

CHAPTER 8 CONCLUSION AND RECOMMENDATION

8.1 Conclusion

The project of Groundwater Development and Water Supply for Seven Towns in Southern Region is concluded as follows:

8.1.1 Field Survey

- (1) Through the reconnaissance of the town and work shops held in the town, the current poor water supply and sanitary conditions, people's eagerness for water supply development, and inhabitants' well understanding on the importance of sanitary condition were recognized.
- (2) A series of hydrogeological investigation grasped the hydrogeological property of the area and selected out 3 test well drilling points. SEG-1, 2, and 3, thus drilled, indicated ground-water yields of around 1.0, 9.0, and 0.1 lit/sec. An automatic water level recorder has been installed in SEG-2, and the groundwater monitoring is still continued.
- (3) A hydro-meteorological survey collected existing data and set a rain-gauge at each target town, two staff gauges along the Mereb, and a staff gauge at two surface dams. Observations through those gauges are still under way.
- (4) A series of socio-economic survey revealed the actual life-level and willingness of the inhabitants, such as occupation, house income, current water supply means and volume of water consumed, willingness to pay, and so forth.

8.1.2 Formulation of Development Plans

- (1) The project for water resources development, water supply and sanitation improvement was formulated as phased plans with horizons of 2005, 2010, and 2015. Water resources development was focused on groundwater, and a domestic water supply was given priority.
- (2) Future population of Segeneiti is projected to be 10680, 13680, and 17000 at each target year respectively. While, a domestic water consumption rate is estimated at 18.8, 19.9, and 22.6 l/c/d for the same respective years. Based on those figures, as well as the consideration on the other water uses, extension of service area, etc., the water demand is to be 344, 517, and 785 m³/day for each target year.
- (3) Groundwater development potential near around Segeneiti is fair because the area is separated into some groundwater basins and each one has fair to small area. The major aquifer in the basin has fair to excellent property. SEG-2 can solely cover the water demand by 2010 target year, and existing DW-1 shall be involved by the year 2015.
- (4) Planned water supply facilities comprise of new borehole and existing dug-well, reservoir tanks, transmission pipeline with max. diameter of 100 mm, distribution pipeline with max. diameter of 125 mm, booster pumps and pumping pits, control houses, etc.

- (5) Planned sanitary facilities are public latrines and school latrines. Besides, sanitation improvement plans such as wastewater and storm water drainage, refused disposal, etc., as well as the educational program on sanitation, were studied and recommended.
- (6) Institutional strengthening plans on MoLWE, MoLG, MoH, WSA, local WSAs and some other local agencies were studied and several recommendations were presented.
- (7) Project costs on water supply and sanitation facilities were estimated as follows:

<u>Target year</u>	<u>Water supply</u>	<u>Sanitation</u>	<u>Total</u>
2005	13,374,400	503,700	13,878,100 Nfa
2010	10,344,500	224,700	10,569,200 Nfa
2015	16,896,300	300,700	17,197,000 Nfa

- (8) O&M cost for the facilities were estimated to be 406500, 662000, and 952300 Nfa for the target years of 2005, 2010, and 2015 respectively.
- (9) Through the financial analysis, water tariffs of 10 – 11 Nfa for house connection, 8 - 9 Nfa for yard connection, and 4 Nfa for communal water points were proposed.
- (10) Economic evaluation figured out –3,939 thousand Nfa of NPV, 0.79 of B/C, and 6.7% of EIRR. The EIRR is far below 10% but it may be tolerable considering its social nature.
- (11) While, financial evaluation suggested a reasonable extent of profit to make a provision for unpredictable financial turbulence, a thick reserve of working capital to prepare for replacement of facilities and nominal profit to the assets invest in the years to come.
- (12) The project was, thus, tolerable for economic and financial evaluation, and withstanding for organizational, technological, social and WID, and environmental evaluations.
- (13) Project implementation plan is formulated as follows: from 2000 for the first, from 2004 for the second, and from 2009 for the third phase implementation. Each phase shall have around one year of preparatory work period and following one year of actual implementation period.

8.1.3 Feasibility Study

- (1) Project feasibility was studied for the priority projects targeting the year of 2005.
- (2) The first phase implementation for the priority projects is feasible on the condition that the initial cost will be subsidized by the government, and to be promoted by the Ministry of Local Government with appropriate foreign assistance.
- (3) Projected water demand in 2005 is 344 m³/day, and the volume is easily covered only by SEG-2. Because of highway extension program, SEG-2 shall be re-drilled.
- (4) Designed facilities to be constructed under the Project are a new borehole, well pump, transmission pipeline, distribution pipeline, booster pump and pumping pit, reservoir, communal water points, temporary access roads, control houses, school latrines, and public latrines.

- (5) Project cost for water supply is estimated at 13,374,400 Nfa, while for sanitation 503,700 Nfa. The O&M cost for the first phase is estimated to be 406,500 Nfa.
- (6) For smooth implementation and effective O&M of the facilities, a capacity building of local WSA as well as the establishment of local sanitary committees, is required.
- (7) Water tariff to be applied under the Project is estimated at 10, 8, and 4 Nfa/m³ for house connection, yard connection, and communal water points users respectively. Revenue estimation based on the tariff suggested enough sound management of WSA.
- (8) Cost benefit streams analyzed were -2,277 thousand Nfa of NPV, 0.78 of B/C, and 6.0% of EIRR, showing far below 10%. However, it may be tolerable considering its social nature. Sensitivity analysis figured out the EIRR stays above the discount rate of zero even under the unfavorable situation (20% of cost overrun).
- (9) Financial evaluation figured out 110.3% of revenue to cost ratio, 9.1% of profit rate, 40.3% of working capital to revenue ratio, and 0.6% of profit to total assets ratio. The figures show the WSA will have a reasonable profit, a thick reserve of working capital, and a nominal profit to assets invested in the year to come.
- (10) The Project is tolerable for organizational, technological, social and WID aspect evaluations.
- (11) Implementation schedule is to be divided into two stages: a preparatory stage and construction stage.
- (12) The Project is, thus, feasible.

8.2 Recommendation

- (1) The Government of Eritrea is recommended to consider financing of the Project of Groundwater Development and Water Supply for Seven Towns in Southern Region to implement the first phase of the phased plans targeting 2005.
- (2) Institutional strengthening of RAD of MoLG, WD of MoLWE, EHU of MoH are quite important, not only for the Project but also for all other national development programs.
- (3) Smooth and complete establishments of WSA both of national and local levels, as well as the associated local committees based on autonomous management, are highly recommended.
- (4) PMU of the Project, under RAD of MoLG, shall be established as soon as possible.
- (5) Establishment of a training center under the national level WSA, for financial, technical, and legal personnel of local WSA, is recommended.
- (6) The concept of community based management and people's participation shall be taken into the consideration throughout the project implementation and O&M after construction.
- (7) Besides the provision of public/school latrines under the Project, provision of on-site drainage system for sewerage, and refuse truck/containers for refuse disposal are recommended.

- (8) Educational program is also of vital importance for sanitation improvement, against the construction of sanitary facilities. Thus, carrying out the educational program formulated under the Project is recommended.
- (9) Monitoring of groundwater, observation of rainfall, and measuring of river runoff are essential for the Project and for future water resources development programs. To continue those measurement is highly recommended.

APPENDICES

A. Scope of Work	i
B. Member of the Study Team	viii
C. Name of Counterpart Personnel.....	viii




A. Scope of Work


SCOPE OF WORK
FOR
THE STUDY
ON
GROUNDWATER DEVELOPMENT AND WATER SUPPLY
FOR
THE SEVEN TOWNS IN SOUTHERN REGION
OF
ERITREA

AGREED UPON BETWEEN
THE MINISTRY OF LAND, WATER AND ENVIRONMENT
AND
THE JAPAN INTERNATIONAL COOPERATION AGENCY

Asmara, April 22, 1997


TESFAI GHERMAZIEN, Ph.D.
Minister for Land, Water and Environment




Dr. Yuji MARUO
Leader of the Preparatory Study Team,
Japan International Cooperation
Agency (JICA)

I . INTRODUCTION

In response to the official request of the Government of State of Eritrea (hereinafter referred to as "the Government of Eritrea"), the Government of Japan decided to conduct a Study on Groundwater Development and Water Supply for the Seven Towns in Southern Region of Eritrea (hereinafter referred to as "the Study") in accordance with the relevant laws and regulations in force in Japan.

The Japan International Cooperation Agency (hereinafter referred to as "JICA"), the official agency responsible for the implementation of the technical cooperation programs of the Government of Japan, will undertake the Study in close cooperation with the authorities concerned of the Government of Eritrea.

The present document sets forth the Scope of Work for the Study.

II . OBJECTIVES OF THE STUDY

The objectives of the Study are:

- (1) to evaluate potential of water resources, focusing on groundwater
- (2) to formulate a development plan for water supply and sanitation
- (3) to conduct feasibility study for water supply project
- (4) to pursue technology transfer to counterpart personnel in the course of the Study.

III . STUDY AREA

The Study will cover following 7 towns in Southern Region.

- Adiquala, Segeneiti, Adi Keyih, Senafe, Mendefera, Dekemhare, Debarwa

IV . SCOPE OF THE STUDY

Stage I: Data Collection and Evaluation of Present Condition

1. Collection, review and analysis of related data and information
 - a. social and economic conditions
 - b. natural conditions (topographical maps, hydrogeological maps, meteorological data, hydrological data, geological data, aerial photo, etc.)
 - c. other projects relevant to the Study
 - d. existing well data and existing water supply services
 - e. sanitary conditions
 - f. present conditions and policies related to "Women in Development (WID)"
 - g. laws, regulations and policies on water resource development, water supply and sanitation
 - h. other relevant data and information
2. Topographic surveying
3. Diagnostic survey of existing water supply facilities
4. Water quality analysis for existing water supply facilities

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5. Survey on actual conditions of seven towns
 - a. condition of water use and sanitation
 - b. social and economic aspects
 - c. people's awareness on health and hygiene and their willingness to pay for better water supply services
 - d. cultures and habits on water supply and sanitation
 - e. women's social situation

6. Initial Environmental Evaluation (IEE)

Stage II: Water Resources Potential Survey

1. Field reconnaissance
 - a. topographical and geological investigation
 - b. rivers and springs
 - c. hydrogeological investigation
2. Preparation of inventory of existing wells
3. Geophysical exploration
4. Test well construction, well logging, pumping test and water quality analysis
5. Leveling survey for observation wells
6. Observation of groundwater level
7. Observation of river flow and water quality analysis
8. Water balance analysis and preparation of hydrogeological map
9. Evaluation of water resources potential

Stage III: Development Plan for Water Supply and Sanitation

1. Water demand projection and confirmation of planning framework
2. Formulation of water sources development plan
3. Formulation of water supply facility plan
4. Formulation of operation and maintenance plan and institutional development plan
5. Sanitation development plan
6. Cost Estimation
7. Evaluation
 - a. socio-economic evaluation
 - b. institutional and technical evaluation

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- c. environmental impact
- 8. Formulation of implementation program
- 9. Selection of projects for feasibility study

Stage IV: Feasibility Study on Development Projects

- 1. Supplementary investigation
- 2. Water demand projection and confirmation of planning framework
- 3. Formulation of groundwater development plan
- 4. Formulation of water supply facility plan
- 5. Preliminary design of facilities
- 6. Cost Estimation
- 7. Formulation of operation and maintenance plan and institutional development plan
- 8. Evaluation
 - a. financial plan and evaluation
 - b. institutional and technical evaluation
 - c. socio-economic evaluation
 - d. environmental impact assessment (EIA)
- 9. Formulation of implementation program

V. SCHEDULE OF THE STUDY

The Study will be carried out in accordance with the tentative schedule as attached in the appendix. The schedule is tentative and subject to modification if such necessity should arise during the course of the Study and mutually agreed to by both parties.

VI. REPORTS

JICA shall prepare and submit the following reports in English to the Government of Eritrea.

1. Inception Report:

Ten(10) copies at the commencement of the first work period in Eritrea. This report will contain the schedule and methodology of the Study as well as outline of the field survey.

2. Progress Report :

Ten (10) copies about three(3) months after the commencement of the first work period in

Eritrea.

3. Interim Report:

Ten (10) copies at the end of the first work period in Eritrea. This report will summarize the findings of the first field survey.

4. Draft Final Report:

Ten (10) copies at the third work period in Eritrea. The Government of Eritrea shall submit its comments within one (1) month after the receipt of the Draft Final Report.

5. Final Report:

Ten (10) copies within two (2) months after the receipt of the comments on the Draft Final Report.

VII. UNDERTAKINGS OF THE GOVERNMENT OF ERITREA

1. To facilitate the smooth conduct of the Study, the Government of Eritrea will take the following necessary measures:

- (1) To secure the safety of the Japanese study team (hereinafter referred to as "the Team")
- (2) To permit the members of the Team to enter, leave and sojourn in Eritrea for the duration of their assignment therein, and exempt them from foreign registration requirements and consular fees
- (3) To exempt the members of the Team from taxes, duties, fees and any other charges on equipment, machinery and other materials brought into Eritrea for the conduct of the Study
- (4) To exempt the members of the Team from income tax and charges of any kind imposed on or in connection with any emoluments or allowances paid to the members of the Team for their services in connection with the implementation of the Study
- (5) To provide necessary facilities to the Team for remittance as well as utilization of the funds introduced into Eritrea from Japan in connection with the implementation of the Study
- (6) To secure permission for the Team to enter into private properties or restricted areas for the implementation of the Study
- (7) To secure permission for the Team to take all data and documents (including photographs and maps) related to the Study out of Eritrea to Japan
- (8) To provide medical services as needed, expenses for which will be chargeable to the members of the Team.

2. The Government of Eritrea shall bear claims, if any arise, against the members of the Team resulting from, occurring in the course of, or otherwise connected with, the discharge of

their duties in the implementation of the Study, except when such claims arise from gross negligence or willful misconduct on the part of the member of the Team.

3. The Ministry of Land, Water and Environment shall act as a counterpart agency to the Japanese Study Team and also as a coordinating body in relation with other governmental and non-governmental organizations for the smooth implementation of the Study. The Ministry of Land, Water and Environment shall, at its own expense, provide the Team with the followings, in cooperation with other organizations concerned:

- (1) available data and information related to the Study
- (2) counterpart personnel
- (3) suitable office space with necessary equipment in Asmara
- (4) credentials or identification cards
- (5) appropriate number of vehicles with drivers.

VIII. UNDERTAKINGS OF JICA

For the implementation of the Study, JICA shall take the following measures:

1. to dispatch, at its own expense, study teams to Eritrea
2. to pursue technology transfer to the Government of Eritrea counterpart personnel in the course of the Study.

IX. CONSULTATION

JICA and the Ministry of Land, Water and Environment shall consult with each other in respect of any matter that may arise from or in connection with the Study.

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APPENDIX TENTATIVE STUDY SCHEDULE

MONTH DESCRIPTION	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
WORK IN ERITREA																	
WORK IN JAPAN																	
STAGE OF THE STUDY			STAGE I	STAGE II							STAGE III, IV						
REPORT PRESENTATION	▲ IC/R			▲ P/R				▲ IT/R							▲ DF/R		▲ F/R

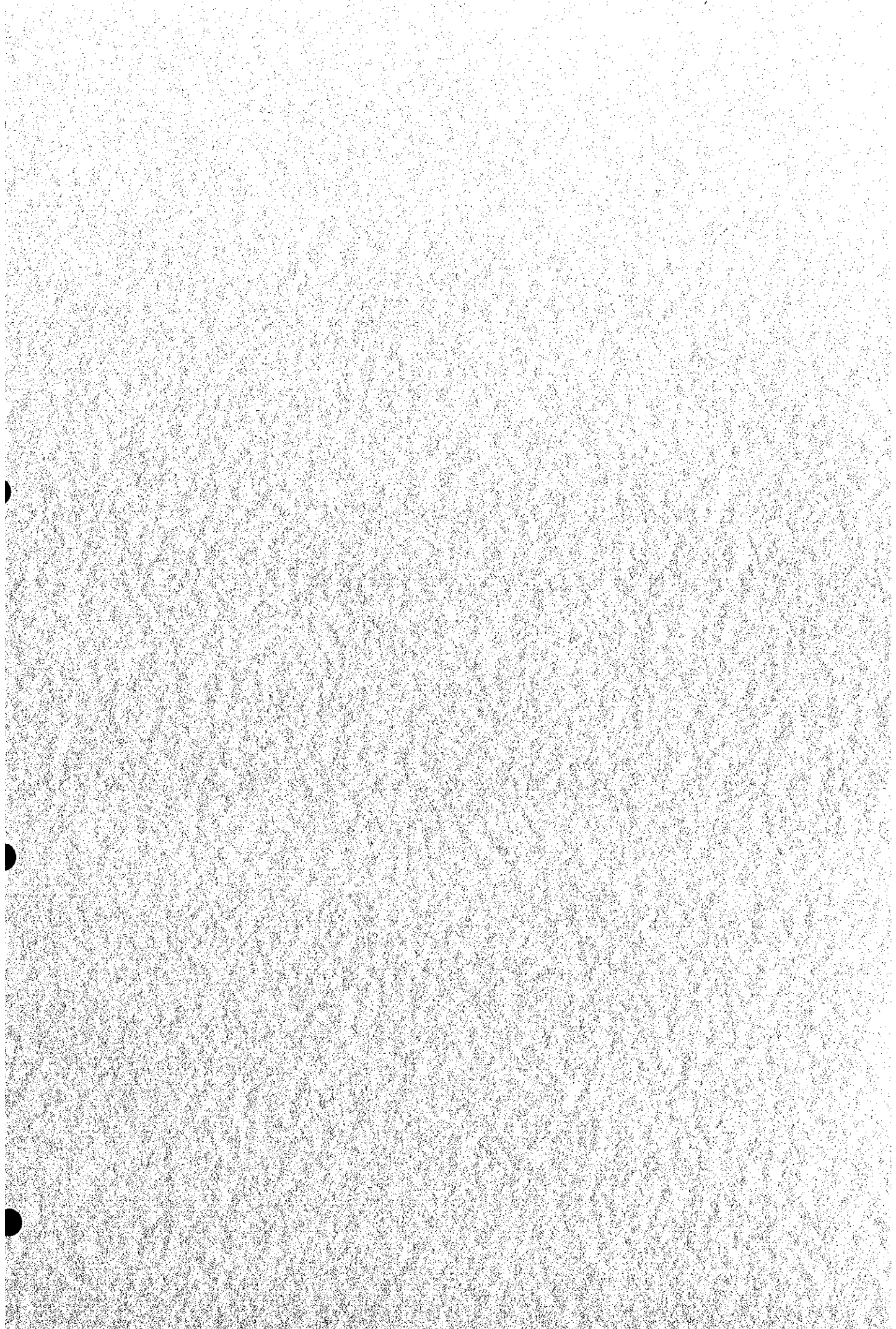
26

B. Member of the Study Team

KUME Takao	Team Leader / Water Supply
KAWASAKI Ryoichi	Hydrogeology (A) / Groundwater Development
HIGUCHI Masao	Hydrogeology (B)
Mahbub A.K.M. REZA	Hydrology / Environment
TAKAHASHI Naoyoshi	Geophysics
HASE Masahiro	Drilling Supervisor
ISHIBASHI Naomichi	Financial Planning / O&M
Haregu GEBRESILASSIE	Sanitary / Hygiene Improvement Planning
KIMATA Noriyasu	Facility Planning / O&M
TANAKA Etsuji	Design / Cost Estimation
Tesfa Mariam TEKIE	Socio-economy / People's Participation
SHIBATA Eichi	Coordinator

C. Name of Counterpart Personnel

Mr. Ghebremichael Temnewo	Acting General Manager
Mr. Michael Negash	Chief Hydrologist
Mr. Tewelde Solomon	Chief Hydrogeologist
Mr. Fikremariam Kahsai	Head, Water Quality Test Laboratory



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