No.

BASIC DESIGN STUDY REPORT
ON
THE PROJECT FOR WATER SUPPLY
IN AMHARA NATIONAL REGIONAL STATE
IN
THE FEDERAL DEMOCRATIC REPUBLIC OF ETHIOPIA

MARCH 2005

JAPAN INTERNATIONAL COOPERATION AGENCY (JICA)
GRANT AID MANAGEMENT DEPARTMENT

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PREFACE

In response to a request from the Government of the Federal Democratic Republic of Ethiopia, the Government of Japan decided to conduct a basic design study on the Project for Water Supply in Amhara National Regional State in the Federal Democratic Republic of Ethiopia and entrusted the study to the Japan International Cooperation Agency (JICA).

JICA sent to Ethiopia a study team from October 7 to December 15, 2004 and March 7 to 18, 2005.

The team held discussions with the officials concerned of the Government of Ethiopia, and conducted a field study at the study area. After the team returned to Japan, further studies were made. Then, a mission was sent to Ethiopia in order to discuss a draft basic design, and as this result, the present report was finalized.

I hope that this report will contribute to the promotion of the project and to the enhancement of friendly relations between our two countries.

I wish to express my sincere appreciation to the officials concerned of the Government of the Federal Democratic Republic of Ethiopia for their close cooperation extended to the teams.

March, 2005

Seiji Kojima

Vice-President
Japan International Cooperation Agency

March, 2005

Letter of Transmittal

We are pleased to submit to you the basic design study report on the Project for Water Supply in Amhara National Regional State in the Federal Democratic Republic of Ethiopia.

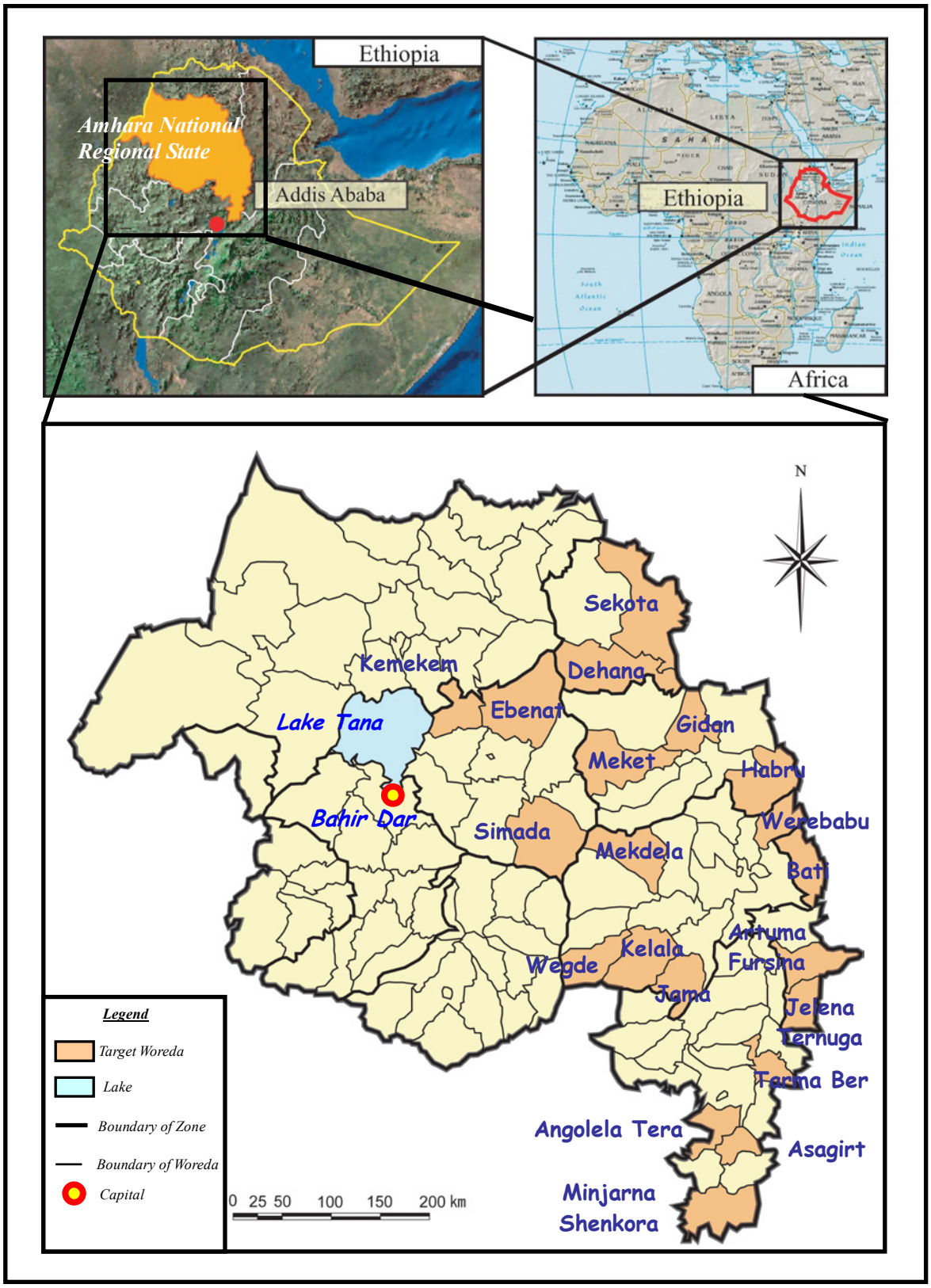
This study was conducted by Nippon Koei Co., Ltd., under a contract to JICA, during the period from October, 2004 to March, 2005. In conducting the study, we have examined the feasibility and rationale of the project with due consideration to the present situation of Ethiopia and formulated the most appropriate basic design for the project under Japan's grant aid scheme.

Finally, we hope that this report will contribute to further promotion of the project.

Very truly yours,

Masato Fujinami

Chief Consultant
Basic Design Study Team on the Project
for Water Supply in Amhara National Regional State
in the Federal Democratic Republic of Ethiopia
Nippon Koei Co., Ltd.



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ABBREVIATIONS

AWRDB	Amhara Water Resource Development Bureau
AWWCE	Amhara Water Works Construction Enterprise
DTH	Down the Hole
ESRDF	Ethiopia Social Rehabilitation & Development Fund
E/N	Exchange of Note
EU	European Union
FAO	Food and Agricultural Organization
FINNIDA	Finland International Development Agency
GDP	Gross Domestic Product
GRDP	Gross Regional Domestic Product
IBRD	International Bank for Reconstruction and Development
JICA	Japan International Cooperation Agency
MDGs	Millennium Development Goals
MoFED	Ministry of Finance and Economic Development
MOU	Memorandum of Understanding
MoWR	Ministry of Water Resources
NGO	Non Governmental Organization
O&M	Operation and Maintenance
ODA	Official Developmental Organization
PDM	Project Design Matrix
PRSP	Poverty Reduction Strategy Paper
SDPRP	Sustainable Development and Poverty Reduction Program
UNDP	United Nations Development Programme
UNICEF	United Nations Children's Fund
uPVC	Unplasticised Polyvinyl Chloride
WHO	World Health Organization
WRDB	Water Resource Development Bureau
WSDP	Water Sector Development Program
WSSDP	Water Supply and Sanitation Development Program
WWCE	Water Works Construction Enterprise
WWDE	Water Works Drilling Enterprise

Units

Length

mm	=	millimeter
cm	=	centimeter
m	=	meter
km	=	kilometer
ft	=	feet

Area

cm^2	=	square centimeter
m^2	=	square meter
km^2	=	square kilometer

Volume

cm^3	=	cubic centimeter
m^3	=	cubic meter
l or lit	=	liter

Weight

mg	=	milligram
g	=	gram
kg	=	kilogram

Time as denominator

/s or /sec	=	per second
/min	=	per minute
/hr.	=	per hour

Derived measures

mg/l	=	milligram per liter

Pressure

Kgf/cm^2	=	kilogram-force per squarer centimeter

Others

%	=	percent
Ph	=	potential of hydrogen
°C	=	degrees Celsius
ppm	=	parts per million
micro S/cm	=	micro siemens per centimeter

Currency

JPY	Japanese Yen
US$	US Dollar
Birr	Ethiopian Birr

Exchange Rate as of the end of November 2004

1 US$ = Birr 8.64 = JPY 109.92

Summary

SUMMARY

The rate of access to safe water in Ethiopia is about 23.1%. This is extremely low compared with the 54% average of the Sub Sahara region (UNDP in 2002). People in rural areas, where 85% of the population reside, spend a lot of time and labor on securing domestic water, and this is one of the causes of poverty. Therefore, improving this situation is one of the most important issues for the water supply and sanitation program in Ethiopia.

The ministry of water resource of the federal government has established the year 2001 as a base year for the Water Supply and Sanitation Development Program (WSSDP). The target period to year 2016 is divided into plans of five years each, and the coverage ratio of rural water supply is set according to the whole country and each regional state. According to this, it is assumed that a coverage ratio of 23.1% (base year 2001) will be raised to 70.9% in the whole country by the target year 2016. On the other hand, the coverage ratio in Amhara National Regional State aims at being raised from the base year's 23% to 62% in the target year 2016.

Under the above circumstances, the Government of the Federal Democratic Republic of Ethiopia made a request to the Government of Japan in July 2003 to extend grant aid assistance for procurement of drilling equipment and material for well construction. It will strongly support the Amhara National Regional State to improve the supply of safe clean drinking water for the rural population.

The Government of Japan entrusted the study to examine the viability of the Project to the Japan International Cooperation Agency (JICA), the official agency implementing the Japanese Government's technical assistance and expediting proper execution of Japan's Grant Aid. Hence, JICA decided to conduct a Basic Design Study (the Study) and has sent the Study Team.

As a result, the basic design study in Ethiopia was executed from October 7 to December 15 2004, the basic study was formulated based on subsequent study in Japan. Afterwards, the study carried out the basic design and explained the proposed project in the draft report in Ethiopia during March 7 to 18, 2005. The Study Team discussed the contents of the project with the officials of the Government of Ethiopia concerned with project. The basic design was accepted by the Government of Ethiopia.

The validity of the request of Ethiopia was assessed by the basic design study. The following items

were adopted as the criteria for assessment.

1) To adapt the function of the requested items to the objectives of the water supply facilities construction project of the AWRDB in Amhara National Regional State.

The Amhara National Regional State has a population of about 18.6 million, with 78% of the inhabitants living in the rural areas. In the rural areas, no social infrastructure is maintained and the public health environment is also bad. For instance, the infant mortality rate is high at 114/1000. Conventional water sources, which are not protected from contamination, are widely used in the most part of the project site.

Moreover, the water fetching work imposes heavy tasks on adult women. Therefore, the issues seen from social and economic viewpoints are as follows:

- To improve the hygiene environment by securing continuous safe and steady water sources.
- To reduce the burden on adult women by shortening access time to water sources.

In consideration of such issues, the procurement plan of the project is formulated to select the well drilling rigs, casing pipes and the screens necessary to construct the protected water supply facilities (shallow wells with hand pumps and deep wells with submersible motor pumps).

2) To coordinate with the present equipment of AWRDB and AWWCE.

The rural water supply project in Amhara region has been undertaken by Amhara National Regional State Water Resources Development Bureau (AWRDB), and responsibility is to be transferred to the village communities after construction of facilities. Construction of rural water supply facilities in Amhara region has been undertaken by Amhara Water Works Construction Enterprise (AWWCE) under the supervision of AWRDB.

The engineering and technical staff of AWWCE consists of 66 people. There are five chief drillers to operate the existing five well drilling rigs at present.

Existing drilling rigs of AWWCE are tabulated below:

Existing drilling rigs of AWWCE

Type	Method	origin	Source	Year
Halco V-866	DTH/Mud rotary	UK	Unicef	1978
Super Rock 5000 (1)	DTH/Mud rotary	South Africa	Government	2001
Super Rock 5000 (2)	DTH/Mud rotary	South Africa	Government	2002
R50	DTH	Sweden	Unicef	2002
Euro12	DTH	France	Unicef	1990

The UK made rig is trouble-prone due to its age. The South African drilling rigs are somewhat newer, but performance could not reach the nominal specifications due to poor construction and mechanical problems. The average drilling depth of those rigs is about 100 m. The R50 and Euro12 are categorized as shallow well drilling rigs and can drill to about 60 m maximum depth. Therefore, the well drilling capacities of the existing drilling rigs are limited due to poor performance.

The requested equipment is composed of water well drilling rigs with supporting trucks for drilling, hydro-geological survey equipment, and well casing pipes and screens for drilling wells. Amhara National Regional State will construct the water supply facilities with government budget by using proposed drilling rigs and materials.

Validity and suitable amounts of each piece of requested procurement equipment are described as follows:

Well drilling rigs

When the Basic Study was initiated, the Ethiopian side proposed two track mounted rotary drilling rigs and one cable percussion drilling rig. A percussion drilling rig was excluded from the procurement because a percussion drilling rig is not suitable for drilling hard rock and 70% of the drilling layer in Amhara region is hard rock. As a result of this, two truck mounted rotary drilling rigs are proposed for procurement, which can drill both hard rock and alluvial formations. Therefore, the drilling method is proposed to be the “Down the Hole” method for hard rock and the direct mud rotary circulation method for alluvial formations. The proposed drilling depth of 40 wells out of 200 wells ranges from 100 m to 250 m. However, there are no adequate drilling rigs to support the depth

range from 100 m to 250 m. Moreover, the well development program in Amhara region in the WSSDP indicated that there are about 2,000 deep wells to be drilled to more than 100 m depth by 2015.

As result, the requirements of the rigs to be procured shall be as follows, considering the well design to be drilled, road conditions of the site, and similarity to the existing rigs.

Type : Top drive type

Drilling method : Both DTH and mud rotary

Drilling capacity : Depth 250 m

Hole diameter : 12-1/4" (mud rotary), 9-5/8" (DTH)

Mounting truck : Drive type shall be 6 x 4 to meet the road conditions of the site

Air lift equipment for shallow well development

AWWCE can use drill pipes and a high pressure air compressor used for DTH for development of the deep wells with 6" diameter. However, for shallow wells with 4" diameter, the drill pipe cannot be used and proper well development cannot be executed with the high pressure air compressor used for DTH. Therefore, two sets of the following equipment shall be procured. The specification is based on past experience.

Compressor 10.5 kgf/cm^2

Water pipe 3" in diameter

Air pipe 1-1/2" in diameter

Support trucks for well construction

Two support trucks are required for each drilling rig, as shown below:

- Truck No.1 (stationed on site):

  for loading of generator/welder and drill pipes, etc.

- Truck No.2 (working between the site and stock yard):

  for transport of casing pipe, screens, gravel, water tanks, etc.

Therefore, one each of the above trucks shall be procured for each procured drilling rig.

Small support vehicles that were in the request were excluded since some of the cars that are out of order at present could be repaired.

Truck mounted pumping test equipment

AWWCE carries out pumping tests with an old submersible pump using a superannuated cable percussion drilling rig as the crane for pump installation for the pumping test. Therefore, for well pumping tests, one set of submersible pumps, a generator, water pipes and electrode cables, etc. shall be procured. This equipment shall be loaded on a cargo truck equipped with a crane and rack for the generator and water pipes (for a total capacity of 150 m length).

The diameter of the submersible pump shall be small enough to be installed in a 6-inch casing pipe. Based on the pumping records at the project area, the following two kinds of pumps shall be procured:

- Submersible pump (1) : Q= 3-4 lit./sec, H= 75 m - 85 m
- Submersible pump (2) : Q= 6-8 lit./sec, H= 130 m - 150 m

Groundwater survey equipment (Electric geophysical equipment and others)

The following groundwater survey equipment shall be procured.

1) Borehole logging equipment and electric geophysical prospecting equipment for well siting and design of well.
2) Portable water quality equipment and portable water level meter for well evaluation.

uPVC casing & screen

Casing pipes and screens for the wells to be constructed by AWWCE in the coming three years shall be procured. Wall thickness of the casing/screen with ND 100 shall be of a standard for shallow wells (Standard Wall), while that of the casing/screen with ND 150 shall be of a standard for deep wells (Thick Walled).

Taking the above into consideration, the Project proposes the procurement of water well drilling rigs with supporting trucks for drilling, hydro-geological survey equipment, and well casing pipes and screens for drilling wells as shown in the following Table.

Amhara National Regional State will construct the water supply facilities of 200 wells with government budget by using this proposed equipment and materials.

In addition, there are many drillers taking training at the Groundwater Development & Water Supply Training Center in Addis Ababa. Therefore, AWWCE will promote a professionally trained driller to be a chief driller for the new drilling rigs. This means the requirements for operation of the new drilling rigs can be met from present manpower. Consequently, there are no issues to the conduct of the project.

Equipment and Materials Proposed for Procurement

Item		Specification	Number
Truck Mounted Rotary Drilling Rigs		Drilling diameter: 9-5/8" (DTH), 12-1/4" (Mud system) Drilling depth: 250 m	2
Air Lift System for Development of Shallow Wells		Air compressor, water pipe 3"	2
Support Trucks for Well Drilling	Crane Trucks	Crane truck 5 tons	2
	Cargo Trucks	10 ton truck	2
Groundwater Survey Equipment	Electric Logger	Resistivity, SP, depth in 300m	1
	Geo-electric Equipment	VES, 2nd dimensions method	1
	Portable Water Level Detector	100 m x 2, 200 m x 2	4
	Portable Water Quality Meter	EC meter, pH meter	1
Pumping Test Equipment (Mounted on the Crane Truck)		Crane truck, Generator, Submersible pump, water riser Pipes	1
uPVC Casing Pipes and Screens	For Shallow Well	Diameter 100 mm	1 lot
	For Deep Well	Diameter 150 mm	1 lot

An implementation schedule for the project was prepared in accordance with the procedures of Japan's Grant Aid. The procurement will be implemented during the 14 months after the Exchange of Note (E/N), consisting of 3.5 months for detailed design and tendering procedures, and 10.5 months for procedures involving the supplier's contract, manufacturing, equipment combination tests, transportation, final inspection and take-over, and operators' training.

The project cost is estimated at JPY 808 million, composed of JPY 505 million of from the Japanese side and JPY 305 million of from the Ethiopian side in accordance with the work demarcation between the Japanese and Ethiopia sides and based on the conditions outlined above. This cost estimate is provisional and will be further examined by the Government of Japan for approval of the Grant.

It is expected that the direct effects from the Project will be as follows:

The Project will improve the water well drilling ability of Amhara National Regional State, and it will make it possible to construct 200 wells (about 94,000 population served).

It is expected that the indirect effects from the Project will be as follows:

The construction of water supply facilities in the Project area will decrease the incidence of water born disease, reduce labor of women and girls and improve environmental health.

The project is expected to produce effects like those mentioned above, and to strengthen the ability for construction of water supply facilities in Amhara National Regional State. Therefore, the project implementation under Japan's Grant Aid scheme is justified. Operation and maintenance of the proposed equipment can be undertaken by the Ethiopia side within their financial and technical capability.

In addition, the following issues should be fully taken into consideration for smooth implementation and effective performance.

1) AWRDB must secure the regional state's budget to construct the 200 wells with the proposed procurement equipments in the 20 *Woredas*.

2) Amhara Water Works Construction Enterprise (AWWCE) shall form the drilling teams for

the proposed drilling rigs to achieve effective operation of proposed procurement equipment, including the organization of the construction system.

3) AWRDB and AWWCE will implement the program for water supply facilities construction by means of the proposed procurement equipment and complete the Project without delay.

4) Monitoring of performance by the implementation agency for water supply facilities construction using proposed procurement equipment should be done to clarify the effects of the Project and continuously improve the operational performance.

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on
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Background of the Project

CHAPTER 1
BACKGROUND OF THE PROJECT

The rate of access to safe water in Ethiopia is about 23.1%. This is extremely low compared with 54% of the average of the Sub Sahara region (UNDP in 2002). People in rural areas, where 85% of the population reside, spend a lot of time and labor on securing domestic water, and this is one of the causes of poverty. Therefore, improving these situations is one of the most important issues for the water supply and sanitation program in Ethiopia.

The ministry of water resource of the federal government has established the year 2001 as a base year for the Water Supply and Sanitation Development Program (WSSDP). The target period to year 2016 is divided into plans of five years for each, and the coverage ratio of rural water supply is set according to the whole country and each state. According to this, it is assumed that a coverage ratio of 23.1% (base year 2001) will be raised to 70.9% in the whole country by the target year 2016. On the other hand, the coverage ratio in Amhara National Regional State aims at being raised from the base year's 23% to 62% in the target year 2016. The construction of necessary water supply facilities is proposed by WSSDP to achieve the target. They consist of the development of deep wells with submersible pumps, shallow wells with hand pumps, dug wells with hand pumps, and spring water facilities.

Under the above circumstances, Government of the Federal Democratic Republic of Ethiopia made a request to the Government of Japan in July 2003 to extend to grant aid assistance for procurement of drilling equipments and materials for well construction. It will strongly support the Amhara National Regional State to improve supplement of safe clean drinking water for rural population.

The Government of Japan entrusted the study to examine the viability of the Project to the Japan International Cooperation Agency (JICA), the official agency implementing the Japanese Government’s technical assistance and expediting proper execution of Japan’s Grant Aid. Hence, JICA decided to conduct a Basic Design Study (the Study) and has sent the Study Team.. As a result, the basic design study in Ethiopia was executed from October 7 to December 15 2004, the basic study was formulated based on the subsequent study in Japan. After wards, the study was carried out the basic design and explained the proposed project in the draft report in Ethiopia during March 7 to 18, 2005. The Study Team discussed the contents of the project with the officials of the government of Ethiopia concerned with project and the basic design was accepted by the Government of Ethiopia.

Chapter 2
Contents of the Project

CHAPTER 2
CONTENTS OF THE PROJECT

2.1 Basic Concept of the Project

The Water Sector Development Program (WSDP) is a priority program of water sector in Ethiopia. The ministry of water resource of the federal government has established the year 2001 as a base year for the Water Supply and Sanitation Development Program (WSSDP) as sub-sector program. The target period to year 2016 is divided into plans of five years for each, and the coverage ratio of rural water supply is set according to the whole country and each state. According to this, it is assumed that a coverage ratio of 23.1% (base year 2001) will be raised to 70.9% in the whole country by the target year 2016. On the other hand, the coverage ratio in Amhara National Regional State aims at being raised from the base year's 23% to 62.0% in the target year 2016. The construction of necessary water supply facilities is proposed by WSSDP to achieve the target. They consist of the development of deep wells with submersible pumps, shallow wells with hand pumps, dug wells with hand pumps, and spring water facilities.

Taking the above into consideration, this Project aims at improving the living environment of rural areas through construction of water supply facilities in Amhara National Regional State. These are indispensable to the feasible execution of the policies of the Amhara National Regional State Government outlined above.

The Project provides for procurement of water well drilling rigs with supporting trucks for drilling, hydro-geological survey equipment, and well casing pipes and screens for drilling wells as shown in Table-2.1. Amhara National Regional State constructs the water supply facilities of 200 wells with government budget by using procured drilling rigs and materials.

Table-2.1 Proposed Procurement Equipment and Materials

Item		Specification	Number
Truck Mounted Rotary Drilling Rigs		Drilling diameter DTH: 9-5/8”, Mud system: 12-1/4” drilling depth: 250m	2
Air Lift System for Development of Shallow Wells		Air compressor、water pipe 3”	2
Supporting Trucks for Well Drilling	Crane Trucks	Crane truck 5 tons	2
	Cargo Trucks	10 tons truck	2
Groundwater Survey Equipment	Electric Logger	Resistivity, SP, depth in 300 m	1
	Geo-electric Equipment	VES, 2nd dimensions methods	1
	Portable Water Level Detector	100m x 2, 200m x 2	4
	Portable Water Quality Meter	EC meter, pH meter	1
Pumping Test Equipment (Mounted on the Crane Truck)		Crane truck, Generator, Submersible pump, water riser pipes	1
uPVC Casing Pipes and Screens	For Shallow Well	Diameter 100mm	1 lot
	For Deep Well	Diameter 150mm	1 lot

The Project Design Matrix is shown in Table-2.2.

Table-2.2 Project Design Matrix (PDM)

Narrative Summary	Objectively Verifiable Indicators	Means of Verification	Important Assumptions
Overall Goal Improve sanitation conditions in Amhara National Regional State.	a) Decrease water-bone disease in the target communities. b) Provide water supply facilities to be used throughout the year.	a) Results of monitoring survey b) Data of Ministry of Health c) Statistical Data	Socio-economic conditions will not change for the worse.
Project Purpose Increase served population with safe and stable drinking water supply.	a) 200 wells (about 94,000 population served) are constructed. b) Water supply facilities are operated by water users' association.	a) Monitoring O&M after implementation of the project b) Operation records of water users' association	a) O&M activities of water users' association will not suffer.
Outputs a) Provide water supply facilities by shallow and deep wells. b) Set up water users' association to maintain the water supply facilities.	a) New water supply facilities are provided. b) Members of water users' association have learned operation of the facilities	a) Construction report b) Basic data about Well c) Registration record of water users' association	a) Framework of the project implementation agency will not change.
Activities Japanese Side Procurement of Equipment Rotary Rigs, Support Vehicles, Electric Sounding Equipment, Pumping Test Machinery, Casing and Screening Pipes Ethiopian Side Construction of Facilities Well Drilling, Construction of Water Supply Facilities Support for operation and maintenance in villages	Input Japanese Side Human Resources Assistance for procurement (Consultant) 6.62 M/M Equipment a) Rotary Rigs (2 nos.) b) Well Development Machinery (2 nos.) c) Support Vehicles (4 nos.) d) Pumping Test Machinery (1 nos.) e) Electric Logging Equipment (1 nos.) f) Electric Sounding Equipment (1 nos.) g) Portable Water Quality Test Kit (1 nos.) h) Water Level Detector (4 nos.) i) Casing and Screen (1 lot) Project Cost 503million JPY	Ethiopian Side Human Resource (Staff of WWCE) a) Construction Dept. (44 persons) b) Engineering Dept. (7 persons) c) O & M Dept. (19 persons) Construction of Facilities a) Well Drilling and Construction of Water Supply Facilities (200 Sites) Project Cost 303 million JPY	a) Budget for construction and O&M by the project implementation agency will not decrease. b) Trained staff of WRDB and WCCE do not resign within a short time Pre-condition a) Safe water source not dried up.

2.2 Basic Design of the Requested Japanese Assistance

2.2.1 Design Policy

(1) Basic Concept

The validity of the request of Ethiopia was assessed by the basic design study. The following items were adopted as criteria to assess.

- To adapt the function of requested items to the objectives of the water supply facilities construction project of the AWRDB in Amhara state.
- To coordinate with the present equipment of AWRDB and AWWCE.

(2) Natural Conditions

The requested main equipment and materials are composed of truck mounted well drilling rigs and casing pipes and screens. Amhara National Regional State constructs the wells with these well rigs and the casing pipes and screens.

The well drilling sites are located in the villages where there is difficult access to the main road, so that the non-paved bad road or the off-road is used to move the drilling rig and vehicles in the villages. Therefore, the car driving in the most part of the state is difficult in the rainy season. The rainfall pattern of Bahir Dar is as shown in Table-2.3. The rainy season in the state capital city Bahir Dar is from June to October and the dry season is from November to May.

Table-2.3 Monthly Average Rainfall in Bahir Dar

Unit: mm

Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Rainfall	1.8	0.2	2.0	27.4	32.6	241.6	433.6	478.7	185.2	108.2	9.8	4.7	1,525.8

Source: National Metrological Station

Therefore, the selected truck-mounted well drilling rigs and the supporting vehicles must be practicable models for the bad roads of the rainy season. A multi driving shaft system is first consideration in this case.

(3) Social and Economic Conditions

The Amhara National Regional State has a population of about 18.6 million, with 78% of inhabitants living in the rural areas. In the rural areas, no social infrastructure is maintained and the public health environment is also bad. For instance, the infantile mortality indicates a high value such as 114/1000. The water sources of conventional type that are not protected from any contamination are widely used in the most part of the project site.

According to the social survey, about 88% of the community used un-protected water sources in the rainy season which consists of river water (42%), spring water (34%), and reservoir ponds (12%).

Moreover, the water fetching work imposes heavy tasks on adult women. Therefore, the issues seen from a social and economical condition are as follows:

- To improve the hygiene environment by securing safe and steady water sources anytime.
- To reduce the burden to adult women by shortening access time to water sources.

In consideration of such kind of issues, the procurement plan of the project is formulated to select the well drilling rigs, casing pipes and the screens necessary to construct the protected water supply facilities (shallow wells with hand pumps and deep wells with submersible motor pumps).

(4) Operation and management capacity of implementation agency

The requested main equipment is composed of equipment for well drilling works. Therefore, the operation and management capacity of AWWCE is examined on the present operational condition, the maintenance of existing equipment, and capacity of staff. The technological level of drilling works is examined on the well drilling achievement annually. The ability of AWRDB is examined on the capacity of budget and their staff.

(5) Selection of equipment

Well drilling rigs

The possibility of the procurement of third country products is examined for procurement cost reduction. In addition to cost reduction, this study examines the quality of products, systems for after-sales service, and the ability of the agencies.

Support vehicles

A suitable ability and amount for use was examined from the purpose and the operational condition of the existing vehicles.

(6) Procurement method and implementation schedule

The procurement, not only for Japan products but also third country products for cost reduction is examined. The procurement equipment is manufactured and collected in the third country or Japan which are transported by sea from each port to Djibouti port. The procurement equipment is unloaded to Djibouti and transported to the yards of AWWCE and AWRDB at Bahir Dar in Amhara national regional state through the border of Djibouti and Ethiopia through the land route. The customs clearance is carried out in Ethiopia.

Therefore, the implementation schedule is divided into three portions (manufacturing and procurement, marine transport from a third country or Japan, customs clearance and inland transportation).

2.2.2 Basic Plan (Equipment Procurement Plan)

The equipment to be procured is tabulated below:

Table-2.4 Equipment Procurement Plan

Requested Items	Requested Specifications	Requested Quantity	Planned Quantity
1) Truck mounted top drive rotary drilling rigs	Drilling dia. : DTH: 9-5/8", mud rotary: 12-1/4" Depth: 250m	2	2
2) Truck mounted percussion drilling rigs	Drilling dia. : 12" Depth: 150m	1	0
3) Air lift equipment for shallow well development	Air compressor, Water pipe	2	2
4) Support trucks			
Cargo trucks	10 ton truck	3	2
Cargo trucks with cranes	5 ton truck with crane	3	2
5) Truck mounted pumping test equipment	Cargo truck with crane, Generator, Submersible pump, Water pipes	1set	1set
6) Groundwater survey equipment			
Borehole logging equipment	Resitivity, SP, Depth 300m	1	1
Geophysical prospecting equipment	VES, Two dimension	1	1
Portable water quality meter	EC, pH	1	1
Portable water level detector	100m x 2, 200m x 2	4	4
7) uPVC casing, screen	Dia. 4", 6"	1 lot	1 lot
8) Support vehicle	Pick up, etc.	6	0

As shown above, a percussion drilling rig was excluded from the procurement. Because, a percussion drilling rig is not suitable for drilling the hard rock and 70% of the drilling layer in Amhara region is hard rock.

Moreover, a support vehicle was also excluded since some of the cars that are out of order at present could be repaired.

Necessity and the basis for the planned quantities for respective equipment are described hereinafter.

(1) Truck mounted top drive rotary drilling

Amhara Water Works Construction Enterprise (AWWCE) has, at present, the following drilling rigs:

- Drilling capacity 100m depth : 1 nos. (more than 25 years since procurement)
- Drilling capacity 100m depth : 2 nos. (2-3 years since procurement)

（These rigs' nominal capacity is 300m depth. However, these rigs are prone to breakdown and the actual capacity is limited to 100m depth.）

- Drilling capacity 60m depth : 1 nos. (10 years since procurement)
- Drilling capacity 60m depth : 1 nos. (2 years since procurement)

The number of wells that are planned to be constructed for a period of three years after the procurement of equipment by AWWCE is shown below. Casing pipes of the wells are to be procured by this Japanese grant aid project.

Table-2.5 Well Drilling Plan by Grand Aid

	Shallow wells (depth 50m- 100m)	Deep wells (depth 100m- 250m)
Number	160	40

Note: One well with 90m depth is classified as a deep well, since its diameter is 6" and it is equipped with a submersible pump.

Moreover, the well development plan in Amhara National Region State indicated in the "National Water Supply and Sanitation Master Plan Framework (The Master Plan)" that is based on WSDP is shown below.

Table-2.6 Well Drilling Plan (Target)

Year	2006-2011	2011-2015	Total
Shallow wells (depth less than 100m)	1,648	1,945	3,593
Deep wells (depth 100m- 250m)	1,109	1,181	2,290
Total	2,757	3,126	5,883

Source: WSDP

It is proposed that AWWCE's well drilling capacity shall be increased as shown below, in order to contribute to implementation of the above development plan. That is, the well drilling capacity shall be increased from 120 wells/year to 160 wells/year, contributing to above development plan (590 wells/year).

Table-2.7 Present Capacity and Planned Capacity of Drilling Rig

Drilling rigs	Present capacity		Planned capacity	
	Nos.	Drilling capacity	Nos.	Drilling capacity
Capacity: 250m depth (Planned procurement)			2	30 wells/year/rig ＝60 wells/year
Capacity: 100m depth (Existing)	3	19 wells/year/rig ＝57 wells/year	2	20 wells/year/rig ＝40 wells/year
Capacity: 60m depth (Existing)	2	30 wells/year/rig ＝60 wells/year	2	30 wells/year/rig ＝60 wells/year

Note: One existing rig with capacity of 100m depth has become superannuated and is expected to stop working.

The requirements of the rigs to be procured shall be as follows, considering the well design to be drilled, road condition of the site, and similarity to the existing rigs.

Type : Top drive type

Drilling method : Both DTH and mud rotary

Drilling capacity : Depth 250 m

Hole diameter : 12-1/4" (mud rotary), 9-5/8" (DTH)

Mounting truck : Drive type shall be 6 x 4 to meet the road conditions of the site

(2) Air lift equipment for shallow well development

AWWCE can use drill pipes and a high pressure air compressor used for DTH, for development of the deep wells with 6" diameter. However, for shallow wells with 4" diameter, the drill pipe cannot be used and proper well development cannot be executed with a high pressure air compressor used for DTH.

Therefore, two sets of the following equipment shall be procured. The specification is based on past experience.

- Portable air compressor

  Free air delivery : approx. 8.5 m^3/min

  Max. pressure : 10.5 kgf/cm^2

- Air pipe 1-1/2" one set

- Water pipe 3”　　one set

(3)　Support trucks

(3)-1　Support trucks for well construction

Two support trucks are required for each drilling rig, as shown below:

- Truck No.1 (fixed at site□:

  for loading of generator/welder and drill pipes, etc.
- Truck No.2 (working between the site and stock yard) :

  for transport of casing pipe, screens, gravel, water tanks, etc.

Therefore, one each of the above trucks shall be procured for each procured drilling rig. Considering the road conditions, the trucks shall be of 6 x 4 drive and shall meet the following requirements.

a)　Truck No.1　(fixed at site)

Loading capacity shall be 15 ton:

- Generator/Welder　　: approx. 2.5 ton
- Compressor for well development, etc.　: approx. 2.5 ton
- Drill pipe, Tools, etc.　　: approx. 8 - 9 ton

  Total 13 - 14 ton

Length of the bed shall be more than 7 m（Length of drill pipes is more than 6 m）

b)　Truck No.2　(working between the site and stock yard)

Loading capacity shall be 13 ton:

- Casing pipe　　: approx. 5.5 ton　(for 200 m depth)

- Gravel : approx. 12 ton (for 200 m depth)
- Water tank : approx. 2 ton
- Bentonite : approx 2.5 ton (for 50 bags)

Length of the bed shall be more than 7 m□Length of casing pipes is more than 6 m□

Truck mounted crane with loading capacity of 3 ton for lifting casing pipe, water tank (weight: approx. 1 ton), etc. shall be equipped.

(4) Truck mounted pumping test equipment

For well pumping tests, one set of submersible pumps, generator, water pipes and electrode cables, etc. shall be procured. This equipment shall be loaded on a cargo truck with crane that is equipped with a rack for the generator and water pipes (for 150 m length).

Diameter of the submersible pump shall be small enough to be installed in 6 inch casing pipe. Based on the pumping records at the project area, the following two kinds of pumps shall be procured:

- Submersible pump (1) : Q= 3-4 lit./sec, H= 75 m - 85 m
- Submersible pump (2) : Q= 6-8 lit./sec, H= 130 m -150 m

The generator shall have enough capacity for staring the above submersible pumps:

Capacity: 70-80KVA, AC380V, 3-phase, 4 lines, 50Hz

Loading capacity of the cargo truck with crane (capacity 2.9 ton) shall be 7 ton so that the submersible pumps, water pipes, and generator, etc. can be loaded and the drive type shall be 4 x 4.

(5) Groundwater survey equipment (Electric geophysical equipment and others)

The following groundwater survey equipment shall be procured.

1) Borehole logging equipment (Resistively & SP):

one nos. (Length of the logging cable shall be 300 m)

2) Electric geophysical prospecting equipment (VES & Two dimension):

one nos.(including software for data analysis)

3) Portable water quality meter (EC meter, pH meter) :

one each

4) Portable water level detector (for 100m depth and 200 meter depth) :

two each

(6) uPVC casing & screen

Casing pipes and screens for the wells to be constructed by AWWCE for the coming three years shall be procured.

- uPVC casing ND 100, L=3m& 6m : DIN4925& DIN8061or equivalent
- uPVC casing ND 150, L=3m & 6m : DIN4925& DIN8061or equivalent
- uPVC screen ND 100, L=3m : DIN4925& DIN8061or equivalent
- uPVC screen ND 150, L=3m & 6m : DIN4925& DIN8061or equivalent

Wall thickness of the casing/screen with ND 100 shall be of a standard for shallow wells (Standard Wall), while that of the casing/screen with ND 150 shall be of a standard for deep wells (Thick Walled).

(7) Procurement of spare parts and consumables

Procurement of spare parts should be considered for the following equipment:

- Truck mounted rotary drilling rigs
- High pressure air compressor for DTH

- Truck for mounting of the above compressor
- Generator
- Air compressor for well development
- Submersible pump
- Supporting truck (Cargo truck, Cargo truck with crane)

For appropriate operation and maintenance of the above equipment, spare parts for two years operation shall be procured. However, spare parts for the supporting truck are available at the agent in Addis Ababa and shall be excluded from the procurement.

2.2.3 Basic Design Drawing

Basic drawings for the following equipment are attached.

- Truck mounted rotary drilling rig
- Air lift equipment for well development
- Pumping test equipment
- Cargo truck
- Cargo truck with crane
- uPVC pipe & screen

2.2.4 Procurement Plan

2.2.4.1 Procurement Policy

Assuming that the Project is implemented under the Japanese Grant Aid Scheme, the following principles should be applied for implementation:

1) The executing agency of the Ethiopian side is Amhara National Regional State Government Water Resource Development Bureau (AWRDB).

2) At signing of the Exchange of Notes between the Japanese and Ethiopian Governments, AWRDB should proceed with necessary actions for implementation of the Project.

3) After signing of the Exchange of Notes between the Japanese and Ethiopian Governments, a Japanese consulting firm will sign a contract with AWRDB, and the consultant will prepare detailed design and tender documents, and then commence the tendering procedure.

4) A Japanese contractor will sign a contract with AWRDB and execute procurement under supervision of the consultant.

5) The Japanese consulting firm will be provided a room in the AWRDB free of charge.

6) The equipment to be procured are:

   - Truck mounted top drive rotary drilling rigs
   - Air lift equipment for shallow well development
   - Support trucks
   - Truck mounted pumping test equipment
   - Groundwater survey equipment
   - uPVC casing & screen

This equipment is not manufactured in Ethiopia and is to be procured from Japan or a third country. The procurement should be done by one contractor.

At the completion of the procurement, responsibility for the procured equipment is handed over to WRDB

2.2.4.2 Procurement Conditions

Procured equipment shall be transported to Djibouti port by sea and inland transported to Ethiopia. Customs clearance is not necessary at Djibouti and will be done in Ethiopia. Formalities for the customs clearance shall be undertaken by AWRDB.

To secure proper operation of the drilling rigs, initial operation guidance to the staff of AWWCE for O&M of the procured drilling rigs will be provided. The guidance will be executed by a pair of technicians, a mechanic and a driller. The guidance period will be one month. In addition, spare parts for two years operation of the drilling rig will be procured.

2.2.4.3 Scope of Works

Japanese Side:

1) Detailed design (Specification)
2) Preparation of tender documents, tender evaluation, assistance for contract awards
3) Procurement of the planned equipment
4) Performance tests at the factory and packing inspection
5) Pre-shipment inspection by the third party
6) Inspection, acceptance and handing-over of equipment to the Government of Ethiopia
7) Preparation of the procurement documents
8) Transportation of the procured equipment to the final destination
9) Tuning up, trial operation, and initial operation guidance

Ethiopian Side:

1) Provision of stock yards and storage house for the procured equipment, spare parts, materials etc.

2) Provision of the office for the procurement contractor and the consultant

3) Customs clearance of the equipment

4) Tax exemption for the procured equipment

5) Application for approval of custom clearance and payment of the expenses

6) Maintenance of the procured equipment

7) Budgeting for the well construction using the procured material

8) Assignment of the counterpart personnel

2.2.4.4 Procurement Supervision

The consultant will conclude a consulting service contract with the Ethiopian executing agency within a framework of the E/N and provide the following services.

(1) Confirmation of the procurement item

The consultant will confirm the procurement item, procurement schedule and obligation of the Ethiopian government, based on the basic design and results of consultation with the Ethiopian side.

(2) Preparation of Tender documents

The consultant will prepare the tender documents based on the above confirmed procurement plan. The tender documents will be submitted to the executing agency for approval. The approved tender documents will be submitted to JICA.

(3) Tender call, Tender opening, Tender evaluation, Conclusion of contract

The consultant will conduct the tender call, prepare answers to queries by the tenderers, attend the tender opening, and prepare the tender evaluation report. The consultant will assist the executing agency in contract negotiation and contract conclusion.

(4) Check of the shop drawing

Following the contract conclusion, the consultant will verify the shop drawings submitted by the contractor to check whether those are in accordance with the specification.

(5) Factory inspection, Pre-shipment inspection, Pre-loading inspection by the third party

a) Factory inspection

The consultant will attend the factory inspection and confirm the performance of the equipment and verify the inspection report prepared by the manufacturer.

b) Pre-shipment inspection

The consultant will confirm the item and quantity of the equipment before those are packed for shipment.

c) Pre-loading inspection by a third party

The consultant will entrust the pre-loading inspection to a third party. The consultant will liaise between the contractor and the third party.

(6) Acceptance and hand over

The resident engineer of the consultant will stay in Ethiopia from the arrival of the equipment to completion of hand-over in order to supervise the opening of the packing, initial operation guidance, acceptance, and handover.

2.2.4.5 Quality Control Plan

The consultant will confirm in each procurement step that the procurement is conducted in accordance with the contract. The inspection for each step is as follows.

Check of the shop drawings	: confirmation of specifications and quantity
Factory inspection	: confirmation of performance, verification of the test reports
Pre-shipment inspection	: confirmation of shipment items, specification, and quantity
Pre-loading inspection	: confirmation of loading items, specification, and quantity
Acceptance and hand over	: confirmation of procured items, specification, and quantity, checking if any damages occur, confirmation of proper

execution of the initial operation guidance

2.2.4.6 Procurement Plan

(1) Procurement Plan

All the equipment to be procured is manufactured outside of Ethiopia. The procurement source countries are determined considering the following:

- Quality, performance, price, and delivery period
- Advantages in maintenance (availability of the spare parts, etc.)

The procurement source countries for respective equipments are as follows:

1) Well drilling rigs

The source countries of the drilling rigs used in Ethiopia are Japan, UK, USA, Italy Sweden, and South Africa. Other than Japan, Sweden is judged to be a proper source country in terms of quality of the equipment and after-sales service. Therefore, the equipment to be procured in Japan or in Sweden will be made in Japan or in Sweden.

2) Air compressor, Generator, and Submersible pump

The source countries of this equipment are Japan, Sweden (air compressor), Denmark (submersible pump). This equipment is appropriate in terms of quality and convenience in maintenance. Therefore, the equipment to be procured in Ethiopia will be made in Japan or these third countries.

3) Support trucks

The Japanese and Italian manufactures have agents with workshops in Addis Ababa and are well organized for the after-sales service. Therefore, the equipment to be procured in Ethiopia will be made in Japan or in Italy.

4) Groundwater survey equipment (Electric geophysical equipment and others)

The source countries of this equipment are Japan, Sweden, USA, Germany, and UK. This equipment is appropriate in terms of quality and convenience in maintenance. Therefore, the equipment to be procured in Ethiopia will be made in Japan or these third countries.

(2) Transportation plan

The equipment will be unloaded at Djibouti port and will be transported by land to the delivery place, Bahir Dar. Customs formality is not necessary at Djibouti port and is executed in Ethiopia. The transportation distance is about 1,500 km via Addis Ababa and 1,000 km directly.

2.2.4.7 Implementation Schedule

Implementation is composed of the detailed design stage and procurement stage.

The implementation schedule is dominated by the procurement schedule of the drilling rig and the expected periods are as follows:

Check of the shop drawings/specification	: 0.5 months
Manufacture/procurement	: 5 months
Factory Inspection/shipment	: 1 month
Transportation	: 3 months
Initial operation guidance/Acceptance/hand over	: 1 month
Total	: 10.5 months

The draft implementation schedule is as follows:

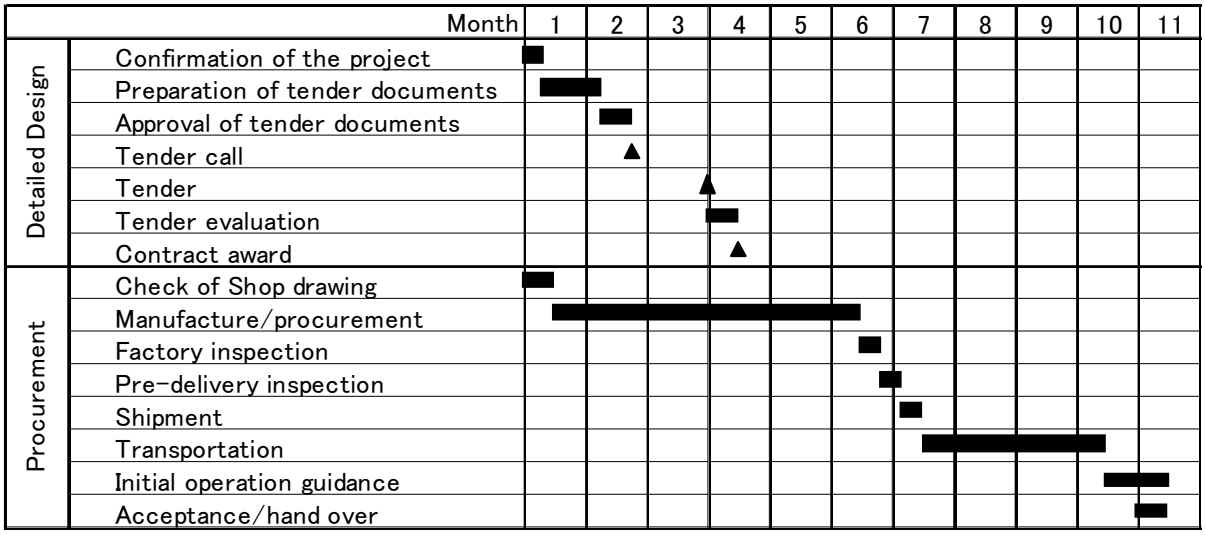


Figure-2.1 Implementation Schedule for the Project for Water Supply in Amhara National Regional State

2.3 Obligations of the Recipient Country

Undertakings of the Government of Ethiopia are drafted as follows:

(1) To provide data and information necessary for the Project.

(2) To provide a warehouse for storing of spare parts and other equipment procured by the Project, at the head office of AWWCE.

(3) To provide the office space for the consultant service during implementation of the Project, at the head office of Amhara Water Resources Development Bureau.

(4) To construct 200 water wells using equipment and materials procured by the Project.

(5) To bear all the expenses, other than those to be borne by the Grant Aid, necessary for construction of the facilities as well as for the transportation and installation of the equipment.

(6) To maintain and use properly and effectively the equipment and casing pipes and screens procured under the Grant Aid.

(7) To bear the commissions of the Japan bank for banking services based upon the

Banking Arrangement.

(8) To exempt taxes and to take necessary measures for customs clearance of materials and equipment procured by the Project at the port of disembarkation.

(9) To ensure the prompt unloading and customs clearance at a port of disembarkation in Ethiopia and facilitate internal transportation therein of the products purchased under the Grant.

(10) To exempt Japanese nationals from customs duties, internal taxes and other fiscal levies that may be imposed in Ethiopia with respect to the supply of the products and services under the Verified Contracts.

(11) To accord Japanese nationals whose services may be required in connection with supply of the products and services under the verified contracts, such facilities as may be necessary for their entry into Ethiopia and stay therein for the performance of their work.

(12) To assign the necessary staff and secure the necessary budget for operation and maintenance of the equipment purchased under the Grant Aid.

(13) To maintain and use properly and effectively the facilities constructed and equipment provided under the Grant Aid.

2.4 Project Operation Plan

2.4.1 Operation and Maintenance System

The rural water supply project in Amhara National Regional State has been undertaken by Amhara National Regional State Water Resources Development Bureau (AWRDB), and responsibility is being transferred to the village communities after construction of facilities. Construction of rural water supply facilities in Amhara National Region State has been undertaken by Amhara Water Works Construction Enterprise (AWWCE), which received orders from AWRDB for well construction.

The Project is to be carried out for the procurement of water well drilling rigs and supporting vehicles for AWRDB to enhance the capacity of the rural water supply project in Amhara region. AWRDB and AWWCE are responsible for the operation and maintenance of the equipment and services in Amhara National Region State.

(1) AWRDB

AWRDB is the implementation agency for the Project and is situated within the Agricultural and Rural Development Bureau as shown in the organization chart (Figure-2.2). The responsible person for the Project is the director of AWRDB, and the chief counterpart is the deputy director of AWRDB in charge of water supply and hygiene.

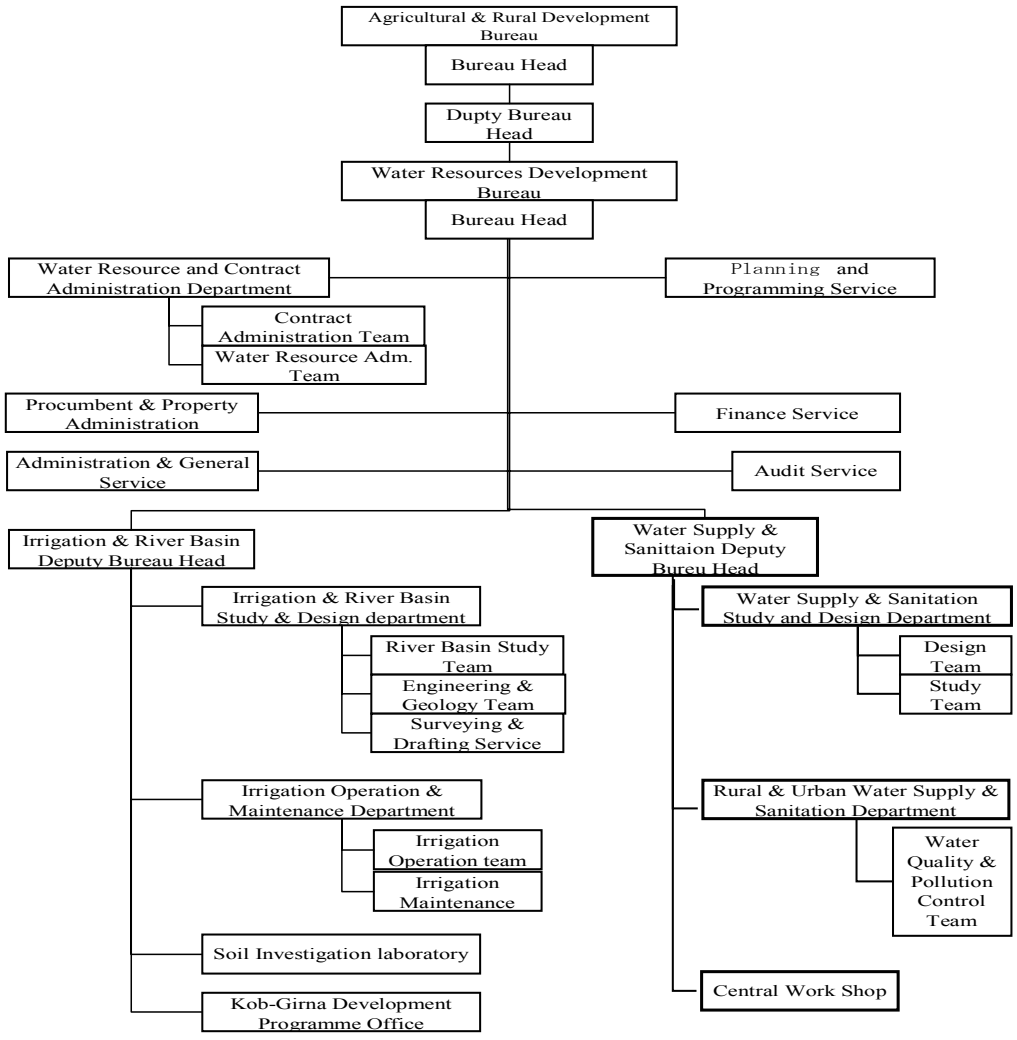


Figure-2.2 Water Sector Organizational Structure of Amhara National Regional State

(2) AWWCE

AWWCE is to construct 200 wells using the procurement well drilling rigs and the casing pipes and screens under the supervision of AWRDB.

The total number of staff of AWWCE is 195 people, and the well drilling section that shows in the organization chart (Figure-2.3) takes charge of well drilling The construction section is responsible for the construction of the water supply facilities. The equipment supply and operation and maintenance department is responsible for the maintenance of equipment.

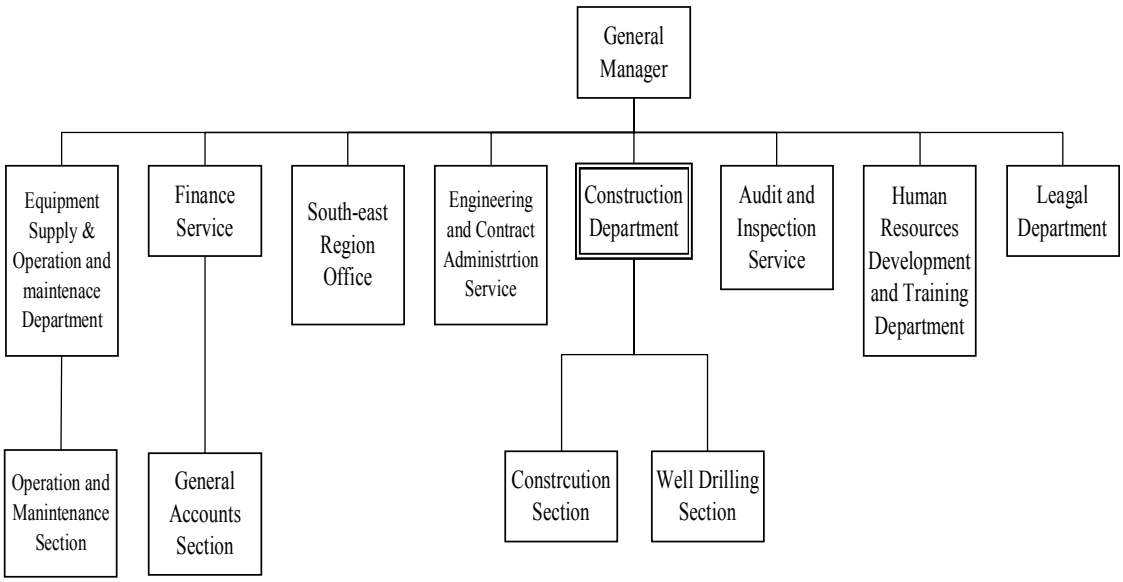


Figure-2.3 Organization Chart of AWWCE

The engineering and technical staff of AWWCE consists of 66 people, as shown in Table-2.8. There are five chief drillers to operate the existing five well drilling rigs at present. In addition, there are many drillers being trained at the Groundwater Development & Water Supply Training Center in Addis Ababa. Therefore, they will promote a professionally trained driller to be a chief driller for the new drilling rigs. This means the requirements for the operation of the new drilling rigs can be achieved with present manpower. Consequently, there are no issues for the conduct of the project.

Table-2.8 The Engineering and Technical Staff of AWWCE

Department	Category	Number	Department	Category	Number
Construction	Manager	1	Equipment Supply and Operation & Maintenance	Manager	1
	Supervisors	2		Workshop Head	1
	Chief drillers	5		Chief Mechanics	2
	Drillers	8		Mechanics	3
	Assistant Drillers	28		Assistant Mechanics	5
Engineering and Contract Administration Service	Manager	1		Welder	1
	Water Supply Engineers	3		Assistant Welders	2
	Design engineer	1		Electricians	4
	Geologists	2	Total		66

Source: AWWCE

2.4.2 Operation and Maintenance

The main equipment of the project consists of well drilling rigs and their supporting vehicles. In addition to this equipment, casing pipes and screens for 200 wells are included in the project. However, the construction of the wells is the responsibility of the Ethiopian side.

These equipment and materials are provided to AWRDB, and then those equipment and materials are to be used to strengthen AWRDB or AWWCE depending on the purpose. AWRDB is to conduct the survey and planning for the construction program of 200 wells and takes measures to obtain the budget for implementation of the program.

AWWCE will construct the wells using the new well drilling rigs and the casing pipes and the screens. The average amount of well construction and average drilling depth of each of the five drilling rigs of the AWWCE in the latest three years are as shown in Table-2.9.

Table-2.9 Average Numbers Drilling Well by Each Drilling Rig in AWWCE

Drilling Rig	Average Drilling Depth	Average Wells Drilled A Year
Halco V-866	70m	17
Super Rock 5000 (1)	70m	20
Super Rock 5000 (2)	70m	24
R50	40-50m	35
Euro12	40-50m	25
Total	-	121

Source: AWWCE

AWWCE constructed an average of 120 wells a year with five drilling rigs. Based on the above-mentioned results, AWWCE has enough technology to construct the wells using the new drilling rigs. The annual expenditure of the AWWCE maintenance section is shown in the following Table-2.10.

Table-2.10 Annual Cost of Equipment Maintenance Service Department in AWWCE

(Unit：1,000 Birr)

Item	Fiscal 2002	Fiscal 2003	Fiscal 2004
1. Salaries of Staff	228	228	228
2. Maintenance Cost (Office)	1	1	1
3. Maintenance of Equipment and Vehicles	353	358	1,053
4. Materials Cost	232	276	881
5. Labor Costs	46	89	85
Total	860	952	2,248

Source: AWWCE

The operation and maintenance expense of fiscal year 2004 is about 1.05 million Birr (about 14 million yen). This amount is adequate to maintain five well drilling rigs and 14 (six of which are broken down) trucks. However, AWWCE needs to repair the broken-down trucks and to renew the maintenance equipment. Moreover, the operation and maintenance of the new rigs are required to maintain the equipment, so AWWCE must budget carefully for its requirements. The allocated operation and maintenance budget for AWWCE in 2005 is 2.8 million Birr.

According to the estimate of AWRDB, an approximate estimate for drilling 200 wells is shown in the following Table-2.11. AWRDB must budget for this cost.

Table-2.11 Estimated Cost for Well Drilling

Year	2007	2008	2009
SBH（Shallow Wells）	62	60	38
DBH（Deep Wells）	14	14	12
Cost（Million Birr）	9.0	8.8	6.2

Source: AWRDB

On the other hand, the budgets of the Amhara National Regional State in recent years are as follows:

Table-2.12 Budget of Amhara National Regional State

Unit（million Birr）

Year		1997	1998	1999	2000	2001	2002
Income collected from the Region		178	183	193	204	217	245
Direct Foreign Aid	Grant	28	29	16	14	-	-
Subsidy from Federal Government	Recurrent Expenditure	416	443	402	579	643	790
	Capital Expenditure	310	199	130	204	188	180
Foreign Aid through Federal Government	Grant	15	29	11	5	5	24
	Loan	6	26	29	51	23	45
Total		953	909	781	1,057	1,076	1,284

Source: AWRDB

An adequate budget allocation to meet the cost of well construction for the 200-well program is possible judging from the current budget scale and capital expenditure of the Amhara National Regional State.

2.5 Project Cost

2.5.1 Project Cost

The project cost is estimated at JPY808million, composed of JPY 503 million of from the Japanese side and JPY 305 million of from the Ethiopian side in accordance with the work demarcation between the Japanese and Ethiopia sides and based on the conditions outlined below. This cost estimate is provisional and would be further examined by the Government of Japan for approval of the Grant.

(1) Japanese side

Project Cost : 503 million yen

Item		Cost (million yen)
Procurement of Equipment		483
	Equipment (drilling rigs, air lift equipment, Support trucks, etc.)	442
	Transportation, Operation guidance, over head	41
Engineering service		20
	Detailed design	16
	Procurement supervision	4
Total		503

(2) Ethiopian side

Construction of 200 wells by using the equipment and materials procured by this project is planned in the coming three years. The necessary cost to be born by Ethiopian side is as shown below:

Item	Cost	
	million Birr	Equivalent Yen (million Yen)
Construction of 200 wells	24	305

(3) Conditions of Cost Estimate

1) Time of Estimate : December 2004

2) Exchange rate : 1US$ = 109.92 Yen

: 1 Birr = 12.72 Yen

3) Procurement Period : As shown in the implementation schedule

4) Others : The project shall be implemented in accordance with the regulations and systems of the Japan's grant Aid Scheme

2.5.2 Operation and Maintenance Cost

The equipment, such as drilling rigs and support trucks, to be procured by this project will be operated by AWWCE. Operation and maintenance expenditures of AWWCE from FY2002 to FY2004 are shown in the table below:

Table-2.13 Annual Cost of Equipment Maintenance Service Department in AWWCE

(Unit: 1,000 Birr)

FY	2002	2003	2004
1. Personnel expenses	228	228	228
2. Office expenses	1	1	1
3. Maintenance expenses	353	358	1,053
4. Material cost	232	276	881
5. Labor cost	46	89	85
Total	860	952	2,248

Source: AWWCE

The above table shows that the expenses for maintenance of vehicles and equipment account for about 50 % of the annual expenditure for operation and maintenance. The expenditure in both FY 2002 and FY2003 was about 350,000 Birr. In FY 2004, the amount budgeted was substantially increased to about 1.05 million Birr (14 million yen) in proportion to the increase in the construction works. If new drilling rigs are provided, the budged budget for operation and maintenance of those that equipment would be necessary. According to AWWCE, the budged budget will be increased and 2.8 million Birr is appropriated for operation and maintenance in the next year's budget. Considering these instances, it can be said that the Ethiopian government could bear the budged budget increase for the newly procured equipment.

Chapter 3
Project Evaluation and Recommendation

CHAPTER 3
PROJECT EVALUATION AND RECOMMENDATIONS

3.1 Project Effect

3.1.1 Effects of Implementation of the Project and Improvements

The expected effects of implementation of the project are listed as follows:

Table-3.1 Effects of Implementation of the Project and Improvements

Current Situation and problems	Measures for the Project	Effects and Improvements
It is the most important issue in Ethiopia to solve the shortage of domestic water in the villages. The ministry of water resource of the federal government has established the year 2001 as a base year for the Water Supply and Sanitation Development Program (WSSDP). The target period to year 2016 is divided into plans of five years each, and the coverage ratio of rural water supply is set according to the whole country and each state. According to this, the coverage ratio in Amhara National Regional State aims at being raised from the base year's 23% to 62.0% in the target year 2016. The Amhara National Regional State government procures drilling equipment for the accomplishment of this goal of the water supply plan because AWRDB and AWWCE are in urgent need of the strengthening of their facilities construction ability.	Well drilling rigs and construction support equipment, groundwater survey equipment and the casing pipes and screens are procured by the project. The construction of water supply facilities will be carried out using the procured equipment and materials at the selected 200 well drilling sites under the financial and technical responsibility of Amhara National Regional State.	The execution of the Project is aimed at the improvement of water supply facilities construction ability, and contributes to the improvement of resident's living environment.

3.1.2 Direct Effects

It is expected that the direct effects from the Project will be the improvement of the water well drilling ability of Amhara National Regional State, and it will become possible to construct 200 wells (about 94,000 population served).

3.1.3 Indirect Effects

The construction of water supply facilities in the Project area will reduce the incidence of water born disease, reduce the labor load on women and girls, and improve environmental health.

3.2 Recommendations

The following issues should be fully taken into consideration for smooth implementation and effective performance of the Project.

1) Secure the staff and budget for the obligations of the Ethiopian side.

The Ethiopian side bears responsibility for the construction of the water wells and secures the necessary staff to implement the Project.

2) Enhance the system for management and maintenance of the water supply facilities to be constructed with the proposed procurement equipment.

In order to enable smooth operation and maintenance of the water supply facilities constructed using the proposed procurement equipment, it is required to arrange the construction work system of AWWCE for the proposed drilling rig before handing over the procurement equipment.

3) Complete the Project without delay when the Project is executed.

Prepare and control the implementation schedule of water supply facilities using the proposed procurement equipment for completion of the Project without delay.

4) Monitor the water supply facilities construction that uses the proposed procurement equipment.

The periodic monitoring surveys on the project activities during the 200-well drilling program will be carried out to clarify the effects of the Project.

3.3 Project Justification

The Project is justified for implementation under the Grant Aid Scheme for the following reasons.

1) The project will improve the water well drilling ability of Amhara National Regional State, and it will become possible to construct 200 wells in the 20 *Woredas* (about 94,000 population served).

2) The construction of water supply facilities in the Project area will decrease the incidence of water born disease, reduce the labor load of women and girls and improve environmental health.

3) It is possible for the Ethiopian side to construct the water supply facilities using the proposed procurement equipment within their financial and technical capability.

4) This Project contributes to the Water Sector Development Program (WSDP) of Ethiopia, so it is consistent with the national policy of the Government of Ethiopia.

5) This Project is judged to have no significant adverse effects on the environment.

6) The Project can be implemented under the Grant Aid Scheme of the Japanese Government without any difficulties.

3.4 Conclusion

The Project is justified for implementation under the Japan's Grant Aid Scheme from the aforesaid effects and contribution to improvement of the extremely poor water supply situation. The Ethiopian side will be able to properly organize the operation and maintenance, including staffing and financial arrangements for the project.

In addition, the following issues should be fully taken into consideration for smooth implementation and effective performance.

1) AWRDB must secure the regional states budget to construct the 200 wells with the

proposed procurement equipment in the 20 *Woredas*.

2) AWWCE shall form the drilling teams for the proposed drilling rigs to achieve effective operation of the proposed procurement equipment, including the organization of the construction system.

3) AWRDB and AWWCE will implement the program of water supply facilities construction by means of the proposed procurement equipment and complete the Project without delay.

4) Monitoring of performance by the implementation agency for water supply facilities construction using the proposed procurement equipment should be done to clarify the effects of the Project and continuously improve the operational performance.

Appendixes

1. Member List of Study Team
2. Survey Itinerary
3. List of Parties Concerned in the Recipient Country
4. Minutes of Discussions
5. Other Relevant Data

Appendix-1
Member List of Study Team

Appendix-1 : Member List of the Study Team

1. Explanation of Inception Report and Field Survey (October 6 to December 15, 2004)

Position in Charge	Name	Affiliation
Team Leader	JIN, Kimiaki	Deputy Resident Representative, JICA Ethiopia Office
Chief Consultant/ Rural Water Supply	FUJINAMI, Masato	Nippon Koei Co., Ltd.
Vice Chief Consultant/ Groundwater Development	TAKAHASHI, Shinya	Nippon Koei Co., Ltd.
Hydrogeology / Geophysical Survey	KIKAWADA, Atsusa	Nippon Koei Co., Ltd.
Water Supply Facility Planning	FUJIYAMA, Taketoshi	Nippon Koei Co., Ltd.
Donor Coordinatoin	NINOMIYA, Masanobu	Nippon Koei Co., Ltd.
Sustainable O&M Planning with Beneficiary's Participation	NISHI, Makoto	Nippon Koei Co., Ltd.
Procurement Planning / Procurement Management	TAMURA, Hidehisa	Nippon Koei Co., Ltd.
Construction & Procurement Planning / Cost Estimation	KOZAWA, Takuo	Nippon Koei Co., Ltd.
Coordinator	TAKAHASHI, Masayuki	Nippon Koei Co., Ltd.

2. Explanation of Draft Final Report (March 7 to 18, 2005)

Position in Charge	Name	Affiliation
Team Leader	JIN, Kimiaki	Deputy Resident Representative, JICA Ethiopia Office
Chief Consultant/ Rural Water Supply	FUJINAMI, Masato	Nippon Koei Co., Ltd.
Vice Chief Consultant/ Groundwater Development	TAKAHASHI, Shinya	Nippon Koei Co., Ltd.
Donor Coordinatoin	NINOMIYA, Masanobu	Nippon Koei Co., Ltd.

Appendix-2
Survey Itinerary

Appendix-2 : Survey Itinerary

1. Explanation of Inception Report and Field Survey (October 5 to December 17, 2004)

No	Date		Member	Station	Activities
1	Oct.5	Tue	Ninomiya	On Board	
2	6	Wed	Ninomiya	Addis Ababa	
3	7	Thu	Ninomiya	Addis Ababa	Data Collection
4 ・ 5	8 ・ 9	Fri ・ Sat	Ninomiya	Addis Ababa	Data Collection
6	10	Sun	Ninomiya	Addis Ababa	Data Collection
			Fujinami, M.Takahashi	On board	
7	11	Mon	Ninomiya	Addis Ababa	Data Collection
			Fujinami, M.Takahashi	Addis Ababa	
8	12	Tue	Jin, Fujinami, Ninomiya, M.Takahashi	Addis Ababa	Courtesy Call to JICA and Discussion with JICA Courtesy Call to MoFED and MoWR
9	13	Wed	Jin, Fujinami, Ninomiya, M.Takahashi	Bahir Dar	Courtesy Call to SWRDB, Discussion on Contents of Minutes
10	14	Thu	Jin, Fujinami, Ninomiya, M.Takahashi	Bahir Dar	Discussion on Contents of Minutes
11	15	Fri	Jin, Fujinami, Ninomiya, M.Takahashi	Bahir Dar	Discussion on Contents of Minutes
			S.Takahashi, Kikawada	On board	
12	16	Sat	Jin, Fujinami, Ninomiya, M.Takahashi	Addis Ababa	Study Team Meeting
			S.Takahashi, Kikawada	Addis Ababa	
13	17	Sun	Jin, Fujinami, S.Takahashi, Kikawada,Ninomiya, Nishi, M.Takahashi	Awasa	
14	18	Mon	Jin, Fujinami, S.Takahashi, Kikawada,Ninomiya, Nishi, M.Takahashi	Awasa	Courtesy Call to SNNPR WRDB, Discussion on Contents of Minutes
			Fujiyama	On board	
15	19	Tue	Jin, Fujinami, S.Takahashi, Kikawada,Ninomiya, Nishi, M.Takahashi	Awasa	Discussion on Contents of Minutes
			Fujiyama	Addis Ababa	
16	20	Wed	S.Takahashi, Kikawada, Ninomiya, Nishi, M.Takahashi	Awasa	Discussion on Contents of Minutes, Data Collection
			Jin, Fujinami, Fujiyama	Addis Ababa	Courtesy Call to Japan Embassy Data Collection
17 ・ 18	21 ・ 22	Thu ・ Fri	Jin, Fujinami, S.Takahashi, Kikawada, Fujiyama, Ninomiya, Nishi, M.Takahashi	Addis Ababa	Study Team Meeting Data Collection
19	23	Sat	Fujinami, S.Takahashi, Kikawada, Fujiyama, M.Takahashi	Addis Ababa	Data Collection, Field Survey
			Nishi	Awasa	
			Ninomiya	On board	
20	24	Sun	Fujinami, M.Takahashi	Addis Ababa	Data Collection, Field Survey
			S.Takahashi, Kikawada, Fujiyama, Nishi	Awasa	
			Ninomiya	On board	
21	25	Mon	Fujinami, M.Takahashi	Addis Ababa	Data Collection, Field Survey
			S.Takahashi, Kikawada, Nishi	Awasa	
			Fujiyama	Sodo	
			Ninomiya		
22	26	Tue	Fujinami, M.Takahashi	Addis Ababa	Data Collection, Field Survey
			S.Takahashi, Kikawada, Nishi	Awasa	
			Fujiyama	Waka	

No	Date		Member	Station	Activities
23	Oct. 27	Wed	Fujinami, M.Takahashi	Addis Ababa	Data Collection, Field Survey
			S.Takahashi, Kikawada	Awasa	
			Fujiyama	Waka	
			Nishi	Hosaina	
24	28	Thu	Fujinami, M.Takahashi	Addis Ababa	Data Collection, Field Survey
			S.Takahashi, Kikawada	Awasa	
			Fujiyama	Waka	
			Nishi	Hosaina	
25	29	Fri	Fujinami, M.Takahashi	Addis Ababa	Data Collection, Field Survey
・	・	・	S.Takahashi	Dhila	
・	・	・	Kikawada	Hagore Salem	
・	・	・	Fujiyama		
・	・	・	Nishi	Sodo	
26	30	Sat	Kozawa	On board	
27	31	Sun	Fujinami, M.Takahashi	Addis Ababa	Data Collection, Field Survey
			S.Takahashi, Kikawada	Awasa	
			Fujiyama	Kechi	
			Nishi	Sodo	
			Kozawa	Addis Ababa	
28	Nov. 1	Mon	Fujinami, Kozawa, M.Takahashi	Addis Ababa	Data Collection, Field Survey
			S.Takahashi	Hosaina	
			Kikawada	Durame	
			Fujiyama	Kechi	
			Nishi	Tercha	
29	2	Tue	Fujinami, Kozawa, M.Takahashi	Addis Ababa	Data Collection, Field Survey
			S.Takahashi	Hosaina	
			Kikawada	Hosaina	
			Fujiyama	Kechi	
			Nishi	Sodo	
30	3	Wed	Fujinami, Kozawa, M.Takahashi	Addis Ababa	Data Collection, Field Survey
			S.Takahashi	Butajira	
			Kikawada	Butajira	
			Fujiyama	Kechi	
			Nishi	Sodo	
31	4	Thu	Fujinami, Kozawa, M.Takahashi	Addis Ababa	Data Collection, Field Survey
			Tamura	On board	
			S.Takahashi	Butajira	
			Kikawada	Butajira	
			Fujiyama	Kechi	
			Nishi	Sodo	
32	5	Fri	Fujinami, Kozawa, M.Takahashi	Addis Ababa	Data Collection, Field Survey
			Tamura	Addis Ababa	
			S.Takahashi	Butajira	
			Kikawada	Butajira	
			Fujiyama	Kechi	
			Nishi	Sodo	
33	6	Sat	Fujinami, Kikawada, Nishi, Tamura, Kozawa, M.Takahashi	Addis Ababa	Data Collection, Field Survey
			S.Takahashi	Hosaina	
			Fujiyama	Kechi	
34	Nov. 7	Sun	Fujinami, Tamura, Kozawa, M.Takahashi	Bahir Dar	Data Collection, Field Survey
			S.Takahashi	Sodo	
			Kikawasa	Wolayta	
			Fujiyama	Kechi	
			Nishi	Addis Ababa	

No	Date		Member	Station	Activities
35	Nov. 8	Mon	Fujinami, Tamura, Kozawa, M.Takahashi	Bahir Dar	Data Collection, Field Survey
			S.Takahashi	Sodo	
			Kikawasa	Wolayta	
			Fujiyama	Kechi	
			Nishi	Awasa	
36	9	Tue	Fujinami, Tamura, Kozawa, M.Takahashi	Bahir Dar	Data Collection, Field Survey
			S.Takahashi	Sodo	
			Kikawasa	Hosaina	
			Fujiyama	Kechi	
			Nishi	Awasa	
37	10	Wed	Fujinami, Tamura, Kozawa, M.Takahashi	Bahir Dar	Meeting on Technical Notes with AWRDB, Data Collection, Field Survey
			S.Takahashi	Sodo	Data Collection, Field Survey
			Kikawasa	Tercha	
			Fujiyama	Kechi	
			Nishi	Awasa	
38	11	Thu	Fujinami, Tamura, Kozawa, M.Takahashi	Addis Ababa	Data Collection, Field Survey
			S.Takahashi	Sodo	
			Kikawasa	Kechi	
			Fujiyama	Tercha	
			Nishi	Yerega Chaffe	
39	12	Fri	Fujinami, Tamura, Kozawa, M.Takahashi	Addis Ababa	Data Collection, Field Survey
			S.Takahashi	Tercha	
			Kikawasa	Kechi	
			Fujiyama	Loma	
			Nishi	Awasa	
40	13	Sat	Fujinami, Tamura, Kozawa, M.Takahashi	Addis Ababa	Data Collection, Field Survey
			S.Takahashi	Tercha	
			Kikawasa	Kechi	
			Fujiyama	Awasa	
			Nishi	Awasa	
41	14	Sun	Fujinami, Nishi, Tamura, Kozawa, M.Takahashi	Awasa	Data Collection, Field Survey
			S.Takahashi	Sodo	
			Kikawasa	Tercha	
			Fujiyama	Arbaminch	
42	15	Mon	Fujinami, Nishi, Tamura, Kozawa, M.Takahashi	Awasa	Data Collection, Field Survey
			S.Takahashi	Arbaminch	
			Kikawasa	Tercha	
			Fujiyama	Arbaminch	
43	16	Tue	Fujinami, Tamura, Kozawa, M.Takahashi	Awasa	Data Collection, Field Survey
			S.Takahashi	Arbaminch	
			Kikawada	Waka	
			Fujiyama	Arbaminch	
			Nishi	Butajira	

No	Date		Member	Station	Activities
44	Nov. 17	Wed	Fujinami, Tamura, Kozawa, M.Takahashi	Awasa	Data Collection, Field Survey
			S.Takahashi	Jinka	
			Kikawada	Arbaminch	
			Fujiyama	Arbaminch	
			Nishi	Butajira	
45	18	Thu	Fujinami, Tamura, Kozawa, M.Takahashi	Awasa	Data Collection, Field Survey
			S.Takahashi	Jinka	
			Kikawada	Jinka	
			Fujiyama	Arbaminch	
			Nishi	Butajira	
46	19	Fri	Fujinami, Tamura, Kozawa, M.Takahashi	Awasa	Meeting on Technical Notes with SWRDB
			S.Takahashi	Jinka	Data Collection, Field Survey
			Kikawada	Jinka	
			Fujiyama	Arbaminch	
			Nishi	Addis Ababa	
47	20	Sat	Fujinami, Nishi, Tamura, Kozawa, M.Takahashi	Addis Ababa	Data Collection, Field Survey
			S.Takahashi, Kikawada, Fujiyama	Arbaminch	
48	21	Sun	Fujinami, Nishi, Tamura, Kozawa, M.Takahashi	Addis Ababa	Data Collection, Field Survey
			S.Takahashi	Tercha	
			Kikawada	Arbaminch	
			Fujiyama	Arbaminch	
49	22	Mon	Fujinami, Nishi, Tamura, Kozawa, M.Takahashi	Addis Ababa	Data Collection, Field Survey
			S.Takahashi	Sodo	
			Kikawada	Arbaminch	
			Fujiyama	Arbaminch	
50 ・ 51	23 ・ 24	Tue ・ Wed	Fujinami, Nishi, Tamura, Kozawa M.Takahashi	Addis Ababa	Data Collection, Field Survey
			S.Takahashi, Kikawada, Fujiyama	Awasa	
52	25	Thu	Fujinami, S.Takahashi, Kikawada, Fujiyama, Nishi, Tamura, Kozawa, M.Takahashi	Addis Ababa	Data Collection
53	26	Fri	Fujinami, S.Takahashi, Fujiyama, Nishi, Tamura, Kozawa, M.Takahashi	Addis Ababa	Study Team Meeting Data Collection
			Kikawada	On board	
54	27	Sat	Fujinami, S.Takahashi, Fujiyama, Nishi, Tamura, Kozawa, M.Takahashi	Addis Ababa	Data Collection
			Kikawada	On board	
55	28	Sun	Fujinami, S.Takahashi, Fujiyama, Nishi, Tamura, Kozawa, M.Takahashi	Addis Ababa	Data Collection
			Kikawada		
56	29	Mon	Fujinami, S.Takahashi, Nishi, Tamura, Kozawa, M.Takahashi	Addis Ababa	Data Collection
			Fujiyama	On board	
57	30	Tue	Fujinami, S.Takahashi, Nishi, Tamura, Kozawa, M.Takahashi	Addis Ababa	Data Collection
			Fujiyama	On board	
58	Dec. 1	Wed	Fujinami, S.Takahashi, Tamura, Kozawa, M.Takahashi	Addis Ababa	Data Collection
			Fujiyama		

No	Date		Member	Station	Activities
59 ・ 62	Dec. 2 ・ 5	Thu ・ Sun	Fujinami, S.Takahashi, Tamura, Kozawa, M.Takahashi	Addis Ababa	Data Collection
63	6	Mon	S.Takahashi, M.Takahashi	Addis Ababa	Report to Japan Embassy / JICA Ethiopia Office
			Fujinami, Tamura, Kozawa	On board	
64	7	Tue	S.Takahashi, M.Takahashi	Addis Ababa	Data Collection
			Fujinami, Tamura, Kozawa	On board	
65	8	Wed	S.Takahashi, M.Takahashi	Addis Ababa	Data Collection
			Fujinami, Tamura, Kozawa		
66 ・ 71	9 ・ 14	Thu ・ Tue	S.Takahashi, M.Takahashi	Addis Ababa	Data Collection
72	15	Wed		Addis Ababa	Report to JICA Ethiopia Office
			S.Takahashi	On board	
			M.Takahashi	On board	
73	16	Thu	S.Takahashi	On board	
			M.Takahashi	On board	
74	17	Fri	S.Takahashi		
			M.Takahashi		

Note MoFED : Ministry of Finance and Economic Development
MoWR : Ministry of Water Resource
SWRDB : Southern Water Resource Development Bureau
AWRDB : Amhara Water Resource Development Bureau

2. Explanation of Inception Report and Field Survey (October 5 to December 17, 2004)

No	Date		Member	Station	Activities
1	Mar. 6	Sun	Fujinami, S.Takahashi	On Board	
			Ninomiya	On Board	
2	7	Mon	Fuhinami, S.Takahashi, Ninomiya	Addis Ababa	
3	8	Tue	Jin, Fujinami, S.Takahashi, Ninomiya	Addis Ababa	Courtesy Call to JICA Courtesy Call to MoFED
4	9	Wed	Jin, Fujinami, S.Takahashi, Ninomiya	Addis Ababa	Courtesy Call to MoWR
5	10	Thu	Jin, Fujinami, S.Takahashi, Ninomiya	Addis Ababa	Discussion with SNNPR WRDB
6	11	Fri	Jin, Fujinami, S.Takahashi, Ninomiya	Addis Ababa	Discussion with SNNPR WRDB
7	12	Sat	Jin, Fujinami, S.Takahashi, Ninomiya	Addis Ababa	Study Team Meeting
8	13	Sun	Jin, Fujinami, S.Takahashi, Ninomiya	Addis Ababa	-
9	14	Mon	Jin, Fujinami, S.Takahashi, Ninomiya	Addis Ababa	Discussion with Amhara WRDB
10	15	Tue	Ninomiya	On Board	
			Jin, Fujinami, S.Takahashi	Addis Ababa	Discussion with Amhara WRDB
11	16	Wed	Ninomiya	Dubai	
			Jin, Fujinami, S.Takahashi	Addis Ababa	Report to Japan Embassy / JICA Ethiopia Office
12	17	Thu	Ninomiya		
			Jin, Fujinami, S.Takahashi	Addis Ababa	Courtesy Call to Japan Embassy
13	18	Fri	Fujinami, S.Takahashi	On Board	
14	19	Sat	Fujinami, S.Takahashi	Dubai	
15	20	Sun	Fujinami, S.Takahashi	-	

Appendix-3
List of Parties Concerned in the Recipient Country

Appendix-3 : List of Parties Concerned in the Recipient Country

Ministry of Finance and Economic Development
<Department of Bilateral Cooperation>

Mr. Tilahum Tadesse	Team Leader
Mr. Gebremedhine Birega	Desk Officer for Japan
Ms. Asnakech Teferra	Team Leader, Asia Australia & Middle East Countries

Ministry of Water Resources
<Planning & Project Department>

Mr. Gulilat Birhane	Department Head

<Urban Water Supply and Sanitation Department>

Mr. Yohannes G/Medhin	Department Head

Addis Ababa Water and Sewerage Authority
<Engineering Department>

Ms. Azeb Asneka	Department Head

Amhara Natinal Regional State
<Water Resources Development Bureau >

Mr. Teshome Maru	Bureau Head
Dr. Almayeh Mekonnen	Deputy of Bureau Head
Mr. Micluggeta E. Meskel	Procurement & Supply Head
Mr. Habtamu	Civil Engineer
Mr. Shumet Kedebe	Senior Geophyist
Mr. Andarge Yitbarek	Senior Hydro-Geologist

<Water Works Construction Enterprise>

Mr. Shikur Belay	General Manager
Mr. Adugnaw Debebe	Construction Department Head
Mr. Kurabachew Kidane	Administration & Finance Head
Mr. Asmamaw Ayalew	Engineering & Cons tract Administration Department Head
Mr. Fransiskus	Project Manager
Mr. Achmad Yulizar Yani	Head of Rural
Mr. Molla Eshete	Planning & Training Service Head
Mr. Dagim Desalegn	Financial Adviser
Mr. Tamasku	Material Supply & Maintenance Service
Mr. Abebe Worku	Geological Team Leader

Japanese Embassy

Izumi, Kenjiro	Ambassador
Mihogi, Yoshiyuki	Second Secretary

JICA Ethiopia Office

Saito, Naoki	Resident Representative
Jin, Kimiaki	Deputy Resident Representative
Inoue, Hiromu	Assistant Resident Representative

JICA Groundwater Development & Water Supply Training Project

Dr. Maruo, Yuji	Chief Advisor
Ishigaki, Shigeki	Coordinator
Sagawa, Mitsuyoshi	Mechanical Engineer
Suzuki, Takashi	Drilling Engineer

FINNIDA/RESEP Amhara Region

Mr. Arto Suominen	Programme Coordinator

UNICEF

Mr. Tekka	Representative

ESRDF Amhara Region

Zenebe Worku	Rural Water Supply Team Leader

Appendix-4
Minutes of Discussion

Minutes of Discussions
The Basic Design Study on
The Project for Water Supply in Amhara Regional State
in the Federal Democratic Republic of Ethiopia

In response to the request from the Government of the Federal Democratic Republic of Ethiopia (hereinafter referred to as ' Ethiopia'), the Government of Japan decided to conduct a Basic Design Study on the Project for Water Supply in Amhara Regional State (hereinafter referred to as "the Project"), and entrusted the study to Japan International Cooperation Agency (hereinafter referred to as 'JICA').

JICA sent to Ethiopia the Basic Design Study Team (hereinafter referred to as 'the Team'), which was headed by Mr. Kimiaki Jin, Deputy Resident Representative, JICA Ethiopia Office, JICA, and was scheduled to stay in the country from October 11th to 22nd, 2004.

The Team held a series of discussions with the officials concerned of the Government of Ethiopia and conducted a field survey in the study area.

In the course of discussions and field survey, both parties confirmed the main items described on the attached sheets. The Team will proceed to further work and prepare the Basic Design Study Report.

Addis Ababa, Nov. 22nd, 2004

Mr. Kimiaki Jin
Leader,
Basic Design Study Team,
Japan International Cooperation Agency

Mr. Teshome Maru
Head,
Water Resources Development Bureau,
Council of Amhara Regional State,
Federal Democratic Republic of Ethiopia

Witness

Mr. Hailemichael Kinfe
Head,
Bilateral Cooperation Department,
Ministry of Finance and Economic Development,
Federal Democratic Republic of Ethiopia

ATTACHMENT

1. Objective of the Project

The objective of the Project is to improve the water supply services in Amhara Regional State through strengthening physical capacity of Water Resources Development Bureau (WRDB) in order to meet regional requirement to supply safe and adequate drinking water for the residents.

2. Responsible and Implementing Organization

WRDB, Council of Amhara Regional State and Water Works Construction Enterprise (WWCE), the implementation entity of WRDB

3. Site of the Project

The Project sites are as shown in Annex-1 (page 5). Ethiopian side promised to avoid duplication of sites with other donor's activities. As a result of careful review by Ethiopian side and the social survey, the site will be finalized at the time when the draft final report is scheduled to be presented in February 2005.

4. Items requested by the Government of Ethiopia

After discussions with the Team on the points described as below, Ethiopian side finalized the items of the request described in Annex-2 (Page 8). JICA will assess the appropriateness of the request in engineering, social and financial terms and will report the findings to the Government of Japan.

(1) Exclusion of the facility construction

Japanese side explained that the 10 water supply facilities construction would not be included in the Project because of the enough capacity of WWCE. Ethiopian side responded that at least commission of the rigs was necessary for the proper starting of the construction work.

(2) Cable tool percussion rig

The Ethiopian side requested to change a unit of hydraulic fracturing and service rig into a cable tool percussion rig in order to drill borehole in sites with alluvial deposit th at exis ts in Kobo-Girana valley, Nor th Wollo Zone. The change was proposed because of the recent collapses of the boreholes in alluvial deposition area. The change from service rig and the hydraulic fracturing unit into cable tool comes from priority point of views of the Amhara region.

The team explained the technical disadvantage of the cable tool percussion rigs for proposed well sites. Finally, both parties agreed the justification of the provision of a rig would be determined based on the result of geo-physical survey by WRDB for the Project sites. It is also confirmed that priority is given to rotary rigs over cable tool percussion rig.

(3) Pumping test equipment

Both sides agreed that pumping test equipment was included in the request.

(4) PVC casing pips and screens

Ethiopian side explained that casing pipes should be imported from outside of Ethiopia by paying in hard currency and requested to include them in the item to be provided by Grant Aid project. Quantity and diameter of PVC casing pipes and screens shall be determined based on the result of geophysical survey by WRDB as well as social survey by the Team for the Project sites. Allocation of necessary budget by Ethiopian side for drilling activities will also be one of the factors to determine quantity of PVC casing pipes and screens in order to ensure the proper use of them.

5. Japan's Grant Aid Programme

Ethiopia side has understood the system and characteristics of Japan's Grant Aid Programme as described by the Team shown in Annex-3 (Page 9).

6. Necessary measures to be taken by the Ethiopia side

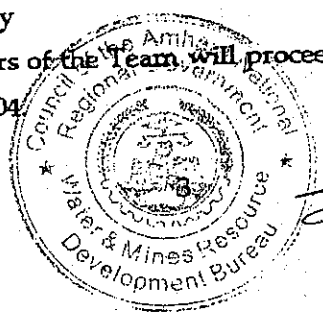
Ethiopia side will take the necessary measures, as described in Annex-4 (Page 13), for smooth implementation of the Project on condition that the Japanese Grant Aid is extended.

In the discussion on Annex-4, Ethiopian side pointed out that internal transportation cost should be covered by Grant Aid scheme although Ethiopian side would cover necessary procedures and cost for custom procedures.

Ethiopian side also expressed that the cost for fuel, local materials, salary and pre-diem for the construction of water wells by using the rigs donated would be covered by Ethiopian side. The Regional government will allocate the necessary budget for the construction in accordance with the result of geo-physical survey that is currently on going as a part of Basic Design Study.

7. Further Schedule of the Study

a. The consultant members of the Team will proceed with further studies in Ethiopia until December 7th, 2004.



b. JICA will prepare the Draft Basic Design Study Report in English and dispatch a mission in order to explain and discuss its contents around February 2005.

8. Other relevant issues

(1) Social Survey

The social survey in the Basic Design Study will be conducted in 166 villages listed in Annex-1 in order to verify the baseline survey.

(2) Questionnaires

The Team submitted questionnaires on the responsible and implementing organization as well as design, construction and cost estimation to Ethiopian side. Ethiopian side will fulfill the questionnaires by the end of October.

(3) Role of Both Countries

Both sides confirmed that the Japanese side procures main equipment and materials necessary for water well drilling and water well.

The Ethiopian side bears all construction works of the water well.

(4) Ownership of the Equipments

Both sides confirmed that the Amhara Regional State would make use of the equipment in the Project.

(5) Maintenance of the equipments and water supply facilities

The Ethiopia side has agreed to secure and allocate the necessary budget to operate and maintain the Water Well Drilling Equipments, and water supply facilities constructed by Project.

(6) Tax Payment

Value Added Tax (VAT), custom duties and any other taxes and fiscal levies in Ethiopia arisen from the Project activities will be born by beneficiary institution.

(7) Safety and security

The Ethiopian side agreed to take any necessary measures deemed necessary to secure the safety of the member of the Team.

Council of the Amhara National Regional Government
Water & Mines Resource Development Bureau

Annex-1 List of Requested Schemes in Amhara Region

No	Zone	Woreda	Area/Kebele	Beneficiary Population	Type of Scheme	Qty	Estimated Cost(Birr)	Implementation Period
1	North Wollo	Gidan	Tetergh (03)	350	SBH	1	24,000	2003-2004
2	North Wollo	Gidan	Tingit	405	SBH	1	24,000	2003-2004
3	North Wollo	Gidan	Kebero Meda oll	1,225	DBH	1	52,000	2003-2004
4	North Wollo	Gubalftu	Shello mender 09	1,050	DBH	1	52,000	2003-2004
5	North Wollo	Gubalftu	Lengisa 010-Gida mesh	1,125	DBH	1	52,000	2003-2004
6	North Wollo	Gubalftu	Adembulbulo 010	985	DBH	1	52,000	2003-2004
7	North Wollo	Habru	Agamsa 027	1,090	DBH	1	52,000	2003-2004
8	North Wollo	Habru	Haro 027	1,135	DBH	1	52,000	2003-2004
9	North Wollo	Habru	Sekela 015	385	SBH	1	24,000	2003-2004
10	North Wollo	Habru	Meja aden 07	1,450	DBH	1	52,000	2003-2004
11	North Wollo	Habru	Sirinka Gerado 04	325	SBH	1	24,000	2003-2004
12	North Wollo	Habru	Jarota 07	1,500	DBH	1	52,000	2003-2004
13	North Wollo	Habru	Darimu 07	1,350	DBH	1	52,000	2003-2004
14	North Wollo	Habru	Abiyot Fire 07	1,650	DBH	1	52,000	2003-2004
15	North Wollo	Habru	Aware 09	2,500	DBH	1	52,000	2003-2004
16	North Wollo	Habru	Deferghe 023	390	SBH	1	24,000	2003-2004
17	North Wollo	Habru	Fakit 034	310	SBH	1	24,000	2003-2004
18	North Wollo	Habru	Tajaabo 025	280	SBH	1	24,000	2003-2004
19	North Wollo	Habru	Enatguya 017	325	SBH	1	24,000	2003-2004
20	North Wollo	Habru	Kega Ber 029	415	SBH	1	24,000	2003-2004
21	North Wollo	Habru	Koso Mender	295	SBH	1	24,000	2003-2004
22	North Wollo	Habru	Derek Wenz+Nacha Feres 031	375	SBH	1	24,000	2003-2004
23	North Wollo	Habru	Keyritu+Birafaf 032	255	SBH	1	24,000	2003-2004
24	North Wollo	Habru	Mekeresha+Zet Yibel 034	354	SBH	1	24,000	2003-2004
25	South Wollow	Jama	Begide+Ibayu 09	1,500	DBH	1	52,000	2003-2004
26	South Wollow	Kelela	Chelhele 03-Sembe	350	SBH	1	24,000	2003-2004
27	South Wollow	Kelela	Yimere 01	250	SBH	1	24,000	2003-2004
28	South Wollow	Jama	Allegn	500	SBH	1	24,000	2003-2004
29	South Wollow	Jama	Laukubi & Tach kub 1	1,000	DBH	1	52,000	2003-2004
30	South Wollow	Jama	Ejerti michael 012	750	SBH	2	24,000	2003-2004
31	South Wollow	Jama	Gerbo, Hodere 017	1,050	DBH	1	52,000	2003-2004
32	South Wollow	Jama	Golelsha 017	750	SBH	2	24,000	2003-2004
33	South Wollow	Jama	Libanos 019	1,550	DBH	1	52,000	2003-2004
34	South Wollow	Jama	Gende Gulo 020	750	SBH	2	24,000	2003-2004
35	South Wollow	Worebabo	Kelkesha 015	1,250	DBH	1	52,000	2003-2004
36	South Wollow	Worebabo	Lhiftu 015	750	SBH	2	24,000	2003-2004
37	South Wollow	Worebabo	Gedida 014	1,000	DBH	1	52,000	2003-2004
38	South Wollow	Worebabo	Gubisa 05	250	SBH	1	24,000	2003-2004
39	South Wollow	Worebabo	Abo Gora 05	1,400	DBH	1	52,000	2003-2004
40	South Wollow	Worebabo	Korekon 05	500	SBH	2	24,000	2003-2004
41	South Gondar	Simada	Agewoch 010	750	SBH	1	24,000	2003-2004
42	South Gondar	Simada	Genta	250	SBH	1	24,000	2003-2004
43	South Gondar	Simada	Mwerem 34	750	SBH	1	24,000	2003-2004
44	South Gondar	Simada	Goref 04	150	SBH	1	24,000	2003-2004
45	South Gondar	Simada	Menkelila	500	SBH	1	24,000	2003-2004
46	South Gondar	Simada	Agamwuha 05	500	SBH	1	24,000	2003-2004
47	South Gondar	Simada	Chifehaf 06	500	SBH	1	24,000	2003-2004
48	South Gondar	Ibnat	Selamaya	1,250	DBH	1	52,000	2003-2004
49	South Gondar	Ibnat	Wegere Selamaya	250	SBH	1	24,000	2003-2004
50	South Gondar	Ibnat	Checheho Jimmaderega	750	SBH	2	24,000	2003-2004
51	South Gondar	Ibnat	Minch Jimmaderega	250	SBH	1	24,000	2003-2004
52	South Gondar	Ibnat	Awsheridi Jimmaderega	250	SBH	1	24,000	2003-2004
53	South Gondar	Ibnat	Tinjut Ber	250	SBH	1	24,000	2003-2004
54	Oromiya	Bati	Garero 07	175	SBH	1	24,000	2003-2004
55	Oromiya	Bati	Ajshayu+kergu	500	SBH	1	24,000	2003-2004
56	Oromiya	Bati	Tatthignaw Lkgo	560	SBH	1	24,000	2003-2004
57	Oromiya	Bati	Laygnaw Laygo, Kembere	600	SBH	2	24,000	2003-2004
58	Oromiya	Bati	Selmani 014	1,000	DBH	1	52,000	2003-2004
59	North Shewa	Angolelanaa Sagirt	Ambel+Koso	455	SBH	1	24,000	2003-2004
60	North Shewa	Angolelanaa Sagirt	Werga	353	SBH	1	24,000	2003-2004
61	North Shewa	Angolelanaa Sagirt	Seriti	285	SBH	1	24,000	2003-2004
62	North Shewa	Angolelanaa Sagirt	Liche Seriti Totose	300	SBH	1	24,000	2003-2004
63	North Shewa	Angolelanaa Sagirt	Mongudo Cheke Zurya	325	SBH	1	24,000	2003-2004
64	North Shewa	Angolelanaa Sagirt	Lafole aje Cheke	295	SBH	1	24,000	2003-2004
65	North Shewa	Angolelanaa Sagirt	Cheke Town	350	SBH	1	24,000	2003-2004
66	North Shewa	Angolelanaa Sagirt	Tsetsergi abanachiros	530	SBH	1	24,000	2003-2004

No	Zone	Woreda	Area/Kebele	Beneficiary Population	Type of Scheme	Qty	Estimated Cost(Birr)	Implementation Period
67	North Shewa	Angolelanaa Sagirt	Tsatsu Dire Tiku, Ugulo	600	SBH	2	24,000	2003-2004
68	North Shewa	Angolelanaa Sagirt	Bewshu 015	300	SBH	1	24,000	2003-2004
69	North Shewa	Angolelanaa Sagirt	Chilkiwolo 010	300	SBH	1	24,000	2003-2004
70	North Shewa	Angolelanaa Sagirt	Shimidir/Limat Kinatchora 012	350	SBH	1	24,000	2003-2004
71	North Shewa	Angolelanaa Sagirt	Dibaran 011	210	SBH	1	24,000	2003-2004
72	North Shewa	Angolelanaa Sagirt	Gela Kamiru Arquatia 011	700	SBH	2	24,000	2003-2004
73	Waghimra	Sekota	Dirinziba, Tasaskiw	750	SBH	2	24,000	2003-2004
74	Waghimra	Sekota	Nigusaleka 08	225	SBH	1	24,000	2003-2004
75	Waghimra	Sekota	Alejewshina 07	250	SBH	1	24,000	2003-2004
76	Waghimra	Sekota	Wellan and Chiffe	150	SBH	1	24,000	2003-2004
77	Waghimra	Sekota	Tesfergi, Abarashir 015	530	SBH	2	24,000	2003-2004
78	Waghimra	Sekota	Tsatsu, Dire Tiku, Ugulo	600	SBH	2	24,000	2003-2004
79	Waghimra	Sekota	Shimhar Tiku 010	250	SBH	1	24,000	2003-2004
80	Waghimra	Sekota	Chilkiw 010 mizrib	300	SBH	1	24,000	2003-2004
81	Waghimra	Sekota	Shimidirla Limat Chora	350	SBH	1	24,000	2003-2004
82	Waghimra	Sekota	Dibaran 011	210	SBH	1	24,000	2003-2004
83	Waghimra	Sekota	Gelalkamiru Arquatiya	700	SBH	2	24,000	2003-2004
84	Waghimra	Sekota	Dirinziba Tsaskiw, Sikuna	750	SBH	2	24,000	2003-2004
85	Waghimra	Sekota	Nigas Alcka 08	225	SBH	1	24,000	2003-2004
86	Waghimra	Sekota	Alcajewshina 07	250	SBH	1	24,000	2003-2004
87	Waghimra	Dahana	Wellcomenta-Hcnubish	100	SBH	1	24,000	2003-2004
88	North Soawa	Minjar Shenkora	Chelfe geberel	1,500	DBH	1	52,000	2003-2004
89	North Soawa	Minjar Shenkora	Chame Ager	500	SBH	1	24,000	2003-2004
90	North Soawa	Minjar Shenkora	Burkek	2,000	DBH	1	52,000	2003-2004
91	North Soawa	Minjar Shenkora	Alamnch Dire	1,750	DBH	1	52,000	2003-2004
92	North Soawa	Minjar Shenkora	Kitichu	1,250	DBH	1	52,000	2003-2004
93	North Soawa	Minjar Shenkora	Gaegolecha	875	SBH	2	24,000	2003-2004
94	North Soawa	Minjar Shenkora	Wunaga	925	SBH	2	24,000	2003-2004
95	North Soawa	Minjar Shenkora	Kiki	625	SBH	2	24,000	2003-2004
96	North Soawa	Minjar Shenkora	Jejebikola	375	SBH	1	24,000	2003-2004
97	North Soawa	Minjar Shenkora	Finanajo	575	SBH	2	24,000	2003-2004
98	North Soawa	Minjar Shenkora	Arage Minjar	1,100	DBH	1	52,000	2003-2004
99	North Soawa	Minjar Shenkora	Zewelde	675	SBH	2	24,000	2003-2004
100	North Shoa	Tarmaber	Argaga	600	DBH	1	52,000	2003-2004
101	South Wello	Harbu	Arinienta	750	SBH	2	24,000	2003-2004
102	South Wello	Harbu	Adcranba	1,000	DBH	1	52,000	2003-2004
103	South Wello	Harbu	Meja	1,000	DBH	1	52,000	2003-2004
104	South Wello	Harbu	Abumaye	1,000	DBH	1	52,000	2003-2004
105	South Wello	Harbu	Wienna	1,500	DBH	1	52,000	2003-2004
106	South Wello	Kelela	Kersa 05	300	SBH	1	24,000	2003-2004
107	South Wello	Kelela	Weda Golwn 030	700	SBH	2	24,000	2003-2004
108	South Wello	Kelela	Inchini 031	250	SBH	1	24,000	2003-2004
109	South Wello	Kelela	Tika 034	750	SBH	2	24,000	2003-2004
110	South Wello	Kelela	Indoda 030	400	SBH	1	24,000	2003-2004
111	South Wello	Kelela	Wode Gctu 036	1,240	DBH	1	52,000	2003-2004
112	South Wello	Kelela	Kore/Fincheftu 037	500	SBH	1	24,000	2003-2004
113	South Wello	Kelela	GendeBoresa 036	500	SBH	1	24,000	2003-2004
114	South Wello	Wegide	Vagi 014	300	SBH	1	24,000	2003-2004
115	South Wello	Wegide	Golele 09	1,000	DBH	1	52,000	2003-2004
116	South Wello	Wegide	Kutiso 03 Abey	1,250	DBH	1	52,000	2003-2004
117	South Wello	Wegide	Bikili 04	800	SBH	2	24,000	2003-2004
118	South Wello	Wegide	Ayele Anp Rufa 02,04	700	SBH	2	24,000	2003-2004
119	South Wello	Wegide	Haleltu 07	400	SBH	1	24,000	2003-2004
120	South Wello	Wegide	Yeshum	750	SBH	2	24,000	2003-2004
121	South Wello	Mekoella	Iwelinta 02	300	SBH	1	24,000	2003-2004
122	South Wello	Mekoella	Yebar 013	300	SBH	1	24,000	2003-2004
123	South Wello	Mekoella	Tilkot 02	350	SBH	1	24,000	2003-2004
124	South Wello	Mekoella	Gematit 02	300	SBH	1	24,000	2003-2004
125	South Wello	Mekoella	Tija Fej 06	250	SBH	1	24,000	2003-2004
126	South Wello	Mekoella	Felana 06	500	SBH	1	24,000	2003-2004
127	South Wello	Mekoella	Gonderoch	250	SBH	1	24,000	2003-2004
128	South Wello	Merdella	Mekoella	300	SBH	1	24,000	2003-2004
129	South Wello	Merdella	Feterot-Ychilcch	1,000	DBH	1	52,000	2003-2004
130	South Wello	Merdella	Dedere 05	200	SBH	1	24,000	2003-2004

No	Zone	Woreda	Area/Kebele	Beneficiary Population	Type of Scheme	Qty	Estimated Cost(Birr)	Implementation Period
131	South Wollo	Merdella	Gose 05	500	SBH	1	24,000	2003-2004
132	South Gondar	Ibnat	Tilbi	250	SBH	1	24,000	2003-2004
133	South Gondar	Ibnat	Kwalisa	1,000	DBH	1	52,000	2003-2004
134	South Gondar	Ibnat	Work mender sebr aba Jale	250	SBH	1	24,000	2003-2004
135	South Gondar	Ibnat	Wonber Ayfwayalewha	250	SBH	1	24,000	2003-2004
136	South Gondar	Libo Kemkem	Berengna Lendur	350	SBH	1	24,000	2003-2004
137	South Gondar	Libo Kemkem	Zanzi	300	SBH	1	24,000	2003-2004
138	South Gondar	Libo Kemkem	Birwuha Ferfer	150	SBH	1	24,000	2003-2004
139	South Gondar	Libo Kemkem	Nushora Ferfer	200	SBH	1	24,000	2003-2004
140	South Gondar	Libo Kemkem	Ashker Terara	550	SBH	2	24,000	2003-2004
141	South Gondar	Libo Kemkem	Kurmat Ategecha	250	SBH	1	24,000	2003-2004
142	South Gondar	Libo Kemkem	Atria agat Ashker	300	SBH	1	24,000	2003-2004
143	South Gondar	Libo Kemkem	Sholit Kalsholit	750	SBH	2	24,000	2003-2004
144	South Gondar	Libo Kemkem	Ambo Asawegan	300	SBH	1	24,000	2003-2004
145	South Gondar	Libo Kemkem	Zelamin Janda	325	SBH	1	24,000	2003-2004
146	South Gondar	Libo Kemkem	Kalaymedhanialem	1,750	DBH	1	52,000	2003-2004
147	South Gondar	Libo Kemkem	Arobakello 015	1,925	DBH	1	52,000	2003-2004
148	South Gondar	Libo Kemkem	Tirusina 015	1,000	DBH	1	52,000	2003-2004
149	South Gondar	Libo Kemkem	Kille 012	500	SBH	1	24,000	2003-2004
150	Oromya	Artuma Jile	Bete ordega Berbelay	1,200	DBH	1	52,000	2003-2004
151	Oromya	Artuma Jile	Blavakello Beteordega	500	SBH	1	24,000	2003-2004
152	Oromya	Artuma Jile	Kerwadi+mutulu	1,000	DBH	1	52,000	2003-2004
153	Oromya	Artuma Jile	Kara Kodema+Lale Gela	700	SBH	2	24,000	2003-2004
154	Oromya	Artuma Jile	Kodema Fugnu	1,500	DBH	1	52,000	2003-2004
155	Oromya	Artuma Jile	Ireti+Huda wello	500	SBH	1	24,000	2003-2004
156	Oromya	Artuma Jile	Koro Rokesa Hader	662	SBH	2	24,000	2003-2004
157	Oromya	Bati	Hdow Barigo, Hadow	400	SBH	1	24,000	2003-2004
158	Oromya	Bati	Kuni 03	750	SBH	2	24,000	2003-2004
159	Oromia	Julle Tumuga	Fugan Dembi	750	SBH	2	24,000	2003-2004
160	Oromia	Julle Tumuga	Gerbi kille	840	SBH	2	24,000	2003-2004
161	Oromia	Julle Tumuga	Gerbi kille	930	SBH	2	24,000	2003-2004
162	Oromia	Julle Tumuga	Merewa Hadere	1,100	DBH	1	52,000	2003-2004
163	Oromia	Julle Tumuga	Guda Chelle	1,300	DBH	1	52,000	2003-2004
164	Oromia	Julle Tumuga	Balchi Tikure	450	SBH	1	24,000	2003-2004
165	Oromia	Julle Tumuga	Dula Chereka	640	SBH	2	24,000	2003-2004
166	Oromia	Julle Tumuga	Arba wayo	980	DBH	1	52,000	2003-2004
				110,044	*SBH*	*156*		
					DBH	*44*		
					Total	200		

SBH: Shallow Borehole
DBH: Deep Borehole

Annex-2 List of Requested Items

Procurement of following equipments

- Two (2) units of truck mounted rotary drilling rigs
- One (1) unit of truck mounted cable tool percussion rig
- Seven (7) units of trucks for well drilling support
- Electric sounding equipment
- Truck mounted pumping test equipment
- PVC casing pipes and screens for 156 shallow wells
- PVC casing pipes and screens for 44 deep wells
- Supporting light vehicles for drilling, pumping and geophysical investigation
  - Three (3) double cabin pick up light vehicles
  - One (1) single cabin pick up light vehicle
  - Two (2) station wagon light vehicles

Council of the Amhara National Regional Government Water & Mines Resource Development Bureau

Annex-3

JAPAN'S GRANT AID SCHEME

1. Grant Aid Procedures

(1) Japan's Grant Aid Program is executed through the following procedures.

Application	(Request made by a recipient country)
Study	(Basic Design Study conducted by JICA)
Appraisal & Approval	(Appraisal by the Government of Japan and Approval by Cabinet)
Determination of Implementation	(The Notes exchanged between the Governments of Japan and the recipient country)

(2) Firstly, the application or request for a Grant Aid project submitted by a recipient country is examined by the Government of Japan (the Ministry of Foreign Affairs) to determine whether or not it is eligible for Grant Aid. If the request is deemed appropriate, the Government of Japan assigns JICA (Japan International Cooperation Agency) to conduct a study on the request.

Secondly, JICA conducts the study (Basic Design Study), using (a) Japanese consulting firm(s).

Thirdly, the Government of Japan appraises the project to see whether or not it is suitable for Japan's Grant Aid Program, based on the Basic Design Study report prepared by JICA, and the results are then submitted to the Cabinet for approval.

Fourthly, the project, once approved by the Cabinet, becomes official with the Exchange of Notes signed by the Governments of Japan and the recipient country.

Finally, for the implementation of the project, JICA assists the recipient country in such matters as preparing tenders, contracts and so on.

2. Basic Design Study

(1) Contents of the Study

The aim of the Basic Design Study (hereinafter referred to as "the Study"), conducted by JICA on a requested project (hereinafter referred to as "the Project") is to provide a basic document necessary for the appraisal of the Project by the Japanese Government. The contents of the Study are as follows:

1) Confirmation of the background, objectives, and benefits of the requested project and also institutional capacity of agencies concerned of the recipient country necessary for the Project's implementation.

2) Evaluation of the appropriateness of the Project to be implemented under the Grant Aid Scheme from a technical, social and economic point of view.

3) Confirmation of items agreed on by both parties concerning the basic concept of the Project.

4) Preparation of a basic design of the Project.

5) Estimation of costs of the Project.

The contents of the original request are not necessarily approved in their initial form as the contents of the Grant Aid project. The Basic Design of the Project is confirmed considering the guidelines of Japan's Grant Aid Scheme.

The Government of Japan requests the Government of the recipient country to take whatever measures are necessary to ensure its self-reliance in the implementation of the Project. Such measures must be guaranteed even though they may fall outside of the jurisdiction of the organization in the recipient country actually implementing the Project. Therefore, the implementation of the Project is confirmed by all relevant organizations of the recipient country through the Minutes of Discussions.

(2) Selection of Consultants

For smooth implementation of the Study, JICA uses (a) registered consultant firm(s). JICA selects (a) firm(s) based on proposals submitted by interested firms. The firm(s) selected carry(ies) out a Basic Design Study and write(s) a report, based upon terms of reference set by JICA.

The consulting firm(s) used for the Study is (are) recommended by JICA to the recipient country to also work in the Project's implementation after the Exchange of Notes, in order to maintain technical consistency.

3. Japan's Grant Aid Scheme

(1) Grant Aid

The Grant Aid Program provides a recipient country with non-reimbursable funds to procure facilities, equipment and services (engineering services and transportation of the products, etc.) for economic and social development of the country under principles in accordance with the relevant laws and regulations of Japan. Grant Aid is not supplied through the donation of materials as such.

(2) Exchange of Notes (E/N)

Japan's Grant Aid is extended in accordance with the Notes exchanged by the Governments concerned, in which the objectives of the Project, period of execution, conditions and amount of the Grant Aid, etc. are confirmed.

(3) "The period of the Grant Aid" means the one fiscal year which the Cabinet approves the Project for. Within the fiscal year, all procedures such as exchanging of the Notes, concluding contracts with (a) consultant firm(s) and (a) contractor(s) and a final payment to them must be completed.

However in case of delays in delivery, installation or construction due to unforeseen factors such as weather, the period of the Grant Aid can be further extended for a maximum of one fiscal year by mutual agreement between the

two Governments.

(4) Under the Grant Aid, in principle, Japanese products and services including transport or those of the recipient country are to be purchased.

When the two Governments deem it necessary, the Grant Aid may be used for the purchase of the products or services of a third country.

However the prime contractors, namely, consulting, contracting and procurement firms, are limited to "Japanese nationals". (The term "Japanese nationals" means persons of Japanese nationality or Japanese corporations controlled by persons of Japanese nationality.)

(5) Necessity of "Verification"

The Government of recipient country or its designated authority will conclude contracts denominated in Japanese yen with Japanese nationals. Those contracts shall be verified by the Government of Japan. This "Verification" is deemed necessary to secure accountability to Japanese taxpayers.

(6) Undertakings required of the Government of the Recipient Country

In the implementation of the Grant Aid project, the recipient country is required to undertake such necessary measures as the following:

1) To secure land necessary for the sites of the Project, and to clear, level and reclaim the land prior to commencement of the construction.

2) To provide facilities for the distribution of electricity, water supply and drainage and other incidental facilities in and around the sites.

3) To secure buildings prior to the procurement in case the installation of the equipment.

4) To ensure all the expenses and prompt execution for unloading, customs clearance at the port of disembarkation and internal transportation of the products purchased under the Grant Aid.

5) To exempt Japanese nationals from customs duties, internal taxes and other fiscal levies which will be imposed in the recipient country with respect to the supply of the products and services under the Verified Contracts.

6) To accord Japanese nationals whose services may be required in connection with the supply of the products and services under the Verified Contracts, such facilities as may be necessary for their entry into the recipient country and stay therein for the performance of their work.

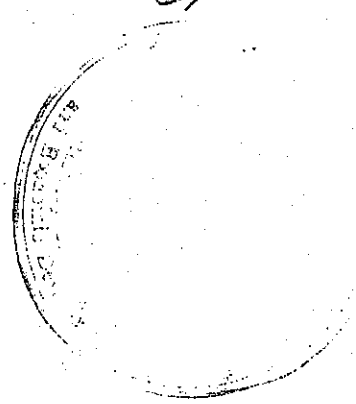
7) Proper Use
The recipient country is required to maintain and use the facilities constructed and equipment purchased under the Grant Aid properly and effectively and to assign staff necessary for this operation and maintenance as well as to bear all the expenses other than those covered by the Grant Aid.

8) Re-export
The products purchased under the Grant Aid should not be re-exported from the recipient country.

9) Banking Arrangement (B/A)

(a) The Government of the recipient country or its designated authority should open an account in the name of the Government of the recipient country in a bank in Japan (hereinafter referred to as "the Bank"). The Government of Japan will execute the Grant Aid by making payments in Japanese yen to cover the obligations incurred by the Government of the recipient country or its designated authority under the verified contracts.

(b) The payments will be made when payment requests are presented by the Bank to the Government of Japan under an authorization to pay issued by the Government of the recipient country or its designated authority.



Annex-4

MAJOR UNDERTAKING TO BE TAKEN BY EACH GOVERNMENT

No.	Items	To be covered by Grant Aid	To be covered by Recipient Side
1	To procure equipment and materials for the project	●	
2	To procure local materials and to construct water wells		●
3	To bear the following commissions to a bank of Japan for the banking services based upon the B/A		
	1) Advising commission of A/P		●
	2) Payment commission		●
4	To ensure prompt unloading and customs clearance at port of disembarkation in recipient country		
	1) Marine (Air) transportation of the products from Japan to the recipient country	●	
	2) Tax exemption and custom clearance of the products at the port of disembarkation		●
	3) Internal transportation from the port of disembarkation to the project site	●	
5	To accord Japanese nationals whose services may be required in connection with the supply of the products and the services under the verified contact such facilities as may be necessary for their entry into the recipient country and stay therein for the performance of their work		●
6	To exempt Japanese nationals from customs duties, internal taxes and other fiscal levies which may be imposed in the recipient country with respect to the supply of the products and services under the verified contact		●
7	To maintain and use properly and effectively the facilities constructed and equipment provided under the Grant Aid		●
8	To bear all the expenses, other than those to be borne by the Grant Aid, necessary for construction of the facilities as well as for the transportation and installation of the equipment.		●

Note B/A: Bank Arrangement

A/P: Authorization to Pay

MINUTES OF DISCUSSIONS
ON BASIC DESIGN STUDY
ON THE PROJECT FOR WATER SUPPLY IN AMHARA NATIONAL REGIONAL STATE
IN THE FEDERAL DEMOCRATIC REPUBLIC OF ETHIOPIA
(EXPLANATION ON DRAFT REPORT)

In October 2004, the Japan International Cooperation Agency (hereinafter referred to as "JICA") dispatched a Basic Design Study Team on THE PROJECT FOR WATER SUPPLY IN AMHARA NATIONAL REGIONAL STATE (hereinafter referred to as "the Project") to the Federal Democratic Republic of Ethiopia (hereinafter referred to as Ethiopia), and through discussion, field survey, and technical examination of the results in Japan, JICA prepared a draft report of the study.

In order to explain and consult with the Ethiopia authorities concerned on the components of the draft report, JICA sent to Ethiopia the Draft Report Explanation Team (hereinafter referred to as " the Team "), which is headed by Mr. Kimiaki JIN, Deputy Resident Representative, JICA Ethiopia Office, from March 7th to March 18th 2005.

As a result of discussions, both parties confirmed the main items described on the attached sheets.

Addis Ababa, March 15th 2005

Mr. Kimiaki JIN
Leader
Draft Report Explanation Team
Japan International Cooperation Agency
Japan

Mr. Teshome Maru
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Mr. Ayichew Kebede
Head,
Finance and Economic Development Bureau
Amhara National Regional State,
Federal Democratic Republic of Ethiopia

ATTACHMENT

1. Components of the Draft Report

The Government of Ethiopia agreed and accepted in principle the components of the draft report explained by the Team.

2. Japan's Grant Aid scheme

Ethiopian side understands the Japan's Grant Aid Scheme and the necessary measures to be taken by the Government of Ethiopia as explained by the Team and described in Annex-3 and Annex-4 of the Minutes of Discussions signed by both parties on November 22nd 2004.

3. Schedule of the Study

JICA will complete the final report in accordance with the confirmed item and send it to the Government of Ethiopia by May 2005.

4. Other relevant issues

The following issues were discussed and confirmed by both sides.

(1) Application of Offsetting under on –budget arrangement

It is well understood among authorities concerned that the intended project as Japan's Grant Aid Scheme shall be implemented in an ordinary and regulatory framework prevailing in the country that a project cost be incurred by Japan shall be registered on the budget of the country. It is also understood that on –budgeted cost shall be treated under offsetting arrangement.

In accordance with this, it is confirmed that the Finance and Economic Development Bureau of the Amhara National Regional State in close collaboration with the Water Resources Development Bureau of the Amhara National Regional State shall make necessary arrangements as regional mandate for ensuring the smooth implementation of Japan's Grant Aid Scheme.

(2) Tax Payment

Value Added Tax (VAT), custom duties and any other taxes and fiscal levies in Ethiopia arising from the project activities will be born by Ethiopian beneficiary institution (Amhara National Regional State).

(3) Components and implementation of the Project

Both parties agreed that the Project would be composed of the following components, provided that the Government of Japan finally decides the implement of the Project.

Proposed Procument equipment and materials

Item		Specification	Number
Truck mounted rotary drilling rigs		Drilling diameter DTH: 9-5/8", mud system: 12-1/4" drilling depth 250m	2
Air lift system for development of shallow well		Air compressor, water pipe 3"	2
Supporting truck for well drilling	Crane trucks	Crane truck 5 tons	2
	Cargo trucks	10 tons truck	2
Geo-electric survey equipment	Electric logger	Resistivity,SP 300m	1
	Geo-electric equipment	VES, 2nd dimensions methods	1
	Portable water level detector	100m x 2, 200m x 2	4
	Portable water quality equipment	EC meter, Ph meter	1
Pumping test equipment(mounted on the crane truck)		Crane truck, Generator, Submersible pump, water riser pipes,	1
uPVC casing pipes and screens	For shallow well	Diameter 100mm	1 lot
	For deep well	Diameter 150mm	1 lot

(4) Project Site

The project sites of listed at Annex-1 of the Minutes of Discussions signed by both parties on November 22nd 2004 had been studied, both parties agreed modification of the project sites as listed in Annex-1.

(5) Equipment and well construction

Both parties confirmed that the Japanese side procures main equipment and materials necessary for water well drilling and water well. Both parties confirmed that the Amhara National Regional State make use of the equipment in the Project. The Ethiopia side bears all construction works of the water well and other necessary equipment except above mentioned. Ethiopian side agreed to prepare the implementation program of 200 wells construction. Amhara Water Works Construction Enterprise (AWWCE) agreed to formulate the two drilling teams for the two drilling rigs to be procured.

(6) Maintenance of the equipment

The Ethiopia side has agreed to secure and allocate the necessary budget to operate and maintain the water well drilling equipment. Ethiopian side agreed to arrange of land and ware house for equipment, spare parts and accessory to be procured.

(7) Temporary site management office

Ethiopian side agreed to provide the temporary site management office for the contractor and the consultant.

(8) Monitoring

The Ethiopian side agreed to implement periodical monitoring survey on the project activities during the 200 wells drilling program, and prepare a monitoring report annually for three years. The Ministry of Finance and Economic Development will submit the reports prepared by Amhara National Regional State government to JICA Ethiopia Office.

(9) Project Title

Both parties agreed that the project title of "The Project for Water Supply in Amhara National Regional State in the Federal Democratic Republic of Ethiopia".

End of the document

List of Requested Schemes and Proposed Well Depth Estimated by Geo-electrical Survey in Amhara Regional State

No	Zone	Woreda	Area/Kebele	Population	Type	Original Qty	Geo-electrical Survey	Geology	Proposed depth	Revised Qty. of well		Note
									(m)	SBH	DBH	
1	North Wollo	Gidan	Tetergh (03)	350	SBH	1	FFSH	WFB	60	1		
2	North Wollo	Gidan	Tingit	405	SBH	1	FFSH	WFB	60	1		
3	North Wollo	Gidan	Kebero Meda oil	1,225	DBH	1	FFSH	WFB	130		1	
4	North Wollo	Gubalftu	Shelle mender 09	1,050	DBH	1						Completed
5	North Wollo	Gubalftu	Lengisa 010-Gdla mech	1,125	DBH	1						Completed
6	North Wollo	Gubalftu	Adembulbulo 010	985	DBH	1						Completed
7	North Wollo	Habru	Agamsa 027	1,090	DBH	1	C	WFB^	150		1	
8	North Wollo	Habru	Haro 027	1,135	DBH	1	C	WFB^	150		1	
9	North Wollo	Habru	Sekela 015	385	SBH	1	C	WFB^	80	1		
10	North Wollo	Habru	Meja adea 07	1,450	DBH	1	C	WFB^	150		1	
11	North Wollo	Habru	Sirinka Gerado 04	325	SBH	1	C	WFB^	80	1		
12	North Wollo	Habru	Jarota 07	1,500	DBH	1	C	WFB^	110		1	
13	North Wollo	Habru	Darimu 07	1,350	DBH	1	C	WFB^	150		1	
14	North Wollo	Habru	Ablyot Fire 07	1,650	DBH	1	C	WFB^	150		1	
15	North Wollo	Habru	Aware 09	2,500	DBH	1	C	WFB^	180		1	
16	North Wollo	Meket	Deferghe 023	390	SBH	1		WFB	70	1		
17	North Wollo	Habru	Fakit 034	310	SBH	1	FFSH	WFB	80	1		
18	North Wollo	Meket	Tajaabo 025	280	SBH	1	FFSH	WFB	70	1		
19	North Wollo	Meket	Enatguya 017	325	SBH	1	FFSH	WFB	70	1		
20	North Wollo	Habru	Kega Ber 029	415	SBH	1	FFSH	WFB^	80	1		
21	North Wollo	Habru	Koso Mender	295	SBH	1	FFSH	WFB^	90	1		
22	North Wollo	Meket	Derek Wenz+Nacha Feres 031	375	SBH	1	C	WFB	70			
23	North Wollo	Meket	Keynitu+Birafaf 032	255	SBH	1	FFSH	WFB	70			
24	North Wollo	Meket	Mekerecha+Zet Yibel 034	354	SBH	1	C	WFB	70			
25	South Wollow	Jama	Begide+Ibayu 09	1,500	DBH	1	C	WFB	150		1	
26	South Wollow	Kelela	Chellhele 03-Sembe	350	SBH	1	C	WFB	60	1		
27	South Wollow	Kelela	Yimere 01	250	SBH	1						NF
28	South Wollow	Jama	Alley	500	SBH	1	C	WFB	70	2		
29	South Wollow	Jama	Laukubl & Tach kub 1	1,000	DBH	1	C	WFB	145		1	
30	South Wollow	Jama	Ejerti michael 012	750	SBH	2	C	WFB	70	3		
31	South Wollow	Jama	Gerbo, Hodere 017	1,050	DBH	1	C	WFB	90		1	
32	South Wollow	Jama	Goleisha 017	750	SBH	2	FFSH	WFB	60	3		

Annex-1

List of Requested Schemes and Proposed Well Depth Estimated by Geo-electrical Survey in Amhara Regional State

No	Zone	Woreda	Area/Kebele	Population	Type	Original Qty	Geo-electrical Survey	Geology	Proposed depth	Revised Qty. of well		Note
									(m)	SBH	DBH	
33	South Wollow	Jama	Libanos 019	1,550	DBH	1	FFSH	WFB	130		1	
34	South Wollow	Jama	Gende Gulo 020	750	SBH	2	FFSH	WFB	60	3		
35	South Wollow	Worebabo	Kelkesha 015	1,250	DBH	1	C	SD	180		1	
36	South Wollow	Worebabo	Lhiffu 015	750	SBH	2	C	SD	80	3		
37	South Wollow	Worebabo	Gedida 014	1,000	DBH	1	FFSH	WFB	140		1	
38	South Wollow	Worebabo	Gubisa 05	250	SBH	1	FFSH	WFB	60	1		
39	South Wollow	Worebabo	Abo Gora 05	1,400	DBH	1	FFSH	WFB	150		1	
40	South Wollow	Worebabo	Korekon 05	500	SBH	2	FFSH	WFB	70	2		
41	South Gondar	Simada	Agewoch 010	750	SBH	1	FFSH	WFB	60	3		
42	South Gondar	Simada	Genta	250	SBH	1	C	WFB	50	1		
43	South Gondar	Simada	Mwerem 34	750	SBH	1	C	WFB	60	3		
44	South Gondar	Simada	Goref 04	150	SBH	1	C	WFB	60	1		
45	South Gondar	Simada	Menkelila	500	SBH	1	FFSH	WFB	60	2		
46	South Gondar	Simada	Agamwuha 05	500	SBH	1	C	WFB	50	2		
47	South Gondar	Simada	Chifchaf 06	500	SBH	1	FFSH	WFB	60	2		
48	South Gondar	Ibnat	Selamaya	1,250	DBH	1						Completed
49	South Gondar	Ibnat	Wegere Selamaya	250	SBH	1						Completed
50	South Gondar	Ibnat	Checheho Jimmaderega	750	SBH	2	C	WFB	60	3		
51	South Gondar	Ibnat	Minch Jimmaderega	250	SBH	1	C	WFB	60	1		
52	South Gondar	Ibnat	Awsheridi Jimmaderega	250	SBH	1	C	WFB	60	1		
53	South Gondar	Ibnat	Tinjut Ber	250	SBH	1	FFSH	WFB	60	1		
54	Oromiya	Bati	Garero 07	175	SBH	1	C	WFB^	80	1		
55	Oromiya	Bati	Alshayu+kersu	500	SBH	1						NF
56	Oromiya	Bati	Tachignaw Lkgo	560	SBH	1	FFSH	WFB^	80	1		
57	Oromiya	Bati	Laygnaw Laygo, Kembere	600	SBH	2	FFSH	WFB^	80	2		
58	Oromiya	Bati	Selmani 014	1,000	DBH	1	C	WFB^	150		1	
59	North Shewa	Angolelanaa Sagirt	Ambel+Koso	455	SBH	1	FFSH	WFB	60	2		
60	North Shewa	Angolelanaa Sagirt	Werga	353	SBH	1	FFSH	WFB	60	1		
61	North Shewa	Angolelanaa Sagirt	Seriti	285	SBH	1	C	WFB	60	1		
62	North Shewa	Angolelanaa Sagirt	Liche Seriti Totose	300	SBH	1	C	WFB	60	1		
63	North Shewa	Angolelanaa Sagirt	Mongudo Chieke Zurya	325	SBH	1	C	WFB	60	1		
64	North Shewa	Angolelanaa Sagirt	Lalfole aje Cheke	295	SBH	1	C	WFB	60	1		

Annex-1

List of Requested Schemes and Proposed Well Depth Estimated by Geo-electrical Survey in Amhara Regional State

No	Zone	Woreda	Area/Kebele	Population	Type	Original Qty	Geo-electrical Survey	Geology	Proposed depth	Revised Qty. of well		Note
									(m)	SBH	DBH	
65	North Shewa	Angolo Ianaa Sagiri	Cheke Town	350	SBH	1						Completed
66	Waghimra	Sekota	Tsetsergi abanachiros	530	SBH	1						*
67	Waghimra	Sekota	Tsatsu Dire Tiku, Ugulo	600	SBH	2						*
68	Waghimra	Sekota	Bewshu 015	300	SBH	1	FFSH	WFB	60	1		
69	Waghimra	Sekota	Chilkiwolo 010	300	SBH	1	FFSH	WFB	60	1		
70	Waghimra	Sekota	Shimidir/Limat Kinatchora 012	350	SBH	1	FFSH	WFB	60	1		
71	Waghimra	Sekota	Dibaran 011	210	SBH	1						*
72	Waghimra	Sekota	Gela Kamiru Arquatia 011	700	SBH	2						*
73	Waghimra	Sekota	Dirinziba, Tasaskiw	750	SBH	2						*
74	Waghimra	Sekota	Nigunaleka 08	225	SBH	1	FFSH	WFB	60	1		
75	Waghimra	Sekota	Akjewshina 07	250	SBH	1						*
76	Waghimra	Sekota	Wellan and Chifte	150	SBH	1	FFSH	WFB	60	1		
77	Waghimra	Sekota	Testsergi, Abanachir 015	530	SBH	2	FFSH	WFB	60	2		
78	Waghimra	Sekota	Tsatsu, Dire Tiku, Ugulo	600	SBH	2	FFSH	WFB	60	2		
79	Waghimra	Sekota	Shimbar Tiku 010	250	SBH	1	FFSH	WFB	60	1		
80	Waghimra	Sekota	Chilkiw 010 mizrib	300	SBH	1	FFSH	WFB	60	1		
81	Waghimra	Sekota	Shimidirla Limat Chora	350	SBH	1	C	WFB	60	1		
82	Waghimra	Sekota	Dibaran 011	210	SBH	1	FFSH	WFB	60	1		
83	Waghimra	Sekota	Gelakamiru Arquatiya	700	SBH	2	C	WFB	60	3		
84	Waghimra	Sekota	Dirinziba Tsaskiw, Sikuna	750	SBH	2	FFSH	WFB	60	3		
85	Waghimra	Sekota	Nigas Aleka 08	225	SBH	1	FFSH	WFB	60	1		
86	Waghimra	Sekota	Akejewshina 07	250	SBH	1	FFSH	WFB	60	1		
87	Waghimra	Dahana	Welkementa+kerubish	100	SBH	1	C	WFB	60	1		
88	North Shoa	Minjar Shenkora	Chelle geberel	1,500	DBH	1	C	SD	220		1	
89	North Shoa	Minjar Shenkora	Chome Ager	500	SBH	1	C	SD	80	2		
90	North Shoa	Minjar Shenkora	Biruk Ager	2,000	DBH	1	C	SD	240		1	
91	North Shoa	Minjar Shenkora	Alemneh Dire	1,750	DBH	1	C	SD	180		1	
92	North Shoa	Minjar Shenkora	Kiticha	1,250	DBH	1	C	SD	250		1	
93	North Shoa	Minjar Shenkora	Golegolecha	875	SBH	2	C	SD	80	3		
94	North Shoa	Minjar Shenkora	Wmaga	925	SBH	2	C	SD	80	3		
95	North Shoa	Minjar Shenkora	Kiki	625	SBH	2	C	SD	80	2		
96	North Shoa	Minjar Shenkora	Jejebakola	375	SBH	1	C	SD	80	1		

Annex-1

List of Requested Schemes and Proposed Well Depth Estimated by Geo-electrical Survey in Amhara Regional State

No	Zone	Woreda	Area/Kebele	Population	Type	Original Qty	Geo-electrical Survey	Geology	Proposed depth	Revised Qty. of well		Note
									(m)	SBH	DBH	
97	North Shoa	Minjar Shenkora	Finanajo	575	SBH	2	C	SD	80	2		
98	North Shoa	Minjar Shenkora	Aroge Minjar	1,100	DBH	1	C	SD	240		1	
99	North Shoa	Minjar Shenkora	Zewelde	675	SBH	2	C	WFB^	55	2		
100	North Shoa	Tamabex	Argaga	600	DBH	1	C	WFB^	150		1	
101	South Wello	Harbu	Alimenta	750	SBH	2	C	WFB^	80	3		
102	South Wello	Harbu	Aderanba	1,000	DBH	1	FFSH	WFB^	160		1	
103	South Wello	Harbu	Meja	1,000	DBH	1	FFSH	WFB^	150		1	
104	South Wello	Harbu	Abunaye	1,000	DBH	1	FFSH	WFB^	160		1	
105	South Wello	Harbu	Wiensa	1,500	DBH	1	FFSH	WFB^	120		1	
106	South Wello	Kelela	Kersa 05	300	SBH	1	C	WFB	60	1		
107	South Wello	Kelela	Weda Golwn 030	700	SBH	2	FFSH	WFB	60	2		
108	South Wello	Kelela	Inchini 031	250	SBH	1	C	WFB	60	1		
109	South Wello	Kelela	Tika 034	750	SBH	2	FFSH	WFB	60	3		
110	South Wello	Kelela	Indoda 030	400	SBH	1	C	WFB	60	1		
111	South Wello	Kelela	Wede Getu 036	1,240	DBH	1	C	WFB	120		1	
112	South Wello	Kelela	Kore/Fincheftu 037	500	SBH	1	FFSH	WFB	60	1		
113	South Wello	Kelela	GendeBorena 036	500	SBH	1	FFSH	WFB	60	1		
114	South Wello	Wegide	Yagi 014	300	SBH	1	FFSH	WFB	60	1		
115	South Wello	Wegide	Golele 09	1,000	DBH	1	FFSH	WFB	120		1	
116	South Wello	Wegide	Kutiso 03 Abey	1,250	DBH	1	C	WFB	140		1	
117	South Wello	Wegide	Bikill 04	800	SBH	2	C	WFB	60	3		
118	South Wello	Wegide	Aycle Anba Rufa 02,04	700	SBH	2	C	WFB	60	2		
119	South Wello	Wegide	Haleltu 07	400	SBH	1	C	WFB	60	1		
120	South Wello	Wegide	Yeshum	750	SBH	2	C	WFB	60	3		
121	South Wello	Meqdella	Ivelinta 02	300	SBH	1	FFSH	WFB	50	1		
122	South Wello	Meqdella	Yebar 013	300	SBH	1	FFSH	WFB	50	1		
123	South Wello	Meqdella	Tilket 02	350	SBH	1	FFSH	WFB	50	1		
124	South Wello	Meqdella	Genatil 02	300	SBH	1	FFSH	WFB	50	1		
125	South Wello	Meqdella	Tija Fej 06	250	SBH	1	FFSH	WFB	50	1		
126	South Wello	Meqdella	Felana 06	500	SBH	1	FFSH	WFB	50	1		
127	South Wello	Meqdella	Gonderoch	250	SBH	1	FFSH	WFB	50	1		
128	South Wollo	Meqdella	Meqdella	300	SBH	1	FFSH	WFB	50	1		

Annex-I

List of Requested Schemes and Proposed Well Depth Estimated by Geo-electrical Survey in Amhara Regional State

No	Zone	Woreda	Area/Kebele	Population	Type	Original Qty	Geo-electrical Survey	Geology	Proposed depth	Revised Qty. of well		Note
									(m)	SBH	DBH	
129	South Wollo	Meqdella	Feterot+Ychikech	1,000	DBH	1	FFSH	WFB	120		1	
130	South Wollo	Meqdella	Dedere 05	200	SBH	1	FFSH	WFB	60	1		
131	South Wollo	Meqdella	Gose 05	500	SBH	1	FFSH	WFB	60	1		
132	South Gondar	Ibnat	Tilbi	250	SBH	1						NA
133	South Gondar	Ibnat	Kwalisa	1,000	DBH	1	C	WFB	140		1	
134	South Gondar	Ibnat	Work mender achr aba Jale	250	SBH	1						NA
135	South Gondar	Ibnat	Wenber Ayhayakwha	250	SBH	1						NA
136	South Gondar	Libo Kemkem	Berengna Lentdur	350	SBH	1	FFSH	WFB^	80	1		
137	South Gondar	Libo Kemkem	Zanzi	300	SBH	1	FFSH	WFB^	80	1		
138	South Gondar	Libo Kemkem	Birwuha Ferfer	150	SBH	1	FFSH	WFB^	80	1		
139	South Gondar	Libo Kemkem	Nashora Ferfer	200	SBH	1	FFSH	WFB^	80	1		
140	South Gondar	Libo Kemkem	Ashker Terara	550	SBH	2	C	WFB^	80	2		
141	South Gondar	Libo Kemkem	Kurmat Atege cha	250	SBH	1	FFSH	WFB^	80	1		
142	South Gondar	Libo Kemkem	Atria agat Ashker	300	SBH	1	FFSH	WFB^	80	1		
143	South Gondar	Libo Kemkem	Sholit Kalsholit	750	SBH	2	FFSH	WFB^	80	2		
144	South Gondar	Libo Kemkem	Ambo Asawegan	300	SBH	1	FFSH	WFB^	80	1		
145	South Gondar	Libo Kemkem	Zelamin Janda	325	SBH	1	FFSH	WFB^	80	1		
146	South Gondar	Libo Kemkem	Kalaymedhan lalem	1,750	DBH	1	C	WFB^	160		1	
147	South Gondar	Libo Kemkem	Arobakello 015	1,925	DBH	1	C	WFB^	140		1	
148	South Gondar	Libo Kemkem	Tirusina 015	1,000	DBH	1	FFSH	WFB^	160		1	
149	South Gondar	Libo Kemkem	Kille 012	500	SBH	1	FFSH	WFB^	70	2		
150	Oromiya	Artuma Fursi	Bete ordega Berbelay	1,200	DBH	1	C	WFB^	180		1	
151	Oromiya	Artuma Fursi	Bkavakello Beteordega	500	SBH	1	C	WFB^	70	1		
152	Oromiya	Artuma Fursi	Kersaadi+mutulu	1,000	DBH	1	C	WFB^	180		1	
153	Oromiya	Artuma Fursi	Kara Kodema+Lale Gela	700	SBH	2	FFSH	WFB^	80	2		
154	Oromiya	Artuma Fursi	Kodema Fugnu	1,500	DBH	1	C	WFB^	180		1	
155	Oromiya	Artuma Fursi	Ireti+Huda wello	500	SBH	1	FFSH	WFB^	80	1		
156	Oromiya	Artuma Fursi	Koro Rokesa Hader	662	SBH	2	FFSH	WFB^	80	2		
157	Oromiya	Bati	Hdow Barigo, Hadew	400	SBH	1	FFSH	WFB^	80	1		
158	Oromiya	Bati	Kuni 03	750	SBH	2	FFSH	WFB^	80	2		
159	Oromiya	Jille Tumuga	Fugan Dembi	750	SBH	2	C	WFB^	80	2		
160	Oromiya	Jille Tumuga	Gerbi kille	840	SBH	2	FFSH	WFB^	80	2		

Annex-1

No	Zone	Woreda	Area/Kebele	Population	Type	Original Qty	Geo-electrical Survey	Geology	Prop-osed depth	Revised Qty. of well		Note
									(m)	SBH	DBH	
161	Oromiya	Julle Tumuga	Gerbi kille	930	SBH	2	FFSH	WFB^	70	3		
162	Oromiya	Julle Tumuga	Merewa Hadere	1,100	DBH	1	C	WFB^	160		1	
163	Oromiya	Julle Tumuga	Ouda Chelle	1,300	DBH	1	FFSH	WFB^	160		1	
164	Oromiya	Julle Tumuga	Balchi Tikure	450	SBH	1	FFSH	WFB^	80	1		
165	Oromiya	Julle Tumuga	Dula Chereke	640	SBH	2	FFSH	WFB^				NA
166	Oromiya	Julle Tumuga	Arba wayu	980	DBH	1	C	WFB^	160		1	
				110,044	*SBH*	*156*						
					DBH	*44*						
					Total	200				*160*	*40*	200

Note:

WFB: Stands for Weathered and Fractured Basalt
WFB^: Stands for Weathered and Fractured Basalt with thick soil cover
SD: Stands for thick soil deposit
FFSH: Stands for Found Feasible by its Surface Hydrogeological conditions
C: Stands for Conducted; Geophysical Survey is conducted in the areas indicated
NF: Stands for Not Feasible
NA: Stands for Not Accessible
Completed means water supply schemes are constructed in the areas in the past two years
Bold word: correction of miss-spelling and unseen error
*: Duplicated location
: No proposed well

Appendix-5 Other Relevant Data

5.1 Basic Design Drawings

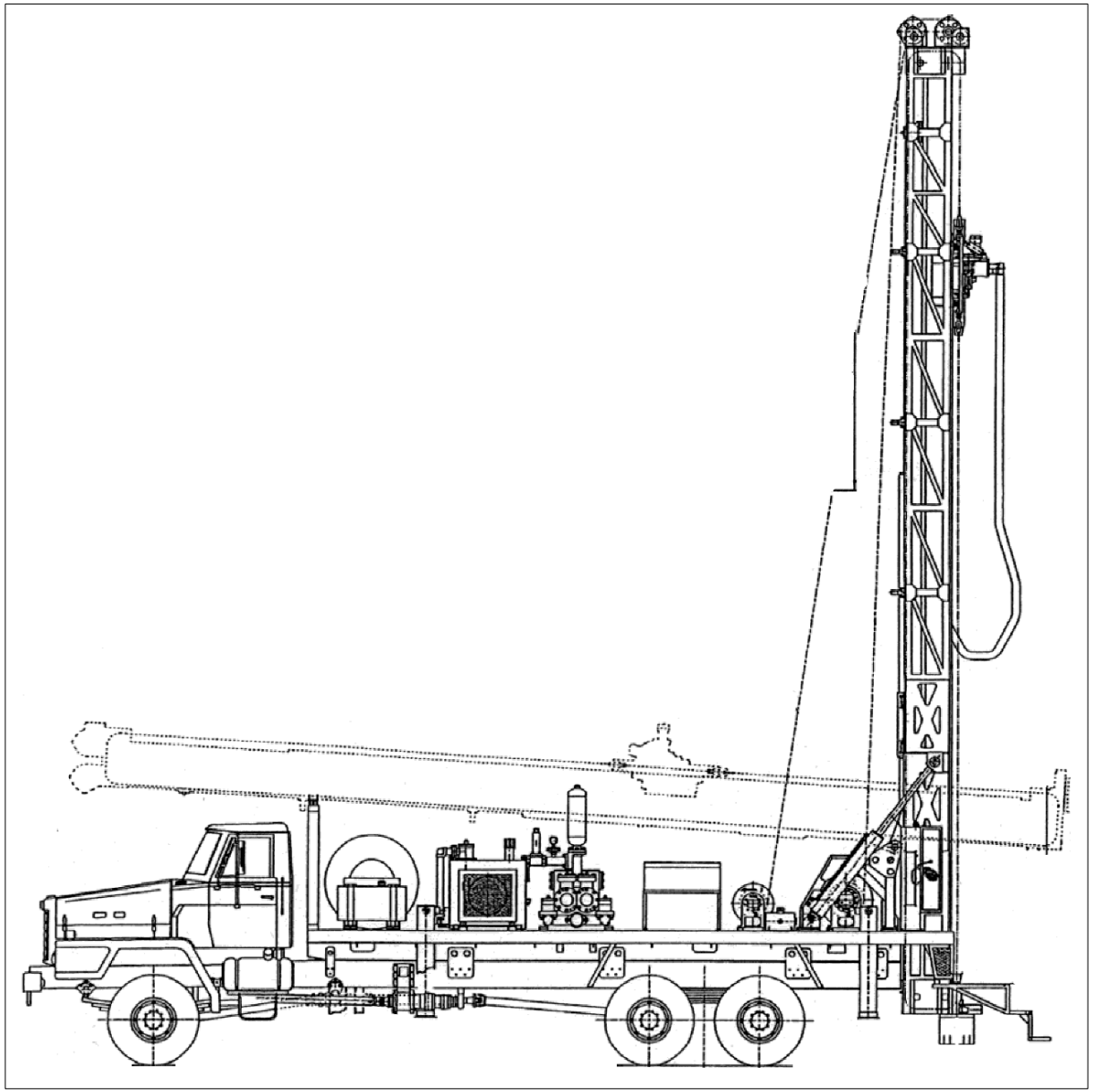
5.2 Results of Water Quality Survey

5.3 Selection of Project Target Communities

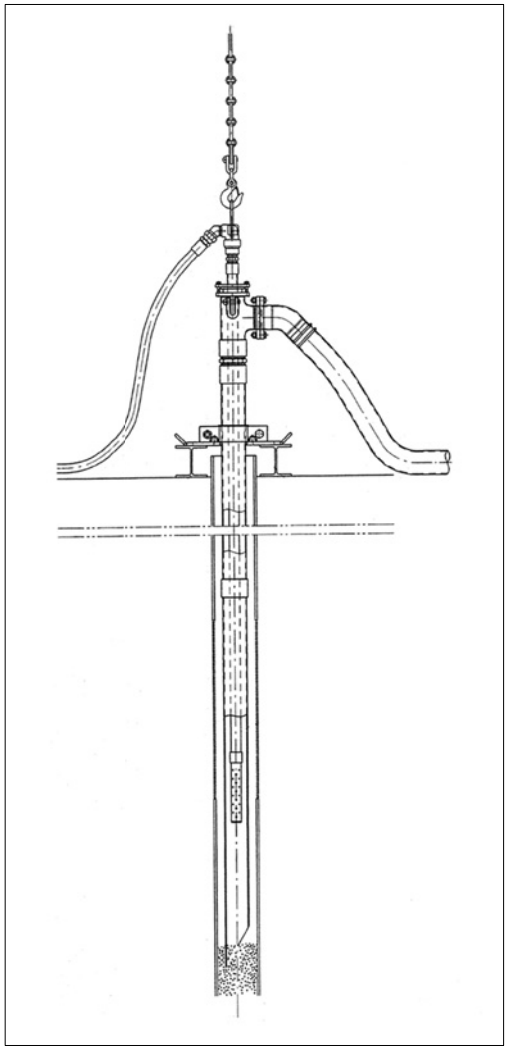
5.4 Social Survey Results

5.5 Specification for Ethiopian Drinking Water Quality Guidelines

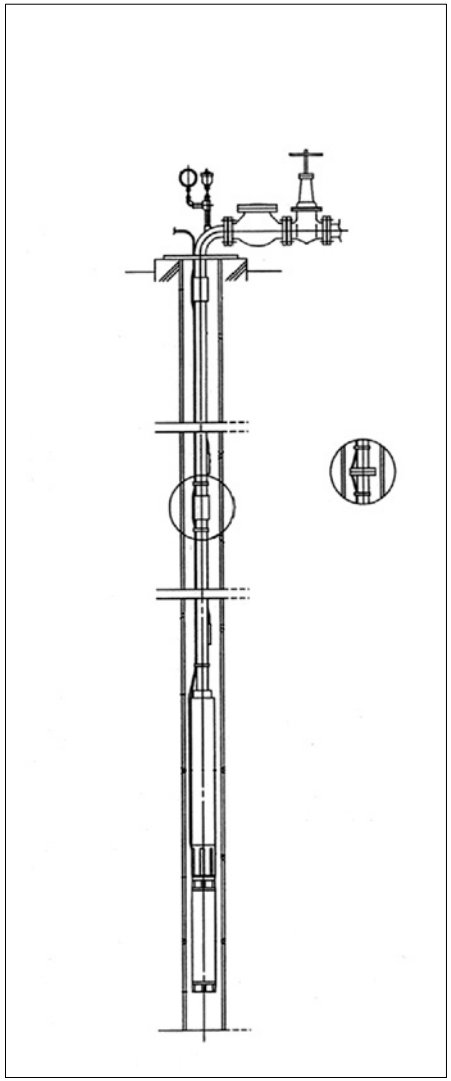
5.1
Basic Design Drawings



OWNER : JAPAN INTERNATIONAL COOPERATION AGENCY (JICA)	PROJECT NAME : THE BASIC DESIGN STUDY ON THE PROJECT FOR WATER SUPPLY IN AMHARA NATIONAL REGIONAL STATE IN THE FEDERAL DEMOCRATIC REPUBLIC OF ETHIOPIA	CONSULTING ENGINEERS : NIPPON KOEI CO.,LTD.	DRAWING TITLE : Rotary Drilling Rig	
			SCALE None	DATE February 2005
				DRAWING NO. PE-1.1

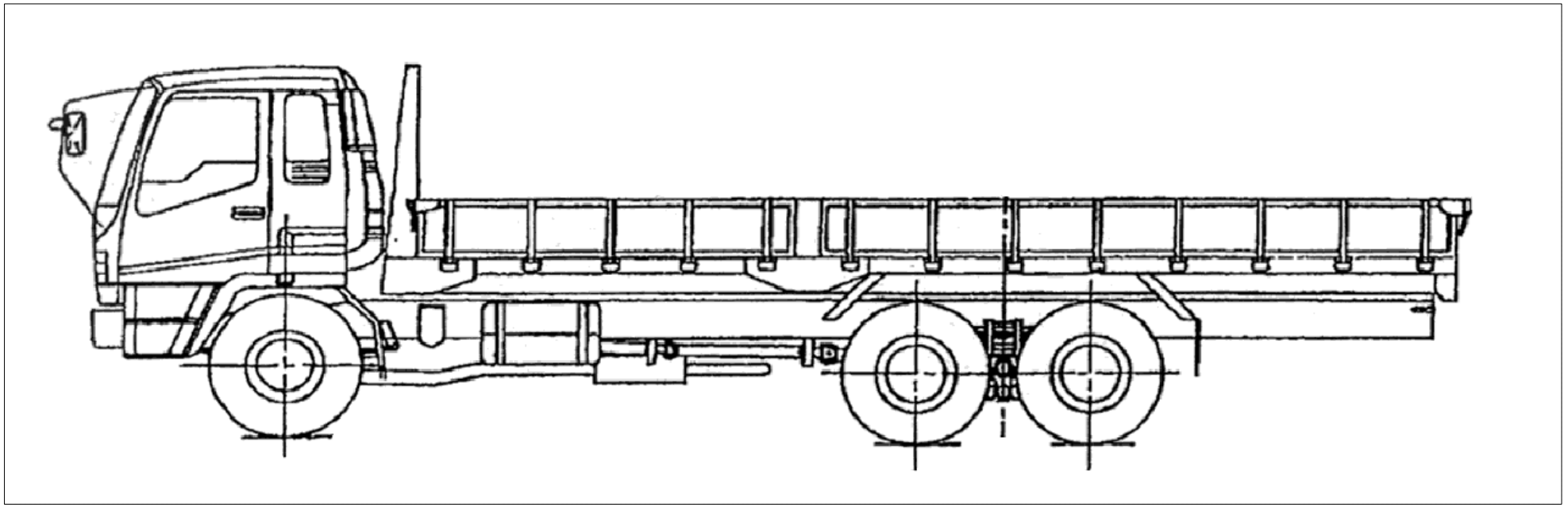


Air Lift Equipment

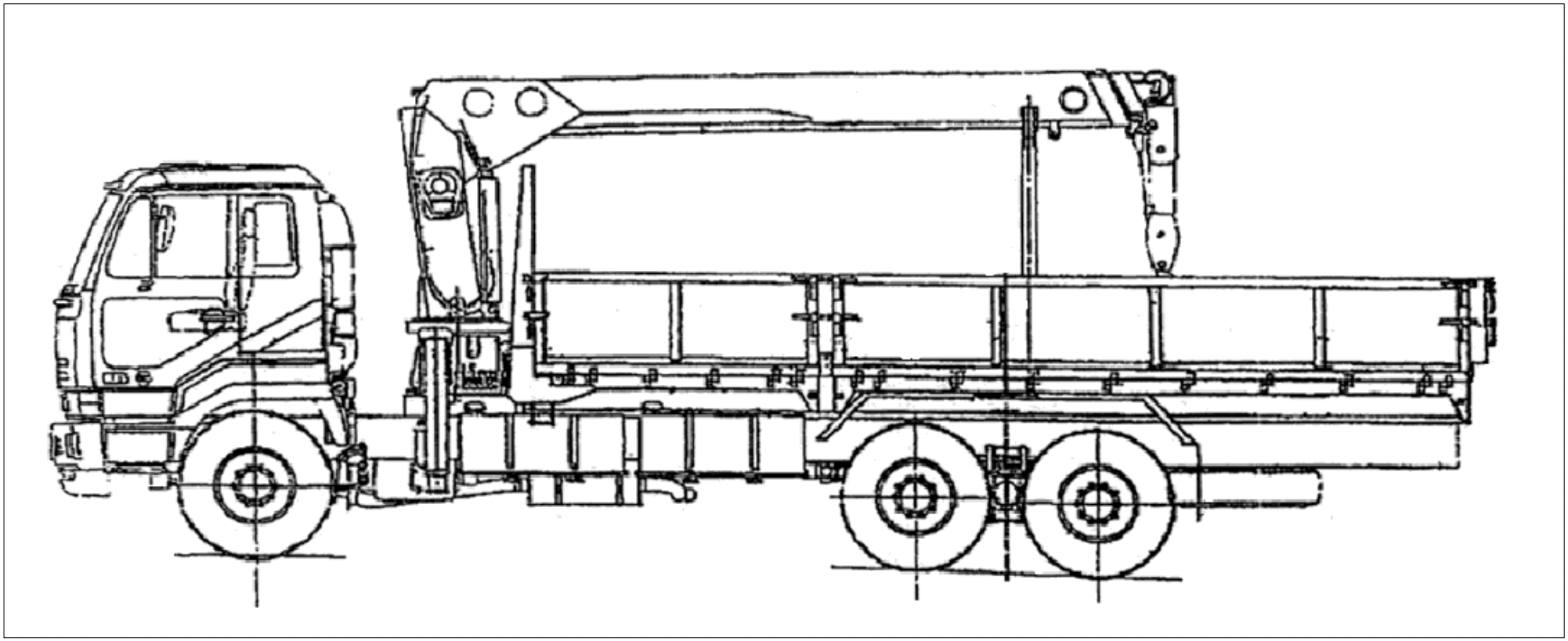


Pumping Test Machinery

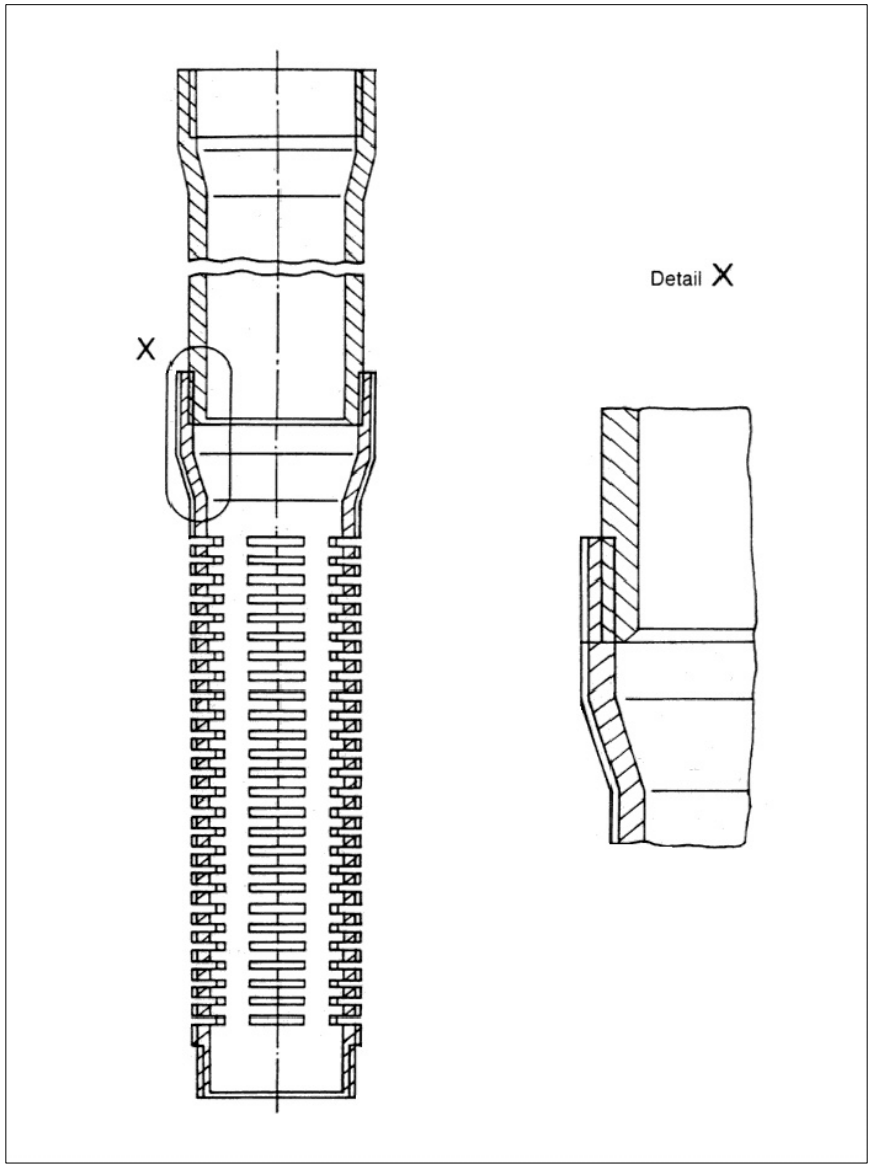
OWNER : JAPAN INTERNATIONAL COOPERATION AGENCY (JICA)	PROJECT NAME : THE BASIC DESIGN STUDY ON THE PROJECT FOR WATER SUPPLY IN AMHARA NATIONAL REGIONAL STATE IN THE FEDERAL DEMOCRATIC REPUBLIC OF ETHIOPIA	CONSULTING ENGINEERS : NIPPON KOEI CO.,LTD.	DRAWING TITLE : Air Lift Equipment / Pumping Test Machinery SCALE: None / DATE: February 2005 / DRAWING NO.: PE-2.1



OWNER :	PROJECT NAME :	CONSULTING ENGINEERS :	DRAWING TITLE :		
JAPAN INTERNATIONAL COOPERATION AGENCY (JICA)	THE BASIC DESIGN STUDY ON THE PROJECT FOR WATER SUPPLY IN AMHARA NATIONAL REGIONAL STATE IN THE FEDERAL DEMOCRATIC REPUBLIC OF ETHIOPIA	NIPPON KOEI CO.,LTD.	Gargo Truck		
			SCALE: None	DATE: February 2005	DRAWING NO.: PE-3.1



OWNER :	PROJECT NAME :	CONSULTING ENGINEERS :	DRAWING TITLE :		
JAPAN INTERNATIONAL COOPERATION AGENCY (JICA)	THE BASIC DESIGN STUDY ON THE PROJECT FOR WATER SUPPLY IN AMHARA NATIONAL REGIONAL STATE IN THE FEDERAL DEMOCRATIC REPUBLIC OF ETHIOPIA	NIPPON KOEI CO.,LTD.	Gargo Truck with Crane		
			SCALE: None	DATE: February 2005	DRAWING NO.: PE-3.2



OWNER : JAPAN INTERNATIONAL COOPERATION AGENCY (JICA)	PROJECT NAME : THE BASIC DESIGN STUDY ON THE PROJECT FOR WATER SUPPLY IN AMHARA REGIONAL STATE IN THE FEDERAL DEMOCRATIC REPUBLIC OF ETHIOPIA	CONSULTING ENGINEERS : NIPPON KOEI CO.,LTD.	DRAWING TITLE : Screen and Casing Pipe	
			SCALE None	DATE February 2005
				DRAWING NO. PE-4.1

5.2
Results of Water Quality Survey

Laboratory Water Quality Analysis (Amhara Regional State)

				Chemicals for Health Significance									Substance and parameters that may give rise to complaints from consumers									
	Zone	Woreda	Water Point	Ba	Cd	Cr	Cu	Mn	Pb	CN	F	No3	Zn	Al	Fe	H2S	TDS	Hardness	Cl	So4	Na	pH
				mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	–
1	N. Shewa	Angolelan	DW-72	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.002	0.28	13	<0.1	<0.1	<0.1	Nil	412	204	3	7	12	7.86
2	N. Shawa	Minjarshenora	BH-10	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.001	1.08	10.08	0.2	<0.1	<0.1	Nil	567	158	10	12	62	7.68
3	N. Wollo	Gidan	DW-22	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.001	0.07	42.09	<0.1	<0.1	<0.1	Nil	218	78	20	8	7.5	6.64
4	N. Wollo	Gubalafto	DW-32	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.002	0.24	28.8	0.2	<0.1	<0.1	Nil	830	432	10	3	24	7.69
5	N. Wollo	Habru	DW-38	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.001	0.23	11.96	<0.1	<0.1	<0.1	0.32	453	217	7	10	14	7.72
6	Oromyia	Bati	DW-57	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.001	0.62	46.52	<0.1	<0.1	<0.1	Nil	1695	720	112	195	103	7.58
7	Oromyia	Chefa Dewa	DW-60	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.002	0.45	3.1	<0.1	<0.1	<0.1	Nil	495	217	11	13	32	7.22
8	Oromyia	Julle Tumuga	DW-63	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.006	0.79	20.82	<0.1	<0.1	<0.1	0.32	1466	390	138	44	126	7.36
9	S. Gonnder	Ibnat	DW-16	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.002	0.22	50.95	<0.1	<0.1	<0.1	Nil	596	259	13	14	27	7.23
10	S. Gonnder	Libo Kemkem	DW-10	<0.1	<0.1	<0.1	<0.1	0.6	<0.1	0.004	0.44	24.62	0.2	<0.1	0.6	Nil	859	419	28	13	32	7.23
11	S. Gonnder	Simada	CS-2	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.001	0.33	23.04	<0.1	<0.1	<0.1	Nil	258	95	8	7	15	7.32
12	S. Wollo	Jama	DW-53	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.001	0.41	5.32	<0.1	<0.1	<0.1	Nil	345	133	10	6	18	7.88
13	S. Wollo	Mekdella	DW-52	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.007	0.17	177.2	<0.1	<0.1	<0.1	Nil	1097	292	114	46	86	7.61
14	S. Wollo	Kelela	CS-9	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.001	0.28	19.94	1.2	<0.1	<0.1	Nil	438	200	1	–	15	7.67
15	S. Wollo	Wegdie	DW-42	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.002	0.35	14.18	<0.1	<0.1	<0.1	Nil	266	117	3	4	9	7.43
16	S. Wollo	Werebaba	DW-40	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.003	0.21	93.03	<0.1	<0.1	<0.1	Nil	665	283	53	19	16	7.02
17	Waghimra	Dahina	DW-25	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.005	0.29	20.38	0.2	<0.1	<0.1	Nil	605	283	12	10	20	7.27
18	Waghimra	Sekota	DW-26	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.003	0.42	33.23	0.9	<0.1	<0.1	Nil	714	360	10	15	18	7.71
(Ethiopian Standards)				1.8	0.003	0.01	5	0.8	0.02	0.07	3	50	6	0.4	0.4	0.07	1776	392	533	483	358	

Results of In-Situ Water Quality Analysis (Amhara Regional State)

No		Zone	Woreda	Area/Kebele	Basic Information					In-situ Water Quality Analysis												
					Geo-electrical survey	Geology	Proposed well depth	Revised Q'ty of well		Specific Location (UTM)		Water Point	In-situ Analysus						Elevation	Topography	Geology	Remarks	
							(m)	SBH	DBH	Easting	Northing		Temp (deg. C)	Ph	Cond. (micro-S/cm)	Fe (mg/l)	F (mg/L)	T.Coliform (colonies)	(m.amsl)				
1	1	North Wollo	Gidan	Tetergh (03)	FFSH	WFB	60	1		535787	1337719	CS3	11	7.7	200	Nil	Nil	18	3481	Depression	W.Basalt	We found only one water point	
2	1	North Wollo	Gidan	Tingit	FFSH	WFB	60	1														No water point to be sampled	
3	1	North Wollo	Gidan	Kebero Meda oll	FFSH	WFB	130		1	538386	1317126	DBH 22	12	6.4	200	Nil	Nil	15	3464	Plain	Alluvium	We found only one water point	Labo Test
4	1	North Wollo	Gubalftu	Shelle mender 09						564518	1306607	BH 5	15	7.3	640	Nil	Nil	Nil	1908	Plain	Alluvium	We found only one water point	
5	1	North Wollo	Gubalftu	Lengisa 010-Gdla mech						561050	1304451	DBH 32	20	7.5	780	Nil	Nil	Nil	1897	Plain	Alluvium	We found only one water point	Labo Test
6	1	North Wollo	Gubalftu	Adembulbulo 010						560533	1304112	DBH 33	22	7.4	820	Nil	Nil	Nil	1907	Flood Plain	Alluvium	We found only one water point	
7	1	North Wollo	Habru	Agamsa 027	C	WFB^	150		1													No water point to be sampled	
8	1	North Wollo	Habru	Haro 027	C	WFB^	150		1	587514	1304887								1508	Plain	Basalt	No water point to be sampled	
9	1	North Wollo	Habru	Sekela 015	C	WFB^	80	1		571857	1281117	DBH 38	19	7.5	420	Nil	Nil	1	1621	Plain	Basalt	-	Labo Test
9	1	ditto	ditto	ditto						546678	1323938	DBH 24	12	7	420	Nil	Nil	57	3091	Plain	Basalt	-	
10	1	North Wollo	Habru	Meja adea 07	C	WFB^	150		1	595418	1293893	No water point only inventory work ins done							1318	Depression	Basalt	No water point to be sampled	
11	1	North Wollo	Habru	Sirinka Gerado 04	C	WFB^	80	1		564667	1300474	BH 6	20	7.5	880	Nil	Nil	2	1881	Plain	Basalt	-	
11	2	ditto	ditto	ditto						564088	1300864	DBH 36	20	7.3	680	Nil	Nil	1	1878	Plain	Basalt	-	
12	1	North Wollo	Habru	Jarota 07	C	WFB^	150		1													No water point to be sampled	
13	1	North Wollo	Habru	Darimu 07	C	WFB^	150		1	574155	1296040	CS 5	19	7.3	660	Nil	Nil	50	1629	Depression	Basalt	We found only one water point	
14	*1*	*North Wollo*	*Habru*	*Abiyot Fire 07*	*C*	*WFB^*	*150*		*1*													***Area/kebele not found***	
15	1	North Wollo	Habru	Aware 09						571107	1291925	DBH 37	18	7.3	800	Nil	Nil	60	1658	Plain	Alluvium	We found only one water point	
16	*1*	*North Wollo*	***Meket***	*Deferghe 023*																		***Area/Kebele not found***	
17	*1*	*North Wollo*	*Habru*	*Fakit 034*	*FFSH*	*WFB*	*80*	*1*														***Area/kebele not found***	
18	*1*	*North Wollo*	***Meket***	*Tajaabo 025*																		***Area/kebele not found***	
19	*1*	*North Wollo*	***Meket***	*Enatguya 017*																		***Area/kebele not found***	
20	*1*	*North Wollo*	*Habru*	*Kega Ber 029*	*FFSH*	*WFB^*	*80*	*1*														***Area/kebele not found***	
21	*1*	*North Wollo*	*Habru*	*Koso Mender*	*FFSH*	*WFB^*	*90*	*1*														***Area/kebele not found***	
22	*1*	*North Wollo*	***Meket***	*Derek Wenz+Nacha Feres 031*																		***Area/kebele not found***	
23	*1*	*North Wollo*	***Meket***	*Keynitu+Birafaf 032*																		***Area/kebele not found***	
24	*1*	*North Wollo*	***Meket***	*Mekerecha+Zet Yibel 034*																		***Area/kebele not found***	
25	1	South Wollow	Jama	Begide+Ibayu 09	C	WFB	150		1	529637	1163850	DBH 56	17	7.7	500	Nil	Nil	95	2612	Plain	Alluvium	We found only one water point	
26	1	South Wollow	Kelela	Chellhele 03	C	WFB	60	1		501781	1172476	CS 8	17	7.6	400	Nil	Nil	50	2507	Gentle Slope	W. Basalt	-	
26	2	ditto	ditto	Sembe						498237	1171478	CS9	16	7.4	240	Nil	Nil	15	2555	Flood Plain	Basalt	Labo Test	
27	1	South Wollow	Kelela	Yimere 01						502735	1171251	DBH 48	18	7.3	400	Nil	Nil	> 100	2457	Flood Plain	W. Basalt	We found only one water point	
28	***1***	***South Wollow***	***Jama***	***Alley***	***C***	***WFB***	***60-70***	***2***														***Area/kebele not found***	
29	1	South Wollow	Jama	Laukubi & Tach kub 1	C	WFB	145		1	528793	1158220	DBH 54	17	7.6	350	Nil	Nil	45	2607	Flood Plain	Alluvium	-	
29	2	ditto	ditto							526768	1160466	DBH 55	16	7.4	370	Nil	Nil	90	2591	Flood Plain	Alluvium	-	
30	1	South Wollow	Jama	Ejerti michael 012	C	WFB	70	3														No water point to be sampled	
31	1	South Wollow	Jama	Gerbo, Hodere 017	C	WFB	150		1	533335	1150883	DBH 53	16	8.3	320	Nil	Nil	15	2661	Gentle Plain	Basalt	We found only one water point	Labo Test
32	*1*	*South Wollow*	*Jama*	*Golelsha 017*	*FFSH*	*WFB*	*60*	*3*														*Area/kebele not found*	
33	1	South Wollow	Jama	Libanos 019	FFSH	WFB	130		1	524653	1138990	CS 15	12	7.3	260	0.5	Nil	> 100	2632	Flood Plain	Basalt	We found only one water point	
34	1	South Wollow	Jama	Gende Gulo 020	FFSH	WFB	60	3		527101	1142102	CS 16	15	7.9	220	Nil	Nil	40	2594	Plain	Alluvium	We found only one water Point	
35	1	South Wollow	Worebabo	Kelkesha 015	C	SD	180		1													Area/kebele "In-accessible"	
36	1	South Wollow	Worebabo	Lhiftu 015	C	SD	80	3														Area/ kebele "In-accessible"	
37	1	South Wollow	Worebabo	Gedida 014	FFSH	WFB	140		1													Area/kebele "In-accessible"	
38	1	South Wollow	Worebabo	Gubisa 05	FFSH	WFB	60	1		586744	1252660	DBH 40	18	6.9	580	Nil	Nil	> 100	2719	Depression	W. Basalt	We found only one water point	Labo Test
39	1	South Wollow	Worebabo	Abo Gora 05	FFSH	WFB	150		1	584303	1257569	DBH 41	12	7.3	400	Nil	Nil	7	2547	Depression	W. Basalt	We found only one water point	
40	1	South Wollow	Worebabo	Korekon 05	FFSH	WFB	70	2														No water point to be sampled	
41	1	South Gondar	Simada	Agewoch 010	FFSH	WFB	60	3		417364	1258873	CS1	16	7	300	Nil	Nil	> 100	2491	Gentle Slope	Basalt	We found only one water point	
42	1	South Gondar	Simada	Genta	C	WFB	50	1														No water point to be sampled	
43	1	South Gondar	Simada	Mwerem 34	C	WFB	60	3		434772	1243901	DBH 19	20	6.8	260	Nil	Nil	10	2425	Flood Plain	Alluvium	We found only one water point	
44	*1*	*South Gondar*	*Simada*	*Goref 04*	*C*	*WFB*	*60*	*1*														*Area/kebele not found*	
45	1	South Gondar	Simada	Menkelila	FFSH	WFB	60	2		417973	1244960	DBH 21	16	7.4	300	Nil	Nil	2	2422	Plain	Alluvium	We found only one water point	
46	1	South Gondar	Simada	Agamwuha 05	C	WFB	50	2		422907	1254669	DBH 20	18	7.1	240	Nil	Nil	0.5	2511	Flood Plain	Alluvium	We found only one water point	
47	1	South Gondar	Simada	Chifchaf 06	FFSH	WFB	60	2		425952	1275999	CS2	17	7.2	240	Nil	Nil	10	2679	Depression	W. Basalt	We found only one water point	Labo Test

Results of In-Situ Water Quality Analysis (Amhara Regional State)

No		Zone	Woreda	Area/Kebele	Basic Information					In-situ Water Quality Analysis												
					Geo-electrical survey	Geology	Proposed well depth	Revised Q'ty of well		Specific Location (UTM)		Water Point	In-situ Analysus						Elevation	Topography	Geology	Remarks	
							(m)	SBH	DBH	Easting	Northing		Temp (deg. C)	Ph	Cond. (micro-S/cm)	Fe (mg/l)	F (mg/L)	T.Coliform (colonies)	(m.amsl)				
48	1	South Gondar	Ibnat	Selamaya						409205	1339030	DBH 15	16	6.6	260	Nil	Nil	14	2597	Flood Plain	Basalt	Area/kebele repeated	
48	2	ditto	ditto							408558	1339132	DH 2	16	7.1	360	Nil	Nil	6	2624	Flood Plain	Basalt		
49	1	South Gondar	Ibnat	Wegere Selamaya																		Area/kebele repeated	
50	1	South Gondar	Ibnat	Checheho Jimnaderega	C	WFB	60	3		401381	1340061	DBH 17	The Hand pump is not working (only inventory)						2290	Flood Plain	Basalt	No water point to be sampled	
51	1	South Gondar	Ibnat	Minch Jimnaderega																		No water point to be sampled	
52	1	South Gondar	Ibnat	Awsheridi Jimnaderega						400710	1340339	DBH 18	19.1	7.1	480	Nil	Nil	8	2253	Plain	Alluvium	Area/kebele repeated	
53	1	South Gondar	Ibnat	Tinjut Ber	FFSH	WFB	60	1		397002	1340492	DBH 4	9.6	6.6	260	*	Nil	9	2238	Gentle Slope	Volcanic	Area/kebele repeated	
54	1	Oromiya	Bati	Garero 07	C	WFB^	80	1		No water point												Area / kebele "In- accessible"	
55	1	Oromiya	Bati	Alshayu+kersu						609383	1245884	DBH 57	18	7.5	1460	Nil	Nil	> 100	1498	Depression	W. Basalt	We found only one water point	Labo Test
56	1	Oromiya	Bati	Tachignaw Lkgo																		No water point to be sampled	
57	1	Oromiya	Bati	Laygnaw Laygo, Kembere																		No water point to be sampled	
58	1	Oromiya	Bati	Selmani 014	C	WFB^	150		1	608753	1234395	DBH 59	13	7.5	800	Nil	Nil	> 100	1585	Depression	Alluvium	We found only one water point	
59	1	North Shewa	Angolelanaa Sagirt	Ambel+Koso						552123	1032921	DBH 74	10	7.6	180	Nil	*	12	2914	Gentle Slope	Alluvium	We found only one water point	
60	*1*	*North Shewa*	*Angolelanaa Sagirt*	*Werga*																		*Area /kebele not found*	
61	1	North Shewa	Angolelanaa Sagirt	Seriti	C	WFB	60	1		547635	1053015	DBH 72	11	8	400	Nil	Nil	3	2786	Flood Plain	Alluvium	We found only one water point	Labo Test
62	*1*	*North Shewa*	*Angolelanaa Sagirt*	*Liche Seriti Totose*	*C*	*WFB*	*60*	*1*														*Area/kebele not found*	
63	1	North Shewa	Angolelanaa Sagirt	Mongudo Cheke Zurya	C	WFB	60	1		545263	1048004	CS 18	13	7.3	400	Nil	*	3	2819	Plain	Alluvium	We found only one water point	
64	*1*	*North Shewa*	*Angolelanaa Sagirt*	*Laftole aje Cheke*	*C*	*WFB*	*60*	*1*														*Area/kebele not found*	
65	1	North Shewa	Angolelanaa Sagirt	Cheke Town						543649	1045815	CS 17	13	8	360	Nil	*	5	2843	Plain	Basalt	-	
65	2	ditto	ditto							543085	1047202	DBH 73	12	8	240	Nil	*	Nil	2849	Plain	Alluvium	-	
66	1	**Waghimra**	**Sekota**	Tsetsergi abanachiros																		No water point to be sampled	
67	1	**Waghimra**	**Sekota**	Tsatsu Dire Tlku, Ugulo																		No water point to be sampled	
68	1	**Waghimra**	**Sekota**	Bewshu 015																		No water point to be sampled	
69	1	**Waghimra**	**Sekota**	Chilkiwolo 010																		No water point to be sampled	
70	*1*	***Waghimra***	***Sekota***	*Shimidir/Limat Kinatchora 012*																		*Area/kebele not found*	
71	*1*	***Waghimra***	***Sekota***	*Dibaran 011*																		*Kebele not found*	
72	*1*	***Waghimra***	***Sekota***	*Gela Kamiru Arquatia 011*																		*Area/kebele not found*	
73	1	Waghimra	Sekota	Dirinziba, Tasaskiw																		Area /kebele repeated	
74	1	Waghimra	Sekota	Nigunaleka 08						508088	1378586	DBH 31	19	7.5	840	Nil	Nil	Nil	2191	Gentle Slope	Alluvium	We found only one water pooint	
75	1	Waghimra	Sekota	Akjewshina 07																		No water point to be sampled	
76	1	Waghimra	Sekota	Wellan and Chifte						503327	1390328	DBH 29	18	7.4	600	Nil	Nil	3	2163	Gentle Slope	W. Basalt	We found only one water point	
77	1	Waghimra	Sekota	Testsergi, Abanachir 015						501528	1398979	DBH 28	18	7.2	680	Nil	Nil	50	2134	Depression	Sand Stone	Misplaced	
78	1	Waghimra	Sekota	Tsatsu, Dirc Tiku, Ugulo																			
79	1	Waghimra	Sekota	Shimhar Tiku 010						493808	1386400	CS 4	17	7.4	*	*	*	*	2081	Depression	Basalt	We found only one water point	
80	1	Waghimra	Sekota	Chilkiw 010 mizrib						493147	1385915	DBH 26	17	7.3	700	Nil	Nil	*	2129	Plain	W. Basalt	We found only one water point	
81	*1*	*Waghimra*	*Sekota*	*Shimidirla Limat Chora*	*C*	*WFB*	*60*	*1*														*Area/kebele not found*	
82	*1*	*Waghimra*	*Sekota*	*Dibaran 011*																		*Kebele not found*	
83	*1*	*Waghimra*	*Sekota*	*Gelakamiru Arquatiya*	*C*	*WFB*	*60*	*3*														*Area/kebele not found*	
84	1	Waghimra	Sekota	Dirinziba Tsaskiw, Sikuna																		No water point to be sampled	
85	1	Waghimra	Sekota	Nigas Aleka 08																		No water point to be sampled	
86	1	Waghimra	Sekota	Akejewshina 07						508247	1380436	The hand pump is not functioning							2122	Gentle Slope	Basalt	No water point to be sampled	
87	1	Waghimra	Dahana	kenubish	C	WFB	60	1		479493	1373839	DBH 25	16	6.8	520	Nil	Nil	*	2138	Depression	Basalt	We found only one water point	Labo Test
87	2	ditto	ditto	Welkementa						The area is not identified													
88	1	North Shoa	Minjar Shenkora	Chelle geberel	C	SD	220		1													No water point to be sampled	
89	1	North Shoa	Minjar Shenkora	Chome Ager	C	SD	80	2														No water point to be sampled	
90	1	North Shoa	Minjar Shenkora	Biruk Ager	C	SD	240		1													No water point to be sampled	
91	1	North Shoa	Minjar Shenkora	Alemneh Dire	C	SD	220		1													No water point to be sampled	
92	1	North Shoa	Minjar Shenkora	Kiticha	C	SD	250		1	554692	980477	Nowater point (pond and rain harvesting) only							1705	Flood Plain	Alluvium	No water point to be sampled	
92	2	ditto	ditto							554688	979531	Only rain harvestig from the roof							1708	Flood Plain	Alluvium	No water point to be sampled	
93	1	North Shoa	Minjar Shenkora	Golegolecha	C	SD	80	3														No water point to be sampled	
94	1	North Shoa	Minjar Shenkora	Wmaga	C	SD	80	3														No water point to be sampled	

Results of In-Situ Water Quality Analysis (Amhara Regional State)

No		Zone	Woreda	Area/Kebele	Basic Information					In-situ Water Quality Analysis												
					Geo-electrical survey	Geology	Proposed well depth	Revised Q'ty of well		Specific Location (UTM)		Water Point	In-situ Analysus						Elevation	Topography	Geology	Remarks	
							(m)	SBH	DBH	Easting	Northing		Temp (deg. C)	Ph	Cond. (micro-S/cm)	Fe (mg/l)	F (mg/L)	T.Coliform (colonies)	(m.amsl)				
95	1	North Shoa	Minjar Shenkora	Kiki	C	SD	80	2		949888	987544	Inventory							1799	Plain	Alluvium	No water point to be sampled	
96	1	North Shoa	Minjar Shenkora	Jejebakola	C	SD	80	1														No water point to be sampled	
97	1	North Shoa	Minjar Shenkora	Finanajo	C	SD	80	2														No water point to be sample	
98	1	North Shoa	Minjar Shenkora	Aroge Minjar	C	SD	240		1	548220	989762	BH 10	18	7.6	540	Nil	*	*	1775	Plain	Alluvium	We found only one water point	Labo Test
99	1	North Shoa	Minjar Shenkora	Zewelde	C	WFB^	80	2														No water point to be sampled	
100	1	North Shoa	Tamaber	Argaga	C	WFB^	150		1	593372	1098706	BH 9	Only inventory- The well has stopped since						1447	Plain	Alluvium	No water point to be sampled	
101	*1*	*South Wello*	*Harbu*	*Alimenta*	*C*	*WFB^*	*80*	*3*														*Area/kebele not found*	
102	1	South Wello	Harbu	Aderanba	FFSH	WFB^	160		1													No water point to be sampled	
103	1	South Wello	Harbu	Meja	FFSH	WFB^	150		1													No water point to be sampled	
104	1	South Wello	Harbu	Abunaye	FFSH	WFB^	160		1													No water point to be sampled	
105	1	South Wello	Harbu	Wiensa	C	WFB	60	1														No water point to be sampled	
106	1	South Wello	Kelela	Kersa 05	FFSH	WFB^	120		1	574867	1293107	DBH 39	19	8	400	Nil	Nil	Nil	1584	Flood Plain	Alluvium	We found only one water point	
107	1	South Wello	Kelela	Weda Golwn 030	FFSH	WFB	60	2														No water point to be sampled	
108	1	South Wello	Kelela	Inchini 031	C	WFB	60	1														No water point to be sampled	
109	1	South Wello	Kelela	Tika 034	FFSH	WFB	60	3		520695	1177265	CS 11	16	7.4	400	Nil	Nil	6	2557	Flood Plain	Alluvium	We found only one water point	
110	1	South Wello	Kelela	Indoda 030	C	WFB	60	1		497788	1167325	CS 10	13	7.8	400	Nil	Nil	18	2450	Gentle Slope	Basalt	We found only one water point	
111	1	South Wello	Kelela	Wede Getu 036	C	WFB	120		1	517479	1183030	DBH 49	16	7.5	540	Nil	Nil	45	2574	Flood Plain	Basalt	-	
111	2	ditto	ditto							516939	1184515	Only inventory							2602	Flood Plain	Basalt	-	
112	1	South Wello	Kelela	Kore/Fincheftu 037	FFSH	WFB	60	1		515717	1190071	CS 12	17	7.6	400	Nil	Nil	70	2712	Depression	W. Basalt	We found only one water point	
113	1	South Wello	Kelela	GendeBorena 036	FFSH	WFB	60	1														No water point to be sampled	
114	1	South Wello	Wegide	Yagi 014	FFSH	WFB	60	1		463012	1156207	DBH 42	15	7.4	240	Nil	Nil	40	2421	Gentle Slope	Basalt	We found only one water point	Labo Test
115	1	South Wello	Wegide	Golele 09	FFSH	WFB	120		1	467045	1158893	CS 6	15	7.1	220	Nil	Nil	20	2404	Gentle Slope	W. Basalt	We found only one water point	
116	1	South Wello	Wegide	Kutiso 03 Abey	C	WFB	140		1	472146	1165943	DBH 44	17	7.2	360	Nil	Nil	30	2404	Flood Plain	Alluvium	We found only one water point	
117	1	South Wello	Wegide	Bikili 04	C	WFB	60	3		469499	1163764	DBH 43	17	7.4	420	Nil	Nil	60	2412	Flood Plain	Alluvium	We found only one water point	
118	1	South Wello	Wegide	Ayele Anba Rufa 02,04	C	WFB	60	2		473126	1166852	DBH 45	16	7.4	400	Nil	Nil	50	2394	Depression	Alluvium	We found only one water point	
119	1	South Wello	Wegide	Haleltu 07	C	WFB	60	1		469354	1162408	CS 7	16	7.3	360	Nil	Nil	25	2397	Gentle Slope	Basalt	We found only one water point	
120	1	South Wello	Wegide	Yeshum	C	WFB	60	3		490952	1189460	DBH 47	18	7.5	500	Nil	Nil	40	2562	Plain	Alluvium	We found only one water point	
121	1	South Wello	**Meqdella**	Ivelinta 02	FFSH	WFB	50	1		504166	1240525	CS 14	The tap is not working						2781	Flood Plain	Basalt	No water point to be sampled	
122	1	South Wello	**Meqdella**	Yebar 013	FFSH	WFB	50	1														No water point to be sampled	
123	1	South Wello	**Meqdella**	Tilket 02	FFSH	WFB	50	1														No water point to be sampled	
124	1	South Wello	**Meqdella**	Genatit 02	FFSH	WFB	50	1		510656	1240986	DBH 56	15	7.3	300	Nil	Nil	70	2829	Flood Plain	W. Basalt	We found only one water point	
125	*1*	*South Wello*	***Meqdella***	*Tija Fej 06*	*FFSH*	*WFB*	*50*	*1*														*Area/kebele not found*	
126	*1*	*South Wello*	***Meqdella***	*Felana 06*	*FFSH*	*WFB*	*50*	*1*														*Area/kebele not found*	
127	*1*	*South Wello*	***Meqdella***	*Gonderoch*	*FFSH*	*WFB*	*50*	*1*														*Area/kebele not found*	
128	1	South Wollo	**Meqdella**	Meqdella	FFSH	WFB	50	1		507352	1241941	DBH 52	16	7.9	880	Nil	Nil	5	2795	Plain	Basalt	We found only one water point	Labo Test
129	1	South Wollo	**Meqdella**	Feterot+Ychikech	FFSH	WFB	120		1													No water point to be found	
130	1	South Wollo	**Meqdella**	Dedere 05	FFSH	WFB	60	1		515954	1236052	DBH 50	15	7.3	200	Nil	Nil	55	2909	Plain	Basalt	-	
130	2	ditto	**ditto**							514984	1235882	CS 13	15	7.6	360	Nil	Nil	> 100	2896	Gentle Slope	Basalt	-	
131	1	South Wollo	**Meqdella**	Gose 05	FFSH	WFB	60	1														No water point to be found	
132	1	South Gondar	Ibnat	Tilbi						397889	1300900	DBH 2	18	6.5	260	Nil	Nil	Nil	2255	Gentle Slope	W. Basalt	-	
132	2	ditto	ditto							390414	1338275	DBH 3	9.5	7.6	460	0.5	Nil	5	2338	Depression	Basalt	-	
133	1	South Gondar	Ibnat	Kwalisa																		Area /kebele "In-accessaible"	
134	1	South Gondar	Ibnat	Work mender acbr aba Jale						395300	1342062	DBH 13	19	6.9	800	Nil	Nil	4	2176	Depression	W. Basalt	-	
134	2	ditto	ditto							396208	1342473	DBH 14	20	6.7	620	Nil	Nil	6	2140	Gentle Slope	Basalt	-	
135	1	South Gondar	Ibnat	Wenber Ayhayakwha						393956	1346013	DBH 11	18	6.7	480	Nil	Nil	7	2254	Depression	W. Basalt	-	
135	2	ditto	ditto							394103	1344058	DBH 12	20	7	500	Nil	Nil	8	2223	Gentle Slope	W. Basalt	-	
136	*1*	*South Gondar*	*Libo Kemkem*	*Berengna Lentdur*	*FFSH*	*WFB^*	*80*	*1*														*Area/kebele not found*	
137	1	South Gondar	Libo Kemkem	Zanzi	FFSH	WFB^	80	1		360215	1334674	DBH1	20	6.6	660	< 0.2	Nil	8	1828	Flood Plain	Alluvium	-	
137	2	ditto	ditto							359717	1334644	BH 1	20	7.9	440	< 0.2	Nil	Nil	1824	>>	Alluvium	-	
138	*1*	*South Gondar*	*Libo Kemkem*	*Birwuha Ferfer*	*FFSH*	*WFB^*	*80*	*1*														*Area/kebele not found*	
139	1	South Gondar	Libo Kemkem	Nashora Ferfer	FFSH	WFB^	80	1		378983	1359783	DBH 8	Only inventory, The hand pump is damaged						1972	Depression	W. Basalt	No water point to be sampled	

Results of In-Situ Water Quality Analysis (Amhara Regional State)

No		Zone	Woreda	Area/Kebele	Basic Information					In-situ Water Quality Analysis												
					Geo-electrical survey	Geology	Proposed well depth	Revised Q'ty of well		Specific Location (UTM)		Water Point	In-situ Analysus						Elevation	Topography	Geology	Remarks	
							(m)	SBH	DBH	Easting	Northing		Temp (deg. C)	Ph	Cond. (micro-S/cm)	Fe (mg/l)	F (mg/L)	T.Coliform (colonies)	(m.amsl)				
140	1	South Gondar	Libo Kemkem	Ashker Terara	C	WFB^	80	2														No water point to be sampled	
141	1	South Gondar	Libo Kemkem	Kurmat Ategecha	FFSH	WFB^	80	1		378571	1365258	DBH 6	18.9	6.7	680	Nil	Nil	2	1849	Depression	W. Basalt	We found only one water point	Labo Test
142	*1*	*South Gondar*	*Libo Kemkem*	*Atria agat Ashker*	*FFSH*	*WFB^*	*80*	*1*														*Area/kebele not found*	
143	1	South Gondar	Libo Kemkem	Sholit Kalsholit	FFSH	WFB^	80	2		392025	1364977	DBH 5	Only inventory						2053	Plain	Basalt	No water point to be sampled	
144	1	South Gondar	Libo Kemkem	Ambo Asawegan	FFSH	WFB^	80	1														No water point to be sampled	
145	1	South Gondar	Libo Kemkem	Zelamin Janda	FFSH	WFB^	80	1		377937	1389451	DBH 10	20	7.1	820	Nil	Nil	14	1847	Flood Plain	W. Basalt	We found only one water point	Labo Test
146	1	South Gondar	Libo Kemkem	Kalaymedhanialem	C	WFB^	160	1		367239	1376077	DBH 9	19	7	1040	Nil	Nil	3	1899	Plain	Alluvium	We found only one water point	
147	*1*	*South Gondar*	*Libo Kemkem*	*Arobakello 015*																		*Area/kebele not found*	
148	1	South Gondar	Libo Kemkem	Tirusina 015						594872	1196819	DBH 60	16	7	500	0.5	Nil	> 100	1572	Depression	Ig	-	Labo Test
148	2	ditto	ditto							594516	1196323	DBH 61	15	7.2	660	Nil	Nil	> 100	1555	Depression	Basalt	-	
149	*1*	*South Gondar*	*Libo Kemkem*	*Kille 012*																		*Area/kebele not found*	
150	1	Oromiya	Artuma Fursi	Bete ordega Berbelay																		Area /kebele misplaced	
151	1	Oromiya	Artuma Fursi	Bkavakello Beteordega																		Area /kebele misplaced	
152	*1*	*Oromiya*	*Artuma Fursi*	*Kersaadi+mutulu*	*C*	*WFB^*	*180*		*1*													*Area/kebele not found*	
153	*1*	*Oromiya*	*Artuma Fursi*	*Kara Kodema+Lale Gela*	*FFSH*	*WFB^*	*80*	*2*														*Area/kebele not found*	
154	*1*	*Oromiya*	*Artuma Fursi*	*Kodema Fugnu*	*C*	*WFB^*	*180*		*1*													*Area/kebele not found*	
155	1	Oromiya	Artuma Fursi	Ireti	FFSH	WFB^	80	1		609124	1138892	DBH 66	18	6.9	680	Nil	Nil	> 100	1454	Depression	Ig	We found only one water point	
156	1	Oromiya	Artuma Fursi	Koro Rokesa Hader	FFSH	WFB^	80	2		609168	1141065	DBH 68	17	7.2	680	Nil	Nil	> 100	1396	Depression	Alluvium	We found only one water point	
157	1	Oromiya	Bati	Hdow Barigo, Hadow	FFSH	WFB^	80	1		In accissable												No water point to be sampled	
158	1	Oromiya	Bati	Kuni 03	FFSH	WFB^	80	2		610020	1242552	DBH 58	The hand pump is damaged only inventory						1749	Depression	W. Basalt	No water point to be sampled	
159	1	Oromiya	Julle Tumuga	Fugan Dembi	C	WFB^	80	2		614764	1134300	DBH 64	18	7.1	1280	Nil	Nil	> 100	1316	Gentle Slope	W. Basalt	-	
159	2	ditto	ditto							615073	1135234	DBH 65	16	7.1	900	0.2	Nil	> 100	1302	Gentle Slope	W. Basalt	-	
160	1	Oromiya	Julle Tumuga	Gerbi kille	FFSH	WFB^	80	2		609772	1133377	DBH 62	15	7	1300	Nil	Nil	1	1410	Depression	Basalt	-	
161	1	Oromiya	Julle Tumuga	Gerbi kille	FFSH	WFB^	70	3		609803	1133356	DBH 63	15	7	1200	Nil	Nil	20	1406	Depression	Alluvium	Area /kebele repeated	Labo Test
162	1	Oromiya	Julle Tumuga	Merewa Hadere	C	WFB^	160		1	607316	1139645	DBH 67	17	7.2	1400	Nil	Nil	> 100	1426	Gentle Slope	Alluvium	We found only one water point	
163	1	Oromiya	Julle Tumuga	Guda Chelle	FFSH	WFB^	160		1	608052	1128470	BH 8	Only inventory						1376	Depression	Alluvium	No water point to be sampled	
164	1	Oromiya	Julle Tumuga	Balchi Tikure	FFSH	WFB^	80	1		602121	1114466	DBH 70	19	7.1	2700	Nil	Nil	5	1141	Plain	Alluvium	-	
164	2	ditto	ditto							602930	1114645	DBH 71	20	7.1	2200	Nil	Nil	Nil	1178	Plain	Alluvium	-	
165	1	Oromiya	Julle Tumuga	Dula Chereka	FFSH	WFB^																Areai/kebele "In-accessible"	
166	1	Oromiya	Julle Tumuga	Arba wayu	C	WFB^	160		1													Area/kebele "In-accessible"	
				合計				*130*	*34*			96	90	83	83	83	83	83					16

Note:

WFB: Stands for Weathered and Fractured Basalt

WFB^: Stands for Weathered and Fractured Basalt with thick soil cover

SD: Stands for thick soil deposit

FFSH: Stands for Found Feasible by its Surface Hydrogeological conditions

C: Stands for Conducted; Geophysical Survey is conducted in the areas indicated

NF: Stands for Not Feasible

NA: Stands for Not Accessible

Completed means water supply schemes are constructed in the areas in the past two years

Bold word: correction of miss-spelling and unseen error

***:** Duplicated location

The boreholes' depth of 164 wells was estimated and the remaining 36 boreholes' depth shall be estimated by Amhara Water Resource Development Bureau up to January, 2005.

ETHIOPIAN GEOLOGICAL SURVEY CENTRAL GEOLOGICAL LABORATORY

WATER LABORATORY
DATA CODING FOR TRACE CONSTITUENTS

Dep./Proj. **Originator** Geomatrix **Approved by** HEAD,CGL

Sample Type Water **Source Area** **Date Submitted** 20/12/04

Chemical Constituents in ppm(mg/lit.) **Date completed** 24/01/05

Request No. 12685-2005PVT

FIELD No.	Cond. CS-2	S.Wol. DW-53	S.Wol..DW-52	S.Wol. CS-9	S.Wol. DW-42	S.Wol.DW-40	Wag. DW-25	Wag. DW-26
LAB. No.	12695	12696	12697	12698	12699	12700	12701	12702
Barium (Ba)	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Cadmium (Cd)	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Chromium (Cr)	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Copper (Cu)	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Zinc (Zn)	<0.1	<0.1	<0.1	1.2	<0.1	<0.1	0.2	0.9
Manganses (Mn)	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Aluminum (Al)	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Iron (Fe)	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Lead (Pb)	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Cyanide (CN)	0.001	0.001	0.007	0.001	0.002	0.003	0.005	0.003
Hydrogen Sulfide (H2S)	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil
Total dissolved solids(TDS)	258	345	1097	438	266	665	605	714
Hardness	95.06	133.26	292.63	200.73	117.84	283.87	283.61	360.85

Analysed by Water Analysts **Checked by**

Head Water Lab

Head, Central Geological Laboratory

Tesfaye Lemma (DR.)
Head, Central Geological Laboratory

Federal Democratic Republic of Ethiopia
Ministry of Mines
Geological Survey of Ethiopia

ETHIOPIAN GEOLOGICAL SURVEY CENTRAL GEOLOGICAL LABORATORY

WATER LABORATORY
DATA CODING FOR MAJOR CONSTITUENTS

Dep./Proj. **Originator** *Geomatrix* **Approved by** Head, CGL

Sample Type Water **Source Area** **Date Submitted** 20/12/04

Chemical Constituents in ppm(mg/lit.) **Date completed** 24/01/05

Request No. 12685-2005PVT

FIELD No.	Cond. CS-2	S.Wol. DW-53	S.Wol..DW-52	S.Wol. CS-9	S.Wol. DW-42	.Wol.DW-40	Wag. DW-25	Wag. DW-26
LAB. No.	12695	12696	12697	12698	12699	12700	12701	12702
Chloride(Cl)	8	10	114	1	3	53	12	10
Sulphate(SO4)	7	6	46	-	4	19	10	15
Fluoride(F)	0.33	0.41	0.17	0.28	0.35	0.21	0.29	0.42
Nitrate(NO3)	23.04	5.32	177.2	19.94	14.18	93.03	20.38	33.23
Sodium(Na)	15	18	86	15	9	16	20	18
pH	7.32	7.88	7.61	7.67	7.43	7.02	7.27	7.71

Analysed by Water Analysts

Checked by

Head, Water Laboratory T Asfaw Teferra

Head, Central Geological Laboratory 25/01/2005

Tesfaye Lemma (Dr.)
Head, Central Geological Laboratory

The Federal Democratic Republic of Ethiopia * Ministry of Mines Geological Survey of Ethiopia *

ETHIOPIAN GEOLOGICAL SURVEY CENTRAL GEOLOGICAL LABORATORY

WATER LABORATORY
DATA CODING FOR TRACE CONSTITUENTS

Dep./Proj. **Originator** Geomatrix **Approved by** HEAD,CGL

Sample Type Water **Source Area** **Date Submitted** 20/12/04

Chemical Constituents in ppm(mg/lit.) **Date completed** 24/01/05

Request No. 12685-2005PVT

FIELD No.	N. Sh. DW-72	N. Sh. BH-10	N. Wol. DW-22	N.Wol. DW-32	N.Wol. DW-38	Or. DW-57	Or. DW-60	Or.DW-63	Cond-DW-16	Cond-DW-10
LAB. No.	12685	12686	12687	12688	12689	12690	12691	12692	12693	12694
Barium (Ba)	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Cadmium (Cd)	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Chromium (Cr)	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Copper (Cu)	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Zinc (Zn)	<0.1	0.2	<0.1	0.4	<0.1	<0.1	<0.1	<0.1	<0.1	0.2
Manganses (Mn)	<0.1	<0.1	<0.1	0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.6
Aluminum (Al)	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Iron (Fe)	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.1	0.1	<0.1	0.6
Lead (Pb)	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Cyanide (CN)	0.002	0.001	0.001	0.002	0.001	0.001	0.002	0.006	0.002	0.004
Hydrogen Sulfide (H2S)	Nil	Nil	Nil	Nil	0.32	Nil	Nil	0.32	Nil	Nil
Total dissolved solids(TDS)	412	567	218	830	453	1695	495	1466	596	859
Hardness	203.62	158.28	78.46	432.64	217.94	720.86	217.46	389.97	258.9	418.93

Analysed by Water Analysts **Checked by**

Federal Democratic Republic of Ethiopia Ministry of Mines Geological Survey of Ethiopia

Head Central Geological Laboratory Tesfaye Lemma (Dr.)

Head, Central Geological Laboratory

Head Water Lab

ETHIOPIAN GEOLOGICAL SURVEY CENTRAL GEOLOGICAL LABORATORY

WATER LABORATORY
DATA CODING FOR MAJOR CONSTITUENTS

Dep./Proj. **Originator** *Geomatrix* **Approved by** Head, CGL

Sample Type Water **Source Area** **Date Submitted** 20/12/04

Chemical Constituents in ppm(mg/lit.) **Date completed** 24/01/05

Request No. 12685-2005PVT

FIELD No.	N.Sh. DW-72	N.Sh. BH-10	N.W.DW-12	N.W.DW-32	N.W.DW-38	Or. DW-57	Or.DW-60	Or.DW-63	Gond. DW-16	Gond DW-10
LAB. No.	12685	12686	12687	12688	12689	12690	12691	12692	12693	12694
Chloride(Cl)	3	10	20	10	7	112	11	138	13	28
Sulphate(SO4)	7	12	8	3	10	195	13	44	14	13
Fluoride(F)	0.28	1.08	0.07	0.24	0.23	0.62	0.45	0.79	0.22	0.44
Nitrate(NO3)	13.29	10.08	42.09	28.8	11.96	46.52	3.1	20.82	50.95	24.62
Sodium(Na)	12	62	7.5	24	14	103	32	126	27	32
pH	7.86	7.68	6.64	7.69	7.72	7.58	7.22	7.36	7.23	7.23

Analysed by Water Analysts

Checked by

Head, Water Laboratory

Head, Central Geological Laboratory

Tesfaye Lemma (Dr.)
Head, Central Geological Laboratory

Federal Democratic Republic of Ethiopia
Ministry of Mines
Geological Survey of Ethiopia

5.3
Selection of Project Target Communities

List of Requested Schemes and Proposed Well Depth Estimated by Geo-electrical Survey in Amhara Regional State

No	Zone	Woreda	Area/Kebele	Population	Type	Original Qty	Geo-electrical Survey	Geology	Proposed depth	Revised Qty. of well		Note
									(m)	SBH	DBH	
1	North Wollo	Gidan	Tetergh (03)	350	SBH	1	FFSH	WFB	60	1		
2	North Wollo	Gidan	Tingit	405	SBH	1	FFSH	WFB	60	1		
3	North Wollo	Gidan	Kebero Meda oll	1,225	DBH	1	FFSH	WFB	130		1	
4	North Wollo	Gubalftu	Shelle mender 09	1,050	DBH	1						Completed
5	North Wollo	Gubalftu	Lengisa 010-Gdla mech	1,125	DBH	1						Completed
6	North Wollo	Gubalftu	Adembulbulo 010	985	DBH	1						Completed
7	North Wollo	Habru	Agamsa 027	1,090	DBH	1	C	WFB^	150		1	
8	North Wollo	Habru	Haro 027	1,135	DBH	1	C	WFB^	150		1	
9	North Wollo	Habru	Sekela 015	385	SBH	1	C	WFB^	80	1		
10	North Wollo	Habru	Meja adea 07	1,450	DBH	1	C	WFB^	150		1	
11	North Wollo	Habru	Sirinka Gerado 04	325	SBH	1	C	WFB^	80	1		
12	North Wollo	Habru	Jarota 07	1,500	DBH	1	C	WFB^	110		1	
13	North Wollo	Habru	Darimu 07	1,350	DBH	1	C	WFB^	150		1	
14	North Wollo	Habru	Abiyot Fire 07	1,650	DBH	1	C	WFB^	150		1	
15	North Wollo	Habru	Aware 09	2,500	DBH	1	C	WFB^	180		1	
16	North Wollo	**Meket**	Deferghe 023	390	SBH	1		WFB	70	1		
17	North Wollo	Habru	Fakit 034	310	SBH	1	FFSH	WFB	80	1		
18	North Wollo	Meket	Tajaabo 025	280	SBH	1	FFSH	WFB	70	1		
19	North Wollo	Meket	Enatguya 017	325	SBH	1	FFSH	WFB	70	1		
20	North Wollo	Habru	Kega Ber 029	415	SBH	1	FFSH	WFB^	80	1		
21	North Wollo	Habru	Koso Mender	295	SBH	1	FFSH	WFB^	90	1		
22	North Wollo	**Meket**	Derek Wenz+Nacha Feres 031	375	SBH	1	C	WFB	70			
23	North Wollo	Meket	Keynitu+Birafaf 032	255	SBH	1	FFSH	WFB	70			
24	North Wollo	**Meket**	Mekerecha+Zet Yibel 034	354	SBH	1	C	WFB	70			
25	South Wollow	Jama	Begide+Ibayu 09	1,500	DBH	1	C	WFB	150		1	
26	South Wollow	Kelela	Chellhele 03-Sembe	350	SBH	1	C	WFB	60	1		
27	South Wollow	Kelela	Yimere 01	250	SBH	1						NF
28	South Wollow	Jama	Alley	500	SBH	1	C	WFB	70	2		
29	South Wollow	Jama	Laukubi & Tach kub 1	1,000	DBH	1	C	WFB	145		1	
30	South Wollow	Jama	Ejerti michael 012	750	SBH	2	C	WFB	70	3		

List of Requested Schemes and Proposed Well Depth Estimated by Geo-electrical Survey in Amhara Regional State

No	Zone	Woreda	Area/Kebele	Population	Type	Original Qty	Geo-electrical Survey	Geology	Proposed depth	Revised Qty. of well		Note
									(m)	SBH	DBH	
31	South Wollow	Jama	Gerbo, Hodere 017	1,050	DBH	1	C	WFB	90		1	
32	South Wollow	Jama	Golelsha 017	750	SBH	2	FFSH	WFB	60	3		
33	South Wollow	Jama	Libanos 019	1,550	DBH	1	FFSH	WFB	130		1	
34	South Wollow	Jama	Gende Gulo 020	750	SBH	2	FFSH	WFB	60	3		
35	South Wollow	Worebabo	Kelkesha 015	1,250	DBH	1	C	SD	180		1	
36	South Wollow	Worebabo	Lhiftu 015	750	SBH	2	C	SD	80	3		
37	South Wollow	Worebabo	Gedida 014	1,000	DBH	1	FFSH	WFB	140		1	
38	South Wollow	Worebabo	Gubisa 05	250	SBH	1	FFSH	WFB	60	1		
39	South Wollow	Worebabo	Abo Gora 05	1,400	DBH	1	FFSH	WFB	150		1	
40	South Wollow	Worebabo	Korekon 05	500	SBH	2	FFSH	WFB	70	2		
41	South Gondar	Simada	Agewoch 010	750	SBH	1	FFSH	WFB	60	3		
42	South Gondar	Simada	Genta	250	SBH	1	C	WFB	50	1		
43	South Gondar	Simada	Mwerem 34	750	SBH	1	C	WFB	60	3		
44	South Gondar	Simada	Goref 04	150	SBH	1	C	WFB	60	1		
45	South Gondar	Simada	Menkelila	500	SBH	1	FFSH	WFB	60	2		
46	South Gondar	Simada	Agamwuha 05	500	SBH	1	C	WFB	50	2		
47	South Gondar	Simada	Chifchaf 06	500	SBH	1	FFSH	WFB	60	2		
48	South Gondar	Ibnat	Selamaya	1,250	DBH	1						Completed
49	South Gondar	Ibnat	Wegere Selamaya	250	SBH	1						Completed
50	South Gondar	Ibnat	Checheho Jimnaderega	750	SBH	2	C	WFB	60	3		
51	South Gondar	Ibnat	Minch Jimnaderega	250	SBH	1	C	WFB	60	1		
52	South Gondar	Ibnat	Awsheridi Jimnaderega	250	SBH	1	C	WFB	60	1		
53	South Gondar	Ibnat	Tinjut Ber	250	SBH	1	FFSH	WFB	60	1		
54	Oromiya	Bati	Garero 07	175	SBH	1	C	WFB^	80	1		
55	Oromiya	Bati	Alshayu+kersu	500	SBH	1						NF
56	Oromiya	Bati	Tachignaw Lkgo	560	SBH	1	FFSH	WFB^	80	1		
57	Oromiya	Bati	Laygnaw Laygo, Kembere	600	SBH	2	FFSH	WFB^	80	2		
58	Oromiya	Bati	Selmani 014	1,000	DBH	1	C	WFB^	150		1	
59	North Shewa	Angolelanaa Sagirt	Ambel+Koso	455	SBH	1	FFSH	WFB	60	2		
60	North Shewa	Angolelanaa Sagirt	Werga	353	SBH	1	FFSH	WFB	60	1		

List of Requested Schemes and Proposed Well Depth Estimated by Geo-electrical Survey in Amhara Regional State

No	Zone	Woreda	Area/Kebele	Population	Type	Original Qty	Geo-electrical Survey	Geology	Proposed depth	Revised Qty. of well		Note
									(m)	SBH	DBH	
61	North Shewa	Angolelanaa Sagirt	Seriti	285	SBH	1	C	WFB	60	1		
62	North Shewa	Angolelanaa Sagirt	Liche Seriti Totose	300	SBH	1	C	WFB	60	1		
63	North Shewa	Angolelanaa Sagirt	Mongudo Cheke Zurya	325	SBH	1	C	WFB	60	1		
64	North Shewa	Angolelanaa Sagirt	Laftole aje Cheke	295	SBH	1	C	WFB	60	1		
65	North Shewa	Angolelanaa Sagirt	Cheke Town	350	SBH	1						Completed
66	**Waghimra**	**Sekota**	Tsetsergi abanachiros	530	SBH	1						*
67	**Waghimra**	**Sekota**	Tsatsu Dire Tlku, Ugulo	600	SBH	2						*
68	**Waghimra**	**Sekota**	Bewshu 015	300	SBH	1	FFSH	WFB	60	1		
69	**Waghimra**	**Sekota**	Chilkiwolo 010	300	SBH	1	FFSH	WFB	60	1		
70	**Waghimra**	**Sekota**	Shimidir/Limat Kinatchora 012	350	SBH	1	FFSH	WFB	60	1		
71	**Waghimra**	**Sekota**	Dibaran 011	210	SBH	1						*
72	**Waghimra**	**Sekota**	Gela Kamiru Arquatia 011	700	SBH	2						*
73	Waghimra	Sekota	Dirinziba, Tasaskiw	750	SBH	2						*
74	Waghimra	Sekota	Nigunaleka 08	225	SBH	1	FFSH	WFB	60	1		
75	Waghimra	Sekota	Akjewshina 07	250	SBH	1						*
76	Waghimra	Sekota	Wellan and Chifte	150	SBH	1	FFSH	WFB	60	1		
77	Waghimra	Sekota	Testsergi, Abanachir 015	530	SBH	2	FFSH	WFB	60	2		
78	Waghimra	Sekota	Tsatsu, Dirc Tiku, Ugulo	600	SBH	2	FFSH	WFB	60	2		
79	Waghimra	Sekota	Shimhar Tiku 010	250	SBH	1	FFSH	WFB	60	1		
80	Waghimra	Sekota	Chilkiw 010 mizrib	300	SBH	1	FFSH	WFB	60	1		
81	Waghimra	Sekota	Shimidirla Limat Chora	350	SBH	1	C	WFB	60	1		
82	Waghimra	Sekota	Dibaran 011	210	SBH	1	FFSH	WFB	60	1		
83	Waghimra	Sekota	Gelakamiru Arquatiya	700	SBH	2	C	WFB	60	3		
84	Waghimra	Sekota	Dirinziba Tsaskiw, Sikuna	750	SBH	2	FFSH	WFB	60	3		
85	Waghimra	Sekota	Nigas Aleka 08	225	SBH	1	FFSH	WFB	60	1		
86	Waghimra	Sekota	Akejewshina 07	250	SBH	1	FFSH	WFB	60	1		
87	Waghimra	Dahana	Welkementa+kenubish	100	SBH	1	C	WFB	60	1		
88	North Shoa	Minjar Shenkora	Chelle geberel	1,500	DBH	1	C	SD	220		1	
89	North Shoa	Minjar Shenkora	Chome Ager	500	SBH	1	C	SD	80	2		
90	North Shoa	Minjar Shenkora	Biruk Ager	2,000	DBH	1	C	SD	240		1	

List of Requested Schemes and Proposed Well Depth Estimated by Geo-electrical Survey in Amhara Regional State

No	Zone	Woreda	Area/Kebele	Population	Type	Original Qty	Geo-electrical Survey	Geology	Proposed depth	Revised Qty. of well		Note
									(m)	SBH	DBH	
91	North Shoa	Minjar Shenkora	Alemneh Dire	1,750	DBH	1	C	SD	180		1	
92	North Shoa	Minjar Shenkora	Kiticha	1,250	DBH	1	C	SD	250		1	
93	North Shoa	Minjar Shenkora	Golegolecha	875	SBH	2	C	SD	80	3		
94	North Shoa	Minjar Shenkora	Wmaga	925	SBH	2	C	SD	80	3		
95	North Shoa	Minjar Shenkora	Kiki	625	SBH	2	C	SD	80	2		
96	North Shoa	Minjar Shenkora	Jejebakola	375	SBH	1	C	SD	80	1		
97	North Shoa	Minjar Shenkora	Finanajo	575	SBH	2	C	SD	80	2		
98	North Shoa	Minjar Shenkora	Aroge Minjar	1,100	DBH	1	C	SD	240		1	
99	North Shoa	Minjar Shenkora	Zewelde	675	SBH	2	C	WFB^	55	2		
100	North Shoa	Tamaber	Argaga	600	DBH	1	C	WFB^	150		1	
101	South Wello	Harbu	Alimenta	750	SBH	2	C	WFB^	80	3		
102	South Wello	Harbu	Aderanba	1,000	DBH	1	FFSH	WFB^	160		1	
103	South Wello	Harbu	Meja	1,000	DBH	1	FFSH	WFB^	150		1	
104	South Wello	Harbu	Abunaye	1,000	DBH	1	FFSH	WFB^	160		1	
105	South Wello	Harbu	Wiensa	1,500	DBH	1	FFSH	WFB^	120		1	
106	South Wello	Kelela	Kersa 05	300	SBH	1	C	WFB	60	1		
107	South Wello	Kelela	Weda Golwn 030	700	SBH	2	FFSH	WFB	60	2		
108	South Wello	Kelela	Inchini 031	250	SBH	1	C	WFB	60	1		
109	South Wello	Kelela	Tika 034	750	SBH	2	FFSH	WFB	60	3		
110	South Wello	Kelela	Indoda 030	400	SBH	1	C	WFB	60	1		
111	South Wello	Kelela	Wede Getu 036	1,240	DBH	1	C	WFB	120		1	
112	South Wello	Kelela	Kore/Fincheftu 037	500	SBH	1	FFSH	WFB	60	1		
113	South Wello	Kelela	GendeBorena 036	500	SBH	1	FFSH	WFB	60	1		
114	South Wello	Wegide	Yagi 014	300	SBH	1	FFSH	WFB	60	1		
115	South Wello	Wegide	Golele 09	1,000	DBH	1	FFSH	WFB	120		1	
116	South Wello	Wegide	Kutiso 03 Abey	1,250	DBH	1	C	WFB	140		1	
117	South Wello	Wegide	Bikili 04	800	SBH	2	C	WFB	60	3		
118	South Wello	Wegide	Ayele Anba Rufa 02,04	700	SBH	2	C	WFB	60	2		
119	South Wello	Wegide	Haleltu 07	400	SBH	1	C	WFB	60	1		
120	South Wello	Wegide	Yeshum	750	SBH	2	C	WFB	60	3		

List of Requested Schemes and Proposed Well Depth Estimated by Geo-electrical Survey in Amhara Regional State

No	Zone	Woreda	Area/Kebele	Population	Type	Original Qty	Geo-electrical Survey	Geology	Proposed depth	Revised Qty. of well		Note
									(m)	SBH	DBH	
121	South Wello	**Meqdella**	Ivelinta 02	300	SBH	1	FFSH	WFB	50	1		
122	South Wello	**Meqdella**	Yebar 013	300	SBH	1	FFSH	WFB	50	1		
123	South Wello	**Meqdella**	Tilket 02	350	SBH	1	FFSH	WFB	50	1		
124	South Wello	**Meqdella**	Genatit 02	300	SBH	1	FFSH	WFB	50	1		
125	South Wello	**Meqdella**	Tija Fej 06	250	SBH	1	FFSH	WFB	50	1		
126	South Wello	**Meqdella**	Felana 06	500	SBH	1	FFSH	WFB	50	1		
127	South Wello	**Meqdella**	Gonderoch	250	SBH	1	FFSH	WFB	50	1		
128	South Wollo	**Meqdella**	Meqdella	300	SBH	1	FFSH	WFB	50	1		
129	South Wollo	**Meqdella**	Feterot+Ychikech	1,000	DBH	1	FFSH	WFB	120		1	
130	South Wollo	**Meqdella**	Dedere 05	200	SBH	1	FFSH	WFB	60	1		
131	South Wollo	**Meqdella**	Gose 05	500	SBH	1	FFSH	WFB	60	1		
132	South Gondar	Ibnat	Tilbi	250	SBH	1						NA
133	South Gondar	Ibnat	Kwalisa	1,000	DBH	1	C	WFB	140		1	
134	South Gondar	Ibnat	Work mender acbr aba Jale	250	SBH	1						NA
135	South Gondar	Ibnat	Wenber Ayhayakwha	250	SBH	1						NA
136	South Gondar	Libo Kemkem	Berengna Lentdur	350	SBH	1	FFSH	WFB^	80	1		
137	South Gondar	Libo Kemkem	Zanzi	300	SBH	1	FFSH	WFB^	80	1		
138	South Gondar	Libo Kemkem	Birwuha Ferfer	150	SBH	1	FFSH	WFB^	80	1		
139	South Gondar	Libo Kemkem	Nashora Ferfer	200	SBH	1	FFSH	WFB^	80	1		
140	South Gondar	Libo Kemkem	Ashker Terara	550	SBH	2	C	WFB^	80	2		
141	South Gondar	Libo Kemkem	Kurmat Ategecha	250	SBH	1	FFSH	WFB^	80	1		
142	South Gondar	Libo Kemkem	Atria agat Ashker	300	SBH	1	FFSH	WFB^	80	1		
143	South Gondar	Libo Kemkem	Sholit Kalsholit	750	SBH	2	FFSH	WFB^	80	2		
144	South Gondar	Libo Kemkem	Ambo Asawegan	300	SBH	1	FFSH	WFB^	80	1		
145	South Gondar	Libo Kemkem	Zelamin Janda	325	SBH	1	FFSH	WFB^	80	1		
146	South Gondar	Libo Kemkem	Kalaymedhanialem	1,750	DBH	1	C	WFB^	160		1	
147	South Gondar	Libo Kemkem	Arobakello 015	1,925	DBH	1	C	WFB^	140		1	
148	South Gondar	Libo Kemkem	Tirusina 015	1,000	DBH	1	FFSH	WFB^	160		1	
149	South Gondar	Libo Kemkem	Kille 012	500	SBH	1	FFSH	WFB^	70	2		
150	Oromiya	Artuma Fursi	Bete ordega Berbelay	1,200	DBH	1	C	WFB^	180		1	

List of Requested Schemes and Proposed Well Depth Estimated by Geo-electrical Survey in Amhara Regional State

No	Zone	Woreda	Area/Kebele	Population	Type	Original Qty	Geo-electrical Survey	Geology	Proposed depth	Revised Qty. of well		Note
									(m)	SBH	DBH	
151	Oromiya	Artuma Fursi	Bkavakello Beteordega	500	SBH	1	C	WFB^	70	1		
152	Oromiya	Artuma Fursi	Kersaadi+mutulu	1,000	DBH	1	C	WFB^	180		1	
153	Oromiya	Artuma Fursi	Kara Kodema+Lale Gela	700	SBH	2	FFSH	WFB^	80	2		
154	Oromiya	Artuma Fursi	Kodema Fugnu	1,500	DBH	1	C	WFB^	180		1	
155	Oromiya	Artuma Fursi	Ireti+Huda wello	500	SBH	1	FFSH	WFB^	80	1		
156	Oromiya	Artuma Fursi	Koro Rokesa Hader	662	SBH	2	FFSH	WFB^	80	2		
157	Oromiya	Bati	Hdow Barigo, Hadow	400	SBH	1	FFSH	WFB^	80	1		
158	Oromiya	Bati	Kuni 03	750	SBH	2	FFSH	WFB^	80	2		
159	Oromiya	Julle Tumuga	Fugan Dembi	750	SBH	2	C	WFB^	80	2		
160	Oromiya	Julle Tumuga	Gerbi kille	840	SBH	2	FFSH	WFB^	80	2		
161	Oromiya	Julle Tumuga	Gerbi kille	930	SBH	2	FFSH	WFB^	70	3		
162	Oromiya	Julle Tumuga	Merewa Hadere	1,100	DBH	1	C	WFB^	160		1	
163	Oromiya	Julle Tumuga	Guda Chelle	1,300	DBH	1	FFSH	WFB^	160		1	
164	Oromiya	Julle Tumuga	Balchi Tikure	450	SBH	1	FFSH	WFB^	80	1		
165	Oromiya	Julle Tumuga	Dula Chereka	640	SBH	2	FFSH	WFB^				NA
166	Oromiya	Julle Tumuga	Arba wayu	980	DBH	1	C	WFB^	160		1	
				110,044	*SBH*	*156*						
					DBH	*44*						
					Total	200				*160*	*40*	200

Note:

WFB: Stands for Weathered and Fractured Basalt
WFB^: Stands for Weathered and Fractured Basalt with thick soil cover
SD: Stands for thick soil deposit
FFSH: Stands for Found Feasible by its Surface Hydrogeological conditions
C: Stands for Conducted; Geophysical Survey is conducted in the areas indicated
NF: Stands for Not Feasible
NA: Stands for Not Accessible
Completed means water supply schemes are constructed in the areas in the past two years
Bold word: correction of miss-spelling and unseen error
***:** Duplicated location
:No proposed well

5.4
Social Survey Results

Social Survey Results

(1) Finalization of Applicant *Kebeles* (Administrative village)

An official request was made by Amhara National Regional State Government of Ethiopia with a regional target to construct two hundred (200) rural water supply schemes situated in a total of one hundred sixty six (166) *Kebeles*, which are defined as administrative villages in Ethiopia, by mobilizing requested drilling rigs and machinery into construction works. In consultation with Amhara National Regional Water Resources Development Bureau (hereinafter refer to AWRDB), seven weredas (districts) are identified with those *woredas* in which requested activities are duplicated with ones of UNICEF. Seven *woredas* include Gidan, Meqdelle, Simada, Ibnat, Sekota, Dahana, and Tamber *Woreda*. In principle it is agreed among donors and the international community not to have any duplication.

The above duplication is understood to have happened during the last two years at least since the first request was made. Through the Basic Design Study (hereinafter referred to as the Study), careful cross-check on the issue of duplication was made in order not to have any duplication of the same water supply development at *Kebele* level. Apart from duplication, immediately after the commencement of the Study, it was found that nine *Kebeles* are identified with areas inaccessible by heavy trucks to be used for drilling and construction purposes, since these areas can be reached only by a two to three-hour walk on foot. Three *Kebeles*, where natural springs are to be used as the source of water supply, are found to have areas inappropriate for the intended project due to a shortfall of water flow from springs as per requirements, while a few *Kebeles* have already installed new water supply schemes, and some *Kebeles* have been removed from request list by *woreda* (district) offices. During the Study, it was agreed that those *Kebeles* which are removed from the target list are to be replaced by other *Kebeles* located in the same *Woredas*.

As a result, it is finalized and confirmed through the Study by AWRDB that an intended project is formulated to target about 92,000 population in a total of 145 *Kebeles* in which AWRDB plans to construct shallow borehole schemes with hand pumps and deep-borehole schemes with submersible pumps. The summary is presented in the Table 1.

Through social survey, it is reported by *Woreda* officials that at least two *Woredas* have been divided into sub-*Woredas* that are newly emerged.

Zone	Woreda		Remark
	Listed in Amhara Water Bureau	Result from Social Survey	
North Shewa	Angolelanaa Sagirt	Asagrid	Division
		Angolelanaa Teri	Division
South Gondar	Libo Kemkem	Libo Kemkem	Division
		West Belesa	Division
		East Belesa	Division

Table 1 Finalized Targets of the requested Project

Zone	Woreda	Number of Kebele	Population to be served
North Wello	Gidan	3	1,925
	Habru	12	12,305
	Meket	3	995
	Gubalfu*[1]	-	0
Shoth Wello	Jama	8	7,850
	Kelela	9	4,640
	Worebabo	6	5,150
	Wedgide	7	5,200
	Meqdella	11	3,950
	Harbu	5	5,250
South Gondar	Simada	7	3,400
	Ibnat	5	2,500
	Libo Kemkem	14	5,225
Oromiya	Bati	6	3,050
	Artuma Fursi	7	5,912
	Julle Tumuga	7	6,350
North Shewa	Angolelanaa Sagirt	6	2,010
	Minjar Shenkora	12	12,150
	Tamaber	1	600
Waghimra	Sekota	15	5,490
	Dahana	1	100
6 Zones	21 Woredas	145	94,102

Note:*1: Requested *woreda* of Gubalfu is officially removed from the list, since it is confirmed that new water supply schemes have been already constructed in the *woreda*.

(2) Objectives of the Social Survey

A social survey was carried out, mainly with the two following objectives:

i) To collect quantitative and related information of the current socio-economic situation and the present status of water users in the all targeted villages; and,

ii) To make rapid assessment on social preparedness of applicant communities for their self-management of an intended water supply scheme.

(3) Period of Social Survey

25 October to 30 November 2004

(4) Basic Methods of Social Survey

Interview method was employed to collect necessary information from the Representatives of the respective 14 *woreda* offices, Chairpersons and women's and youths' representatives of 145 *Kebeles*, focal groups of applicant communities, by using both close-ended and open-ended questionnaires.

(5) Main findings from Social Survey

1) Number of *Kebeles* (administrative villages) under the Social Survey

Social survey was undertaken in all the 145 *Kebeles*, while focal group meetings and interviews of village representatives were carried out in 171 applicant local communities, out of 200 communities, that submitted their respective applications for the construction of a rural water supply to the *Woreda* offices concerned through the *Kebele* offices.

2) Present status of water supply

From interviews with 171 applicant local communities it is found that water supply schemes were previously constructed in 39 percent of the local communities. Except for 13 schemes, community members expressed their views that those schemes were rarely in use. Main reasons behind no use are comprised of (i) long distance since these schemes are said to be located outside of their villages and (ii) poor quality of water causing outbreaks of water borne diseases. It was confirmed that these schemes are located within the geographical area of other hamlets/village than the applicant local communities.

3) Involvement in collective actions for village development activities

It is revealed that a *Kebele* school committee is organized in 74.8 percent of applicant communities, a health committee is established in 65.5 percent of applicant communities,

while an HIV/AIDS prevention committee is formed in only 8.2 percent of applicant communities. In addition to these, 17 percent of the communities had experience in organizing themselves into water committees at some time in the past.

In relation with the presence of their experiences in making any form of local contributions towards development works, all the applicant local communities have experience in contributions in a form of the provision of their labour forces, local materials and cash. Despite this, seven *Kebeles* are identified with those which have no experience to mobilize physical labour forces of community members into developmental works. Especially, 15 % of local community members in *kebeles* in Angolelanaa Sagirt *Woreda* had previous experience to contribute their physical labors. It is also found that the level of contribution of physical labour is comparatively lower in Bati, Meket, Wegidu, Julle Tumuga, and Meqdelle *woreda* respectively. Cash contributions accounted for 50 cents per household, while the maximum total contributions from within a single local community in Gidan reached Birr 50,000 to purchase an electric generator.

Out of the total population in targeted communities, 26 % had experience in cash contributions towards village development works including construction of schools, rural roads, or farmers' training centers, and Kebeke offices as well as environmental conservation activities such as terracing, soil conservation, rain water harvesting, and afforestation. To sum up, it is found that all the interviewed applicant communities expressed their preparedness to make their contributions towards construction of an intended water supply scheme by providing a project with their labour forces, local materials and/or cash.

4) Existing water sources

Table 2 shows the existing water sources that are currently in use of local communities.

Table 2 Existing water source

Existing water source	Rainy Season	Dry Season
River	42 %	43 %
Pond	12 %	6 %
Natural unprotected spring	34 %	35 %
Spring locally protected	5 %	8 %
Shallow well	1 %	2 %
Hand pump	5 %	5 %
Others	1 %	1 %

In relation with water quality of the said existing water sources, self-assessment was made through interview survey resulting in Table 3. To sum up, more than about 75 % of interviewed community members are dissatisfied with the water quality of existing water sources used both in rainy and dry seasons.

Table 3 Water Quality from Existing Water Source

Self-assessment	Rainy Season	Dry Season
Good quality	15.8 %	13.5 %
Tolerable quality	7.6 %	11.1 %
Poor quality	76.6 %	75.4 %

With regards to an average consumption of water per household per day, it is revealed that around 40 liter per day per household is the mean of water consumption in the interviewed communities. Regarding a degree of awareness on relationships between water quality and diseases, it is revealed that only 54 percent of interviewed males and 37 % females are aware of its cause-effect relationship. On the contrary there are people who do not recognize relationships between water quality and water borne diseases.

In relation with role delineation among gender, the member of the family who usually fetches water in all interviewed communities is found to be an adult woman. Following adult woman, a female child is found to be responsible for fetching water, and in all interviewed communities adult males only fetch water when their wives are sick or

pregnant.

5) Willingness to pay water fees

It is revealed that all the interviewed community leaders expressed, in principle, their preparedness to make a payment of water fees (See Table 4). In 14 *woredas* (districts), 12.8 % of *Kebeles* are found to have had experience to adopt a fixed-rate water charge system, while a consumption-proportional rate system is not popular in rural areas, except for 6 cases found in 3 *Woredas*.

In the case of fixed rate systems, the most popular monthly rate is at around Birr 0.50 per household. Considering possible application of consumption-proportional rate system in the future, it is found that 63% of interviewed local community members expressed their views that a rate with 5 cents per 20 litres is preferable. On the other hand, 14 % of interviewed community members are found to be reluctant to make any payment of water fees. In accordance with the intention survey, 6 cents per 20 litres shall be calculated as a reasonable consumption-proportional rate.

Table 4 Assessment of opinions regarding Consumption-Proportional Rate per 20 liters

Wereda	Number of Votes				Total
	No fee	0.05	0.10	0.25	
Gidan	0	35	0	0	35
Habru	0	107	0	0	107
Meket	n.a.	n.a.	n.a.	n.a.	n.a
Jama	0	124	0	0	124
Kelela	15	65	57	0	137
Worebabo	0	70	0	0	70
Wedgide	42	75	12	0	129
Meqdella	4	81	82	0	167
Simada	0	48	12	0	60
Ibnat	28	91	2	0	121
Libo Kemkem	80	101	0	0	181
Bati	0	133	0	0	133
Artuma Fursi	n.a.	n.a.	n.a.	n.a.	n.a
Julle Tumuga	n.a.	n.a.	n.a.	n.a.	n.a
Angolelanaa Sagirt	0	9	0	0	9
Minjar Shenkora	85	161	185	91	522
Tamaber	0	30	0	0	30
Sekota	10	85	0	6	101
Dahana	15	0	0	0	15
Total	279	1215	350	97	1,941
Ratio (%)	14	63	18	5	100

In a combination of two survey results that (i) average daily consumption of water is at around 20 liters per household, and (ii) 5 cents is the most preferable rate of water fee per 20 liters, it shall be further calculated that the total amount of water fees that could be charged is around Birr 1.50 per household per month, which is a bit higher level than the fixed rate prevailing in the 20 *woredas*, which is around Birr 0.50.

With regards to a degree of awareness on type of costs, it is indicated in Table 5 that a majority of members are well aware of three basic types of costs, i.e., (i) operation cost; (ii) maintenance cost; and (iii) replacement cost.

Table 5 Degree of Awareness on Types of Costs

Type of Costs	Aware		Not aware	
	Male	Female	Male	Female
Operation Cost	94 %	88 %	6 %	12 %
Maintenance Cost	93 %	89 %	7 %	11 %
Replacement Cost	89 %	84 %	11 %	16 %

6) Current capacity to pay water fees

In reference to the practices of two water charge systems, i.e., the fixed rate water charge system and consumption-proportional rate water charge system, patterns of rates adopted by the respective existing water committees, which are managerial units of individual water supply schemes organized by users, are presented in the Table 6 and Table 7 respectively.

Table 6 Rate adopted in the Fixed Rate Water Charge System

Monthly Fixed Rate in Birr	Number of Water Committees									Total
	Gidan	Jama	Kelala	Worebabo	Wegide	Simada	Ibnat	Libo Kemkem	Sekota	
0.10							1			1
0.25									1	1
0.30					2					2
0.50		3	1				2	2	2	10
1.25					1					1
1.50	1									1
2.00					1					1
3.00				1		1				2
3.25					1					1
Total	1	3	1	1	5	1	3	2	3	20

Despite a fact that the size of the survey sample is too small, 50 % of present water committees are found to adopt the fixed rate of Birr 0.50 per household per month. This provides a basis for assessing current capacity of payment in the respective *woredas*.

Table 7 Rate adopted in the Consumption-Proportional Rate Water Charge System

Proportional Rate per one Jerri Can (20 liters)	Number of Water Committees			Total
	Habru	Jama	Minja Shenkora	
0.20			3	3
0.40	2			2
0.50		1		1
Total	2	1	3	6

In the case of the consumption-proportional rate water charge system, it is found that a rate of 20 cents per 20 litres is commonly used in the interviewed existing water committees in the three targeted *Woredas*.

The main expenditures of a water committee can be categorized into three items of expenditures; namely, (i) operation cost; (ii) maintenance cost; and (iii) replacement cost. In the context of policy implementation on water supply in Ethiopia, full-cost recovery is, in principle, to be applied for the case of urban water supply schemes, while partial cost-recovery is addressed to rural water supply schemes in which the users' community is responsible for meeting at least operation and maintenance costs with an exemption of replacement cost. In the case of shallow wells with hand pumps, the main items of expenditure for operation cost are constituted by personal expenditures for guards. It is expressed by interviewed community members that around Birr 100 shall be a preferable rate applied for a monthly salary of an operator.

However, modes of payment are found to vary from locality to locality due to the financial capacity of the individual water committee. It is observed that salary for a guard can be paid in a combination of cash and kind. In some cases the local community provides a guard with a farm plot under the recognition of a Peasant Association (i.e., *Kebele*) by which the guard can earn from agricultural production. Another item included in operation cost is stationary cost for administrative works of the water committee. With regards to

maintenance cost, no reliable data is available. In reference to the Regional Guideline for Management of Rural Water Supply Schemes in Oromia, which is one of the regional states neighboring Amhara National Regional State, it is suggested that 3 percent (%) of investment cost shall be reserved annually to meet a variety of maintenance costs to be required for spare-part procurement, repair of pumps and other equipment and the like. With regards to replacement reserves for a hand pump, it shall be suggested that Birr 750 shall be accumulated annually by a water committee when the price of a hand pump is estimated on an average at Birr 6,000 for a service period of eight (8) years. This implies that the monthly replacement reserve for the hand pump is calculated at Birr 62.5.

As mentioned earlier, however, a mandate to accumulate replacement reserve by rural water supply schemes is exempted in accordance with the current policy guidelines in Ethiopia in general, as well as in Amhara National Regional State in particular. As a consequence, each water committee is expected to hold expenditures within an amount ranging from Birr15 to Birr 120 monthly. In other words, individual user households, who form a water committee, are expected to make a payment at a rate ranging from Birr 0.2 to Birr 1.7 in the case of a fixed rate water charge system, the amount depends upon patterns of local arrangements to cover the salary of a guard. This amount is eventually found to be similar with the present rates of water fees practiced in existing water committees.

7) Intention for organizing a Water Committee

Table 8 Intention to organize a Water Committee

Intention to organize themselves into Water Committee	Willingness to Organize Water Committee		Willingness to Participate as an Executive Member	
	Male	Female	Male	Female
	99 %	98 %	92 %	80 %

In accordance with regional guidelines, users of each water supply scheme are requested to form a water committee, which can be defined as a managerial unit of a scheme responsible for ensuring its effective, efficient and sustainable management. Within the water committee, an executive committee is to be established through democratic election for administration of daily operation and management activities. The executive committee consists of seven members including a chairperson, vice-chairperson, secretary, treasurer, cashier, storekeeper and internal auditor. Although the executive members take day to day responsibility for operation and management of the scheme, the members are advised to

work on a voluntary basis without any salary or remuneration. Under such working conditions, interviewed local community leaders expressed their willingness to organize themselves into a water committee and to actively participate in activities to be undertaken by the executive committee (See Table 8).

8) Physical aspects of preparedness

As stated in Table 9, applicant local communities can be categorized into four groups in terms of three aspects of physical conditions; namely, (i) accessibility by heavy truck to an intended site; (ii) readiness of land allocation for an intended water supply scheme; and, (iii) geographical distance between centre of hamlets and location of proposed site.

Table 9 Categorization of Applicant Communities by Physical Preparedness

Items	Ratio in %
(1) Full accessibility	52 %
(2) Insufficient readiness of land allocation with a distance of around 20 minutes walk	29 %
(3) Necessity of construction of an access road with a length of a 20 to 40 minute walk	11 %
(4) Necessity of construction of an access road with a length of more than a 40 minute walk	8 %

In consideration of the above, it is advised to formulate an implementation plan.

(6) Expected outcome from implementation of an intended Project

Expected outcomes to be obtained from the implementation of this intended project are presented in Table 10 using an indicator of water coverage rate in comparative views on situations without and with project intervention.

In use of statistical data obtained from the Water Supply and Sanitation Master Plan formulated by the Ministry of Water Resources, this intended project can contribute towards a 2.58 % increase in water coverage rate in 20 *woredas* at the year of 2009 when construction works shall be completed. In other words, this improvement is equivalent to an increase in water coverage rate of an entire Amhara region at a ratio of 0.56%.

Within the time frame of the planning period, in addition to the improvement estimated as above, it is expected that a further 157,000 population shall have access to potable water for the subsequent period from 2009 of 2014 in a case where drilling rigs to be provided

through the project can continue drilling at the same pace of annual drilling. In such case, the implementation of the intended project can contribute towards an increase in water coverage for the 20 *woredas* at a rate of 6.11 percent as well as 1.23 percent for the entire region. These expected outcomes are presented in Table 10.

Table 10 Expected Outcomes

Zone	Woreda	Population			Population served				Population served to be increased by the project		Coverage					Coverage to be increased by the Project	
		2004*2	2009*4	2014*4	2004*2	W/O-P 2009/2014	W-P 2009*3	W-P 2014	2009*3	2014	2000*2	W/O-P 2009	W/O-P 2014	W-P 2009	W-P 2014	(points) 2009	(points) 2014
		a	b	c	d	e=d	f=e+h	g=e+i	h	i	j=d/a	k=e/b	l=e/c	m=f/b	n=g/c	o=m-k	p=n-l
North Wollo	Gidan	163,699	185,844	210,984	46,982	46,982	48,907		1,925		28.7%	25.3%		26.3%		1.04	
	Habru	212,183	240,886	273,473	48,654	48,654	60,959		12,305		22.9%	20.2%		25.31%		5.11	
	Meket	236,790	268,822	305,188	53,396	53,396	54,391		995		22.6%	19.9%		20.23%		0.37	
	Gubalfu*1															0.00	
South Wollo	Jama	127,931	145,237	164,884	29,590	29,590	37,440		7,850		23.1%	20.4%		25.78%		5.40	
	Kelele	144,063	163,551	185,676	22,546	22,546	27,186		4,640		15.7%	13.8%		16.62%		2.84	
	Worebabu	113,003	128,290	145,644	30,872	30,872	36,022		5,150		27.3%	24.1%		28.08%		4.01	
	Wegide	131,618	149,423	169,636	27,508	27,508	32,708		5,200		20.9%	18.4%		21.89%		3.48	
	Megddle	148,417	168,494	191,288	17,988	17,988	21,938		3,950		12.1%	10.7%		13.02%		2.34	
	Harbu	232,534	263,990	299,702	59,343	59,343	64,593		5,250		25.5%	22.5%		24.47%		1.99	
South Gondar	Simada	260,152	295,345	335,298	49,143	49,143	52,543		3,400		18.9%	16.6%		17.79%		1.15	
	Ibnet	244,445	277,513	315,054	45,027	45,027	47,527		2,500		18.4%	16.2%		17.13%		0.90	
	Libo Kemkem	196,813	223,437	253,663	39,363	39,363	44,588		5,225		20.0%	17.6%		19.96%		2.34	
Oromiya	Bati	136,626	155,108	176,091	23,049	23,049	26,099		3,050		16.9%	14.9%		16.83%		1.97	
	Artuma Furisi	112,215	127,395	144,629	16,148	16,148	22,060		5,912		14.4%	12.7%		17.32%		4.64	
	Jelle Tumga	93,748	106,430	120,827	19,968	19,968	26,318		6,350		21.3%	18.8%		24.73%		5.97	
North Shewa	Angolelanna Sagit	90,907	103,205	117,166	14,991	14,991	17,001		2,010		16.5%	14.5%		16.47%		1.95	
	Minjar	136,342	154,786	175,725	29,613	29,613	41,763		12,150		21.7%	19.1%		26.98%		7.85	
	Tamaber	101,154	114,838	130,373	17,358	17,358	17,958		600		17.2%	15.1%		15.64%		0.52	
Waghimra	Sekota	174,752	198,392	225,230	13,211	13,211	18,701		5,490		7.6%	6.7%		9.43%		2.77	
	Dahana	131,667	149,478	169,699	28,177	28,177	28,277		100		21.4%	18.9%		18.92%		0.07	
Targeted 21 words		3,189,059	3,620,465	4,110,230	632,926	632,926	726,978	883,926	94,052	251,000	19.8%	17.5%	15.4%	20.08%	21.51%	2.58	6.11
Amharic*2		16,176,346	18,364,631	20,848,940	2,799,767	2,799,767	2,893,819	3,050,767	94,052	251,000	17.3%	15.2%	13.4%	15.76%	14.63%	0.56	1.23

注：
*1 In the three communities in the worked, existing water supply facilities were found available.
*2 Population(2004) from the Water Bureau, Amharic
*3 Estimation by the Water Bureau, Amharic; reviewed by the Team
*4 Population growth rate: 2.57%
*W-P: With project
*W/O-P: Without project
・Year 2009：Completion of planed 200 wells； Year 2014：Target year of the Project
・Benefited population in year 2009：obtained by the hearing of this study
・For 3 years from 2007to 2009, wells are constructed with the procured rigs, increasing 94,000 of beneficiary.
・From then for 6 years, two times as the beneficiary population (188,000) as the previous increment (94,000) will be increased.

5.5
Specification for Ethiopian Drinking Water Quality Guidelines

THE FEDERAL DEMOCRATIC REPUBLIC OF ETHIOPIA
MINISTRY OF WATER RESOURCES

SPECIFICATION FOR ETHIOPIAN DRINKING WATER QUALITY GUIDELINES

September 2002
Addis Ababa

PREFACE

The development of tailor made national water quality guideline is necessary to promote and protect the public health, prevent and control diseases as well as to address the water quality concerns of the country. This guideline is developed on the basis of latest publications of WHO Guidelines for Drinking Water Quality Volumes-1, 2, 3 and Addendum of volume-1 and taking into consideration a variety of local factors such as geographical, socio-economic and environmental conditions.

It is believed that this guideline is used as Ethiopian Drinking Water Quality Guideline encompassing recommendations for water quality requirement that will be fit for human consumption and other domestic purposes as well as water quality monitoring.

This guideline is dynamic and has to be improved and updated with new findings and developments in the field. Therefore, constructive comments and suggestions are always welcome.

1.0 SCOPE

This tailor made guideline value, developed on the principles of risk-benefit approach or acceptable risk, represents the concentration of the constituents that does not result in any significant risk to the health of the consumer over the Ethiopian lifetime of consumption.

2.0 APPLICATION

This guideline applies to microbiological, physical, chemical, radiological quality of drinking water. It is relevant to all domestic water uses such as drinking, food preparation and personal hygiene.

3.0 REQUIREMENTS

The basic quality requirements for drinking water are illustrated as follows: -

3.1 The drinking water shall be free from any diseases causing pathogenic organisms and concentration of toxic chemical compounds that have adverse effect on human health (as prescribed in **Tables-1, 2 and 5).**

3.2 The drinking water shall be fairly clear (i.e., of low turbidity and color) and contain no compounds that cause offensive taste and odor and free of substances and organisms that cause corrosion or encrustation of water supply system as presented in **Table-3.**

3.3 When the guideline values are exceeded, it should only be a signal to investigate and take remedial action. Short-term exposure, however, does not necessarily mean that the water is unsuitable for consumption. The amount by which, and the period for which, the guideline value can be exceeded without affecting public health depends upon the specific substance involved and its concentration.

A continuous effort should be made to maintain drinking water quality at the highest possible level. Although the guideline value recommends the quality of water acceptable for consumption, it does not imply that the quality of drinking water should be degraded to the recommended level.

All desirable parameters and substances should be examined whenever a doubt arises. When a new water supply source develops it has to be examined before any supply.

In order to keep the uniformity of measurement results units of microbiological quality, physical parameters, chemical constituents and radioactive substances should be the same as presented in **Tables-1, 2,3,4** and **5.**

Table-1 Bacteriological Quality

No.	Substance	Guideline Value (G_N)	Remark
A	**Treated Water Entering the Distribution System**		
1	*E.coli* or thermo tolerant Coliform bacteria	0/100 ml	Membrane filtration is recommended for low turbid water
2	Total Coliform Bacteria	0/100 ml	93.0 % of samples examined throughout the year
B	**Treated Water In the Distribution System**		
1	*E.coli* or thermo tolerant Coliform bacteria	0/100 ml	Membrane filtration is recommended for low turbid water
2	Total Coliform Bacteria	0/100 ml	93.0 % of samples examined throughout the year

Table-2 Chemicals of Health Significance

No.	Substance	Guideline (G_N) (mg/l)	Remark (Health Effect)
A	**Inorganic Constituents**		
1	Arsenic	0.01 (P)	High incidence of skin & possibly other cancers
2	Barium	1.8	Increase blood pressure & suspect of cardiovascular diseases
3	Boron	0.3	Long-term exposure leads to gastrointestinal irritation
4	Cadmium	0.003	Kidney is the main target organ of toxicity
5	Chromium	0.10	Carcinogenicity suspect of chromium (VI) compounds
6	Copper	5	Acute gastric irritation & liver cirrhosis from long-term exposure
7	Cyanide	0.07	Acute toxicity is high. Effects on thyroid & particularly the nervous system on long-term exposure occurred.
8	Fluoride	3.0	At low conc. prevent dental carries. At high conc. increase risk of dental fluorisis, & much higher conc. leads to skeletal fluorisis.
9	Lead	0.02	Toxic to both the central & peripheral nervous systems, including subencephalopathic neurological effects.
10	Manganese	0.8	Neurotoxicity and other toxic effects
11	Mercury (total)	0.001	The kidney is the main target for inorganic Hg, whereas methyl-mercury affects mainly the central nervous system.
12	Nitrate (as NO_3^-)	50	Causes methaemoglobinaemia in infants and suspect of certain form of cancer risk
13	Nitrite (as NO_2^-)	6.0	,, ,, ,, ,,
14	Selenium	0.01	Long-term exposure cause toxic effect on nails, hairs and liver.
B	**Organic Constituents**		
B1	Aromatic hydrocarbons	(μg/l)	
1	Benzene	10	Acute exposure at high conc. affects the central nervous system. At lower conc. it is toxic to haematopoietic system. Carcinogenic to humans (Group-1)
2	Benzo[a]pyrine	0.7	It causes cancer and induces tumors at the site of administration.
B2	Chlorinated alkanes		
1	Carbon tetrachloride	2	Possibly carcinogenic to humans (Group-2B)
2	1,2-dichloroethane	30	Possibly carcinogenic to humans (Group-2B)
B3	Chlorinated ethenes		
1	1,1-Dichloroethene	30	Potentially carcinogenic (Group-3)
2	Trichloroethene	70(P)	Potentially carcinogenic (Group-3)
3	Tetrachloroethene	40	Possibly carcinogenic to humans (Group-2B)

Table-2 (Cont.)

No.	Substance	Guideline (G_N) (mg/l)	Remark (Health Effect)
C	**Pesticides**		
		(μg/l)	**Remark (Health Effect)**
1	DDT	2	Possibly carcinogenic to humans (Group-2B)
2	Aldrine/Deldrine	0.03	Potentially carcinogenic (Group-3)
3	Chlordane	0.2	Possibly carcinogenic to humans (Group-2B)
4	Pentachlorophenols	9 (P)	Potentially carcinogenic to lab animals.
5	2,4-D	30	Possibly carcinogenic to humans (Group-2B)
D	**Disinfectant & Disinfectant By-products**		
D1	**Disinfectant**	**(mg/l)**	**Remark (Health Effect)**
1	Chlorine	5	• For effective chlorination, free residual chlorine 0.5 mg/l after 30 min of contact time & pH<8 • Potentially carcinogenic (Group-3)
D2	***Disinfectant By-products***	(μg/l)	
D2.1	*Chlorophenol*		
1	2,4,6-Trichlorophenol	200	Possibly carcinogenic to humans (Group-2B)
D2.2	***trihalomethane***		
1	Chloroform	200	Possibly carcinogenic to humans (Group-2B)

- P – Provisional guideline value (see WHO, Vol-1, p178)
- Group - is the IARC classification (see WHO, Vol-1, p35)
- The sum of the ratio of the concentration of (NO_3 & NO_2 to its respective guideline values should not exceed 1.

Table-3 Substances and Parameters that may Give Rise to Complaints from Consumers

No.	Substance	Guideline Value (G_N) (mg/l)	Remark (Adverse Effect)
A	Physical Parameters		
1	True Color	22	Unpleasing appearance
2	Odor	Non-Objectionable	Unappealing to drink
3	Test	Non-Objectionable	Unappealing to drink
4	Temperature	Non-Objectionable	High temperature may enhance growth of micro organisms & may increase test, odor, color & corrosion
5	Turbidity	7	Stimulate after growth & cause objectionable appearance
B	Inorganic Constituents		
1	Aluminum	0.4	Deposition of aluminum hydroxide flocks in pipes & exacerbation of discoloration of water by iron
2	Ammonia	2	Objectionable odor
3	Chloride	533	Undesirable taste
4	Copper	2	Increase corrosion of GI & steel fittings, staining laundry & sanitary ware and give rise taste problem.
5	Hardness	392*	Based on 300 as Reference WHO recommendation
6	Hydrogen Sulfide	0.07	Objectionable rotten egg odour
7	Iron	0.4	Cause reddish-brown color, promote iron-bacteria & stain laundry & plumbing fixtures
8	Manganese	0.13	Stain laundry & plumbing fixtures and give rise to undesirable taste to beverages. Deposited as black precipitate in pipes. Certain micro organisms concentrate to give taste, odor, & turbidity problem.
9	Dissolved Oxygen	-	Low DO encourage for anaerobic reaction & formation of NO_2, H_2S giving rise to odor. It also increase Fe(II).
10	pH	6.5 – 8.5	High pH imparts taste & soapy feel, while low pH cause corrosion. Preferably <8.0 for effective disinfection
11	Sodium	358	Undesirable taste
12	Sulfate	483	Causes noticeable taste & corrosion of pipes
13	TDS	1776	Undesirable taste
14	Zinc	6	Imparts astringent taste & opalescent and develop a greasy film on boiling.
B	Disinfectants & Disinfectant by-products		
	Disinfectants	(μg/l)	
1	Chlorine	600 – 1000	Taste and odour problem

* There is no as such any Guideline figure set by WHO. However the maximum recommended value of 300 is taken for calculation.

Table-4 Chemicals not of Health Significance at Concentration Normally Found in Drinking Water

No.	Substance	Guideline Value (G_N)	Remark
1	Asbestos		U
2	Silver		U
3	Tin		U

U – It is unnecessary to recommend a health-based guideline value, because they are not hazardous to human health at concentrations normally found in drinking water.

Table-5 Radioactive Constituents of Drinking Water

No.	Substance	Screening Value (Bq/litre)	Remark (Health Effect)
1	Gross alpha activity	0.1	• If a screening value exceeded, more detail radionuclide analysis is necessary. WHO & other countries' is the same value. • The main concern is Cancer
2	Gross beta activity	1	

4.0 SAMPLING TECHNIQUE

The detail procedure for preservation and handling of samples is presented in WHO, Vol-3 chapter-4 and ISO Water- Sampling- Part 3: Reference No. 5667-3:1994(E).

4.1 General Requirement For Bacteriological Sampling

Sampling for bacteriological examination should be carried out using sterile container of glass or polyethylene. Samples should be preserved under low temperature of 2 to 5 °C during storage and transport. The time between sampling and analysis should not exceed 6 hours, and 24 hours is considered the absolute maximum. If ice is not available, the transport time must not exceed 2 hours.

The bacteriological test should be accompanied with turbidity and free residual chlorine and pH where chlorination is applied. The minimum recommended frequency of sampling and analysis for on spot and piped distribution water supply schemes are given in **Table-6** and **Table-7** respectively.

Table-6 Minimum Frequency of Sampling and Analysis of On-spot Distribution Water Schemes

Sources & Mode of supply	Minimum frequency of sampling & Analysis		Remarks
	Bacteriological	Physico-chemical	
HDW & shallow well with HP	Sanitary protection Bacteriological test only if situation demands	Once initially, thereafter as situation demands	The situation requiring testing are change in environmental conditions, outbreak of water born diseases, or increase in incidents of water born diseases
BH-with HP	Once initially, thereafter as situation demands	Once initially, thereafter as situation demands	Ditto
Protected spring	Once initially, thereafter as situation demands	Periodically for residual chlorine if water is chlorinated	Ditto

BH = Borehole, HDW = Hand-dug-well, HP = Hand-pump

Table-7 Minimum Sample Numbers for Piped Drinking Water in the Distribution System

Group	Pop served	No of Annual samples
1	<5000	2
2	5000-100,000	(Pop/5000) x 6
3	>100,000	(Pop/ 10,000) + 120

4.2 General Requirement for Physico-Chemical Sampling

In general samples for physico-chemical analysis are recommended to be stored in a clean glass or polyethylene bottles at a low temperature in the dark (see **Table-8**). It is essential that the container should not be a cause of contamination and absorb or adsorb the constituents to be determined.

Table-8 Allocation of Physico-chemical Parameters (of interest) to the Type of Preservation

No.	Preservation by	Suitable for	Not Suitable for	Remarks
1	Acidification to pH<2	Alkali metals Aluminum Ammonia Arsenic Alkali earth metal Nitrate Total hardness Phosphorus, total Heavy metal	Cyanide Sulfides Carbonates, bicarbonates, CO2 Nitrites	Don't use sulfuric acid for Calcium and lead. Don't use hydrochloric acid for silver, lead and mercury. Don't use nitric acid for tin.
2	Cooling to 2°C to 5°C	Alkalinity Ammonia Conductivity Nitrate Nitrite Odour Orthophosphates Sulfates Total residue		

Every newly developed source has to be tested for full physico-chemical analysis before any service. Then after, the sampling for piped system should be carried out in such a way that one sample should be taken every two years for ground water sources such as borehole, shallow-tube-well and spring.

Surface water intended for water supply source should be sampled at least 6 times per year per site to detect the maximum and minimum concentration of interest. Then after two full physico-chemical analyses per year is recommended.

In all water sources when situation demands testing should be done for important parameters. These special situations are change in environmental condition, outbreak of water born diseases or increase of water born diseases.

4.3 Identification and Records

The source of the sample and the conditions under which it was collected should be recorded and attached to the bottle immediately after filling. At least the following information should be included with the sample (See **Figure-1**).

Figure-1 Suggested Form to Accompany Water Samples

Water-quality monitoring program SAMPLING DATA		
1	Region	
2	Zone	
3	Wereda	
4	Town/Village	
5	Sampling site	
6	Source	
7	Nature of sample (Treated or non-treated)	
8	Residual chlorine	
9	Date of sampling	
10	Time of sampling	
11	Sampled by (Organization)	

5.0 TESTING METHODS

The following test methods are selected mainly form ISO (International Organization for Standardization), based on WHO recommendation, to serve as reference test methods, in which every water quality laboratory in the country should develop towards it (see **Table-9** to **Table-13**). International Organization for Standardization (**ISO**) is a worldwide federation of national standards bodies (ISO member bodies).

Table-9 Bacteriological Quality of Drinking Water

I	SUBSTANCE	REFERENCE	TEST METHOD
1	*E.coli* or thermo tolerant Coliform bacteria	ISO 9308-1:1990 or	Determination & enumeration of coliform organisms, thermo-tolerant *coliform* organisms and presumptive *eschercia coli* – Part 1: Membrane filtration method
		ISO 9308-2:1990	Determination & enumeration of coliform organisms, thermo-tolerant *coliform* organisms and presumptive *eschercia coli* – Part 2: Multiple Tube (MPN) method
2	Total Coliform bacteria	ISO 9308-1:1990 or	Determination & enumeration of coliform organisms, thermo-tolerant *coliform* organisms and presumptive *eschercia coli* – Part 1: Membrane filtration method
		ISO 9308-2:1990	Determination & enumeration of coliform organisms, thermo-tolerant *coliform* organisms and presumptive *eschercia coli* – Part 2: Multiple Tube (MPN) method

- Membrane filtration is recommended for low turbidity water

Table-10 Substances and Parameters that May Give Rise to Complaints from Consumers

1	SUBSTANCE	REFERENCE	TEST METHOD
A	**Physical Parameters**		
1	True Color	ISO 7887:1984(E)	Examination and Determination of Color
2	Odor	WHO, Vol-2, p358	Panel evaluation
3	Test	WHO, Vol-2, p358	Panel evaluation
4	Turbidity	ISO 7027:1990(E)	Determination of Turbidity
B	**Inorganic constituents**		
1	Aluminum	ISO 12020:1997(E)	Determination of Aluminum AAS method
2	Ammonia	ISO 7150-2:1986(E)	Determination of Ammonium Part2: Automated spectrophotometeric method
3	Chloride	ISO 9297:1989(E)	Determination of Chloride – silver nitrate titration with chromate indicator (Mohr's method)
4	Copper	ISO 8280:1986(E)	Flam Absorption Spectrophotometeric method
5	Hardness	ISO 6059:1984	Determination of the sum of calcium and magnesium - EDTA titrimetric method
6	Hydrogen Sulfide	WHO, Vol-2, p243	Methylene blue colorimetric method
7	Iron	ISO 6332:1988(E)	Determination of Iron - Spectrometric Method using 1,10-phenanthroline
8	Manganese	ISO 6333:1986(E)	Determination of Manganese Formaldoxime spectrometric method
9	DO	WHO, Vol-2, p324	Electrochemical probe or dissolved oxygen meter
10	pH	ISO 10523:1990(E)	Determination of pH
11	Sodium	ISO 9964-3: 1993(E)	Determination of Sodium and potassium by flam emission spectrophotometery
12	Sulfate	ISO 9280:1990(E)	Gravimetric method
13	TDS	WHO, Vol-2, p367	Conductivity probe
14	Zinc	ISO 8288:1986(E)	Flam Absorption Spectrophotometeric method
B	**Disinfectant**		
1	Chlorine	ISO 7393-2:1985(E)	Determination of free chlorine and total chlorine using N.N-diethyly-1, 4 phylenediamine, for routine control process

Table-11 Chemicals Of Health Significance

1	SUBSTANCE	REFERENCE	TEST METHOD
A	Inorganic Constituents		
1	Arsenic	ISO 6595:1982(E)	Determination of total Arsenic – silver diethyl dithiocarbonate spectrophotometeric method
2	Barium	WHO, vol-2, p175	AAS, using either direct aspiration into an air-acetylene flame or atomization in a furnace.
3	Boron	ISO 9390:1990(E)	Determination of Borate – spectrophotometeric method using Azomethine-H
4	Cadmium	ISO 5961:1994(E)	Determination of cadmium – by AAS method
		ISO 8288:1986(E)	Flam Absorption Spectrophotometeric method
5	Chromium	ISO 11083:1994(E)	Determination of chromium (vi) – spectrometric method using 1,5-diphenycarbazide
6	Copper	ISO 8288:1986(E)	Flam Absorption Spectrophotometeric method
7	Cyanide	ISO 6703:1984(E)	Determination of cyanide- Part 1: Determination of total cyanide
8	Fluoride	ISO 10359-1:1992(E)	Electrochemical probe method - for potable and lightly polluted water
9	Lead	ISO 8288:1986(E)	Flam Absorption Spectrophotometeric method
10	Manganese	ISO 6333:1986(E)	Determination of Manganese Formaldoxime spectrometric method
11	Mercury (total)	ISO 9965-3: 9984(E)	Determination of total mercury- by flameless AAS – method after digestion with bromine
12	Nitrate (as NO_3^-)	ISO 7890-3:1988(E)	Determination of nitrate- Part 3:spectrometric method using sulfosalsalicylic acid.
13	Nitrite (as NO_2^-)	ISO 6777:1984(E)	Determination of nitrite - Molecular Absorption spectrometric method
14	Selenium	ISO 9965:1993(E)	Determination of Selenium – AAS method (hydride technique)
B	Organic Constituents		
B1	Aromatic hydrocarbons		
1	Benzene	WHO, Vol-2, p462	A purge and trap gas chromatographic procedure with photoionization detection
2	Benzo[a]pyrine	WHO, Vol-2, p496	Gas chromatography in conjunction with mass spectrographic
B2	Chlorinated alkanes		
1	Carbon tetrachloride	WHO, Vol-2, p390	A purge and trap gas chromatography
2	1,2-dichloroethane	WHO, Vol-2, p411	A purge and trap gas chromatographic procedure
B3	Chlorinated ethenes		
1	1,1-Dichloroethene	WHO, Vol-2, p432	A purge and trap gas chromatographic procedure
2	Trichloromethene	WHO, Vol-2, p445	A purge and trap gas chromatographic procedure
3	Tetrachloroethene	WHO, Vol-2, p453	A purge and trap gas chromatographic procedure

Table-11 (Cont.)

C	Pesticides	Reference	Test Method
1	DDT	WHO, Vol-2, p639	Gas Chromatography with electron-capture detector.
2	Aldrine/Deldrine	WHO, Vol-2, p604	Extraction with pentane followed by Gas Chromatography with electron-capture detector
3	Chlordane	WHO, Vol-2, p628	Extraction with pentane followed by gas chromatography with electron capture detector
4	Pentachlorophenols	ISO 8165-1:1992(E)	Determination of selected monovalent phenols Part1: Gas-chromatographic method after enrichment by extraction
D	Disinfectant & disinfectant bi-product		
D1	Disinfectant		
1	Chlorine	ISO 7393-2:1985(E)	Determination of free chlorine and total chlorine using N.N-diethyly-1, 4 phylenediamine, for routine control process
D2	Disinfectant By-products		
D2.1	Chlorophenol		
1	2,4,6-Trichlorophenol	ISO 8165-1:1992(E)	Determination of selected monovalent phenols-Part 1: Gas chromatographic method after enrichment by extraction
D2.2	Trihalomethane		
1	Chloroform	WHO, Vol-2, p850	Gas chromatography- with detection by flame ionization, electron-capture, or mass spectroscopy

Table-12 Chemicals not of Health Significance at Concentration normally Found In Drinking Water

1	SUBSTANCE	REFERENCE	TEST METHOD
1	Asbestos	WHO, Vol-2, p168	Transmission electron microscopy (TEM) with identification by energy depressive X-ray analysis and selected-area electron diffraction (TEM/SAED)
2	Silver	WHO, vol-2, p339	Spectrographic and colorimetric method with dithi-zone
3	Tin	WHO, vol-2, p361	AAS either direct aspiration into a flame or furnace technique

Table-13 Radioactive Constituents of Drinking Water

1	SUBSTANCE	REFERENCE	TEST METHOD
1	Gross alpha activity	ISO 9696:1992	Measurement of Gross Alpha activity in non-saline water - thick source method.
2	Gross beta activity	ISO 9697:1992	Measure of gross beta activity in non-saline water

6.0 SANITARY INSPECTION

Sanitary survey and WQ analysis are complementary activities that should be conducted by both the water supply agency as well as surveillance agency. The sanitary inspection forms, prepared in the form of checklist, are possible to determine an overall measure of the sanitary state of the supply.

6.1 Frequency of Sanitary Inspection

One of the most important surveys is that undertaken when new water sources are developed. When alternative water sources are under consideration, each should be surveyed. The guiding principle is that no new water supply should be approved without a sanitary inspection. Routine surveys of existing supplies should be undertaken periodically as stated in **Table-14** by the community, water supplier and surveillance agency.

Table-14 Minimum Annual Frequency of Sanitary Survey

1	Source & Mode of Supply	Community	Water-supply Agency	Surveillance Agency
1.0	**On Spot supply**			
1.1	Hand-dug well (Without windlass)	6	-	-
1.2	Hand-dug well (With windlass)	6	-	-
1.3	Dug well with hand-pump	4	-	0.5
1.4	Shallow & deep tube well with hand-pump	4	-	0.5
1.5	Gravity spring	4	-	0.5
2.0	**Piped Supply**			
2.1	Groundwater with & without chlorination	-	0.5	0.5
2.2	Treated surface water with chlorination: <5,000 Pop 5,000 to 20,000 Pop	 - -	 0.5 1	 0.5 0.5
2.3	Distribution system of piped supply	-	6	0.5