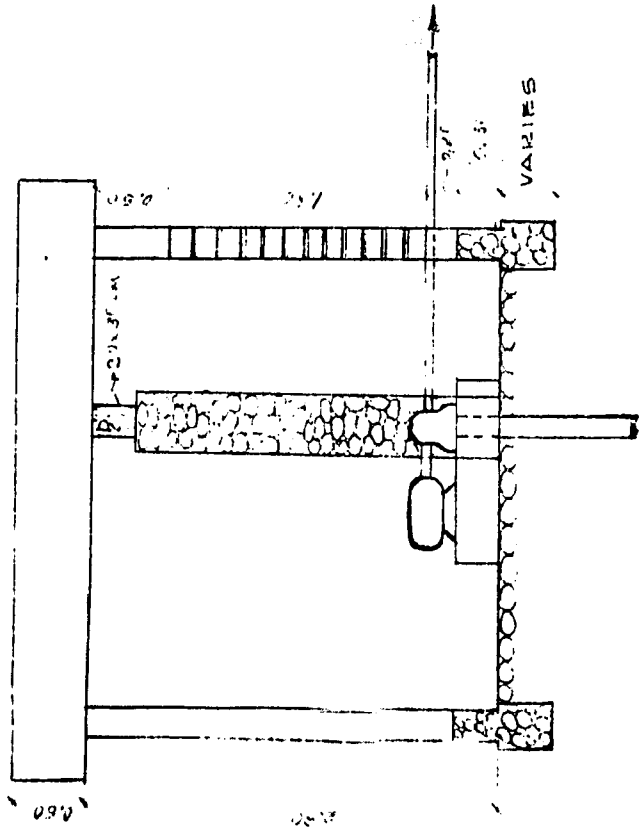
DETAILS

ANNEX III EXHIBIT A

TYPE A. DETAILS

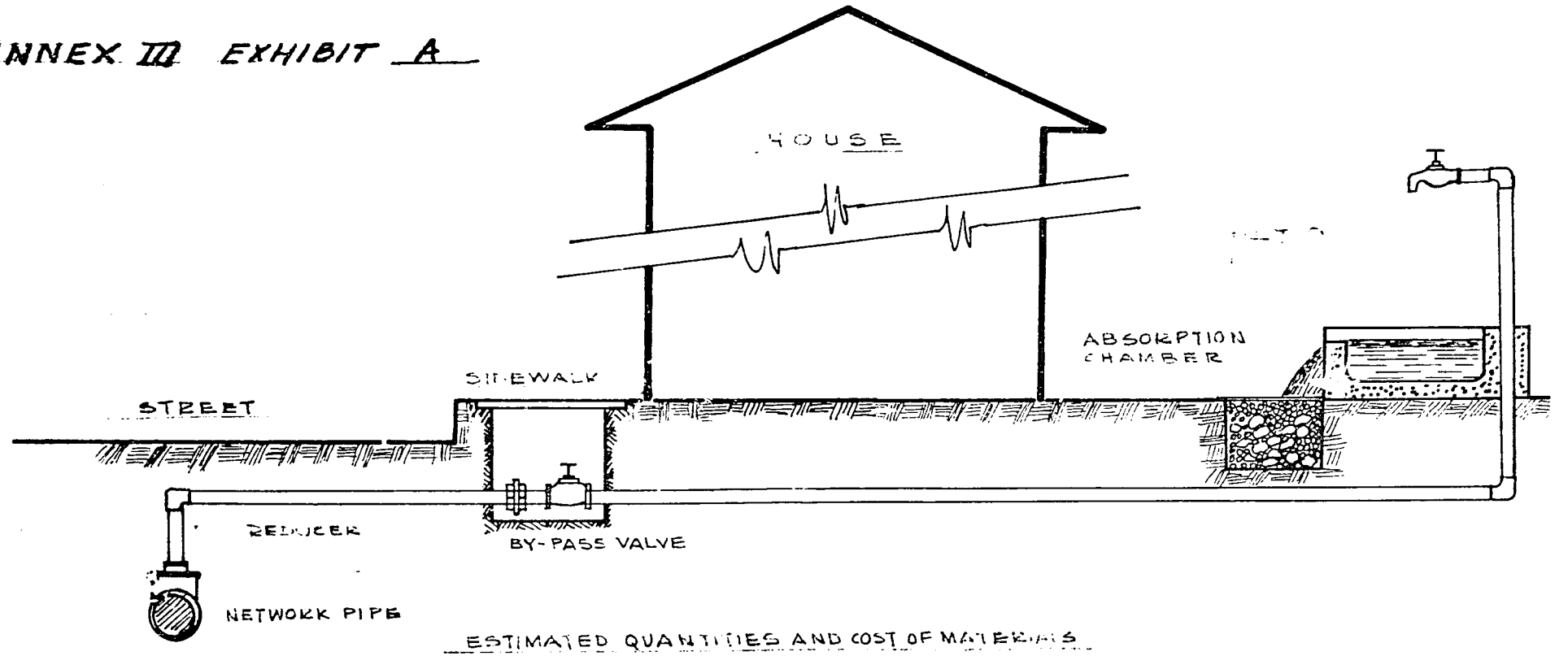






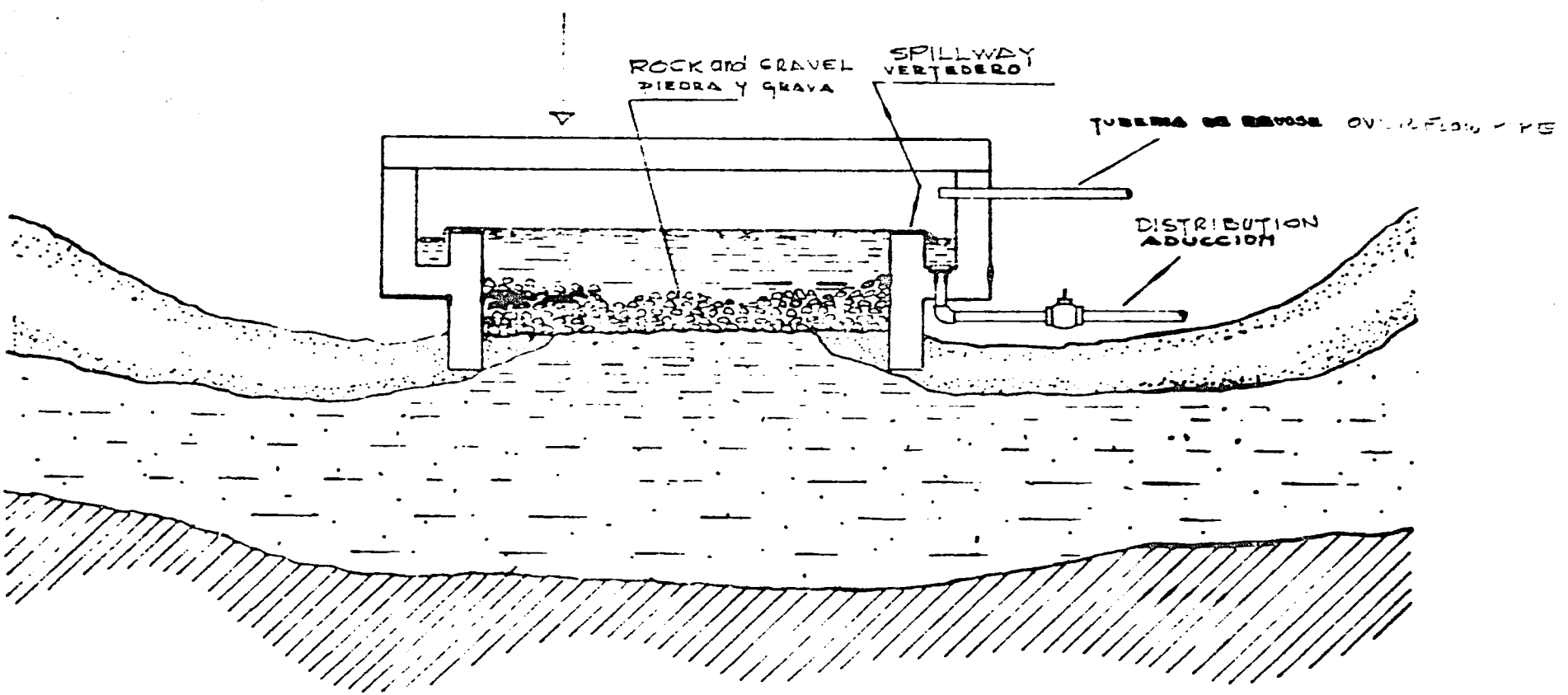
SKETCH OF A YARD CONNECTION

ANNEX III EXHIBIT A



ESTIMATED QUANTITIES AND COST OF MATERIALS

1 FAUCET 1/2" ϕ	₱ 75
12 mo. of 1/2" ϕ PIPE	₱ 216
1 Tee 1/2" ϕ	₱ 30
5 Elbows 1/2" ϕ	₱ 25
1 By-pass valve 1/2" ϕ	₱ 50
1 Reducer 1 1/2" to 1/2"	₱ 20
1 coupling 1" ϕ	₱ 8
1 Universal joint	₱ 20
1 R. concrete slab	₱ 100
1 absorption chamber	₱ 60
TOTAL COST	₱ 600



PROTECCION DE MANANTIALES TIPO ARTESIANO

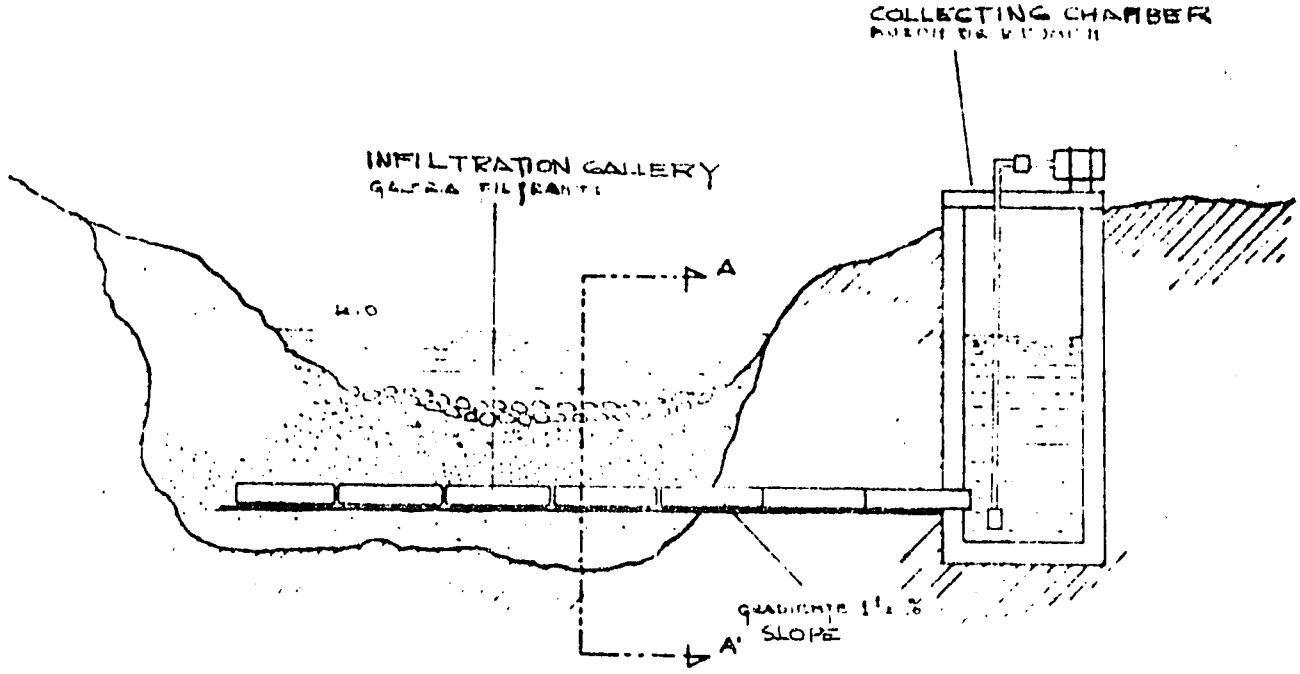
TYPE OF PROTECTION FOR ARTESIAN SPRINGS

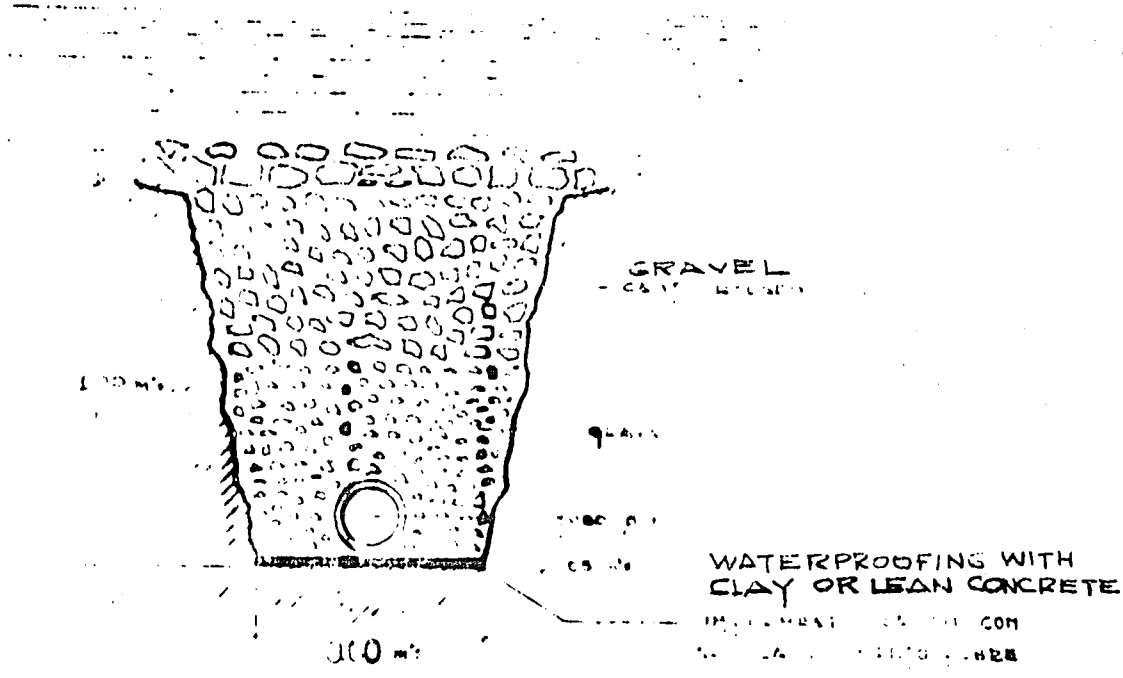
GALERIA FILTRANTE PARA

INFILTRACION DE RIOS

INFILTRATION GALLERY FOR RIVER INFILTRATION

ANNEX III EXHIBIT A

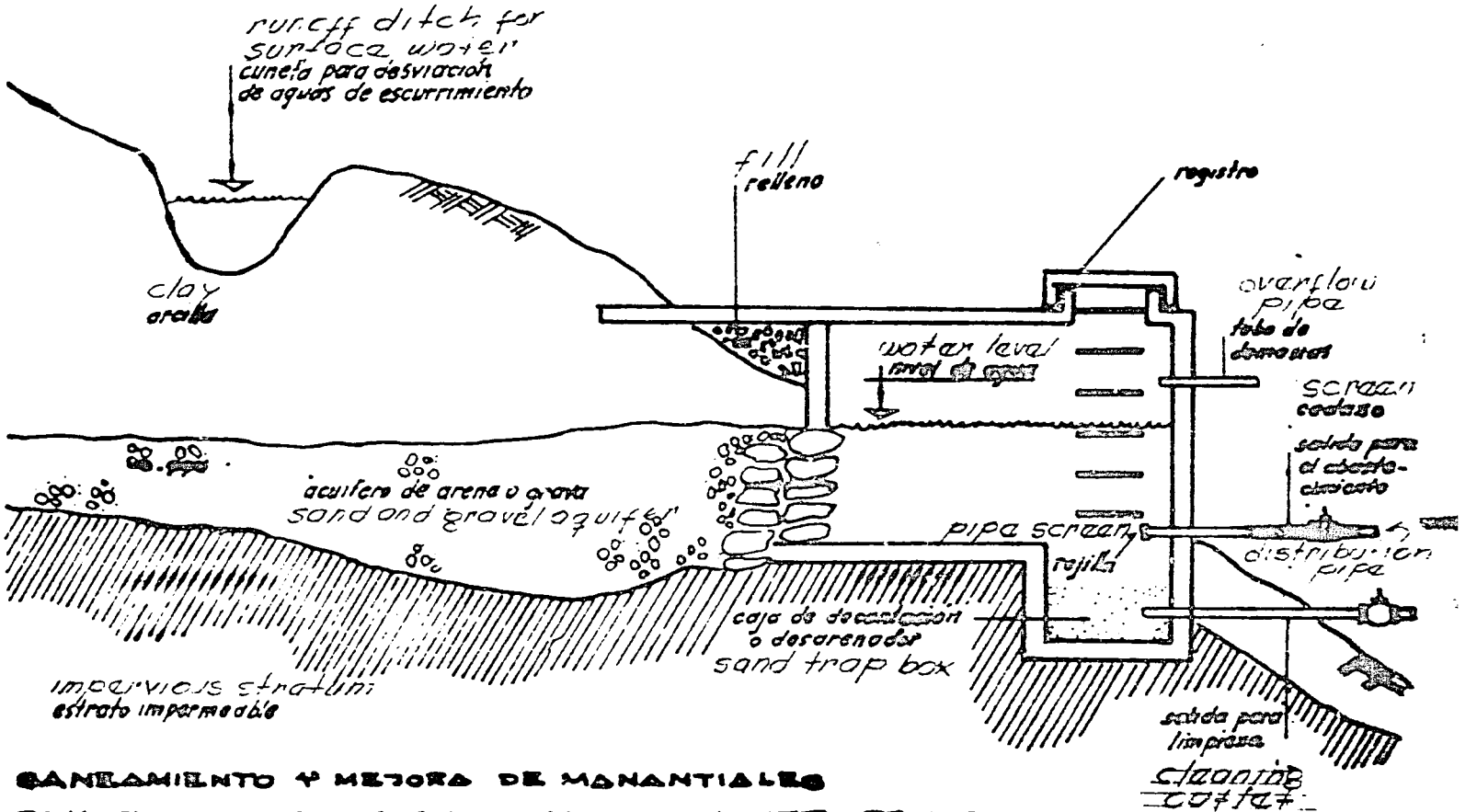




CORTE A-A'
SECTION

NOTA: EL DISEÑO DE LAS CAMARAS DE REUNION ESTA INDICADO EN EL PLANO DE GALERIA FILTRANTE PARA AGUAS SUPERFICIALES

DESIGN OF COLLECTING CHAMBERS IS INDICATED ON THE INFILTRATION GALLERY'S PLAN FOR SURFACE AQUIFERS.



SANEAMIENTO Y MEJORA DE MANANTIALES

SANITATION AND IMPROVEMENT OF WATER SPRINGS

LOAN FUNDED
EQUIPMENT PROCUREMENT
(US$)

La Paz Office

	Function	Quantity	Description	Cost
A.	Supervision			
		1	Jeep	8,300
		1	Short wave radio communication System (La Paz, Cochabamba, Sucre)	9,000
B.	Field Studies			
	(4 teams of one engineer and one topographer)	4	Pick-ups (1 ton)	38,000
		4	Surveying equipment (transits, levels, compasses, altimeters)	18,000
		8	Camping Equipment (sets)	4,000
C.	System Design			
		1	Blue-print copying machine	2,800
		1	Office copying machine	3,800
		4	Drafting tables/chairs/lamps; drawing sets, pantographs.	4,000
		1	Kardex (filing plans and drawings)	1,400
		2	Desk calculators	800
			Miscellaneous drafting supplies	3,500
D.	Administration			
		2	Kardex (office and warehouse)	1,000
		2	Office desk calculators	700
		3	Typewriters	2,700
		4	Desks/chairs	1,400
		5	Filing Cabinets	1,000
			Miscellaneous office equipment	2,200
			Office furniture, warehouse	1,400
			Sub Total La Paz	$ 104,000

Cochabamba Technical Office

	Function	Quantity	Description	Cost
A.	Project Supervision			
		1	Pick-up (1 ton)	9,500
		1	Water testing lab.	5,500
		2	Drafting tables/chairs/ lamps; drawing sets	2,000
		4	Desks/chairs	1,400
		1	Typewriter	950
		1	Desk calculator	350
			Miscellaneous office equipment and supplies	2,000
B.	Field Operations			
		2	Trucks (5 ton)	26,000
		1	Dump truck (5 ton)	16,000
		1	Water truck	14,000
		3	Pick-ups (1 ton)	28,500
		4	Jeeps	33,200
		1	Well Drilling Rig (Rotary, plus accesories)	110,000
		1	Repair/maintenance truck	36,000
		2	Concrete mixers	4,000
		2	Vibrators	4,000
		1	Air Welder	4,000
		1	Air compressor	2,200
			Miscellaneous equipment and tools	22,000
		15	Water testing units	3,000
		6	Camping Equipment (sets)	3,000
			Sub total Cochabamba	$ 327,600

Chuquisaca Technical Office

	Function	Quantity	Description		Cost
A.	Project Supervision				
		1	Pick up (1 ton)	$	9,500
		1	Water testing lab.		2,500
		2	Drafting table/chair/ lamp; drawing set		1,000
		4	Desks/chairs		1,400
		1	Typewriter		950
		1	Desk calculator		350
			Miscellaneous office supplies and equipment		1,700
B.	Field Operations				
		1	Truck (5 ton)		13,000
		2	Jeeps		16,500
		2	Pick-ups (1 ton)		9,500
		1	Well Drilling Rig (percussion, with accessories)		61,000
		1	Concrete mixer		
		1	Vibrator		
		1	Air compressor		
			Miscellaneous equipment and tools		13,600
		12	Water testing units		2,400
		4	Camping Equipment (sets)		2,000
			Sub-total Chuquisaca	$	135,400
			TOTAL	$	567,000

ALTERNATIVE FOR PUBLIC TAPS

The difference in costs for a model community of 380 inhabitants for installing house connections versus installing public taps is minimal. For type A systems the per capita increase in cost for installing house connections is about $.35/capita for type B systems about $1.40 and for type C systems the difference is about $1.35. These figures are based on the following analysis:

11 Public Taps at $90 versus 54 yard connection at $28 Family:

Difference in Costs: Applicable to types A, B and C in Part IV.

1. Cost of public taps: Has been estimated at $90 ea. Cost for 11 taps for model is 90 x 11 = $990.

Total for 54 yard connections required for each model is $28 x 54 = $1,512.

2. Additional cost for yard connections over taps per system
1,512 - 990 522

3. For yard connections, the community participation has been estimated to be $250 per system, whereas the community participation for taps has been estimated as 20% the total or 990 x 0.20 $198.

4. Therefore the additional cost to be born by the community for yard connections over tap system in $5,000 - 198 = $52. This last figure is the one that has been used in the preparation of the below table.

	DSA	COMMUNITY	LOAN	TOTAL
Differences in Cost:	-	52	470	522
TYPE A - Previous Totals (Includ.Administr. Reduction)	4,450	2,205	11,570	18,225
	-	- 52	- 470	- 522
New Totals	4,450	2,153	11,100	17,703
New Cost Per Capita:				
w/Taps (Present)	$\frac{17,703}{380}$ = $46			
w/Taps (12 Yrs.)	$\frac{354,030}{473}$ = $37			

For yard connections the present per capita cost for type A increases from $46 to $47 a difference of $1.35

		DSA	COMMUNITY	LOAN	TOTAL
TYPE B:	Previous Total	4,079	2,605	12,353	19,037
	Reduction	-	- 52	- 472	-25,224
	New Total	4,079	2,553	11,881	18.513

New Per Capita Cost:

w/Taps (Present) $\frac{18,513}{380} = \$49$

w/Taps (12 Years) $\frac{18,513}{473} = \$39$

For Yard connections the present per capita cost for type B increases from 974 to 1,002 a difference of $1.40

		DSA	COMMUNITY	LOAN	TOTAL
TYPE C:	Previous Total	4,170	3,340	14,346	21,856
	Reduction	-	- 52	- 472	- 524
	New Total	4,170	3,288	13,874	21,332

New Per Capita Cost:

w/Taps (Present) $\frac{21,332}{380} = \$56$

w/Taps (12 Yrs.) $\frac{21,332}{473} = \$45$

For yard connections the present per Capita Cost for type C increases from $56 to 57 a difference of $1.35

MAINTENANCE COSTS

The following table details the maintenance costs for type A, B and C systems for communities of 200, 380 and 600. These figures include funds for administration operation, maintenance and a reserve fund for equipment maintenance and rehabilitation.

Type of System	Total Costs per month	Monthly Cost per family
A (200 inhabitants)	$30	$1
A (380 ")	71	1.33
A (600 ")	124.50	1.45
B (200 inhabitants)	28	0.94
B (380 ")	69.80	1.29
B (600 ")	123.50	1.44
C (200 inhabitants)	13.50	0.45
C (380 ")	45.50	0.85
C (600 ")	75	0.89

Maintenance costs for hand pumps average about $1.20/month per family.

Water System - Type A (with 200 inhabitants)

		$b.
a.	Local Administration:	
	Operator salary (Incl. social benefits)	100
	Mail and colmunications	20
	Transportation	40
	Desk supplies	10
	Subtotal	170
b.	Operation:	
	Fuel and lube	220
	Subtotal	220
c.	Maintenance (Network and equipment)	120
	Subtotal	120
d.	Reserve fund for equipment rehabilitation	100
	Subtotal	100
	TOTAL	610

Monthly cost per family $\frac{610}{30}$ = $b 20

Water System - Type B (with 200 inhabitants)

a.	Local Administration:	
	Same as Type A)	170
	Subtotal	170
b.	Operation:	
	Fuel and lube	220
	Chlorination	40
	Subtotal	260

c. Maintenance		
(Network and equipment		80
	Subtotal	80
d. Reserve fund for rehabilitation		50
	Subtotal	50
	Total	560
Monthly cost per family	$\frac{560}{30}$ = $b	18.70

Water System - Type C (with 200 inhabitants)

a. Administration:		
Operator salary (Inc. social benefits)		100
Mail and communication		20
Transportation		40
Desk supplier		10
	Subtotal	170
b. Operation:		
Chlorination		40
	Subtotal	40
c. Maintenance		60
	Subtotal	60
	TOTAL	270
Monthly cost per family	$\frac{270}{30}$ = $b	9

Water System - Type A (With 600 inhabitants)

a. Local administration

Operator salary (including social benefits)	700
Mail and communications	100
Transportation	170
Desk supplies	50
Sub total	1,020

B. Operations

Fuel and Lube	700
Sub total	700

c. Maintenance (network and equipment) 450

Sub total	450

d. Reserve fund for equipment rehabilitation 320

Sub total	320
Total	2,490

Monthly cost per family $\frac{2,490}{86}$ = $b29

Water System - Type B (with 600 inhabitants)

a. Local administration

(same as type A) 1,020

Sub total	1,020

b. Operations

Fuel and Lube	700
Chlorination	150
Sub total	850

c.	Maintenance		400
		Sub total	400
d.	Reserve fund for equipment rehabilitation		200
		Sub total	200
		Total	2,470 / 86 = $b 28.70

Water System - Type C (with 600 inhabitants)

a.	Local administration		
	Operator salary		650
	Mail and communications		100
	Transportation		170
	Desk supplies		50
		Sub total	970
b.	Operation		
	Chlorination		150
		Sub total	150
c.	Maintenance		380
		Sub total	380
		Total	1,500
	Monthly cost per family	1,500 / 86 ≈	$b17.70

Note: US$1 = $b20.00

DEEP WELL SYSTEM - TYPE A
COST OF WATER SYSTEM
($US)

	DSA	COMMUNITY	LOAN	TOTAL
I. Elevated Tank:				
a. Tank	210	112	803	1,125
b. Supporting Structure	210	113	802	1,125
c. Miscellaneous Equipment	-	-	175	175
Sub-Total of I	420	225	1,780	2,425
II. Pumping System:				
a. Pump and Motor	-	-	2,250	2,250
b. Pump House	250	40	110	400
c. Well Construction	625	-	495	1,120
d. Factor to Account for dry well	155	-	125	280
Sub-Total of II	1,030	40	2,980	4,050
III. Line from Well to Distrib. Point:				
a. Pipe	-	-	1,340	1,340
b. Pipe Installation	-	-	200	200
c. Excavation and Backfill	-	300	-	300
Sub-Total of III	-	300	1,540	1,840
IV. Network:				
a. Pipe	-	-	3,235	3,235
b. Pipe Installation	-	-	770	770
c. Excavation and Backfill	-	1,390	-	1,390
d. Yard Connections	-	250	1,265	1,515
Sub-Total of IV	-	1,640	5,270	6,910
Total Direct Cost (I, II, III and IV)	145	2,205	11,570	15,225
*V. Supervision & Management:	3,000	-	-	3,000
TOTAL	4,450	2,205	11,570	18,225

* This item is estimated as 20% ± of the total Direct Costs.

Recap. for TYPE "A" :

	DSA	COMMUNITY	LOAN	TOTAL
I	420	225	1,780	2,425
II	1,030	40	2,980	4,050
III	-	300	1,540	1,840
IV	-	1,640	5,270	6,910
V	3,000	-	-	3,000
TOTAL	4,450	2,205	11,570	18,225

Cost per Capita: Present $ 48.00 (avg. 380 Residents)

To 12 Years $ 38.50 (avg. 473 Residents)

SURFACE SOURCE WITH PUMPING - TYPE B
COST OF WATER SYSTEM
($US)

		DSA	COMMUNITY	LOAN	TOTAL
I.	Elevated Tank:				
	a. Tank	210	112	803	1,125
	b. Supporting Structure	210	113	802	1,125
	c. Miscellaneous Equipment	-	-	175	175
	Sub-Total of I	420	225	1,780	2,425
II.	Pumping System:				
	a. Pump and Motor	-	-	1,300	1,300
	b. Pump House	250	40	110	400
	c. Intake Structure	210	100	790	1,100
	Sub-Total of II	460	140	2,200	2,800
III.	Line from Intake Tank to Distribution Point:				
	a. Pipe	-	-	2,700	2,700
	b. Pipe Installation	-	-	400	400
	c. Excavation & Backfill	-	600	-	600
	Sub-Total of III	-	600	3,100	3,700
IV.	Network:				
	a. Pipe	-	-	3,235	3,235
	b. Pipe Installation	-	-	770	770
	c. Excavation and Backfill	-	1,390	-	1,390
	d. Yard Connections	-	250	1,265	1,515
	Sub-Total of IV	-	1,640	5,270	6,910
	Total Direct Cost (I, II, III and IV):	880	2,605	12,350	15,835
V.	Supervision & Management:	3,200	-	-	3,200
	TOTAL	4,080	2,605	12,350	19,035

\ This item is estimated as 20% ± of the total Direct Costs.

Recap. for TYPE "B":

	DSA	COMMUNITY	LOAN	TOTAL
I	420	225	1,780	2,425
II	460	140	2,200	2,800
III	-	600	3,100	3,700
IV	-	1,540	5,270	6,911
V	3,200	-	-	3,200
TOTAL	4,080	2,605	12,350	19,036

Cost per Capita: Present $ 50.10

To 12 Years $ 40.00

SURFACE SOURCE HIGH ENOUGH NO PUMPING (Gravity System)

TYPE C
($US)

		DSA	COMMUNITY	LOAN	TOTAL
I.	Cost of Water System Intake Structure:				
	a. Intake Structure	140	50	310	500
	b. Sedimentation Tank	140	50	310	500
	Sub-Total of I	280	100	620	1,000
II.	Line from Intake Structure to Distribution Point:				
	a. Pipe (Source to town 2000 mts. avg. vs. 800 in Type B)	-	-	6,695	6,695
	b. Pipe Installation	-	-	1,000	1,000
	c. Excavation and Backfill	-	1,500	-	1,500
	Sub-Total of II	-	1,500	7,695	9,195
III.	Distribution Tank:				
	a. Tank on Surface (Regulating)	210	100	690	1,000
	b. Miscellaneous Equipment	30	-	70	100
	Sub-Total of III	240	100	760	1,100
IV.	Network (Same as Type A):	-	1,640	5,270	6,910
	Sub-Total of IV	-	1,640	5,270	6,910
	Total Direct Cost(I, II, III and IV)	520	3,340	14,345	18,205
*V.	Supervision and Management:	3,650	-	-	3,650
	TOTAL	4,170	3,340	14,345	21,855

* 20% of Direct Costs.

Recap. for TYPE "C":

	DSA	COMMUNITY	LOAN	TOTAL
I	280	100	620	1,000
II	-	1,500	7,695	9,995
III	240	100	760	1,100
IV	-	1,640	5,270	6,910
V	3,650	-	-	3,650
TOTAL	4,170	3,340	14,345	21,855

Cost per Capita: Present $ 57.50

To 12 Years $ 46.20

HAND DUG WELLS - TYPE D
10 Mt. & 15 Mts. Avg. - 12.5
COST OF WATER SYSTEM

	DSA	COMMUNITY	LOAN	TOTAL
I. Hand Dug Well:				
a. Excavation	-	63	-	63
b. Masonry Work and Sanitary Seal	125	280	295	700
c. Cover Slab & Manhole	-	18	42	60
d. Pump	-	-	100	100
Sub-Total of I	125	361	437	923
Total Direct Cost (I)	125	361	437	923
II. Administration & Management: (5%)	45	-	-	45
Total per Well	170	361	437	968
Total for 8 Wells per/Mod.	1,360	2,904	3,480	7,744

Cost per Capita: Present $ 20.35

To 12 Years $ 16.35

DESIGNING A WATER SYSTEM

In the design of a rural water supply program, a decision must be made as to the proximity of the water source to each family dwelling. Public outlets must either be strategically placed or each house should be provided with its own outlet. The closer the water source is brought to each house, the more costly is the system, and this fewer systems can be built both a given amount of resources.

Therefore, a decision must be made as to whether more villages covered with a less expensive public outlet strategy imply a greater amount of benefits than fewer villages covered with an individual house coverage strategy. The decision must be based on the two following considerations: (1) Does the public outlet system accomplish its purpose of providing potable, as well as more, water per capita which it is assumed will improve the health of the villagers by reducing various diseases; and (2) "Can the extra expense needed to increase coverage to each house be justified by the increase in benefits resulting from the reduction in distance to the water supply?".

To address the first consideration posed about the impact of the public outlet strategy, we can look at the experience with such systems in Latin America. When we speak of public outlets we are referring to two possibilities: (1) a system of several hand pump wells in a village and (2) mechanized pumpwell that distributes water via piping to several public taps in a village. In discussions with numerous professionals involved with rural water systems, there appears to be a growing disenchantment, or concern, with water systems that do not bring the water at least to the individual yard. The most important concerns are that though these limited coverage systems may provide potable water at the source but by the time it is ingested, it is not potable; that the amount of water used may not increase enough to help keep the water potable in the house; and that there may not be enough water available to keep receptacles and utensils clean.

The various diarrheal studies indicate that in-house connections provide a greater over-all improvement in health than public outlets. This improvement occurs in part because the water has a greater chance of remaining potable due to the shorter distance. The shorter distance implies less opportunity for contamination during the trip from source to the home. However, distance has an even greater

impact on water use the more water available and the easier the access the greater the probability is that water containers, dishes, utensils, clothes, food and hands will be washed regularly.

It has been estimated that as high as 50% of diarrheal causing agents do not reach the mouth by directly drinking unpotable water, but by poor personal hygiene practices, and hence could be eliminated by teaching people better hygine practices. But the success of such and endeavor depends on a readily available source of water.

It is not clear what the critical distance must be to cause water usage to rise to a level sufficient to eliminate the sources of contamination but it has been recognized that when a new water source is introduced, there must be a fairly substantial change in the distance water has traditionally been carried.

There is mounting evidence that water at the public outlet becomes contaminated as soon as it leaves the ground or public tap. If the amount of water used increased significantly, the increase in water use argument alone might justify a public outlet system. But, as we have seen, distance is a critical, and as yet, nquantifiable factor that may prevent a sufficient increase in water usage.

Another important factor effecting a public outlet system is maintenance. Experience in many countries of Latin America indicates that hand pumps and public taps are quite susceptible to breakdowns due to heavy usage. This factor coupled with what is often inadequate can lead to the complete breakdown of the system. Thus the potential benefits to accrue as result of the system are often not realized.

A final difficulty is the administration of the public water system. If each family in a community is to be financially responsible for themaintenance of the system via monthly payments, payment enforcement is often difficult because of problems in preventing delinquent users from using public taps. Experience is mixed, but the potential for problems exists. In Colombia, for example, problems with the case against public outlets is that based on the following conclusions: (1) that the health benefits anticipated will not be realized essentially because of the distance factor; (2) that if maintenance is not adequate the system will not function and hence that the benefits will not be realized and (3) that it may be difficult to collect maintenance charges which may also imply that benefits will not be realized.

One choice open to the designer, and one being given consideration by professionals in rural water systems, is to significantly increase the number of public outlets per village. The conventional wisdom had held that one hand pump or public tap could serve up to 100 people, or approximately 15 families. But given the difficulties described above, experts in rural water supply are suggesting that one hand pump or public tap should serve from 5-7 families. It is now believed that such a small number of families per outlet will install pride of ownership which will directly impact on the way in which the outlet is treated thus reducing maintenance difficulties. In addition, there is an implicit reduction in distance which may be sufficient to insure that the health benefits are realized.

When supplying the number of houses connections, consideration needs to be given to the extra cost of installing house connections. If the house connection system is cheaper, if is obviously preferable. However, if house connection are more expensive consideration must be given to whether the extra cost will elicit enough extra benefits to warrant the house connection system.

To justify the more expensive house connection system, the present value of the incremental benefits over the life of the system must be at least equal to the incremental cost per capita. In most instances there will be some health data that can be quantified, such as days lost to diarrheal bouts, and cost of associated medical treatment. It is admittedly weak data, but very conservative use of it in conjunction with nonquantifiable data can be useful to the designer. In annex , utilizing health data from the Health Sector Assessment and a consultant's report, it is estimated that a $5 incremental cost can easily be justified, and set it as the maximum limit for installing house connection systems, the basic assumption being that whenever the difference in per capita cost is $5 or less, house connection should be installed. This implies that the benefits per dollar expenditure are higher for house connections than for public outlets. Thus the construction strategy will house connections systems first, and then whenever the difference is greater than $5, public outlet systems will be constructed. Any figure above this maximum $5 incremental limit will mean that the public outlet system will be installed rather than the house connection system. Setting a maximum limit implies that there exists the possibility that the public outlet system will provide the intended service and that the benefits per dollar may be higher for it than for the house connection system when the extra cost exceeds the maximum.

Per capita incremental cost can be useful to the designer because he can combine it with the knowledge he has about the differences between the two systems (as discussed at the beginning of this section), and simply state that given all the reservations regarding public water systems, he is willing to assert that he believes that house connections will provide enough incremental benefits to justify per capita cost in no greater than a certain figure. This clearly is not the most satisfactory approach, but given the inability to quantify benefits, it would seem to be a practical one.

The purpose of calculating the incremental cost and attempting to place a value on incremental benefits is to eliminate or reduce the usual a priori decision making regarding the type of system that should be installed which so often occurs with rural water system projects.

COST ESTIMATES BY VILLAGE SIZE

To estimate the costs of the three types of water systems, Types A,B, and C, for village populations sizes of 200 and 760 respectively, we apply expansion factors to the village of 760 persons, and contraction factors to the village of 200 persons. These factors are applied to the standard cost estimates of the village of 380 persons. Annex III, Exhibit A provides the cost details of the standard village of 380 persons.

For an explanation of the line items in Tables 1,2, and 3, please refer to Annex III, Exhibit A.

Table 1

III Type C - Surface Gravity Flow System

Population [1]	200 persons		760 persons	
Part I				
a)	1.0 x $b 10,000 =	$b 10,000	1.0 x $b 10,000 =	$b 10,000
b)	.9 x 10,000 =	9,000	1.8 x 10,000 =	18,000
Part II				
a)	.7 x 133,900 =	93,730	1.3 x 133,900 =	174,070
b)	.7 x 20,000 =	14,000	1.3 x 20,000 =	26,000
c)	.7 x 30,000 =	21,000	1.3 x 30,000 =	39,000
Part III				
a)	.6 x 20,000 =	12,000	1.3 x 20,000 =	26,000
b)	.6 x 2,000 =	1,200	1.3 x 2,000 =	2,600
Part IV				
a)	.7 x 64,700 =	45,290	1.7 x 64,700 =	109,990
b)	.7 x 15,450 =	10,815	1.7 x 15,450 =	26,265
c)	.7 x 27,800 =	19,460	1.7 x 27,800 =	47,260
d)	.7 x 33,000 =	23,100	1.7 x 33,000 =	56,100
Part V				
a)	.7 x 73,000 =	51,100	1.7 x 73,000 =	124,100
		$b 310,695		$b 663,785
		= US$ 15,534		= US$ 33,189

[1] Date for Populations of 380 persons are included in Annex III, Exhibit A.

See this Exhibit for identification of line items.

Table 2

II Type B - Surface System with Pump*

Population*	700 persons		700 persons	
Part I				
a) .65 x	$b 22,500 =	$b 14,625	1.8 x $b 22,500 =	$b 40,500
b) .70 x	22,500 =	15,750	1.3 x 22,500 =	29,250
c) 1.00 x	3,500 =	3,500	1.2 x 3,500 =	4,200
Part II				
a) .70 x	26,000 =	18,200	1.5 x 26,000 =	39,000
b) 1.00 x	8,000 =	8,000	1.5 x 8,000 =	12,000
c) 1.00 x	22,000 =	22,000	1.0 x 22,000 =	22,000
Part III				
a) .70 x	54,000 =	37,800	1.3 x 54,000 =	70,200
b) .70 x	8,000 =	5,600	1.3 x 8,000 =	10,400
c) .70 x	12,000 =	8,400	1.3 x 12,000 =	15,600
Part IV				
a) .60 x	64,700 =	38,820	1.7 x 64,700 =	109,990
b) .60 x	15,450 =	9,270	1.7 x 15,450 =	26,265
c) .60 x	27,800 =	16,680	1.7 x 27,800 =	47,260
d) .60 x	33,000 =	19,800	1.7 x 33,000 =	56,100
Part V				
a) .60 x	64,000 =	38,400	1.7 x 60,000 =	102,000
		$b 226,845		$b 584,765
		= US$ 11,342		= US$ 29,238

* Data for 380 population can be found in Annex III, Exhibit A.

See this Exhibit for identification of line items.

Table 3

I Type A - Deep Drilled System

Population 700 persons			700 persons		
Part I					
a)	.65 x $b22,500 =	$b14,625	1.8 x $b 22,500 =		$b 40,500
b)	.70 x 22,500 =	15,750	1.3 x 22,500 =		29,250
c)	1.00 x 3,500 =	3,500	1.2 x 3,500 =		4,200
Part II					
a)	.70 x 45,000 =	31,500	1.5 x 45,000 =		67,500
b)	1.00 x 8,000 =	8,000	1.5 x 8,000 =		12,000
c)	1.00 x 22,400 =	22,400	1.0 x 22,400 =		22,400
d)	1.00 x 5,600 =	5,600	1.0 x 5,600 =		5,600
Part III					
a)	.7 x 26,780 =	18,746	2.0 x 26,780 =		53,560
b)	.7 x 4,000 =	2,800	2.0 x 4,000 =		8,000
c)	.7 x 6,000 =	4,200	1.8 x 6,000 =		10,800
Part IV					
a)	.6 x 64,700 =	38,820	1.7 x 64,700 =		109,990
b)	.6 x 15,450 =	9,270	1.7 x 15,450 =		26,265
c)	.6 x 27,800 =	16,680	1.7 x 27,800 =		47,260
d)	.6 x 33,000 =	19,800	1.7 x 33,000 =		56,100
Part V					
a)	. 6 x 60,000 =	36,000	1.7 x 60,000 =		102,000
		$b 247,691			$b 595,425
		= US$ 12,385			= US$ 29,771

* Data for 380 population can be found in Annex III, Exhibit A.

See this Exhibit for identification of line items.

CALCULATIONS OF PER CAPITA COST FOR WATER SYSTEMS

The 380 population village size is the model used for illustrative purposes because it represents the average village in the target area. In Annex IV.B we develop two other village sizes by applying an expansion or contraction factor to the 380 model. Within each village size we develop three different water systems (Types A, B, and C). Each is based on what is considered to be a typical distance from the water source. However, it becomes difficult to compare them on a strictly cost basis because the distances are not always equal. Hence the purpose of this section is to establish four distances, of 400, 800, 1,000 and 2,000 meters for each of the systems for the three population ranges of 200, 380, and 760. Assuming the cost data is fairly accurate, such three system types become uneconomical at each population level. The cost for pipe, excavation, installation and back filling is estimated at $4.60 per meter.

The base cost figures for each type under each population level are developed in Annex B. Base costs for type A are calculated at 400 meters. To make the conversion to 800, 1,000 and 2,000, we add 400, 600, and 1,600 times $4.60 respectively. The base cost figures for type B are calculated on the basis of an 800 meters distance. To make the conversion to 400, 1,000, and 2,000 meters we add to the total cost from Annex B, -400, 200, and 1,200 times $4.60 respectively. The same procedure is followed for type C. Because the base distance is 2,000 meters, the conversion to 400, 800 and 1,000 meters would be: -1,600, -1,200, and -1,000 times $4.60 respectively.

The calculations are based on figures which include the voluntary labor and donated materials of the community. As is discussed in the text, these costs probably represent a zero economic cost or one so low that the total exclusion does not significantly alter the results. Hence in the left column of the following calculations will be found the per capita costs excluding voluntary labor and materials, while the right column includes those costs. The calculations for the meter costs for the left side are based on a cost of $3.89 per meter rather than $4.60 since part of the latter includes voluntary labor.

The highest per capita cost figure is for house connections (HC) and the lowest is for public taps (PT).

TABLE 1

Type A (Deep Drilled System)

Cost adjusted to exclude community Voluntary labor and materials
(In U.S. Dollars)

I.	200 population	Total Cost	$ 12,385
		Cost of Community Inputs*	1,385
		Total Adjusted Cost	$ 11,000
II.	380 population	Total Cost	$ 18,362
		Cost of Community Inputs	2,205
		Total Adjusted Cost	$ 16,157
III.	760 population	Total Costs	$ 29,771
		Cost of Community Inputs	3,737
		Total Adjusted Cost	$ 26,034

* See Annex III, Exhibit A.

TABLE 2

Type A. Deep Drilled Well (Source 400 meters)

Distance from Source	Well Type*	Community Assistance Excluding	Community Assistance Including
I. Population 200			
A. 400 meters	HC	55	62
	PT	53	60
B. 800 meters	HC	63	71
	PT	61	69
C. 1,000 meters	HC	67	76
	PT	65	74
D. 2,000 meters	HC	86	99
	PT	84	97
II. Population 380			
A. 400 meters	HC	43	48
	PT	41	46
B. 800 meters	HC	47	53
	PT	45	51
C. 1,000 meters	HC	49	56
	PT	47	54
D. 2,000 meters	HC	59	68
	PT	57	66
III. Population 760			
A. 400 meters	HC	34	39
	PT	32	37
B. 800 meters	HC	36	42
	PT	34	40
C. 1,000 meters	HC	37	43
	PT	35	41
D. 2,000 meters	HC	42	49
	PT	40	47

HC = House Connection type system.
PT = Public top type system.

TABLE 3

Type b (Surface system with Pumps)

Adjusting Costs to exclude community voluntary labor and materials

I.	200 Population	Total Cost	$ 11,342
		Cost of Community Inputs *	- 1,696
		Total Adjusted Cost	9,646
II.	300 Population	Total cost	$ 19,173
		Cost of Community Inputs	2,605
		Total Adjusted Cost	$ 16,568
III.	760 Population	Total Cost	$ 29,238
		Cost of Community Inputs	- 4,051
		Total Adjusted Cost	$ 25,187

* See Annex III, Exhibit A.

TABLE 4

Type B. Surface System with Pumps (Base 800 meters)

Distance from Source	Well Type*	Community Assistance Excluding	Community Assistance Including
I. Population 200			
A. 400 meters	HC	40	48
	PT	38	46
B. 800 meters	HC	48	56
	PT	46	54
C. 1,000 meters	HC	52	61
	PT	50	59
D. 2,000 meters	HC	71	84
	PT	69	82
II. Population 380			
A. 400 meters	HC	40	46
	PT	38	44
B. 800 meters	HC	44	50
	PT	42	48
C. 1,000 meters	HC	46	53
	PT	44	51
D. 2,000 meters	HC	56	65
	PT	54	63
III. Population 760			
A. 400 meters	HC	31	36
	PT	29	34
B. 800 meters	HC	33	38
	PT	31	36
C. 1,000 meters	HC	34	40
	PT	32	38
D. 2,000 meters	HC	39	46
	PT	37	44

* HC = House Connection type system.
PT = Public top type system.

TABLE 5

Type C. (Surface System With Gravity Flow)

Converting Costs to exclude community voluntary Labor and Materials

I.	200 Population	Total Cost	$ 15,534
		Cost of Community Inputs*	- 2,189
		Total Adjusted Cost	$ 13,345
II.	380 Population	Total Cost	$ 21,993
		Cost of Community Inputs	- 3,340
		Total Adjusted Cost	$ 18,653
III.	760 Population	Total Cost	$ 33,194
		Cost of Community Inputs	- 5,028
			$ 28,176

* See Annex III, Exhibit A.

TABLE 6

Type C. Gravity System without Pump (Base 2,000 meters)

Distance from Source	Well Type*	Community Assistance Excluding	Community Assistance Including
I. Population 200			
A. 400 meters	HC	36	41
	PT	34	39
B. 800 meters	HC	44	50
	PT	42	48
C. 1,000 meters	HC	47	55
	PT	45	53
D. 2,000 meters	HC	67	78
	PT	65	76
II. Population 380			
A. 400 meters	HC	33	39
	PT	31	37
B. 800 meters	HC	37	43
	PT	35	41
C. 1,000 meters	HC	39	46
	PT	37	44
D. 2,000 meters	HC	49	58
	PT	47	56
III. Population 760			
A. 400 meters	HC	29	34
	PT	27	32
B. 800 meters	HC	31	36
	PT	29	34
C. 1,000 meters	HC	32	38
	PT	30	36
D. 2,000 meters	HC	37	44
	PT	35	42

HC = House Connection type system.
PT = Public top type system.

Quantification of Incremental Benefits Resulting from Change in Distance of Water Source

There are 3 main categories of benefits to be considered: (1) health; (2) irrigation of family garden within confines of yard; and (3) watering of livestock. Since data exists only for the health category our analysis is confined to the changes in health that occur as a result of reducing the distance between the water source and house. The other benefits can be used as some unquantified amount to back-up the results from the change in health benefits.

Increased use of potable water leads to a reduction in morbidity and mortality which can lead to an increase in productivity and output, and which can reduce medical expenses for diarrheal medicines and hospitalization due to diarrhea (i.e. cost avoidance).

The increase in productivity and output can be measured by calculating the value of labor which is not foregone owing to improved health. The average daily wage in Cochabamba and Chuquisaca is estimated to range from $2.00-$3.50 ($b40-$b70) by CORPAGUAS and DSA. The shadow price of farm labor during the non-growing season is estimated at $ .56 or $b 11 (Rural Access Roads Project Paper, AID-DLC/P-2171, Bolivia 1976). Since a water system will affect both farm and non-farm laborers during both the growing and non-growing seasons, the value of the shadow price should be somewhat higher than $ .56, but less than $3.50. A figure of $1.00 for the average daily wage would seem to be a conservative figure from both a financial and economic perspective. Hence we assume that the economic and financial daily wage of workers in Cochabamba and Chuquisaca is $1.00.

It is estimated that between 14 and 30 days of work are lost per year by the average person as a result of gastro-intestinal diseases. This estimate assumes 2-3 bouts per year with duration of 7-10 days each (Plessas Report, pages 65-68). If we assume there are 3 bouts of 7 incapacitating days each (which is the average), we have a total of 21 days lost prior to the installation of the public taps. If we assume that the public tap system eliminates one bout, and the house connection system eliminates the remaining two, we can say that the incremental benefit derived from the house connection system is 14 increased working days for the average person.

If we make the simplifying assumption that only the head of household works, and that half of the days lost do not occur during work periods, or that half of the work time lost could be compensated for by a family member, we conclude that bringing the water from the public tap to the yard will increase family income by: 14 days x 1 x 1/2 = $7 per annum. This represents the value of benefits attributable to increased productivity or output.

Other benefits may accrue from cost avoidance. It has been conservatively estimated that a campesino family spends an average $6 per year on health. If we take this figure and assume that 50% of the cost is explained by water related diseases, that 25% of that figure is reduced by the public tap system, and that 50% of the remaining balance is reduced by house connections we can state that medical benefits amount to $1.13 ($6 x .5 x .75 x .5) per family per year due to house connection.

Adding the increased value of production to the cost-avoidance on health benefits gives total annual incremental benefits of $8.13 per family. If garden plots and livestock receive additional water because of the house connection, the $8.13 figure would be even higher. This amounts to a per capita benefit of $1.16. We believe that this represents a conservative estimate, since only one person per family was considered to be productive, and that only half the time he would have been ill.

Use of Present Value Technique

The present value formula for a constant stream of benefits "x" over a 15 year period with an opportunity cost of 15% is:

$$P.V. = x \cdot \sum_{i=1}^{15} \frac{1}{(1.15)} = x \cdot 5.847$$

In our particular example we want to equate the present value of benefits with the present value of costs. Where the costs are known to be $1.75, we determine x, the constant stream of benefits, in the following manner:

$$x = \frac{\$1.75}{5.847} = \$ .30$$

Thus, applying the present value technique, we find that a cost of $1.75 requires a benefit of at least $ .30 per person, or $2.10 per family per year, given an opportunity cost of capital of 15%.

Given a per capita benefit of $1.16 per annum, the present value of benefits of a 15 year period with a discount rate of 15% can be calculated as:

$$P.V. = \$1.16 \times 5.847 = \$6.78$$

SOURCE, QUANTITY AND COST OF MATERIALS TO BE LOAN FUNDED
(in US$ 000)

Description	Proposed Source	Quantity	Units	Cost
Reinforcing Steel	Code 941	200,000	kg.	142,000
Corrugated Iron	Code 941	1,000	M2	3,000
Pumps and Motors	U.S.	150	ea.	300,000
Hand Pumps	U.S.	200	ea.	20,000
Galvanized Iron Pipe (2")	Code 941	15,000	Mtrs.	94,000
PVC Pipe	Bolivia	530,000	Mtrs.	1,066,000
Well Casing	U.S.	4,200	Mtrs.	59,000
Well Casing Accessories/Mt	U.S.			21,000
Piping Accessories Incl. 1 7 Valve & Faucets	U.S.			75,000
Calcium Hypochloride	U.S.	6,000	kg.	12,000
Miscellaneous Items	Bolivia			13,000
Total Materials				1,805,000

MATERIALS TO BE CONTRIBUTED BY THE GOB FOR WATER SYSTEMS TYPES A, B, C AND D AND LATRINES

Description	Quantity	Units	Unit Price	Total GOB
Cement for water systems	22,600	Bags	3.50	79,100
Bricks	310,000	ea.	75.00	23,250
Doors	330		28.75	9,488
Lumber Forms & joists	85,500	BdFt	.31	26,505
Cement for latrines	14,715	Bags	3.50	51,502
Reinforcement	18,182	Kg.	82.50	15,000
Concrete slab				47,500
Corrugated metal roofing etc.				38,000
Miscellaneous items				27,730
				318,075
Plus: 20% increase for inflation and contingency				60,925
				379,000

PROPOSED
TECHNICAL ASSISTANCE
(in US$ 000)

	Time m/m	Total Cost
Grant Funded		
Administrative Advisor	30	181,150
Plus: 8% Contingency (approximately)		18,850
Total Grant		200,000
Loan Funded		
Maintenance and Operation Advisor	30	191,329
Accounting Systems Advisor	6	46,483
Education, Promotion and Evaluation	3	23,797
Education, Promotion and Evaluation	3	23,797
Education, Promotion and Evaluation	3	23,797
Education, Promotion and Evaluation	3	23,797
Organizational Reform	4	25,000
		358,000
Plus: 10% Inflation factor		36,000
8% Contingency		28,640
Total Loan		422,640
Total Grant and Loan		622,640

DSA PERSONNEL
ENGINEERING, SKILLED LABOR AND SUPPORT
(USA)

ENGINEERING

Position	No.	Total Man-Month	Cost
Director	1	28	$ 24,549
Technical Supervisor	1	40	29,232
USAID Project Manager	1	57	34,399
Project Engineers	4	155	93,719
Maintenance	1	51	30,687
Regional Engineers	2	82	49,099
Building Supervisors	6	287	63,066
Surveyors/Draftsmen	3	120	23,722
		820	348,475
Transportation and per diem			154,006
			502,479

SKILLED LABOR

Technicians	3	116	25,201
Mechanics	3	133	36,293
Sanitary Technicians	24	1,224	200,424
Drilling Operators	3	122	14,754
Drilling Helpers	6	245	19,442
Mechanic Helpers	3	122	11,988
Drivers	10	380	38,521
Masons	2	82	6,486
		1,424	353,109
Travel and per diem			135,167
			488,276

SUPPORT PERSONNEL

Administrators	3	122	43,766
Accountant and office clerks	11	433	84,387
Secretaries	5	182	33,785
Messenger/Watchman	3	105	9,314
Laborers	2	82	6,354
		924	177,606
Travel and per diem			8,761
			186,367

DSA OPERATING EXPENSES
(In U.S. Dollars)

Expenses	During Project Cost	After Project Cost
Office Supplies	$ 12,717	$ 23,059
Telephone	1,047	1,904
Postage, cables, telegrams, etc.	581	1,048
Publication	1,435	2,593
Printing	1,938	3,529
Insurance	31,245	17,235
Electricity	3,198	5,812
Repair and maintenance		
Building	1,780	3,311
Office Furniture and Equipment	581	1,048
Other	2,985	5,423
Vehicle repair and maintenance	33,487	60,366
Hand tools	386	690
Recondition of new vehicles	6,600	-
	97,980	126,[illegible]3
Fuel and oil	17,924	32,506
Totals	$ 115,904	$ 158,524

CONTRACT LABOR (LOAN FUNDED) 1/

			Plumbing	Masonry	Total
Type A					
I. (Deep Well)	a.	Tank		500	500
	b.	Supporting Structure		500	500
	c.	Miscellaneous	50		50
II.	b.	Pump House		50	50
III.	b.	Pipe Installation	200		200
IV.	b.	Pipe Installation	770		770
	d.	Yard Connections	250		250
Per System			1,270	1,050	2,320
Type B					
I. (Surface-pumping)	a.	Tank		500	500
	b.	Supporting Structure		500	500
	c.	Miscellaneous	50		50
II.	b.	Pump House		50	50
	c.	Intake Structure		330	330
III.	b.	Pipe Installation	400		400
IV.	b.	Pipe Installation	775		775
	d.	Yard Connections	250		250
Per System			1,475	1,380	2,855

1/ Refer to Engineering Annex III, Exhibit E. for discussion of other construction elements.

			Plumbing	Masonry	Total
Type C					
(Surface Gravity)	I. a.	Intake Structure		170	170
	b.	Sedimentation Tank		170	170
	II. b.	Pipe Installation	1,000		1,000
	III. a.	Surface Tank		370	370
	b.	Miscellaneous	25		25
	IV. b.	Pipe Installation	770		770
	d.	Yard Connections	250		250
Per System			2,050	710	2,760
Type D					
(Hand-dug Wells)	I. b.	Masonry Work		235	235
	c.	Cover Slab/Manhole		15	15
Per Well				250	250
Per System (assumes 8 per community)				2,000	2,000