

PD-AAA-226

ISA 57900

S O M A L I A

COMPREHENSIVE GROUNDWATER DEVELOPMENT PROJECT

PROJECT PAPER

SUPPLEMENT

(AID No. 649-0104)

USAID/Somalia
Agency for International Development
May, 1984

COMPREHENSIVE GROUNDWATER DEVELOPMENT

SUPPLEMENT

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AGENCY FOR INTERNATIONAL DEVELOPMENT

PROJECT DATA SHEET

1. TRANSACTION CODE

A = Add
 C = Change
 D = Delete

Amendment Number

DOCUMENT CODE

3

COUNTRY/ENTITY: SOMALIA

3. PROJECT NUMBER: 649-0104

4. BUREAU/OFFICE: AFRICA

5. PROJECT TITLE (maximum 40 characters): Comprehensive Groundwater Development

6. PROJECT ASSISTANCE COMPLETION DATE (PACD): MM DD YY 01 6 30 8 6

7. ESTIMATED DATE OF OBLIGATION (Under "B:" below, enter 1, 2, 3, or 4)
A. Initial FY 79 B. Quarter 4 C. Final FY 84

8. COSTS (\$000 OR EQUIVALENT \$1 = SS 17.38)

A. FUNDING SOURCE	FIRST FY 79			LIFE OF PROJECT		
	B. FX	C. L/C	D. Total	E. FX	F. L/C	G. Total
AID Appropriated Total						
(Grant)	(757)	()	(757)	(18,800)	()	(18,800)
(Loan)	()	()	()	()	()	()
Other U.S.						
1.						
2.						
Host Country		35	35		5,272	5,272
Other Donor(s)						
TOTALS	757	35	792	18,800	5,272	24,072

9. SCHEDULE OF AID FUNDING (\$000)

A. APPROPRIATION	B. PRIMARY PURPOSE CODE	C. PRIMARY TECH. CODE		D. OBLIGATIONS TO DATE		E. AMOUNT APPROVED THIS ACTION		F. LIFE OF PROJECT	
		1. Grant	2. Loan	1. Grant	2. Loan	1. Grant	2. Loan	1. Grant	2. Loan
(1) ARDN	283	091		6,444		5,800		12,244	
(2) HE	519	545		6,556				6,556	
(3)									
(4)									
TOTALS				13,000		5,800		18,800	

10. SECONDARY TECHNICAL CODES (maximum 6 codes of 3 positions each): 063 051 190 540 720

11. SECONDARY PURPOSE CODE: 113

12. SPECIAL CONCERNS CODES (maximum 7 codes of 4 positions each)

A. Code	PART	TNG	BR	BS
B. Amount	N/A	N/A	N/A	N/A

15. PROJECT PURPOSE (maximum 480 characters):

To strengthen the Somali Water Development Agency and assist in its efforts to establish an ongoing water development program which provides potable and livestock water in rural areas.

14. SCHEDULED EVALUATIONS: Interim MM YY 01 2 85 Final MM YY 01 2 86

15. SOURCE/ORIGIN OF GOODS AND SERVICES: 000 941 Local Other (Specify)

16. AMENDMENTS/NATURE OF CHANGE PROPOSED (This is page 1 of 5 page PP Amendment)

Add funds, realign inputs based on implementation experience, examine potential of private sector increased participation and improve national water sector coordination and planning.

17. APPROVED BY: Signature [Signature] Title: Director, USAID/Somalia Date Signed: MM DD YY 01 5 26 84

18. DATE DOCUMENT RECEIVED IN AID/W, OR FOR AID/W DOCUMENTS, DATE OF DISTRIBUTION: MM DD YY

AUTHORIZATION AMENDMENT

Name of Country : Somalia
Name of Project : Comprehensive Groundwater Development
Number of Project : 649-0104

1. Pursuant to Sections 103 and 104 (c) of the Foreign Assistance Act. of 1961, as amended, the Comprehensive Groundwater Development Project for Somalia was authorized on September 21, 1979. That authorization is hereby amended as follows:
 - a. The second paragraph is amended to indicate that the Project will consist of three components instead of four. Component number one is deleted. Component number three is revised to eliminate dug wells and surface water development.
 - b. The planned obligations authorized for the Project are increased by \$ million dollars in grant funds over approximately a two year period from the date of this authorization amendment.
 - c. The amendment to the Project Grant Agreement shall contain the following conditions and covenants:

Conditions Precedent to initial disbursement of funds authorized by this amendment.

That Grantee will furnish in form and substance satisfactory to AID:

- 1) A letter indicating that this Comprehensive Groundwater Development Project supplementary program has been placed in the core program of the GSDR's Public Investment Program (1984-1986).
- 2) Evidence that it has established a WDA Planning Department, as described in the USAID Project Paper Supplement.
- 3) Evidence that it has established and announced a schedule of quarterly coordination workshops between the WDA, the Ministry of Mineral and Water Resources (MMWR) and donor agencies.
- 4) A letter from the Ministry of Finance confirming that personnel and commodities financed by AID under the Grant shall be exempt from all GSDR taxes and duties,

including taxes on fuel purchased by Project funds.

- 5) Documentation from the MMWR that the GSDR procurement regulations have been revised to allow private sector companies to compete for both private and public water resource development contracts on an equal basis with GSDR agencies, or, in the alternative, evidence that the MMWR has formally requested such rule changes from the appropriate GSDR agency.
- 6) A written commitment that drilling equipment rehabilitated with Project funds will be used in Project regions in furtherance of Project objectives, as stated in the USAID Project Paper Supplement.

Covenants

The Grantee shall agree to:

- 1) Review water user fee levels, their allocation, and use, and implement appropriate changes to the fee collection and use system that more equitably distribute system costs among users to increase the longevity and efficiency of rural water systems.
 - 2) Assist new and existing water resource development firms in the private sector to increase their capacity to help develop Somalia's water resources.
 - 3) Pursue solutions to the problems of hiring and retaining qualified individuals in key positions in the Water Development Agency.
 - 4) Promote and facilitate community participation in rural water system design, operation, and maintenance, to increase the longevity and efficiency of these systems.
 - 5) Strictly enforce policies agreed to by AID and the WDA concerning Project vehicle use and maintenance.
 - 6) Reconfirm agreement to all other covenants under the existing Project Grant Agreement.
2. The authorization cited above remains in force except as hereby amended.

Louis A. Cohen, Director
USAID/Somalia

Clearance: PROJ:MPLeifert mrh

Drafter:KHansen/REDSO/ESA:kw:5/23/84 KWS

d/

DEFINITIONS

CGDP	Comprehensive Groundwater Development Project
WDA	Somali Water Development Agency
MMWR	Somali Ministry of Minerals and Water Resources
LBI	Louis Berger International, Inc. (also LBII)
RM	Roscoe Moss, Inc.
UNDP	United Nations Development Program
FAO	Food and Agriculture Organization
GSDR	Government of the Somali Democratic Republic
EEC	European Economic Community
UNCDF	United Nations Capital Development Fund

PID	AID Project Identification Document
FP	AID Project Paper
ProAg	Project Agreement (Grant)
CPs	Conditions Precedent to ProAg
ABS	USAID Annual Budget Submission

L/C	Local Currency (Somali Shillings)
F/X	Foreign Exchange (US \$)

Comprehensive Groundwater Development Project

Project Paper Supplement

S U M M A R Y

Too Large a Goal!

I. Project Goal

The goal of the Project remains unchanged. It is to help provide an adequate water supply for the people and livestock of Somalia.

II. Project Purpose

The Project purpose continues to be the strengthening of the Somalia Water Development Agency and assistance in its efforts to establish an on-going water development program which provides potable and livestock water in rural areas.

III. Grantee and Implementing Agency

The Somali Government, represented by its Ministry of National Planning, will receive supplemental assistance valued at \$5.8 + ^{13.0} ~~18.8~~ million in AID grant funds. Project activities will continue to be implemented primarily by the Water Development Agency of the Ministry of Mineral and Water Resources.

IV. Financial Plan and Period *

The supplemental period will be approximately 18 months from the point of obligation of new funding (7/84) to the end of activities described herein (2/86). This will require an overall extension in the six year original life of project (9/79 to 9/85) of five months.*

* As described herein, the extension period will actually be slightly longer because of the need to cover long term training in progress.

4

Basic Fiscal Breakdown

	Original Project Funding*		Supplemental Funding	
	AID (\$)	GSDR (\$Equiv.)	AID (\$)	GSDR (\$Equiv.)
Technical Assistance	5,500,000	172,000	2,705,000	1,167,000
Commodities	6,780,000	250,000	1,780,000	247,000
Construction	300,000	672,000	---	(93,000)
Training	320,000	50,000	110,000	1,305,000
Other**	100,000	3,821,000	1,205,000	(2,319,000)
	13,000,000	4,965,000	5,800,000	307,000***

V. Background of Project Supplement

The original Project was obligated in September, 1979. Initial drilling and support equipment commodity orders were placed in June, 1980, six months behind the Project Paper plan. The technical assistance contract with Louis Berger International, Inc became effective in July of 1981, over one year after the date set in the Project Paper. During the first three years of full project implementation, i.e. since the contractor has been on board, however, the Project has met its original design projections. Actions were taken to get participants off for training, initial survey work was completed and the drilling program was begun. Targets set out in the original PP Implementation Plan have largely been met.

Most field efforts have been concentrated in the Bay Region of Somalia. This possibility was foreseen in the original PP which left the rangelands drilling program somewhat flexible through 1984 because the drilling program of range wells was recognized to be dependent on the progress of establishing range associations and grazing reserves before installing water in the Central Rangelands, the Project's second of two priority areas. In line with the original plan, the Project has sponsored rural domestic water supply

* US \$ portion shown is as revised by Project Implementation Letter (PIL) N. 14.

** GSDR "other" contains operating costs, inflation and contingencies.

*** Total increase in shilling costs with appropriate line item adjustments.

efforts and only recently began to move to the rangelands as Central Rangelands' needs become better defined.*

Problems have beset the Project from its beginning. Delays in start-up, initial procurement of inappropriate equipment and the late arrival of these and essential repair parts, periodic fuel shortages, unrealistic output targets and controversies in roles and responsibilities between the Groundwater Project and the Bay Region and Central Rangelands Projects have largely been overcome, however. In November of 1983, using three years of implementation experience, USAID/Somalia and the Water Development Agency decided to produce a supplement to the original Project which would reorient efforts along more easily navigable paths to the attainment of established Project objectives.

VI. Description of Project Supplement

The modifications to the original design will:

- A. Improve arrangements for collecting, processing and utilizing technical, sociological, environmental and economic data.
- B. Reorient institution building efforts to attack the weakest points of Water Development Agency operations through training and technical assistance.
- C. Bolster coordination and strengthen information flows between the principal partners in the water resource development sector.
- D. Set realistic exploitation program targets with contractor assistance phase-out plans well defined.
- E. Institutionalize operation, rehabilitation, maintenance, inventory, logistic, new technology and community participation systems developed under the Project.
- F. Encourage liberalization of policies effecting private sector drilling operations while promoting initial efforts to strengthen private drilling enterprises.
- G. Assist the Water Development Agency to evolve to a form more suitable to administrating its mandated functions through the establishment of a fully staffed Planning Department.

* See Original PP Section IV "Implementation" - page 26.

- H. Fund a limited amount of short studies to determine potentially beneficial technical, economic/financial and community participation and health initiatives which may be implemented through policy changes or separate project efforts.
- I. Plan for Project termination and subsequent possibly independent Water Development Agency operation.

VII. Summary Findings

The technical analysis undertaken has shown that the Project Paper approved and authorized technology is fundamentally appropriate for the Project and should continue without major changes. Project field activities will continue to be oriented to borehole drilling exploitation and on the job training. Inputs supplied by the Project will also enable the Water Development Agency to enter the computer age.

The social analysis performed has corroborated the considerable progress made to date in facilitating the movement of Water Development Agency design and implementation systems towards those favored by rural communities and points out new directions and concerns to be used as guides during future implementation.

The economic analysis fully treats both the cost and benefit aspects of the Project and supports the modifications and implementation plan to be undertaken.

VIII. Project Issues

Project issues center around three areas:

- A. To what form can or should the community participation and fee charge and use structures be further modified to enable local communities to play an expanded role in water system operation, maintenance and improvement.
- B. To what degree can policies affecting private sector companies be liberalized to allow and promote an expansion of their activities.
- C. To what extent can the Project's institution strengthening activities be successful given Somali civil service rules and structures and other regulatory constraints on Water Development Agency actions.

As will be seen herein, none of these issues are resolved. The Project will, however, fururther Somali Government, USAID an others'

efforts to address each one.

IX. Major Conditions Precedent and Covenants

A. Conditions Precedent:

- 1) A letter indicating that this Comprehensive Groundwater Development Project supplementary program has been placed in the core program of the GSDAR's Public Investment Program (1984-1986)..
- 2) Evidence that it has established a WDA Planning Department, as described in the USAID Project Paper Supplement.
- 3) Evidence that it has established and announced a schedule of quarterly coordination workshops between the WDA, the Ministry of Mineral and Water Resources (MMWR) and donor agencies.
- 4) A letter from the Ministry of Finance confirming that personnel and commodities financed by AID under the Grant shall be exempt from all GSDR taxes and duties, including taxes on fuel purchased by Project funds.
- 5) Documentation from the MMWR that the GSDR procurement regulations have been revised to allow private sector companies to compete for both private and public water resource development contracts on an equal basis with GSDR agencies, or, in the alternative, evidence that the MMWR has formally requested such rule changes from the appropriate GSDR agency.
- 6) A written commitment that drilling equipment rehabilitated with Project funds will be used in Project regions in furtherance of Project objectives, as stated in the USAID Project Paper Supplement.

B. Covenants:

The Grantee shall agree to:

- 1) Review water user fee levels, their allocation, and use, and implement appropriate changes to the fee collection and use system that more equitably distribute system costs among users to increase the longevity and efficiency of rural water systems.
- 2) Assist new and existing water resource development firms in the private sector to increase their capacity to help develop Somalia's water resources.

- 3) Pursue solutions to the problems of hiring and retaining qualified individuals in key positions in the Water Development Agency
- 4) Promote and facilitate community participation in rural water system design, operation, and maintenance, to increase the longevity and efficiency of these systems..
- 5) Strictly enforce policies agreed to be AID and the WDA concerning Project vehicle use and maintenance.
- 6) Reconfirm agreement to all oterh covenants under the existing Project Grant Agreement.

X. Other Considerations

The contract of Louis Berger International, Inc. will be amended to include services through the extension period in accordance with provision made in the original Project Request for Technical Proposals and current contract.

The need for waivers for procurement of goods or services is not anticipated.

XI. Project Supplement Design Team

M.P. Leifert: USAID/Project Development Officer
Y Elmi : WDA/Deputy Director
Sartana : WDA/Chief of Planning
P. Roark : LBII/Team Leader
B. Hudson : LBII/Chief Hydrogeologist
R. Fanale : REDSO/ESA Social Analyst
R. Daugherty: REDSO/ESA Economist
K. Wiebe : IQC/Technology Consultant
A. Heibeh : USAID/Engineer
D. Light : REDSO/ESA Engineer

Groundwater Supplement

I. Introduction

A. Rationale

The Comprehensive Groundwater Development Project (CGDP) Project Paper (PP) was written and approved for a life of project funding of \$13,000,000 in late fiscal year (FY) 1979 for completion in 1986. The PP began with the statement that in arid Somalia, the provision of adequate, good quality water to its population (and livestock) was one of Somalia's highest priorities. Providing water and other services to the country's low density and widely scattered, basically rural and nomadic population was recognized to be a difficult, but essential task. Now, in 1984, the priority for water resource development has not changed. Through the diligent and costly efforts of those concerned, however, some progress has been made in increasing groundwater supplies and in building a Somali capacity to develop more. This supplement to the CGDP is aimed at further increasing groundwater supplies in the short term and to satisfying the long term need for an indigenous capacity to improve upon the present reliable water resource shortfall.

Improvements in Somali ability to develop water resources have basically come from expatriate on-the-job assistance and the provision by organizations, including USAID, of exploitation machinery, equipment and training. Short term benefits from several recent assistance programs include the completion of exploratory wells, installation of production wells and the preparation of surface water reservoirs ("uars") in rural areas. Potential longer term benefits are linked to the Somali institution strengthening aspects of USAID's and others' development assistance programs.

As stated in USAID/Somalia's approved Supplement outline document (Mogadishu cable 10392 of 12/18/83), however, USAID experience during the initial years of CGDP implementation has shown that the institution strengthening aspects of the Project themselves must be further strengthened and extended over a longer frame than currently approved funding will allow. In addition, experience has shown that the longer term impact sought may be facilitated by increased cooperation with other donor agencies, policy changes, modifications in counterpart agency organization structure, and private sector promotion initiatives, which were not contemplated in the existing Project design. This PP Supplement, through such reorientation of

efforts, is intended to modify the Project, based on implementation experience as encouraged by AID Handbook 3, Chapter 13, in order to increase its changes of leaving behind the longer term impact sought.

B. Status

The primary tasks of the existing Project as specified in the ProAg. BI/RM technical assistance contract and existing PP are:

- 1) to conduct preliminary data collection;
- 2) to undertake a groundwater exploration and production program;
- 3) to provide institutional support to the WDA and the Ministry of Mineral and Water Resources (MMWR); and
- 4) to establish an ongoing data collection system.

In regard to these tasks, basic data collection, review and evaluation have been undertaken in a thorough manner, to the extent that maps and reports were actually available. (Some information is scarce in terms of copies and some older reports appear to have been lost all together.) However, the existing data base has been fully utilized in preparing plans for exploration and production wells in the Bay Region and Central Rangelands.

To date within the Phase I Project, the approximately 64 boreholds which have been completed are primarily in the Bay Region of Somalia. This effort has produced an approximate 45 percent success ratio in terms of potentially productive wells. The completion of 29 production wells appears reasonable in consideration of the fact that the program has been largely exploratory and training oriented in nature.¹ Within the Central Rangelands Region, little work has been accomplished within the Phase I Project because of tie ins to the CGDP's slow moving and poorly managed Central Rangelands Project (649-0108), logistic, equipment and supplies procurement problems, site selection controversies, and local, perhaps incidental hostilities.²

Institutional support and training has been provided by LBI/RM to WDA and MMWR engineers, chemists, geophysical loggers, hydrogeologists, drillers, mechanics, pump technicians and spare parts clerks. A complete inventory of spare parts, equipment, and

¹Actually, a total of 688 boreholes have been drilled. The first 4, producing wells in the Mogadishu area, were drilled as test wells. If included in CGDP totals, the 33 production wells of 68 drilled would produce a current success ration of 48.5 percent.

²Annex O provides data on the first 66 boreholes which had been drilled to mid-May 1984.

chemicals has been developed and is being maintained. Mechanical and electrical repair facilities, a water quality laboratory and other support system have been put in place and are being utilized with CGDP technical assistance.

Significant progress has been made in both formal seminar and on-the-job training. Four Somali students are currently enrolled and studying at the University of Arizona in hydrogeology and hydrogeochemistry, and a USAIS program is being utilized in Mogadishu for English language training of selected technicians and counterparts within the WDA and MMWR. Overall, training has been moderately unproductive to highly successful depending upon the particular discipline. For example, the LBI/RM civil engineer, chemist, geotechnician, pump technician and drillers have all trained counterparts and/or counterpart staff members who are now making useful contributions to the overall efforts of the WDA groundwater program. However, similar progress does not yet appear to have been forthcoming for the hydrogeologists and also to a degree, by the light and heavy duty mechanics.

Relative to ongoing basic data management, a standardized system for groundwater drilling data collection has been developed by LBI/RM, and technical, sociological and economic information is being routinely collected. The MMWR Water Quality Laboratory is functioning well and preparing reports on the results of its work. An improved system borehole record keeping, updating and filing is, however, being planned, as records and files are currently able to be kept and maintained only in the LBI/RM offices and not in the offices of the WDA or MMWR.

To summarize CGDP status, in May 1984, at the time of writing the CGDP Supplement, all equipment has been procured, 64 boreholes have been drilled and logged and 29 production wells are operating or will soon be put into production. Preliminary data collection has been undertaken, data utilized and priority drilling area maps are being produced. Significant accomplishments have been made in local community participation and well management. Institutional support and additional data collection are part of the ongoing process oriented to achieve the CGDP objective of strengthening the capability of the WDA to design and implement a national water resources development program.

II. Description

The modifications proposed for the CGDP follow the program outlined in USAID/Somalia's PP Supplement notification cable. Variations between that Project Identification Document (PID) type telegraphed description of intent and this PP Supplement have resulted from a slight restructuring of CGDP components.³ Plans for data collection and utilization, institution strengthening and groundwater exploitation have not changed significantly. Some rearrangement has been devised, however, in order to facilitate ease of understanding of roles and responsibilities and implementation of tasks.

The four original components of the CGDP have been reduced to three. These are listed below with activities to be implemented noted under each. The "Initial Data Collection" component, essentially completed as planned, will have its one remaining unfinished task rolled into the "On-going Data Collection System" component, now to be referred to as "Data Collection and Utilization."

The last item in this Section II "Description" describes the long term USAID personal services contract Project Advisor and a small studies program to be undertaken with Supplement funding.

A. Institutional Support

This component of the CGDP will place increased emphasis on counterpart training. Efforts will also be expended on institutionalizing systems and procedures developed to this point in time.

1. Counterpart training --

As noted above, there are several gaps in counterpart capability and performance. Additional efforts need to be mounted in the critical areas of hydrogeology and light and heavy duty mechanics in particular. This includes new recruitment, seminars and special incentives.⁴ Contractor staffing will be reinforced by a specialist training officer. Relative to the hydrogeologists,

³See Annex D for an annotated chart which shows changes between the PID type cable and this PP Supplement.

⁴A civil service study being funded by USAID will be relied upon to suggest remedies to problems in hiring and retaining good personnel. A covenant (Section VII) will promote implementation of acceptable recommendations.

classroom seminars in the Mogadishu WDA headquarter, used to supplement on the job training, will receive increased emphasis with a planned program and graphic aids, developed by the LBI/RM specialist in hydrogeologic training. A complete analysis of WDA Project related personnel training needs is contained in Annex E.

2. Operations and Maintenance Manuals --

A set of O & M manuals will be prepared for all WDA systems addressed by the CGDP. A series of short term consultancies will conclude in multiple copy programmed learning manuals being produced and a central O & M procedures function being established under the direction of the WDA Deputy Director. Manuals will be produced to facilitate the training of replacement personnel and education of existing counterparts in: warehouse inventory control; local currency budgeting, submission procedures and accounting;⁵ light vehicle periodic preventive maintenance and workshop procedures; heavy and specialized equipment maintenance; and drilling mobilization, logistics preparation and field support. Funds for the short term consultancies, done in conjunction with orientation from long term contractor personnel, and for translation of manuals to Somali, have been provided for in the Supplement's budget.

3. Water Quality Laboratory --

The CGDP will continue to supply technical assistance to the MMWR Water Quality Laboratory. This is necessary because the laboratory could be reduced to conducting partial chemical analysis in the absence of funding for reagent supplies⁶ and the expatriate technician to supervise the running and repair of the flame photometer, atomic adsorption spectrometer, and other specialized analytical equipment. USAID is in agreement with the MMWR that more on the job training by the technician and short term training in sophisticated equipment repair by a specialist arranged through the LBI contract is necessary. When two participants return from their Masters Degree program in hydrogeochemistry at the University of

⁵Counterpart funds are drawn from a special development account ("CIPL"), which has requirements which differ from the GSDR operation budget process.

⁶Recurrent reagent supply costs must be considered in the same light as WDA spare parts procurement constraints. In this case, however, there is a proposal being circulated in Mogadishu for making the water quality lab self sufficient through sales of its services.

Arizona, it is anticipated that the laboratory will have a solid staff capable of continuing its present high quality work without or with only periodic expatriate assistance.

4. Procurement --

Assistance will continue to be supplied by the CGDP in the ordering and supply of equipment and parts. The AID commodity procurement (PIO/C) process will continue to be used, with assistance from LBI/RM in receiving, inspection and placement in inventory. Six months before the end of the CGDP, remaining funds will be utilized to procure spare parts and services needed to maintain CGDP machinery, vehicles, equipment and systems after the supplemented project Project Assistance Completion Date (PACD) is reached. The PP Supplement will also provide for the combining of WDA and CGDP inventories into one warehouse with one control system. According to a recently received report,⁷ the WDA warehouse was observed to be organized, clear and orderly. The record keeping system was complete with registry books for in-coming goods, cart catalog systems for each item received and an efficient and up to date end user record system. Given that the CDGP has had problems identifying and retaining competent counterpart warehouse supervisor personnel, and that WDA warehouse personnel were judged to be quite competent, this combining of two warehouses is a logical step to take. Project supplied commodities will, however, remain separate and dedicated to support of CGDP activities as required by AID regulations.⁸ The USAID Field Service Unit (FSU) will assume responsibilities for commodity receiving, inspection and delivery to the warehouse when the shift from LBI to WDA management is finalized.

B. Data Collection and Utilization

The need for a revision in the "Ongoing Data Collection" component of the existing Project has been one of the two strongest factors in USAID/Somalia's decision to modify the CGDP. Change will center around 1) the establishment of a Planning Department within the WDA and 2) a CGDP funded cooperative data collection, processing and report generation program between the WDA and MMWR in collaboration with the UNDP/FAO. Annex G contains details on the work and personnel of the WDA Planning Department. Annex H describes the National Water Data Center, A CGDP initiated collaborative effort with the UNDP/FAO, in similar detail.

⁷See report No. 6 "WDA Procurement" written 4/21/84 under USAID Purchase Order No. 649-84-0104-052 with K Burns.

⁸A detailed commodity procurement list and schedule is contained in Annex F.

1. WDA Planning Department --

USAID supports the proposed creation of a Planning Department within the Water Development Agency. There is currently no Planning Department within the WDA, nor does the WDA engage in long-term planning, cost accounting, systematic socio-economic surveys, assessment of project benefits or policy study. Fulfillment of these tasks would enable the WDA to better plan its drilling and maintenance programs and to better utilize its limited resources.

The focus of the Planning department will be to integrate technical, sociological, and economic data into viable production, operations, and maintenance plans. It will focus not only on the selection of well-sites, but also on the use of WDA resources (financial, human, and material) in order to help improve overall WDA operations. USAID technical assistance will be required to help create an effective Planning Department within the relatively short time period of the project supplement.

The Planning Department will manage and coordinate various activities outlined in the Supplement PID type cable submitted to AID/W by USAID (see Annex D). These activities include providing input to the MMWR for updating the 1973 UNDP/FAO resource study, and supervising the implementation of the borehole data collection system. A national borehole location map and data summary will be completed, along with overseeing production and use of CGDP Project area hydrogeologic maps. The Planning Department will also generate fee structure reports and recommendations, produce environmental impact reviews, and provide data for existing well maintenance and rehabilitation programs. It is also planned that the Department will oversee a study on community participation in new water resource instigated area development, using PVOs or other non-governmental organizations as implementing agencies.

The Planning Department will work closely with the MMWR and UNDP/FAO National Water Data Center (described below) to ensure continued data collection and flow to the Ministry, which is responsible for overall urban and rural water sector planning. To this end, the WDA will have compatible computer hardware and software with that which the CGDP will supply to the MMWR. In return, the UNDP/FAO will make UN Volunteers available to the Planning Department to help it carry out its national borehole survey work. IPT/RM Planning Department technical assistance will be shared with the MMWR to ensure coordination and compatibility in each of their common areas of concern. Annex G contains details about the Planning Department.

2. National Water Data Center --

The data currently being collected by the CGDP and additional data to be gained through Supplement-funded activities centering around

the WDA Planning Department, will not be capable of producing all potential benefits if they are not utilized by the MMWR. This is because the Ministry, not the WDA, is mandated to produce national, overall water sector development plan recommendations to the National Water Committee.⁹ Relative to this requirement for MMWR participation, discussions with the Ministry and its Chief Technical Advisor supplied by the UNDP/FAO have resulted in a plan to cooperate on data collection and utilization. The plan for collection of water source information outlined in USAID/Somalia's PID type cable will be followed, but working with the UNDP/FAO it will be possible to generate national, rather than only CGDP exploitation area specific data. Basically, a two-pronged approach to data collection will allow the CGDP to concentrate on WDA needs and expend efforts on borehole resource data collection only, with field technical assistance from UNDP supplied UN volunteer hydrogeologists. The UNDP/FAO will supervise urban and non-borehole resource data collection and utilization activities working with the MMWR. These two coordinated efforts will be funded by the PP Supplement. The data collection and utilization point in the WDA will be its Planning department. In the MMWR, the National Water Data Center will be created to process and utilize the data it uncovers plus the data to be supplied by the WDA. Further explanation of funding mechanisms, inputs, outputs, roles and responsibilities have been included in Annex H.

C. Exploitation

As in the Data Collection and Utilization component, nearly three years of implementation experience has also shown a great need to modify the parameters of the CGDP exploitation program. The PID type cable transmitted by USAID/Somalia detailed why these parameters should be changed. Suffice it to say here that modifying CGDP water resource exploitation targets in line with the realities of implementing a development program in Somalia is productive, both to allow the funding agency to more accurately determine the value of its efforts and for the receiving country anticipating results upon which other plans may be based.

With a more realistic projection of results, it is possible to analyze what would happen without CGDP assistance and how critical the Project outputs are. These analyses have been carried out. Their results are included in the sociological and economic analysis .

⁹The National Water Committee is chaired by the Minister of MMWR. It determines priorities, allocates resources, and sets goals, by region, for water resource development activities.

sections further on. A thorough analysis of the technology to be employed during Supplement implementation is also included in Section IV.D.

1. Drilling Plans --

During the PP Supplement period, drilling and well construction will be undertaken at 36 additional sites in the Bay Region and 10 sites in the Central Rangelands. It is anticipated that previous exploratory work in the Bay Region will enable a 70% success ratio. In the Central Rangelands, with scant hydrogeologic data to work from drilling, while production oriented, will be more exploratory in nature and should achieve about the same success ratio of 40% as did the work in Bay in its earlier stages.

In determining to continue with previously employed technology through the WDA to accomplish this drilling program, a number of factors were examined. Hard decisions were made on 1) supporting further WDA based drilling programs versus sponsoring private sector efforts, and 2) expanding CGDP assistance to include dug well and surface water development versus maintaining the Project's focus on borehole drilling. These two items are deserving of special attention and are covered next:

Working through the Private Sector or WDA¹⁰

There are four well drilling private contractors operating in Somalia. The three smallest are Somali owned and the largest is Italian owned. The following table shows the drilling rigs used and the drilling rates achieved by these companies.

-
- ¹⁰ Further information can be found in the following:
1. "Assessment of the Private Sector in Water Development, Somalia" by R. Van Valer of Roscoe Moss, CGDP, 11/30/83.
 2. "Water Facility Construction by the Private Sector" by K. Wiebe of J.M. Montgomery Consulting Engineers, USAID/CGDP/IQC, 5/14/84.
 3. "Somali Drilling Co. (Hargeisa)" field trip report by A. Ashor of USAID, 4/3/84.

Table I¹¹

Private Sector Company Data

<u>Company</u>	<u>Drill Rigs</u>	<u>Drilling Capacities</u>	<u>Avg. Well Completions (mtrs./yr.)</u>
National Drilling (Somali Owned) Mogadishu	1-1966 Falling 1000 Rotary	12 1/4" to 100 m 8 5/8" to 180 m	1-2 (225)
Horn of Africa Drilling (Somali Owned) Mogadishu	1-1953 Mayhew 1000 Rotary	12 1/4" to 100 m 8 5/8" to 175 m	2-3 (360)
	1-1955 Walkeneer 31 Cable tool	16" to 200 m 10" to 400 m	
Murry (Italian Owned) Mogadishu	1-Ingersoll Rand T4 Rotary	12 1/4" to 400 m 8 5/8" to 600 m	10-15 (1220)
	1-Italain Rotary	12 1/4" to 125 m 8 5/8" to 175m	
	2-Cable Tool	16" to 200 m 10" to 400 m	
Somali Drilling ¹⁾ (Somali Owned) Hargeisa	1-Cable Tool	16" to 200 m 10" to 400 m	5 (360)

1)Note: New company, which begain drilling in 1983 has drilled 5 wells to date.

¹¹Based on data given in Van Valer report. For comparative purposes, see WDA 1983 drilling performance data given in Annex O.

Seven of the eight rigs operated by these four companies are old and reported to be worn. The eighth rig (IR T4 Rotary) is reported to have completed more than 10 wells over the last year for a total of 1220 meters drilled. The other rigs are probably capable of completing less than 4 wells each per year even if they remain operational.

The major problem mentioned by the owners of Somali and National Drilling companies has been the availability in Somalia of materials (casing, screens, mud, pit, bits, and cable). In addition, National Drilling Company's owner bemoaned the lack of spare parts for his rig and support vehicle and described significant difficulties in communication, delivery time and financial arrangements when attempting to purchase spare parts from the U.S.

The WDA assists these firms with free hydrogeologic assistance in site selection, well design and logging, since there are not trained Somali hydrogeologists in country other than those employed by the WDA. Materials may also be sold at cost plus 5% to these companies when they are available. However, the WDA has limited capacity to fund even its own activities because of a similar lack of hard currency, much less supply the private sector on a continuing basis.

Three of the drilling companies have made application for currency relief through USAID's Commodity Import Program (CIF). It is somewhat doubtful, however, that they will obtain foreign exchange this way because of the great excess of demand for CIP funds over supply.

Based on the above sketch and other data contained in reports footnoted above, it appears that the future for private drilling contractors in Somalia is not very encouraging. Their drill rigs are mostly old, parts are scarce and the capability to maintain wells they drill is generally lacking. USAID has, therefore, reached the conclusion that, at least for the present, a well production and technician training program of the magnitude needed must be carried out through the WDA.

Never-the-less, one investigative and one pilot program will be undertaken in conjunction with the private sector. The first has already been initiated. A feasibility and planning study for private water resource development companies has been designed.¹² The study, expected to be completed in September 1984, will examine the market open to private contractors, sources of financing, appropriate technology, costs, etc. and possibly result in proposals for 2 new company start-ups in the Northwest and Togdheer regions of Somalia. It will also produce recommendations on how AID should proceed to promote increased private sector activities in water

¹²PIO/T No. 698-0510.49-3-40019 approved 8 May 1984 by USAID.

resource development including the form of assistance likely to stimulate growth in existing company operations.

If study results are positive, funding for these new companies and improvements to existing firms will be obtained from a combination of the CGDP and CIP. Support for the use of FY85 CIP funds for this purpose, if justifiable, will need to be expressed by USAID/Somalia and the WDA when the Program document is negotiated with the Somali Government.

The second CGDP Supplement program with private sector participation involves the sub-contracting by the WDA of a total of four wells to private contractors. The work, which will be performed by one or more firms based on the results of competitive tenders (2 wells at a time), will establish actual cost and performance criteria which may then be considered in conjunction with the private sector study outlined above when USAID designs its Groundwater II Project for FY 1986¹³

Labor and drilling costs for work under these sub-contracts will be paid in foreign exchange to the private contractors to the extent that these funds will be used to purchase needed equipment, spare parts and drilling materials off shore. The WDA will supply sub-contract drilling materials such as casing, screens, etc. from CGDP or other existing stock. The CGDP will replace these items as they are used.¹⁴

Boreholes Versus Uars and Dug Wells

The WDA is the principal Government organization is responsible for developing two of the three primary sources of water supply in urban¹⁵ and rural Somalia: drilled wells and surface water reservoirs ("uars"). Construction goals for drilled wells and uars have been set in the Government's 1982-1986 Five Year Development Program at 250 production borehole wells and 500 uars. The WDA has been made responsible for constructing 50 borehole wells and 10 uars per year. Shallow, dug well construction, the third primary water source, is not specifically listed in the WDA's mandate.

¹³See USAID Project No. 649-0127 narrative in 1986 ABS.

¹⁴See Mogadisho 0661 of 1/23/84. This cable outlined the above plans for ECPR consideration in response to a question raised by the Africa Bureau Project Committee.

¹⁵The WDA's mandate includes all urban areas excluding Mogadishu, Kismayo and Hargeisa, which have their own water agencies reporting directly to the MMWR.

For financial as well as technical reasons, the WDA is currently operating at a level below that called for by the 5 year plan. For example, in 1983, of the 19 WDA rigs that WDA considers useful, even though some may be in need of major overhaul, 10 rigs drilled 18 boreholes in 8 regions. Eleven of these are production wells, the others have either been dry or found water in too little quantity or too saline to use.¹⁶ The 4 surface facility construction units operated by the WDA produced 3 uars during 1983. The output from these units was limited primarily because of frequent mechanical breakdowns without spare parts available to effect repairs.

With these statistics as bried background, it begins to be clear that improving the performance of the WDA in surface water construction activities is a task of the same degree of difficulty as that of improving borehole drilling capability and performance. For this reason, no attempt has been made, nor will an attempt be made in the Supplement, to work with the WDA in the area of uar construction. It is USAID's opinion that insufficient human and financial resources exist in the CGDP to do both at the same time.¹⁷

Alternatively, USAID does not recommend dropping its drilling assistance program in favor of a uar construction project. The time period and funding amount of the CGDP Supplement is neither long enough nor large enough to make an appreciable contribution to the surface water impoundment capacity of the WDA. Also too frequent droughts, which cause many of even the largest uars to run out of water, indicate that uar construction alone cannot solve Somalia's water supply needs.

Assisting in uar and/or dug well construction through the private sector is likewise not a promising option. Too many individuals and groups are involved in this effort to single out one area where a large budget project could effectively concentrate. Such assistance would be better left to import of machinery through the CIP as is currently the case, and funding small target region and group projects of a PVO nature, an activity which will be possible through PVO Operational Program Grants (OPGS) to be made available by USAID in FY 1985.

2. Rig Rehabilitation --

Moving on to other activities under the Exploitation component of the CGDP Supplement, the Project will also finance rehabilitation of

¹⁶See Annex O for further details.

¹⁷See Supplement Technical Analysis (Section IV.D.) for further discussion of CGDP involvement in surface water activities.

one WDA rotary rig and two associated mud pumps currently in need of major repair.¹⁸ This rig will then become the fourth rotary rigs and one percussion rig used by the CGDP should then be able to drill 36 boreholes per year total, or 6 boreholes over the 18 month period from the end of July, 1984 to the end of January, 1986.¹⁹

3. Second Regional Logistics Center --

A second regional CGDP base of operations will be established at Galcaio in the Mudug region of the Central Rangelands. Fuel storage tanks will be placed in the WDA regional office compound and drilling materials will be stock-piled in presently existing facilities.

4. Borehole Rehabilitation and Maintenance --

The WDA will be assisted to obtain data and develop plans for a borehole rehabilitation and maintenance program. Data will be obtained and analyzed under the supervision of the new WDA Planning Department in cooperation with the Drilling Department. An explanation of how this activity will be implemented is contained in Annex G.

5. Windmill Tests --

Two Wind Baron windmills, procured under the existing project should arrive in country in June, 1984. The installation and testing of these units will be done in conjunction with the Bay Region Agricultural Development Project (649-0113) during the period of Supplement implementation.

6. Civil Works --

Lastly, the WDA will continue to be assisted by the LBI/RM team in the refinement of designs, training of Somali personnel and other parameters of civil works for rural water distribution systems.

¹⁸Failing model JED-A drilling rig and Gardner-Denver models FD-FXX-J and FG-FXG-R mud pumps.

¹⁹The rotary rigs operating at expected rates should produce 8 boreholes each per year. The percussion rig should produce half that amount. The rehabilitated Failing rig should be in service for 12 of the 18 months of the PP Supplement period. The percussion rig will be returned to WDA, non-CGDP stock a month before the Failing rig becomes operational to allow for training of new WDA crew on the new rig.

D. Project Advisor and Studies Program

Along term advisor to the CGDP will be hired using existing CGDP funds (see Section III.G. below). The scope of work for this advisor is contained in the PIO/T included as Annex K. The advisor's activities will include responsibility for various aspects of short term water resource development studies to be funded by the Supplement. The list of studies currently being contemplated include:

1. Improving linkages between rural water resource development activities of the WDA and environmental/primary health care programs.
2. Problems related to coordinated planning and government versus community control and management of rural water systems.
3. Design and use of an appropriate groundwater model using the computerized data base generated by the CGDP Supplement.
4. Potential small water resource development programs for PVO or other non-governmental agency implementation.

In addition, the Project Advisor will also assist USAID and the WDA finalize the design, contract for, and implement the mid-term and final CGDP evaluations. He will also utilize his experience gained under the CGDP Supplement to assist USAID/Somalia design and draft the 1986 ABS proposed Groundwater II Project (649-0127).

III. Financial Data

A. Existing Grant Foreign Exchange

The life of Project budget given in Annex 1 to the Grant Agreement²⁰ included six U.S. contribution line items as follows:

Construction	\$	506,000
Technical Assistance		5,421,000
Training		607,000
Commodities		3,999,000
Contingency		237,000
Inflation		2,166,000

The Grant was increased to its full authorized level of \$13,000,000 on January 9, 1983 through Agreement Amendment No. 5 without allotting the \$64,000 difference to any specific line item of the budget.

As of March 31, 1984, the CGDP pipeline was as shown in the following table:

	Pro-Ag(1) Budget	Earmarkings(2)	Accrued Ex- penditures	Pipeline 3/31/84
Technical Assistance	\$5,500	\$5,417	\$4,292	\$1,125
Training (3)	320	219	38	253
Construction	300	150	150	0
Commodities	6,780	6,220	5,150	1,069
Other cities	100	75	68	7
Unearmarked		847		847
Total	\$13,000	\$13,000	\$9,699	\$3,301

(1) Project Implementation Letter (PIL) No. 14 of 3/28/84 adjusted the ProAg budget with contingencies and inflation previously allotted to line items on a weighted proportion basis by PIL No. 9 of 3/28/83.

(2) No additional significant earmarkings have occurred since 3/31/84 or

(3) All costs of on the job and LBI/RM managed in-country training are included under the Technical Assistance (contract) line item.

²⁰Aid Grant No. 79-9 of 9/30/79 with Current PACD of 9/30/85.

B. Existing Project Local Currency

According to the Grant Agreement, the resources to be provided by the Somali Government were not to be less than the equivalent of US \$4,965,000, excluding costs born on an "in-kind" basis. Funding was targeted in Annex I of the ProAg as follows:

	<u>\$ Equivalent</u>
Construction	672,000
Commodities	250,000
Technical Assistance	172,000
Training	50,000
Operating Costs	2,153,000
Contingency	142,000
Inflation	<u>1,526,000</u>
Total	<u>4,965,000</u>

As of March 31, 1984, the CGDP had utilized the local currency (Somali Shillings) allotted to it by various sources²¹ as shown below. Annex I contains detailed tables which identify usage by line item, source and year.

²¹Four sources of L/C supply shillings to the CGDP. They are:

1. CIPL - L/C generated by the CIP and PL-480 programs are deposited in a special account in the GSDR Ministry of Finance. These funds are allotted to USAID projects and other activities by joint agreement of USAID and the GSDR.
2. Trust Funds - A negotiated portion of PL-480 Title I local currency receipts are placed in a special account to be used by the Mission to cover contractor house rental, guard, utility and occasionally, vehicle operation expenses.
3. LBI Contract - The contract contains provisions for payment in shillings of local staff salaries, locally purchased goods and services, utilities, guard service, and contract team house rentals, although the last three of these items have been covered by trust funds. These are not considered to be part of the GSDR's contribution to the GCDP.
4. GSDR Operating Budget - The WDA receives a standard yearly operating budget from the Ministry of Finance which is primarily used for non-GCDP activities.

	<u>\$ Equivalent</u>
Construction	95,710
Commodities	284,795
Technical Assistance	688,457
Training	862,855
Operating Costs	878,159
Total	<u>2,809,976</u>

C. Bases for Supplement Funding

The need for additional funding of \$5,800,000 to cover Supplement costs is primarily the result of three factors. The first is the cost of the LBI/RM technical assistance contract. The original CGDP PP estimated the cost of a six year contract at approximately \$6.5 million, with contingencies and inflation added in. The actual 3 year contract, with 95% of its funding expended and/or earmarked through 3/31/84, is \$5,308,680.²² As shown in the following tables and Annex M, an additional \$2,660,000 must be added to the technical assistance line item of the CGDP to cover an 18 month contract extension.²³

Poor commodity procurement planning and costing in the original PP has also contributed to the present need to add funds to the CGDP. First, the PP underestimated the value of spare parts required to maintain CGDP equipment and vehicles. Second, the costs of project vehicles and equipment were themselves underestimated, causing the CGDP to use almost all of its contingency and inflation allowances to cover these mistakes. The portion of the Supplement budget for new and replacement equipment and spare parts to maintain CGDP up to and past the Project PACD has been estimated at \$1,780,000.²⁴

Third, activities not contemplated in the original PP design will be funded through the Supplement budget. In this regard, technical assistance and support costs of the WDA Planning Department and MMWR National Water Data Center will amount to \$1,066,000 during the 18 month supplement period.

²²ProAg PIL No. 15 of 4/24/84 provided AID approval to a revision of the LBI/WDA host country contract from a time rate to cost plus fixed fee basis as recommended in IG Audit Report No. 3-623-83-12.

²³Details on organization, composition and cost for the Supplement period LBI/RM team are given in Annex M.

²⁴Annex F contains a detailed procurement listing which identifies each item as a replacement for a worn out Project commodity or new item not anticipated in the original PP.

It should also be noted that the CGDP PP anticipated \$25,000 cash payments from the Central rangelands (649-0108) and Bay Region (649-0113) Projects for each completed water system. Unfortunately, neither of these two projects' PPs did likewise and no funds were included in their budgets for making these payments. A tight Bay Region budget has, to the contrary, caused the CGDP to procure \$150,000 in civil works distribution systems construction materials which should not have been supplied by the CGDP.

D. Summary Cost Estimate and Financial Plan²⁵

The following three tables depict the source and application of all CGDP financial resources through the Supplement period:

Table III
Total F/X Source and Use
(\$000)

Use/Source	Existing Grant (1)	Supplement Funding	Total
Technical Assistance	6,000	2,705	8,714
Training	304	110	414
Construction	150	-	150
Commodities	6,430	1,780	8,210
Other Costs	76	690(2)	766
Contingencies	31	515	546
Total	13,000	5,800	18,800

(1) Projected position at beginning of Supplement period per section G below.

(2) Includes small studies funds (\$150) evaluation expenses (\$120) and National Water Data Center non-commodity and training costs (\$420).

²⁵Appropriate inflation factors have been included for future year obligations. Cost estimates have been made based on actual LBI/RM contract provisions and experience over three years of CGDP implementation.

Table IV
Total L/C Source and Use
(\$000)

Use/Source	Existing (2)	Supplement Funding (3)	Total
Technical Assistance	688	651	1,339
Training	863	492	1,355
Construction	96	483	579
Commodities	285	212	497
Other Costs	878	624	1,502
Contingencies	-	-	-
Total	2,810	2,462	5,272

(1) L/C is converted to F/X at So. Shs. 17.38 to US\$ in Tables IV, V, VII and VIII.

(2) Through 3/31/84.

(3) For 2 year period beginning 4/1/84.

Table V
Total F/X and L/C Source and Use
(\$000)

Use/Source	AID (F/X)	GSDR (L/C)	Total (F/X)
Technical Assistance	8,714	1,339	10,053
Training	414	1,355	1,769
Construction	150	589	729
Commodities	8,210	497	8,707
Operating Costs	-	1,502	1,502
Other Costs	766	-	766
Contingencies	546	-	546
Total	18,800	5,272	24,072

For the purpose of clarification, the use of Supplement F/X funds is shown by CGDP component in the following table. However, the reader is advised that numbers in this table are approximations only as technical assistants, vehicles and other items in various cases will support more than one component and an exact tabulation which relates back to Tables III through V above has not been attempted (i.e., one which prorates vehicle usage, percentage of technicians time, etc.)

Table VI
Total F/X Source and Use by Component
(\$000)

Use/Source	AID F/X Funding for Supplement
Component 1 - Institutional Support	1,173
Component 2 - Data Collection and Utilization	1,066
Component 3 - Exploitation	2,688
Project Support	358
Contingencies	515
Total	5,800

E. Costing of Project Outputs/Inputs

Data in the table in this section and the next is shown for outputs expected to result from the use of Supplement funding only.

Table VII

Total F/X and L/C Inputs and Outputs
(\$000)

Outputs/Inputs	AID (F/X)	GSDR (L/C)	Total (F/X)
Component I			
-Training	783	808	1,591
-Manuals	21	-	21
-Water Quality Lab	242	59	301
-Procurement	127	59	186
Component II			
-Planning Department	428	118	546
-Water Data Center	638	54	692
Component III			
-Exploitation Program	2,688	916	3,694
-Rig Rehabilitation	(1) (2)	-	-
-Logistics Center	(2)	10	10
-Other	(2)	5	5
Project Support	358 (3)	433	791
Contingencies	515 (4)	-	515
Total	5,800	2,462	8,262

- (1) Procurement of the repair parts as described in Section II.C.2. will be funded by original CGDP grant funds, not supplement funds, explained in Section G. below.
- (2) Basically local currency and minor technical assistance with negligible allocatable costs.
- (3) Includes: Small studies funds (\$150,000), final evaluations (\$120,000), LBI/RM home office coordinators (\$35,250) and 10% LBI/RM contact direct support costs (\$53,000).
- (4) Funding for USAID Field Service Unit (FSU) services as discussed in Section 3 of Annex M will be taken from contingency funds.

F. Projection of Expenditures by Fiscal Year

Table VIII
Total F/X and L/C Expenditures by Source and Year
(\$000)

Use/Source	FY 84 (1)		FY 85		FY 86		Total	
	AID (F/X)	GSDR (L/C)	AID (F/X)	GSDR (L/C)	AID (F/X)	GSDR (L/C)	AID (F/X)	GSDR (L/C)
Technical Assistance	-	160	1,809	329	896	162	2,705	651
Training (2)	-	122	61	248	49	122	110	492
Construction	-	121	-	242	-	120	-	483
Commodities	-	52	1,602	108	178	52	1,780	212
Operating Costs	-	148	-	322	-	154	-	624
Other Costs	-	-	515	-	175	-	690	-
Contingencies	-	-	172	-	343	-	515	-
Total	-	603	4,159	1,249	1,641	610	5,800	2,462

G. Use of Unearmarked Funds in Existing Grant

Approximately \$847,000 remain unearmarked in the existing Grant per Table II above. These funds may be required for a "between phases" period even though it is planned that AID/W approval, authorization and obligation of Supplement funding will be consummated by July 1, 1984. This is because renegotiation of the technical assistance contract and satisfaction of the amended ProAg conditions precedent may not take place for a few months after that date. The existing grant unearmarked funds would in this case be used to finance an LBI/RM "bridge" contract (about \$541,000), a workshop on Supplement implementation planning (about \$1,000), essential early Supplement phase procurement of goods and services (about \$210,000), and long term CGDP project management (PSC) assistance for USAID (about \$201,000).²⁶ The parameters, including cost, of the "bridge"

²⁶The 4 items total \$953,000. In addition, \$13,000 will be added to the PIO/P for planned USGS training in 6-7/84. This total is greater than the \$847,000 noted as unearmarked in Table II above. Since 3/31/84, however, a number of PIO/Cs have been closed and unused funds made available for other CGDP activities. These recycled funds, plus unused funds in the current LBI contract if necessary, will allow new earmarkings of \$968,000 or more to be made with existing CGDP monies.

contract have been discussed with LBI home office representative and REDSO/ESA RLA participation. Annex L contains a copy of the draft bridge amendment to be negotiated with the WDA. The pre-Supplement implementation workshop will follow the outline contained in AID/W cable 91551 entitled "Speeding Project Implementation."²⁷ Pre-Supplement procurement will include the reservation (PIO/C) of funds for the rehabilitation of the failing rotary rig to be employed in CGDP operations.²⁸ USAID/Somalia is currently organizing the first of these workshops, in this case oriented to improving implementation performance of USAID's Rural Health Delivery Project (649-0102). Experience gained from this workshop will be used in planning and conducting the CGDP workshop--planned for June.

Long term assistance (18 months for USAID in CGDP management is in response to the suggestion made in the ECPR approval cable contained in Annex A.

²⁷USAID/Somalia is currently organizing the first of these workshops, in this case oriented to improving implementation performance of USAID's Rural Health Delivery Project (649-0102). Experience gained from this workshop will be used in planning and conducting the CGDP workshop - planned for June.

²⁸Actual procurement will be held until the amended ProAg CPs are met.

IV. Analyses

A. Social

Most of Somalia's rural population does not have access to a reliable, year-round water supply. Lack of water source development, drought, and the unpredictability of rainfall serve to limit settlement and agricultural production in the higher potential, more settled areas of southern Somalia, and limit livestock production throughout much of the rest of the country. The majority of the population must rely upon depressions in the terrain that collect runoff during the rainy seasons, and upon traditionally developed, privately or locally controlled surface reservoirs, subsurface cisterns and hand dug wells. Most of these sources are subject to high rates of contamination. Most of them can be used only seasonally: during the dry season the nomadic population tends to retreat to home well areas, while the more settled population will often be forced to move temporarily.

According to baseline socioeconomic information collected in the Bay Region as part of the CGDP, most of the agro-pastoral population rely on locally constructed ponds for their water. For four to six months of each year these sources are reliable and minimally adequate for livestock, as well as for cooking, drinking and washing. Although women may spend less than one daily in water procurement during the rainy seasons, most of the sources are dry during the remainder of the year and water procurement may demand up to 6 to 8 hours per day, over distances of up to 15 kilometers. Distances to water are even greater in some villages or in exceptionally dry years: then, entire settlements must take refuge in the nearest large town with a government well, in those few villages fortunate to have a reliable water supply, or in further away riverine sites. While quantity used varies by distance from the source, it is less than the minimum recommended 20 liters per person per day throughout the year, and it may reach life threatening levels of as low as 3 to 5 liters per person daily during the dry seasons.

One of the activities which communities in southern Somalia organize to perform has been and continues to be water source development and management. There is a well-established tradition of paying for water. Village locations are often based upon artificially excavated ponds, with associations of users which cooperate in the construction and maintenance. Individuals may be appointed to collect fees or perform minor maintenance. Those who develop a particular surface pond or well may symbolically own it, but access is shared by all who agree to contribute labor to maintain it. Water use regulations aim to control water wastage, pollution by animals near the source, and dry season access.

Appointed county level water committees have responsibility to coordinate the water related activities of numerous villages and hamlets. While the appointed committees may be involved in oversight of government or donor financed projects, the more localized, traditional committees have not, as a rule, considered government-controlled wells to be their responsibility, and users themselves tend to be unwilling to make contributions to maintain the government systems.

Building upon the experience gained to date, the project will continue to strengthen existing democratic local institutions, expressly for participation in scheme design, site selection, construction, and operation and maintenance.²⁹ Given the population's concern and its capability to organize for water, significant, clearly defined local responsibility for the individual water source is feasible and appropriate, and indeed required to sustain local interest. Community management responsibility will include local autonomy to collect and (to some extent) manage fees, establish rules of use and access and enforce them, and perform minor maintenance. Communities will meet all or nearly all (less fuel) of the systems' recurrent costs. Training for local user committees and individuals (e.g., as masons, plumbers, pump operators, data collectors, and water system managers) will strengthen their ability to make and implement decisions with reference to the project's more complex technologies. Overall, responsibilities are to be shared between users and the government; the government will assist in system development and operation, but user groups will continue their proven pattern of management, maintenance and resource inputs.

A set of procedures to engage user groups in new water supply development through community meetings and training has been developed, tested and applied as part of the CGDP. Project implementation involves participants in planning, construction and maintenance of the water sources, as well as in baseline data collection, monitoring and evaluation. Site selection criteria have been tested as well, which ensure that the sites which are selected are those which are most likely to be viable and reach populations most in need of water. For example, to be selected, villages must: 1) be centers of over 1000 population; 2) be more than 5 kilometers from permanent water; 3) have a water committee. Similarly, criteria have been developed for use in more nomadic areas.

Delegation of management to the local level should enhance proper use, reduce need for major repairs and increase well longevity.

²⁹Details of the community participation program developed by the CDDP are included in Annex J.

Feasibility and sustainability will be enhanced inasmuch as government sectoral policies foster greater community autonomy in rural water supply, and private sector involvement. The WDA Planning Department will monitor and evaluate the effectiveness of the Project's approach to local management, the results of which can assist the development of national policy to strengthen community responsibilities for construction, operation, and maintenance of water systems. Technical assistance and training will assist the WDA to institutionalize and replicate the model tested in the Project for shared responsibilities between government and user groups.

Primary beneficiaries are the average 1,500-2,000 well users per day of the project areas who gain access to reliable supply systems for themselves and their livestock, and opportunities to improve their economic lives. Women, particularly, will benefit from reduced time and labor burdens. Users of new water systems will benefit indirectly through opportunities for increased production and health improvement. A subset of the residents will benefit directly from technical training in the management, operations and maintenance of water supply systems. Public sector personnel will benefit from managerial and technical training which will strengthen their ability to coordinate and administer programs for rural water development. Local firms will benefit from increased opportunities for system operation and maintenance and materials supply. Site monitoring by the Planning Department will include data to permit estimation of actual benefits to users and communities.

B. Economic

Quantification of Benefits

Measuring the economic benefits of the Comprehensive Groundwater Development Project is difficult for two reasons. First, the Project (as noted in the approved original project paper) was designed primarily as an institutional development project. Specifically, its primary objective was to increase the capacity of the Ministry of Minerals and Water Resources (MMWR) and the Water Development Agency (WDA) to design and implement a domestic/livestock water resource development and management of expertise and experience in the development and management of surface water resources, it was further decided to focus the institutional development of the MMWR and the WDA upon groundwater development. This was to be done through training, the development and continued expansion of the hydrogeologic data base, and a program of production well drilling - which was in turn focused on training, expansion of the data base and the provision of production wells initially to the Bay Region and Central Rangelands projects.

In a drought-prone agrarian/pastoral country such as Somalia, a rational and efficient program for the exploitation of groundwater resources is critical if production is to be maximized and human suffering is to be minimized. Indeed, until the country has a better knowledge of the extent of its groundwater resources and the probable costs of their exploitation, it will be difficult to design and implement an appropriate overall development strategy. It has, for example, been commonly assumed that Somalia has significant amounts of unutilized land which could be brought under rain-fed cultivation if water, for human and animal consumption, were made available. If such water does not exist or cannot be made available at a reasonable cost, the unutilized land is effectively removed from the resource base and other investments in irrigated agriculture and off-farm employment become more appropriate. The degree to which this is the case is, however, unknown at the present time.

Accordingly, the institutional development being fostered in the MMWR and the WDA under the auspices of the Project can be expected to have a very high value to the Somali economy - even though this value cannot be precisely quantified. Approval of the original PP thus rested on a subjective consensus on the part of decision makers that the costs of the project were reasonable in the light of the potential, but unquantified benefits of MMWR and WDA institutional development. A decision on continued support for MMWR/WDA institutional development to be funded under this supplement will have to be made on the same basis.

It is also difficult to quantify the economic benefits of the wells that have been (and will be) drilled as a part of the institutional development effort and as inputs to other projects. While the basic nature of such benefits are known - improved health, increased economic production and the stabilization of nomadic and semi-sedentary populations (for the purpose of improving their access to productive agricultural and social services), they have proven (worldwide) to be difficult to value. More importantly, it is difficult to attribute any benefits observed solely to the provision of increased water for human and animal consumption. Other factors, investments and programs may be important as well. Under the circumstances the Louis Berger International Economic Evaluation does about as reasonable a job as can be expected when it estimates well benefits in terms of the numbers of people and animals which could be served by a typical diesel driven well in the Bay and Central Rangelands project areas.³⁰

³⁰See "Economic Evaluation of the Comprehensive Groundwater Development Project" Louis Berger International, January, 1984 as revised April, 1984.

An important component of the original project, and this project supplement, is data collection with respect to the impact of the wells provided. It is to be hoped that as this effort continues and as more production wells come into operation the situation will improve such that it will be at least possible to talk in terms of reduced human morbidity from various diseases, greater livestock production (numbers marketed and general health/ condition) and greater sedentarization (increased time at this PP Supplement are recommended procedures and resources for improving this data collection and analysis effort which will be implemented during the Supplement period.

The inability to quantify the benefits associated with a production well makes it impossible to determine if a particular well is economically justifiable in cost/benefit or net present value terms. Accordingly, all that can be done is to attempt to make the benefits as large as possible while holding costs to minimal levels. As shall be developed more fully below, however, the unquantified benefits and expected costs attributable to a particular well can vary widely depending upon the conditions under which a well will be drilled and what is required by the project in terms of data development. Accordingly, whether a given well - with given expected costs - is acceptable within the general framework of the project is a matter that will have to be determined on the basis of the subjective judgement of project decision makers and in accordance with established criteria for well siting.

Maximization of Benefits

The Comprehensive Groundwater Development Project has established two sets of criteria for locating wells which are designed to maximize the benefits generated. The first set of criteria, which based on local need is as follows:

- 1) Present water sources in the area under consideration are inadequate to meet GSDR set national standards, which are 15-20 liters per day per person and 20 liters per livestock unit, or the quality of present water sources is below designated health standards.
- 2) Present water sources are located at a distance of more than five kilometers for people, or more than thirty kilometers for people, or more than thirty kilometers for livestock.
- 3) Any village with a population exceeding 1,000.
- 4) A transhumant community which is forced to migrate away from its homestead for several months out of the year due to water shortages. (This generates the possibility of increases in output as a result of an increased ability to remain in the area year around. Training and agricultural inputs may be necessary

as well, particularly if villagers are to be encouraged to undertake new activities such as small scale irrigated food production - when excess well capacity is available.)

- 5) Identified arable or grazing lands that are under-utilized due to a lack of water resources. (Again generating the possibility of increased production benefits).

This set of criteria is then subjected to three other technical and administrative criteria before any drilling is done. These are:

- 1) Hydrogeologic suitability of the site, as analyzed by the Project hydrogeologists.
- 2) The degree of village interest in having a well and to contribute to its cost of operation as demonstrated through a series of village meetings.
- 3) Site approval by the Water Development Agency, the National Range Agency and/or local government officials.

In spite of these criteria, however, it is difficult to be certain that the benefits from the production wells within be maximized. First, the Project is committed to providing water for human and animal consumption in support of the Bay Region and Central Rangelands projects. This may result in the project drilling wells in locations that are less than optimal in terms of the probability of successfully finding water. The number of people and animals served and the potential for productivity increases, however, should be maximized.³¹

Second, it must be recognized that any health benefits that can be realized from the wells may be placed in jeopardy by the lack of a health education component within the project. It is generally recognized that the provision of increased quantity and quality of water, while necessary, is not sufficient in and of itself to improve the health status of the population. Education in the proper use of such water is critical as well. While it would be bureaucratically inappropriate to develop a health education unit within the Water Development Agency, steps ought to be taken to

³¹The supportive services and investments provided by the Bay and Central Rangelands projects may be critical to the maximum realization of the benefits to be derived from the water provided. Accordingly the impact of the CGDP on benefits derived from linkages to the Bay and Central Rangelands projects is probably positive.

ensure that the village water committees begin to explore and utilize whatever educational services might be available through the country's health infrastructure, such as might be available through the AID assisted primary health care program. Third, although operating and maintenance costs are only a small part of the total investment, the benefits of the well-drilling program are dependent upon continued well service and adequate maintenance. Operations and maintenance responsibilities are to be shared between the WDA and the community, both of whom must be willing and able to perform necessary procedures in a timely fashion. Efforts must be made to ensure that 1) the WDA is more effective and efficient in operations and maintenance, and 2) where possible, communities are delegated more of a role in well management and are trained in necessary skills to assume new responsibilities.

Financial Viability

In a country as poor and drought prone as Somalia with its great need for groundwater and limited government resources, there is a strong case to be made for making the well drilling program as financially self sufficient as possible given equity objectives (i.e. no-one should be deprived of access to essential quantities of clean water for personal consumption because of the lack of an ability to pay). Only if this is the case can it be ensured that existing wells will be adequately maintained and the well drilling component expanded over time with minimal inputs of GSDR budgetary and donor resources.

At the present time however, the system of fee collection and the fees imposed are far from ensuring that this is the case. Under the present system S.Sh. 10 is charged per cubic meter of water delivered in rural areas regardless of the cost of production.³²

While this charge appears, from LBI and other sources, to be sufficient to cover operation and maintenance costs and to make some contribution to the cost of the well (see Table X below) it is far

³²In fact, such charges are only approximated. Camels, sheep, goats and cattle are charged per animal watered on the basis of an assumed consumption per animal. While water for human consumption is measured and charged for if taken away from the well in large quantities it is provided free in small amounts - thus meeting equity objectives.

from sufficient to cover total cost, particularly in high cost areas.³³

Clearly, the Water Development Agency needs to begin experimenting with higher fees more related to costs (and alternative fee structures) and with improved collection procedures and financial monitoring, if financial viability is to be enhanced.³⁴ The need to do this reinforced by a general awareness that private well owners charge more than 10 shillings per cubic meter - though adequate time series data on precise levels of such fees to define their inter-season and later-year variations is not yet available.

Minimizing of Costs

1. The LBI Economic Evaluation --

In reviewing the Louis Berger International "Economic Evaluation of the Comprehensive Groundwater Project" several problems were encountered.³⁵ First, the LBI analysis includes all capital costs. Some of these expenditures, including large scale investments in drilling rigs, have already been undertaken and can, lacking any alternative use, be regarded as sunk. Accordingly it was decided to cost out the wells both excluding and including these sunk costs.

Second, it was noted that in the original analysis the cost of failed (abandoned) wells was computed on the same basis as a simple exploratory well. In reality however, an abandoned well may have been drilled and cased as a production well before it was known to be a failure. As a result, the cost of a failed well was adjusted

³²Total cost includes all costs of bringing a well into production including capital costs and an appropriate share of overhead costs.

³³In Somalia, however, systems of fees and provision for collection and control clearly have to be reviewed against operational realities. A system that would theoreticall generate a good deal of revenue in an equitable fashion may prove impossible to operate in actual practice. Given the realities of life in Somalia, second or even third best may well be the most rational choice. Accordingly, the best choice for Somalia might well be a system of fixed annual fees for minimal human consumption needs - thus meeting health and equity objectives - with higher charges being imposed for water for animals and higher levels of human consumption.

³⁴The January, 1984 LBI Economic Report was used for the preliminary economic analysis contained in USAID's PID type Groundwater Supplement cable.

upward somewhat. Alternative probabilities of successfully finding potable water were also incorporated into the analysis.

Third, the discount rates used (5 and 10 percent) were felt to be too low to represent the opportunity cost of capital in a poor country such as Somalia. Instead, a discount rate of 15 percent was used. (A technical error in the application of capital recovery factors was corrected as well).

Fourth, it was felt that in focusing on total cost per well, as opposed to the yearly cost of well service, the LBI paper tended to show high per-well costs. Hence it was decided to incorporate an additional measure, cost per year of well service, into the analysis.

These suggested changes and additional concepts have now been incorporated into the LBI Economic Evaluation such that it can serve as a technical appendix to the summary information presented below.³⁵

2. Alternative Cost Scenarios --

Table IX below provides information on the average construction cost per well and the total cost per year of well service under a variety of assumptions. Specifically these assumptions were:

- 1) All cost (and benefits in the form of the number of producing wells constructed and cumulative years of well service provided) should be discounted back to the present at 15 percent per year, with the time period over which this discounting is undertaken being equal to equipment life plus five years. Further, once drilled it was assumed that, if properly maintained, a well will produce for ten years.³⁶
- 2) Normal equipment life assumes that the large capital items already in country (i.e., the drilling rigs) will last eight more years. They have already been in service for two years. In the shortened case this is reduced to five years.

³⁵Copies of the revised LBI Economic Analysis are available in USAID and AFR/PD/EAP files.

³⁶Cost calculations do not include expatriate Technical assistance costs.

- 3) High production assumes that thirty wells can be drilled each year with eighteen successes (ten diesel, eight hand-pumped) and twelve failures. In the high failure case only twelve of the thirty wells are assumed to be successful with seven being diesel and five hand-pumped. In the low production case, the number of wells drilled each year is assumed to fall to twenty with ten being failures, six being diesel and four being hand-pumped.

3. Conclusions on Cost --

Several important conclusions emerge from Table IX. First while costs appear high on a per-well basis they become more reasonable when viewed in terms of cost per year of well service, particularly if sunk capital costs are excluded. Assuming normal equipment life and high production rates a diesel driven well benefiting 1,500 to 2,500 people (as is expected to be typical on an average day in the Bay Region where most of the wells will be drilled) would cost, each year, \$14 - \$23, per human beneficiary.³⁷ This is certainly not an unreasonable figure compared to the potential benefits of an assured clean water supply, and given that at least a portion of these costs will be recovered through user charges. At the same time, however, it does highlight the importance of siting the well such that the number of beneficiaries is maximized.

Second, the costs per year of well service show considerable sensitivity to failure rates. All other things being equal, the cost per beneficiary can be held to a minimum by drilling, if possible, where the probability of locating water is high. While LBI staff are confident that they can attain a 60 percent success rate, this may prove difficult if it is necessary to drill in low probability areas to meet the needs of the Bay Region and Central Rangelands Projects or to expand the hydrogeographic knowledge base.

Costs per year of well service are also greatly affected by the number of wells which can be bored each year. As can be seen in the table, assuming normal equipment life and excluding sunk capital costs, cost per year of service from a diesel well will rise considerably if well production falls to 20 wells each year (only half of which are assumed successful). However, given the continuing problem with fuel availability, the long distances which must be traveled and other logistics problems, these are likely to be the key factors impacting upon program success in Somalia.

³⁷An equal or greater number of livestock will be watered as well. Overall use of the well is highly seasonal with dry season demand estimated to be higher than the figures shown above.

Accordingly, any steps that can be taken at a reasonable cost to minimize operational difficulties are likely to have a very high payoff indeed.

4. Choice of Technology --

With three rotary drilling rigs already in country, the choice of technology has largely been made. In the future, if a decision is made to go ahead with a Groundwater II (1986) type project, it might be advisable to purchase cable tool as opposed to rotary rigs. Cable tool rigs cost less and are easier to maintain, but are slower and hence may not be more economical. This is an issue that needs to be investigated thoroughly from a technical as well as an economic viewpoint.

Some technical choice does remain possible within the scope of the activities to be covered by the PP Supplement. As Table X clearly demonstrates, hand-pumped wells are considerably cheaper than their diesel driven counterparts on a cost per year of well service basis. Thus, in some cases, where a hand pump would meet the demand for water and where the capacity of the well is limited, it may be best to opt for this technology. In cases where the water is at great depth or required pump output too great, however, this may not be possible.

In some cases too, the probability of finding water may be so low and costs so high that drilling may be prohibitive. In this case the only alternative may be to fully develop whatever surface water resources are available in the full realization that while this does not provide an assured year round supply (thus not realizing many of the benefits that would result from a well) it is the best that can be done under the circumstances.

Table IX Summary of Well Construction and Operating Costs (in constant 1983 dollars)

Assumption/Type of Well	Average Construction per Well			Total Cost per Year Well Service		
	High Production Rate	High Failure Rate	Low Production Rate	High Production Rate	High Failure Rate	Low Production Rate
I. Including All Capital Cost						
A. Normal Equipment Life						
Diesel Pumps	202,500	280,400	320,300	49,000	63,700	72,300
Hand-pumps	170,100	248,000	287,900	33,800	48,800	57,300
Average cost	186,100	266,900	307,300	42,300	57,400	66,300
B. Shortened Equipment Life						
Diesel Pumps	226,100	314,800	361,600	56,900	74,600	85,700
Hand-pumps	193,700	282,400	329,200	41,600	59,300	70,300
Average cost	211,700	301,300	348,600	50,100	68,200	79,500
II. Excluding Sunk Capital Costs						
A. Normal Equipment Life						
Diesel Pumps	127,400	167,800	185,100	34,200	41,700	45,600
Hand-pumps	95,000	135,400	152,700	19,000	26,800	30,600
Average cost	113,000	154,300	172,100	27,500	35,500	39,600
B. Shortened Equipment Life						
Diesel Pumps	125,600	164,000	180,600	35,600	43,200	47,300
Hand-pumps	93,200	131,600	148,200	20,200	27,900	31,900
Average cost	111,200	150,500	167,600	28,700	36,800	41,100

Note: High production rate assumes 30 boreholes per year of which 18 are production wells (10 diesel and 8 hand pumps).
 High failure rate assumes 30 boreholes per year, of which 12 are production wells (7 diesel and 5 hand pumps).
 Low production rate assumes 20 boreholes per year, of which 10 are production wells (6 diesel and 4 hand pumps).

Table X Calculation of User Fees based on Water Consumption, Pump Life and Cost Recovery

	--Payback Period 5 Years--		--Payback Period 10 Years--	
	Average Daily Consumption		Average Daily Consumption	
	70 m3 (1)	35 m3 (2)	70 m3 (1)	35 m3 (2)
Annual Operating Cost	5656	4546	5656	4546
Annualized Maintenance Cost (3)	1215	1215	1215	1215
Subtotal I (US\$)	6871	5761	6871	5761
(SS)	119418	100126	119418	100126
Required User Fee (SS/m3) to Recover Subtotal I	5	8	5	8
Annualized Value of Direct Costs (4)	13413	13413	7520	7520
Subtotal II (US\$)	20284	19174	14391	13281
(SS)	352544	333252	250110	230818
Required User Fee (SS/m3) to Recover Subtotal II	14	26	10	18
Annualized Value of Indirect Costs (5)	4391	4391	2462	2462
Subtotal III (US\$)	24676	23566	16852	15742
(SS)	428865	409573	292896	273604
Required User Fee (SS/m3) to Recover Subtotal III	17	32	11	21
Annualized Capital Recovery Cost (6)	25885	25885	14511	14511
Subtotal IV (US\$)	50561	49451	31364	30254
(SS)	878745	858454	545102	525810
Required User Fee (SS/m3) to Recover Subtotal IV	34	67	21	41

Notes: (1) + (2) Corresponds with average daily pumping times of 6 and 3 hours, respectively.
(3) Average annualized value of both routine and periodic maintenance.
(4) Equals direct costs for diesel wells * capital recovery factor.
(5) Equals indirect costs per well * capital recovery factor.
(6) Equals capital costs per well * capital recovery factor.
Assumptions (5) and (6) based on a high production rate, i.e., 18 production wells constructed per year.

C. Administrative

USAID

The Project Officer for the CGDP in USAID/Somalia will continue to be the USAID Project Development Officer (PDO). He will be assisted by a long term advisor working under an AID Personnel Services Contract (PSC) or Participating Agency Service Agreement (PASA). Annex K contains a copy of the PIO/T for this position. Funds for this contract, as noted in Financial Data Section III. G. above, will be taken from unearmarked reserves available under the existing Grant to allow recruitment to proceed while Supplement final approval, obligation and satisfaction of conditions precedent are in process. Signing of the contract, i.e. actual obligation of contract funds, will, however, be held until all Supplement conditions precedent have been met.

USAID anticipates no problems with the administration and monitoring of the Supplement program. Existing project files are in order, procurement records up to date with 27 of 33 PIO/Cs closed out and 4 more likely to be closed before new procurement will be initiated, and lines of communication and cooperation between LBI/RM, the WDA and MMWR, and USAID are well established.

WDA

The prime counterpart and authorized Grantee representative will continue to be the Deputy Director of the WDA. However, the addition of a Planning Department to the WDA will make it possible to move a portion of his daily CGDP management responsibilities to the new Director of Planning. Project implementation management should improve because of this sharing of the CGDP work load, which as been extremely heavy at various times.

The new Director of Planning is well known to USAID. He has been working with USAID and LBI/RM along with the Deputy Director since mid-1983. Both he and the Deputy Director since mid-1983. Both he and the Deputy Director have actively participated in the design of this supplement. The original draft design for the Planning Department contained in Annex G was written by the Director of Planning to be. He is a long term employee of the WDA recently returned from Germany where he obtained his Master in Economics degree. Further, as described in Annex G, two expatriate advisors will be working with the Director of Planning, one in socio-economics and the second in water resource planning, to facilitate implementation of Supplement planned activities.

No claim is being made in this supplement that the WDA is free of deficiencies in the areas of Project and financial management, contracting or reporting. Three plus years of experience working with the WDA has shown, however, that the WDA is a viable counterpart for the CGDP. In this regard, American Management Association training given to the Deputy Director, on the job training given to WDA staff accountants and other aspects of the CGDP institution strengthening program have all contributed to USAID's assessment that the WDA can meet Project administration responsibilities. An organization chart showing the existing and proposed structure of the WDA is included below.

MMWR - UNDP/FAO

Supplement Description Section II.B.2 and Annex H elucidate CGDP plans for formation of the National Water Data Center, with UNDP/FAO assistance, within the MMWR. USAID and LBI have worked with the MMWR Director of Hydrogeology who will have the role of primary counterpart and are confident that they have the capability to implement center plans as designed. Nonetheless, to help facilitate success, expatriate technical assistance in hydrology/ hydrogeology, short term consultants and coordination/consultation on MMWR Data Center and WDA Planning Department activities have been provided for in the CGDP Supplement.

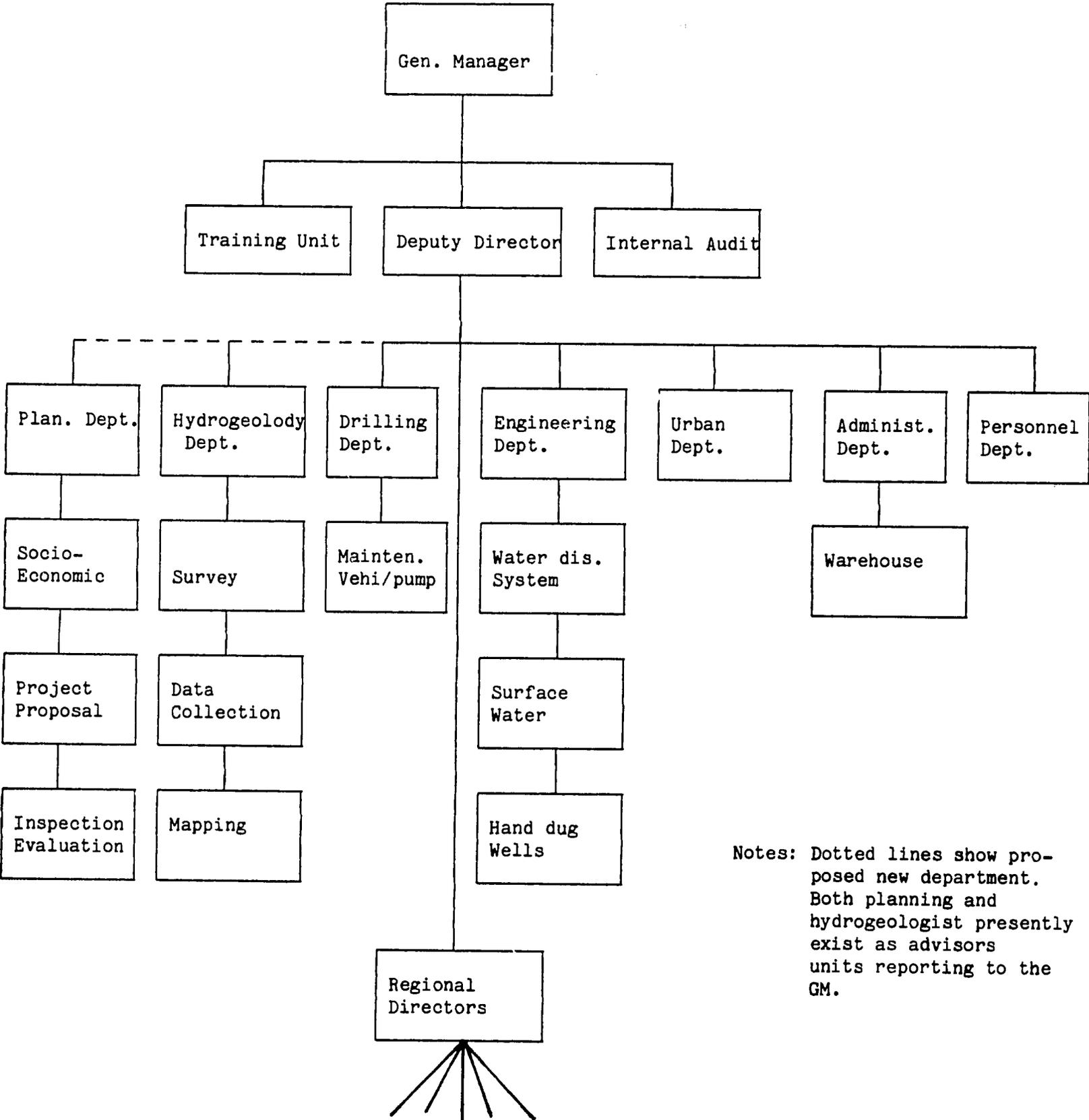
The reader is referred to UNDP Project Document SOM/81/016 for any further clarifications not contained in Section II.B.2. or Annex H.

LBI/RM

The Request for Technical Proposals and LBI contract with the WDA provide for a technical assistance contract of up to six years. There is agreement among all parties to the CGDP that continuation of LBI services, being allowed by the above two documents, would best serve CGDP and Somali water resource development sector interests. Termination of this contract, even if recommended, because of poor performance which is not the case, would result in a long delay in CGDP activities while another contractor is competitively selected and mobilized. If this were to be the only acceptable option for continuation of the CGDP, a decision to close it out might be made. Design work for the 1986 ABS proposed Groundwater II Project might be moved up to compensate, or it might not, depending on GSDR, USAID and AID/W perceptions of the correct course to follow.

In this regard, however, LBI has proven itself capable of fielding qualified personnel who have taken their work seriously and performed to acceptable standards. The Supplement design, including

WDA Organization Chart



Notes: Dotted lines show proposed new department. Both planning and hydrogeologist presently exist as advisors units reporting to the GM.

assistance team composition, has been discussed with LBI home and Somali based personnel. Assurances have been obtained that LBI and RM are capable and willing to undertake work in the Supplement program as designed.

D. Technical Analysis

Introduction

The objective of this analysis is to examine the technical feasibility of the CGSP, to determine if implementation as planned is possible, and if the implementation methodology is most suitable. Per AID Handbook 3 orientation, this analysis will show if the design of the CGDP and its component parts is consistent with the body of cognizant professional community knowledge about possible solutions to the problems the CGDP addresses. The brief analysis which follows considers both the appropriateness of the hydrogeologic work undertaken and planned, and the drilling equipment to be utilized for proposed supplement activities.

Water Resource Evaluations

After the initiation of the project, all available geologic, hydrogeologic, groundwater and water quality data and pertinent reports were collected, reviewed and evaluated by the Project staff. Aerial geology and relevant maps and photos were then studied in the field, in both the Bay Region and the Central Rangelands. Water quality data from existing wells and springs was collected and reviewed. Then, with sociological input on the receptivity of villagers and farmers, sites were selected for exploratory drilling and aquifer testing. Work at each drillsite included formation logging, geophysical logging, water sampling, preliminary production estimates, and then, abandonment of the site or if successful, design of a production well. When water quality and quantity parameters were acceptable, a production well was completed, and aquifer pumping tests conducted to develop aquifer transmissivity and well yield characteristics. Wells were then (or will be) appropriately equipped with either a hand pump or motor pump, depending upon yield. Civil works are then designed (distribution, reservoir, hydrants and stock watering troughs). These groundwater resource activities were paired throughout the Project with classroom and on-the-job training to transmit specialized skills to Somali counterparts.

The Bay Region and the Central Rangeland are areas of significant geologic and hydrologic complexity. For this and other reasons, the Project approach described here is appropriate and should be continued in the planned supplement. It has been proposed, however,

that the approach be amended by the addition of a short-term consultant who will provide special expertise in the areas of logging and radio electronics, lab equipment, planning and manual preparation. It has also been proposed that additional geophysical logging devices be purchased for use on the Project, and that a special Training Officer be included within the Project staff to amplify training given and received. As can be seen elsewhere in this document, including Annexes F and M, these adjustments have been included in the PP Supplement design.

Boreholes and Production Wells

Drilling has been undertaken in Precambrian granites and granite gneisses, karstic and solid limestone, sandstone, shales, evaporite deposits, residuum and alluvium. Exploration has often encountered dry boreholes, low groundwater productivity and very high salinity. Only locally were adequate water resources in terms of quantity and quality successfully located. Somalia is a land of old rocks (Precambrian through Miocene age) high evapotranspiration and low rainfall. Long distances, fuel shortages and political and social unrest exacerbate these difficult conditions. However, employing the methodology outlined in Water Resource Evaluations, above, 64 boreholes were sited and drilled through mid-May, 1984 in Bay and Central Rangelands Project areas. Of these, 29 sites have been or soon will be equipped as production wells for hand pumps or motor pumps. This success ratio (45 percent) appears to be acceptable in consideration of the general paucity of suitable groundwater resources in the study areas.³⁸

During exploration and well construction, skills of mechanics drilling, welding, pump technology and testing and logistic support were passed on to the Somali counterparts.

Based upon review of the area and its problems, it is predicted that during the Supplement period, 35 wells could be constructed in the Bay Region with a 70-percent success ratio, and 10 wells could be constructed in the Central Rangelands with a 40-percent success ratio. These goals appear to be reasonable and obtainable within the Supplement period.

³⁸As previously noted, 4 test wells have also been drilled in Magadishu. These 4 wells, all converted to production status, when added to the 29 for 64 success ratio above, change the ratio to 33 for 68, or a 45.5 percent success ratio.

Drilling Machines

Procurement was initiated at the beginning of the Project and by March, 1982, exploratory drilling activities were started with three, Ingersoll-Rand TH-60 Cyclone drilling rigs. These three TH-60 drilling machines have operated from March 1982 through May 1984, with periodic shutdowns due to fuel shortages, maintenance, and local hostilities.

The TH-60 machines have 600 CFM air compressors which can operate up to 250 PSIG, and can drill with air, foam or mud, in the rotary or air-hammer (down the hole hammer) mode. Basically, the machine is completely hydraulically operated and is thus quite sophisticated. It can incorporate top-head drive, casing hammer and cable pull-down within its complex operation. The rated derrick capacity is 45,000 pounds. The drill rigs are supported by water tankers, fuel tankers, flat bed trucks, transport vehicles, the electric logging equipment, and also the pump rigs.

In general terms, drilling exploratory wells has proceeded by constructing a 6-inch diameter borehole to the desired depth, using air and/or foam. Rock samples were logged, and electric log run at the completion of pilot hole drilling, and decisions then made by the driller and hydrogeologist whether to ram the hole as a test or production well, or to abandon it. Remaining tools have generally been tri-cone rock bits, which open the hole to about 12-inches in diameter. However, in the limestone areas, holes have also been reamed with the down the hole hammer. For the TH-60, maximum depth capabilities are about 300 meters with 6-inch diameter hole and 100 to 150 meters with the 12-inch reamed hole.

As noted above, limitations of the TH-60 include the present non-ability to ream larger than about 12-inch holes to significant depths. This precludes the use of an effective gravel filter pack in many instances. However, suitable gravel is located only in scattered areas of Somalia and sizing is likewise difficult because of the lack of proper sieving screens. Another limitation is accessibility of the drilling machines. During the rainy season, many rural roads and paths are impassable because of mud and erosion. The TH-60's are equipped with 4-wheel drive, but their 30-ton weight has precluded entry to several areas for short periods of time during these rainy seasons.

A number of observers and reviewers have made the observation that the TH-60 machines are perhaps not appropriate for Somalia, basically because of their high level of sophistication. This criticism has been raised on several occasions throughout the Project. Herein it is agreed that in retrospect, the initial selection of this hydraulically controlled equipment may not have been the best possible choice. Notwithstanding this view, the

machines have been procured, are operational and have an adequate spare part backup at this time. The hydraulic systems are reported to have functioned well. Somali drill crews and support staff have been trained in rig operation, and the TH-60's have completed 64 boreholes. Down time appears to have been a function more of logistics, fuel problems and hostilities, than any mechanical function of the machines.

Surface Water

With exception of the Shabeli and Juba River Valleys, both ground and surface water supplies in Somalia are an ephemeral and illusive resource. Because of the arid climate, permeable soil and high evapotranspiration rate, surface water is seldom available throughout the year. As a result, the serious and significant CGDP program has been undertaken by USAID to investigate the availability of groundwater, specifically in the Bay and Central Rangelands Regions. The CGDP has involved geologic study, mapping, exploratory test drilling, logging and production well drilling.

These precious groundwaters can be utilized throughout the year for domestic and stock watering purposes, and are clearly less directly dependant upon rainfall in any given year, because of the large subterranean reservoir upon which they draw. However, as demonstrated by the CGDP's 45 percent success ratio, groundwater of usable quantity and quality is not everywhere available. Some areas can resort only to surface water development. As a result, for Somalia's future sustenance, periodically available surface waters need also to be intercepted, held and utilized.

Where usable groundwater is not available, surface water although limited, represents the only supply that can be developed. This condition may obtain in a very large portion of the country. Surface water impoundments or "uars" have been employed profitably since antiquity, and have been demonstrated to be technically feasible and desirable in a modern sense, in developing Somalia's human and livestock resources.

However, to develop usable uars with an effective life of more than just several years, significant design inputs are required. This includes data on rainfall and rainfall-runoff relationships, intensity, drainage area information, specific soil types, silt loads, etc. With these data, hydrogeologic parameters and design criteria for useful surface impoundments can be developed and uar construction made meaningful.

Within the 1970's and 1980's, agencies actively engaged in water development have included the WDA, National Range Agency, EEC and UNCDF. For example, during 1983, the WDA constructed waters in the Northwest, Middle Shabelle and Lower Juba Regions. These ranged in total capacity from 20,000 to 30,000 cubic meters. In 1984 WDA reported that it had the following collection of earth moving equipment: 6 bulldozers, 8 scrapers, 2 loaders and a dragline, a grader, a mobile crane and a backhoe. However, because of the generally poor condition of the equipment, repair and spare parts were "...desperately needed...".

Within the program of the WDA, it has also been proposed that the technical assistance team for the CGDP become involved with study, analysis and construction of surface impoundments besides groundwater exploration and development.

Documented problems in water construction in Somalia have included plastic membrane liner failure, leakage, percolation, insufficient inflow, flood damage to berms and outflow structures, silting, hand pump failure and probably more. Poor maintenance appears to have been the rule rather than exception; embankments and liner have been damaged by the entry of livestock into the reservoirs, and water quality has been locally degraded by urine and fecal material. Hopefully, some of these problems can and will be remedied in the future, through a coordinated program of foreign assistance. These questions should be given full consideration in the course of planning and preparations for the design of any future assistance to the WDA subsequent to the completion of the CGDP Supplement.

Summary

Principal observations may be summarized as follows:

1. In arid Somalia, maximum development of both ground and surface water resources must be employed in order to provide minimum to adequate water supplies for the population and livestock.
2. Major efforts have been made under the CGDP to explore and develop local groundwaters which by their nature are less directly dependent (in any year) upon rainfall, than are surface water resources.
3. Exploration has shown that some areas in the Bay and Central Rangeland Regions do not contain groundwater, or groundwater of usable quality. Populations in these and other areas without groundwater will be dependent in the future solely upon periodically available surface waters.

4. Because of the paucity of basic hydrologic and soil data, some surface impoundments which have been constructed are plagued by insufficient inflow, percolation losses, erosion, siltation and flood damage. Poor maintenance has resulted in livestock damage to berms and membrane liners, contamination of water supplies, hand pump failure, etc.
5. A coordinated program of foreign assistance will be required to collect basic hydrologic and soil data, to prepare site - and region - specific impoundment designs, and to sustain the maintenance and repair of earth moving equipment already existing in-country.

Recommendations

Based upon the technical review above, the following conclusions are drawn and recommendations are made:

1. A coordinated program of surface water development should be formulated to collect and evaluate hydrologic and soil data, prepare consistent designs, and construct surface water impoundments, especially in areas devoid of usable groundwater resources.³⁹
2. Technical assistance should be provided to the Somali Government in the areas of data collection⁴⁰ and evaluation, design concepts, and equipment maintenance and spare parts acquisition. With appropriate user design, and support for equipment now in-country, the Somalis themselves can make significant advances in the construction and completion of surface water impoundments.
3. The financial and technical resources of WDA and LBI/RN are already fully committed on exploration and development for the Comprehensive Groundwater Development Project. Although assistance for surface water programs is vitally needed, no attempt should be made at this time to divert project staff or WDA counterparts from their full time focus on the groundwater development program.
4. It is considered that the hydrogeologic approach and the exploration and production drilling undertaken during the project, were conducted in a manner consistent with the views of "...the cognizant professional body..." of recognized hydrogeologists and groundwater specialists, and should be continued.

³⁹The UNDP currently has a project proposal which contemplates a portion of these activities.

⁴⁰Part of CGDP Supplement National Water Data Center program.

5. The project should be continued during the 18-month supplement period. It is considered that 36 wells in the Bay Region and 10 wells in the Central Rangelands are reasonable and obtainable goals for the supplement period.
6. The complex TA-60's appear to have functioned adequately in a difficult physical, climatic and social setting. With a foreign assistance team in place during the proposed supplement period, the sophisticated and capital-intensive TH-60 drill rigs would be able to sustain a longer and more productive economic life. The completion of the scheduled drilling program would effectively lower the unit production well cost over the total project period. In addition, Somali drillers and mechanics would be significantly more competent to drill wells by themselves, and to maintain the equipment in working order after the 18 month period.

E. Financial

The purposes of this analysis should be to ensure that the service to be provided by the CGDP, i.e. the provision of potable water in rural Somalia, can be paid for and to determine the profitability of the CGDP from the standpoint of the rural Somali people for whose benefit the CGDP is being undertaken.

Water supplied by WDA wells presently costs 10 Somali Shillings per cubic meter for human consumption, So.Shs. per camel, So.Shs. per cow and So.Shs. per sheep or goat. The following table with data from the first quarter of 1984, shows water revenues against the two major direct operating costs of diesel fuel and oil. As can be seen from Table XI, all but 3 of the 20 Bay Region wells for which data was collected has a positive cash balance for this period. Well number 10 "Sarmann-dheere" was the first CGDP well put into full operation (12/83). It shows revenues of 194 percent. This difference can be explained by the well's siting in a high demand location and its high efficiency of operation.

This data implies that the rural water well users can afford and will pay current charge for water from WDA wells. In periods of drought, as covered more completely in the social and economic analyses above, profitability for users is secondary to survival. At other times, health and decreases in women's and herders' work loads to obtain adequate and safe water assume more prominence in profitability calculations.

As noted in other sections of this document, fee structures will be studied during the Supplement period and recommendations made in

regard to changes in charges and/or collection and distribution systems. For other financial considerations, the reader is referred to the original Groundwater PP.

F. Environmental

The ECPR PID-type approval cable (see Annex A) called for a new or updated Initial Environment Examinationk (IEE) as part of the CGDP Supplement to cover deviations from the originally contemplated exploitation program.

There are no deviations planned by the Supplement in the technical or implementation methodology aspects of the exploitation program. Therefore, no new IEE or update on the original PP Environmental Assessment (EA) has been undertaken.

TABLE XI
REVENUE FROM BAY REGION WELLS *
(Jan. thru March, 1984)

Well No.	Diesel			Oil			Total Sh. Cost	Revenue	Cost
	Liters	Sh/Ltr	Cost	Liters	Sh/Ltr	Cost			
1. Seydheelow	1,200	6.90	8,280	60	23/95	1,437	9,717	20,000	10,283
2. Labaatan-jirow	2,000	6.90	13,800	100	23/95	2,395	16,195	29,200	13,005
3. Tagaal M/Maad	800	6.90	5,520	40	23/95	958	6,478	4,315	(2,163)
4. Goofguduud Buurey	1,800	6.90	12,420	90	23/95	2,155	14,575	24,900	10,325
5. Baraaybaraay	1,800	6.90	12,420	90	23/95	2,155	14,575	25,000	10,425
6. Awdiinle	1,800	6.90	12,420	90	23/95	2,155	14,575	22,250	7,675
7. Waabdoore	1,000	6.90	6,900	50	23/95	1,197	8,097	10,500	2,403
8. Goofguduud Shabeelow	700	6.90	4,830	40	23/95	958	5,788	6,230	442
9. Dusto	800	6.90	5,520	40	23/95	958	6,478	13,000	6,522
10. Sarmaan-dheere	700	6.90	4,830	40	23/95	958	5,788	17,000	11,212
11. Hareeri-jiif	300	6.90	2,070	20	23/95	479	2,549	8,065	5,516
12. Daynuunay	200	6.90	1,380	10	23/95	239	1,619	1,500	(119)
13. Iabaalbarbaar	2,600	6.90	17,940	140	23/95	3,353	21,293	41,000	19,707
14. Koronbood	1,800	6.90	12,420	90	23/95	2,155	14,575	23,600	9,025
15. Lawraar	700	6.90	4,830	40	23/95	958	5,788	9,000	3,212
16. Qansa dheere	1,200	6.90	8,280	60	23/95	1,437	9,717	12,610	2,893
17. Ufurow	2,200	6.90	15,180	90	23/95	2,155	17,335	31,500	14,165
18. Misrra	1,000	6.90	6,900	60	23/95	1,437	8,337	8,000	(337)
19. Xaafato	1,600	6.90	11,040	60	23/95	1,916	12,956	16,900	3,944
20. Xabiibayaal	400	6.90	2,760	60	23/95	718	3,478	4,000	522
Totals:	24,600	-	169,740	1,260	-	30,173	199,913	328,570	128,657

* Source: WDA Bay Regional Manager Report of Operations of April 10, 1984

V. Impementation Plan

Pre-Implementation - Ideal Scenario

During the period from June 1 to the end of the current LBI/RM contract on July 24, the following activities are planned:

- June 1 - USAID/Somalia approval of PP Supplement
- June 15 - AID/W review
- June 22 - AID/W authorization
- June 29 - Obligation of Supplement funds
- July 15 - Satisfaction of Conditions Precedent
- July 25 - Signing of Supplement period LBI/RM 18 month contract amendment and inititation of Supplement activities.

Pre-Implementation - Contingency Plan

Ideally, the Supplement period will begin on July 25, 1984, as noted above, when the current LBI/RM contract ends. For various reasons, however, a contingency plan has been formulated to provide for a delay between the time the current LBI/RM contract ends and new funds for the 18 month Supplement period will be available to sign a new contract and initiate other Supplement activities.⁴¹

The contingency plan is in the form of a "bridge" amendment to the current LBI/RM contract. This three month amendment will provide for the continuation of CGDP activities on a slightly reduced scale until approval, authorization, and obligation of funds and satisfaction of conditions precedent have been consumated.

Annex L contains a draft bridge amendment, yet to be negotiated for the three month period.

⁴¹Potential delays could result from greater than planned time being consumed by the AID/W review and authorization process, negotiation of the ProAg amendment and/or satisfaction of conditions precedent to the ProAg.

