APPENDICES

APPENDIX 1

Member List of the Study Team

Appendix 1. Member List of the Study Team

(1) Implementation Review Study

No	Name	Job Title	Occupation
1	Dr. Yuji MARUO	Team Leader	Senior Advisor, Japan International Cooperation Agency
2	Mr. Hiromu INOUE	Planning Management Officer	Water Resources Management Division II, Water Resources and Disaster Management Group, Global Environment Division, Japan International Cooperation Agency
3	Mr. Hiroyoshi YAMADA	Chief Consultant / Operation and Maintenance Planner	Earth System Science Co., Ltd.
4	Mr. Takaaki SUZUKI	Checking Audit Engineer	Japan Techno Co., Ltd.
5	Dr. Shigeo SUIZU	Water Source Survey Specialist	Earth System Science Co., Ltd.
6	Mr. Shunichi HATANO	Water Supply Facility Designer 1	Japan Techno Co., Ltd.
7	Mr. Shunsaku MATSUO	Water Supply Facility Designer 2	Earth System Science Co., Ltd.
8	Mr. Naoki MORI	Social Condition Survey Specialist	Japan Techno Co., Ltd.
9	Mr. Makoto YAMAMOTO	Implementation and Procurement Planner/Cost Estimator	Japan Techno Co., Ltd.

(2) Explanation of Draft Outline Design

No	Name	Job Title	Occupation
1	Dr. Yuji MARUO	Team Leader	Senior Advisor, Japan International Cooperation Agency
2	Mr. Hiromu INOUE	Planning Management Officer	Disaster Management Division II, Water Resources and Disaster Management Group, Global Environment Division, Japan International Cooperation Agency
3	Mr. Hiroyoshi YAMADA	Chief Consultant / Operation and Maintenance Planner	Earth System Science Co., Ltd.
9	Mr. Makoto YAMAMOTO	Implementation and Procurement Planner/Cost Estimator	Japan Techno Co., Ltd.

APPENDIX 2

Study Schedule

Appendix 2. Study Schedule

Field Survey (1/2)

No.	Date			JICA Leader	JICA Project Management	Chief Consultant / Operation and Maintenance Planner	Water Source Survey Specialist	Water Supply Facility Designer 1	Water Supply Facility Designer 2	Social Condition Servey Specialist	Implementation and Procurement Planner / Cost Estimation Specialist
				Yuji MARUO	Hiromu INOUE	Hiroyoshi YAMADA	Shigeo SUIZU	Shunichi HATANO	Shunsaku MATSUO	Naoki MORI	Makoto YAMAMOTO
1	May	30	Sat			Leave Japan					
2		31	Sun			Arrival in Kigali					
3	Jun	1	Mon	Leave Japan		Meeting with JICA, Prevenance Sudy (ICR explanation)					
4		2	Tue	Arrival in Kigali		ICR Explanation, Meeting with Eastern Province & Districts					
5		3	Wed	Meeting with JICA, Visit local contractor							
6		4	Thu	Discussion of M/D with 3 Distrcts			Preparation of the Water source study, Procurement of Materials & Tools	Discussion of M/D with 3 Districts			
7		5	Fri	Discussion of M/D with Eastern Province, Site Survey			Pricurement of materials, water source survey in Kirehe	Site Survey in Kirehe & Ngoma District (Water Source, Water Supply Area, Existing Facility)			
8		6	Sat	Site Survey			Water source survey in Ngoma District				
9		7	Sun	Revision of M/D			Data Compiling				
10		8	Mon	Discussion of M/D, Signing on M/D(MININFRA)			Water Source Survey in Ngoma District	Site Survey in Ngoma & Kirehe District (Water Source, Water Supply Area, Existing Facility)			
11		9	Tue	Preparation of Report			Water source survey in Kirehe & Kayonza				
12		10	Wed	Report to JICA, Leave Kigali		Signing M/D (Eastern Province & Districts)	Water Source Survey in Kirehe District				
13		11	Thu	Transit		Collecting Information of Relative Organization & Local Contractor					
14		12	Fri	Arrival in Tokyo			Site Survey (Handpump Site), Water Source Survey in Kirehe District				
15		13	Sat			Site Survey	Water Source Data Compiling				
16		14	Sun			Data Compiling	Water Source Data Compiling	Data Compiling			
17		15	Mon			Collecting Materials in Relative Organization, Preparation of the Re-entrustment Contract Documents	Additional Water Source Survey in Ngoma and Kirehe Districts	Site Survey in Ngoma & Kirehe District (Water Source, Water Supply Area, Existing Facility)			
18		16	Tue								
19		17	Wed								
20		18	Thu								
21		19	Fri					Market Survey In Kigari, Collecting Materials			
22		20	Sat								
23		21	Sun			Data Compiling	Data Compiling (Survey Result of Additional Water				
24		22	Mon			Inner Meeting	Data Collecting & Compiling of Atmospheric Data				
25		23	Tue			Tender works	Additional Survey of Water Source in Ngoma District	Inner Meeting :Tender Works（Topographic survey, Soil investigation）			
26		24	Wed				Water source data compiling				
27		25	Thu					Site Survey in Ngoma & Kirehe District (Water Source, Water Supply Area, Existing Facility)			
28		26	Fri				Meteorological Data Compiling				
29		27	Sat			Site survey		Data Compiling			
30		28	Sun			Data Compiling	Data Compiling				
31		29	Mon			Inner Meeting, Tender works	Hydrology Data Compiling	Site Survey in Ngoma & Kayonza District (Water Source, Water Supply Area, Existing Facility)			
32		30	Tue			Interview to Water Users Association					
33	Jul	1	Wed			Interview to District, Sector and Cooperative					
34		2	Thu				Data Compiling (Atmospheric, Hydrology、Hydrologeography Data)	Collecting Materials in Kigari City (Electrogaz, Land Office and MININFRA, etc.)			
35		3	Fri			Contract Negotiation, Preparation of the report of Tendering Procedure					
36		4	Sat								
37		5	Sun			Data Compiling	Water source survey in Ngoma District	Data Compiling			
38		6	Mon			Preparation work for sub contarcting work, Report ot JICA, Discussion with Technical Cooperatio Team	Data Analysis (Atmospheric, Hydrology Data)	Site Survey in Ngoma & Kayonza District (Topographic survey)			
39		7	Tue				Water Source Survey in Kirehe, Kayonza				
40		8	Wed				Data Analysis (Atmospheric, Hydrology Data)			Leave Japan	
41		9	Thu							Arrival in Kigali	
42		10	Fri				Water Source Survey in Ngoma, Kayonza, Kirehe Districts			Meeting with MININFRA and Eastern Province	
43		11	Sat			Data Compiling	Inneer Meeting, Leave Kigali	Data Compiling	Leave Japan	Inner Meeting	Leave Japan
44		12	Sun			Attendance to the Pumping Test	Transit	Data Compiling	Arrival in Kigali	Survey Preparation	Arrival in Kigali
45		13	Mon			Collecting Materials in Districts, Tender Works	Arrival in Tokyo	Site Survey in Ngoma & Kayonza District (Water Source, Water Supply Area, Existing Facility)	Survey on	Meetin and Survey in Kirehe, Ngoma, Kayonza, Rwamagana Distircts	Survey on
46		14	Tue						Visit to WTP in Kigali, discussion with Electrogaz		Visit to WTP in Kigali, discussion with Electrogaz
47		15	Wed			Participation in Seminar of the Development Study			Investigation on the available Bench Mark		Participation in Seminar of the Development Study
48		16	Thu			Seleciton of Public Tap Stand			Supervision of Topographic survey in Kibungo、Site survey in Murama		Site Survey in Mushikiri
49		17	Fri						Site survey in Kazo/Mutendeli	Site Survey of 1st Stage	
50		18	Sat						Data Compiling	Data Compiling	Data Compiling
51		19	Sun			Data Compiling		Data Compiling	Data Compiling	Data Compiling	Data Compiling
52		20	Mon			Meeting with MININFRA	Site Survey in Ngoma & Kayonza District		Site Survey in Kirehe	Site Survey of 1st Stage	Site Survey in Gatore Kirehe
53		21	Tue			Meeting with Re-entrustment Company			Supervision of Topographic Survey		Site Survey in Kigina Kirehe
54		22	Wed			Prepaartion of Technical Note		Data Analysis	Site Survey in Gahara	Supervision of sub contracting work of Soioeconomic survey	Site servey in Nyamugari
55		23	Thu			Discussion with Kayonza District and MINIFRA		Data Analysis	Site Survye in Murama		Site Survey in Gahara
56		24	Fri			Report to JICA, Prepare for re-		Report to JICA	Report to JICA		Site Servey in Kazo & Mutenderi
57		25	Sat			Data Compiling		Data Compiling	Supervision of Topographic Survey		Data Compiling
58		26	Sun			Leave Kigari		Leave Kigari	Data Compiling		
59		27	Mon			Transit		Transit	Site Survey in Murama		Site Survey in Murama
60		28	Tue			Arrival in Tokyo		Arrival in Tokyo	Supervision of Topographis Survey in Gahara & Gatore	Site Survey of 1st Stage	Data Compiling

Appendix 2. Study Schedule

Field Survey (2/2)

No.	Date			JICA Leader	JICA Project Management	Chief Consultant / Operation and Maintenance Planner	Water Source Survey Specialist	Water Supply Facility Designer 1	Water Supply Facility Designer 2	Social Condition Servey Specialist	Implementation and Procurement Planner / Cost Estimation Specialist
				Yuji MARUO	Hiromu INOUE	Hiroyoshi YAMADA	Shigeo SUIZU	Shunichi HATANO	Shunsaku MATSUO	Naoki MORI	Makoto YAMAMOTO
61	Jul	29	Wed						Water source survey in Kibungo, Kazomutendeli	Socioeconomic Condition Survey in other sites	Meeiting with MININFRA Survey on Procurement Condition
62		30	Thu						Water source survey in Gahara	Social condition survey in Kirehe distirct	Survey of Quarry
63		31	Fri						Water source survey in Zaza, Karembo, Mugesera		Survey of Procurement
64	Aug	1	Sat						Site Survey of 1st		Site survey of 1st
65		2	Sun						Water Source Survey in Mushikiri		Data Compiling
66		3	Mon						Data Compiling	Social Condition Survey in Kirehe	Survey of Procurement
67		4	Tue						Supervision of Topographic survey in Kazo, Mutendeli	Social Condition Survey in Ngoma	Site Survey of Karembo, Zaza, Kibare, Mugesera
68		5	Wed						Site Survey in Murama Kibungo		
69		6	Thu						Supervision of Topographic survey in Kirehe, Kigina		Survey of Procurement
70		7	Fri						Site Survey in Kigina, Murama	Supervision of sub contracting work of Soioeconomic survey	Site Survey in Kibungo
71		8	Sat						Site Survey in Nyamugali and Kigina		Data Compiling
72		9	Sun						Site Survey in Murama		
73		10	Mon						Site Survey in Nyamugali	Social Condition Survey in Kayonza	Survey of Quarry Data compiling
74		11	Tue						Supervision of Topographic Survey in Nyamugali, Kigina	Analysis of Data of Sub Contracting Work	Survey of Procurement
75		12	Wed						Supervision of Geotechnical Investigation in Kazo, Mutendeli, Zaza, Karembo, Mugesera		Data Compiling
76		13	Thu								Survey of sand collection site
77		14	Fri								Survey of quarry and sand collection site
78		15	Sat								Data Compiling
79		16	Sun						Meeting with		
80		17	Mon						Site Survey in Nyamugali, Kigina, Gahara, Kibungo	Data Compiling	Survey of Procurement Condition
81		18	Tue							Report to MININFA and Eastern province	
82		19	Wed						Report to JICA and MININFRA	Leave Kigali	Report to JICA and MININFRA
83		20	Thu						Site Survey in Gahara KazoMutendeli	Transit	Survey of Procurement Condition
84		21	Fri						Meeting with Ngoma district	Arrival in Tokyo	Survey of Construction Condition
85		22	Sat						Leave Kigali		Leave Kigali
86		23	Sun						Transit		Transit
87		24	Mon						Arrival in Tokyo		Arrival in Tokyo

Explanation of Draft Outline Design

No.	Date			JICA Leader	JICA Project Mnagement	Chief Consultant / Operation and Maintenance Planner	Implementation and Procurement Planner / Cost Estimation
				Yuji MARUO	Hiromu INOUE	Hiroyoshi YAMADA	Makoto YAMAMOTO
1	Dec	19	Sat	Leave Japan (Kansai)	Leave Japan (Haneda)	Leave Japan (Narita)	
2		20	Sun	Arrival in Kigali			
3		21	Mon	Explanation and Discussion of DBD with Kirehe and Ngoma Districts			
4		22	Tue	Explanation and Discussion of DBD with Eastern Province Explanation and Discussion of DBD with Kirehe District Explanation and Discussion of DBD with Ngoma District			
5		23	Wed	Explanation and Discussion of DBD with MININFRA and PNEAR Signing on Minutes of Discussion (M/D) Report to JICA Rwada Office			
6		24	Thu	Leave Kigali		Meeting with PNEAR, Leave Kigali	
7		25	Fri	Arrival in Japan (Kansai)	Arrival in Japan (Haneda)	Transit	
8		26	Sat			Arrival in Japan (Narita)	

APPENDIX 3

List of Parties Concerned in Rwanda

Appendix 3. List of Parties Concerned in Rwanda

1. Implementation Review Study

(1) Japan International Cooperation Agency, Rwanda Office

Mr. Hiroshi MURAKAMI	Resident Representative
Mr. Masato KOINUMA	Deputy Resident Representative
Mr. Shingo KIKUCHI	Program Manager (Rural Development & Economic Infrastructure)
Ms. Hatsue KIMURA	Program Manager (Human Resource Development)
Mr. Fumihiko SUZUKI	Program Manager (Agriculture)
Mr. SANGWA Samuel	Programme Coordinator (Rural Development and Economic Infrastructure)

(2) Ministry of Infrastructure (MININFRA)

Ms. MUKASINE Marie Claire	Permanent Secretary
Mr. SANO James	Water & Sanitation
Ms. MEDLAND Louise	External Links and Donor Coordination, Water & Sanitation
Mr. YARAMBA Albert	PNEAR
Mr. NYIRIGRA Benoit	PNEAR, Water Engineer
Mr. NDUTIYE Simon	PEAMR
Ms. PAUL Eva	External Links and Donor Coordination in Electricity Sector

(3) Ministry of Natural Resources (MINIRENA)

Mr. SAFARI Patrick	Director, Planning and Policy Department

(4) Meteorological Agency

Mr. SEMAFARA John Ntaganda	Coordinator Rwanda Meteorological Service and PR of Rwanda with WMO
Mr. GAKWISI Syldio	Head of Data management section

(5) National Institute of Statistics

Mr. MURENZI Alphonse

(6) Eastern Province

Ms. MUKANTABANA Aline	Acting Executive Secretary
Mr. MAKONBE Jean Marie Vianny	Coordinator for District Development Programmes

(7) Kayonza District

Mr. MUHORORO Damas	Mayor
Mr. NDAYISHIMIYE Nicolas	Infrastructure Unit

(8) Ngoma District

Mr. NIYOTWAGIRA François	Mayor
Mr. TUYISABE Augustin	Infrastructure Unit

(9) Kirehe District

Mr. MURAYIRE Protais	Mayor
Mr. SEBUDANAI Alphonse	Infrastructure Unit

(10) Rwamagana District

Mr. KIMPAYE Innocent	Infrastructure Unit

(11) Electrogaz

Mr. MANIRAKIZA Patrice	Head of Planning & Studies Development, Electricity Department
Mr. MINANI Theoneste	Head of Water Department
Mr. ALIMAS Emmily	Head of Water Technical Unit, Ngoma Station
Mr. NZEYIMANA Vicent	Head of Electricity Technical Unit, Ngoma Station

(12) Rwanda Environment Management Authority, REMA

Mr. MASHINGA Theobold	Director of Environmental Compliance

2. Explanation of Draft Outline Design

(1) Japan International Cooperation Agency, Rwanda Office

Mr. Hiroshi MURAKAMI	Resident Representative
Mr. Shingo KIKUCHI	Program Manager (Rural Development & Economic Infrastructure)
Mr. SANGWA Samuel	Programme Coordinator(Rural Development and Economic Infrastructure)

(2) Ministry of Infrastructure (MININFRA)

Ms. MUKASINE Marie Claire	Permanent Secretary
Mr. SANO James	Water & Sanitation
Mr. YARAMBA Albert	PNEAR

(3) Eastern Province

Mr. Yussuf MUGIRANEZA	Executive Secretary
Mr. Jean Marie Vianny MAKONBE	Coordinator for District Development Programmes

(9) Kirehe District

Mr. Benson MUHIKIRA	Deputy Mayor
Mr. Alphonse NZIRUMBANJE	Coordinator of Economic Development Unit
Mr. Alphonse SEBUDANAI	Infrastructure Unit

(8) Ngoma District

Mr. Fannçois NIYOTWAGIRA	Mayor
Mr. Boniface NTIRENGANYA	Coordinator of Economic Development Unit

APPENDIX 4

Minutes of Discussions

MINUTES OF DISCUSSIONS
IMPLEMENTATION REVIEW STUDY ON THE PROJECT FOR RURAL WATER SUPPLY IN THE REPUBLIC OF RWANDA

The Government of Japan decided to conduct an Implementation Review Study on the Project for Rural Water Supply in the Republic of Rwanda (hereinafter referred to as "the Project") and entrusted the study to the Japan International Cooperation Agency (hereinafter referred to as "JICA").

JICA sent to Rwanda the Implementation Review Study Team (hereinafter referred to as "the Team"), which is headed by Dr. Yuji MARUO Senior Advisor, Institute for International Cooperation, JICA and is scheduled to stay in the country from May 31 to August 22, 2009.

The Team has held series of discussions with concerned officials of the Governments of Rwanda and conducted a field survey in the study area.

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

Kigali, June 8, 2009

Dr. Yuji MARUO
Leader,
Implementation Review Study Team,
Japan International Cooperation Agency (JICA)

Ms. Marie Claire MUKASINE
Permanent Secretary
MININFRA

Ms. Aline MUKANTABANA
Ag. Executive Secretary,
Eastern Province

Mr. Protais MURAYIRE
Mayor,
Kirehe District

Mr. François NIYOTWAGIRA
Mayor,
Ngoma District

Mr. Damas MUHORORO
Mayor,
Kayonza District

ATTACHMENT

1. Objective of the Project

The objective of the Project is to improve the health and living conditions of the people of Rwanda by providing potable water through the construction of water supply facilities.

2. Consequences of the Project

In the initial Basic Design Study of JICA which was conducted from September 2005 to March 2006, the Project was originally scheduled as shown in Table-1;

Table-1: Original Schedule of the Project

Stage	Number of Water Schemes	
	Piped Water Scheme	Handpump Well
1st Stage	2 (Kayonza) 1 (Ruwamagana)	13 (Kayonza) 11 (Ngoma)
2nd Stage	5 (Kirehe)	-
3rd Stage	1 (Kirehe) 1 (Kayonza) 3 (Ngoma)	-

The 1st stage of the Project was completed on March 2008. However, the competitive tendering for implementation of the 2nd stage of the Project was failed since no bidder participated in the tendering. Thus the Project was suspended.
This Implementation Review Study (hereinafter referred to as "the Study") is to resume the suspended Project, combining the 2nd and 3rd Stages in one single project and selecting appropriate number of the water schemes in order to complete it within the given period of the Japan's Grant Aid.

3. Study Sites

The Rwandan side and the Team (hereinafter referred to as "both sides") confirmed the target sites of the Study were 10 piped water schemes of 2nd and 3rd Stages in Table-1. However, the Project Sites to be implemented would be decided through the Study.
The target sites of the Study are shown in Annex-1.

4. Responsible and Implementing Agencies

(1) The Responsible Agency is the Ministry of Infrastructure (MININFRA).
(2) The Implementing Agencies of the Project are Ngoma, Kirehe and Kayonza Districts.

5. Requested Components of the Project

After discussions, the Rwandan side confirmed the requested project components as follows;

(1) Construction of 10 water supply schemes in Kirehe, Ngoma and Kayonza Districts.

(2) Procurement of water quality test kits

Both sides confirmed that the appropriateness of the request would be examined in accordance with the further studies and analysis in Japan and the final components of the Project would be decided by the Government of Japan.

6. Japan's Grant Aid Scheme

The Rwandan side understood that the Japan's Grant Aid Scheme and the necessary measures to be taken by the Rwandan side as explained by the Team and described in Annex-2, for smooth implementation of the Project, on condition that the Grant Aid Assistance by the Government of Japan is extended to the Project.

7. Schedule of the Study

(1) The consultant members of the Team will proceed to further studies in Rwanda until August 22, 2009.
(2) JICA will prepare the draft Implementation Review Study Report in English and dispatch a mission in order to explain its contents to MININFRA, Eastern Province, Ngoma District, Kirehe District and Kayonza District around December 2009.
(3) In case that the contents of the report are accepted in principle by the Rwandan side, JICA will finalize the report and send it to the Rwandan side around April 2010.

8. Other Relevant Issues

(1) Inception Report

The contents of Inception Report, which the Team explained to the Rwandan side, was understood and accepted in principle by the Rwandan side.

(2) Arrangements of the Rwandan side

As a response to the request by the Team, the Rwandan side agreed to provide necessary number of fulltime counterpart personnel from the respective District Office for the study and also provide all the data and information relevant to the Project for the smooth implementation of the study.
The Rwandan side committed to provide an office space at the Ngoma District Office for the Team.

(3) Prioritization of the Water Schemes

Both sides agreed that the target water schemes were to be prioritized applying following criteria;

- Cost/Benefit Ratio (total construction cost / number of population)
- Stability of water source (discharge rate per day in driest season / total amount of day-demand, water quality)
- Operation and Maintenance Cost (per-head O&M cost / affordability of beneficially)
- Scheme Types (Gravity / Motorized by Generator / Booster pump)
- Accessibility to the source (cost of access road construction)
- Willingness to pay for water supply services

The 2nd Stage sites of original schedule are to be given higher priority.

(4) Local Labour Issue

Both side understood that under terms of Japan's Grant Aid, no specific instruction could be given to the Japanese Contractor on hiring labour. However, every effort will be made to employ local labour where possible.

(5)No duplication with other projects.
Both sides confirmed that there was no duplication at 10 target schemes with projects of other donors, NGOs and the Government of Rwanda. If any duplication is identified, the schemes will be removed from the Project.

(6)Target year of the Project
The Team explained that the facilities would be basically designed for the expected population of 2014, projecting 2.9% of population growth rate for five years in accordance with Japan's Grant Aid, starting from the commencement of the Study. However this could be applied only if the Team confirms the sufficient amount of water source to cover the demand of 2014.
The Rwandan side agreed with it.

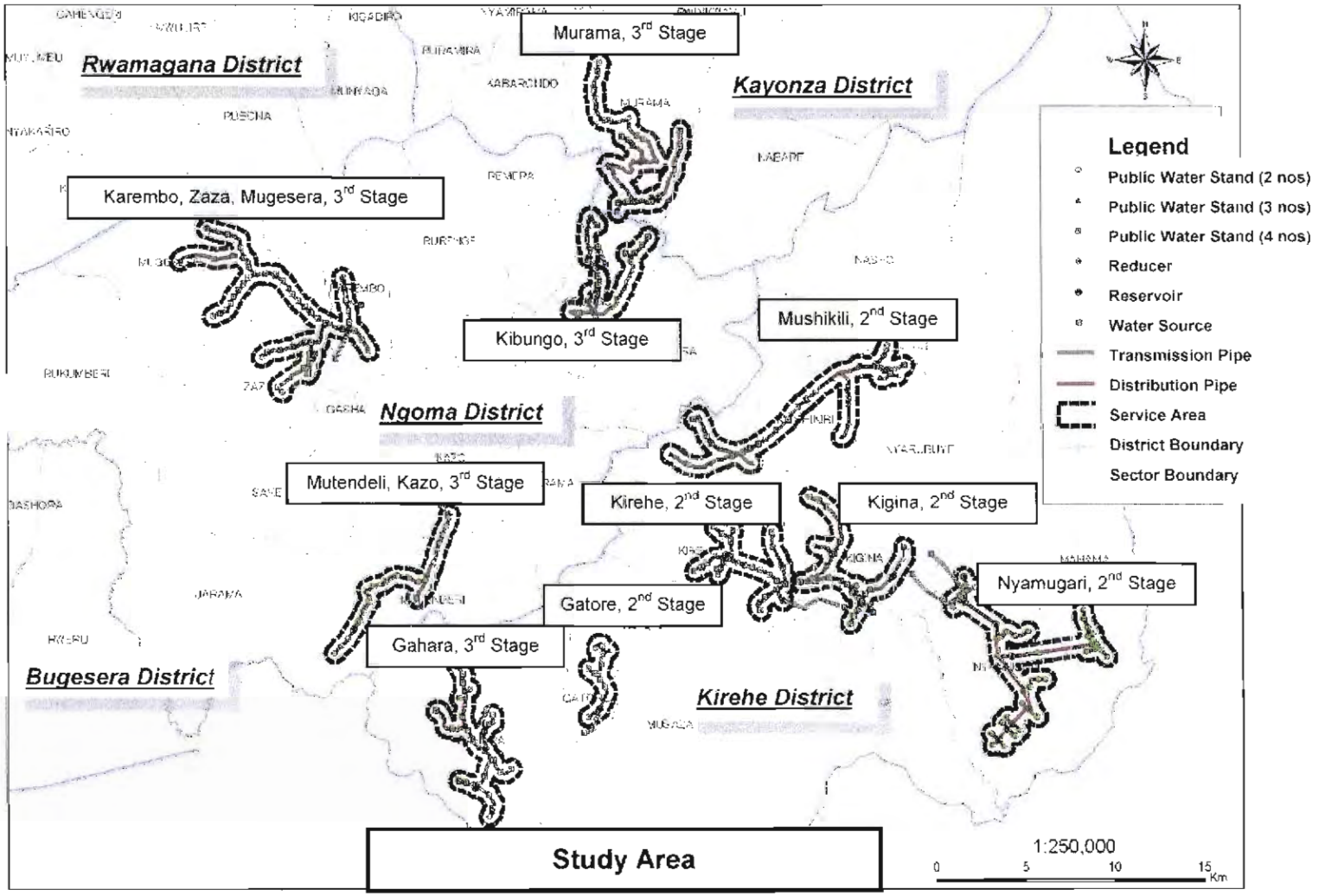
(7) Modality of Operation and Maintenance
The Rwandan side explained that practical modality of privatization in O&M of water supply schemes was in the process of finalization. The Team requested the Rwandan side to inform them the final form of the modality as soon as the process is completed in order to reflect it to the project.

END

Annex-1: Target Sites of the Study
Annex-2: Japan's Grant Aid Scheme / Major Undertakings to be taken by Each Government

Annex-1

Target Sites of the Study



Annex-2

JAPAN'S GRANT AID

The Government of Japan (hereinafter referred to as "the GOJ") is implementing the organizational reforms to improve the quality of ODA operations, and as part of this realignment, JICA was reborn on October 1, 2008. After the reborn of JICA, following the GOJ, Grant Aid for General Project is extended by JICA.

Grant Aid is non-reimbursable fund to a recipient country to procure the 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. The Grant Aid is not supplied through the donation of materials as such.

1. Grant Aid Procedures

Japanese Grant Aid is conducted as follows-

- Preparatory Survey (hereinafter referred to as "the Survey")
  - the Survey conducted by JICA
- Appraisal &Approval
  -Appraisal by The GOJ and JICA, and Approval by the Japanese Cabinet
- Determination of Implementation
  -The Notes exchanged between the GOJ and a recipient country
- Grant Agreement(hereinafter referred to as "the G/A")
  -Agreement concluded between JICA and a recipient country
- Implementation -Implementation of the Project on the basis of the G/A

2. Preparatory Survey

(1) Contents of the Survey

The aim of the Survey is to provide a basic document necessary for the appraisal of the Project by JICA and the GOJ. The contents of the Survey are as follows:

- Confirmation of the background, objectives, and benefits of the Project and also institutional capacity of agencies concerned of the recipient country necessary for the implementation of the Project.
- Evaluation of the appropriateness of the Project to be implemented under the Grant Aid Scheme from a technical, financial, social and economic point of view.
- Confirmation of items agreed on by both parties concerning the basic concept of the Project.
- Preparation of a basic design of the Project.
- Estimation of costs of the Project.

The contents of the original request by the recipient country 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 the Japan's Grant Aid scheme.

JICA 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 Survey, JICA uses (a) registered consulting firm(s). JICA

selects (a) firm(s) based on proposals submitted by interested firms.

(3) Result of the Survey

The Report on the Survey is reviewed by JICA, and after the appropriateness of the Project is confirmed, JICA recommends the GOJ to appraise the implementation of the Project.

3. Japan's Grant Aid Scheme

(1) The E/N and the G/A

After the Project is approved by the Cabinet of Japan, the E/N will be signed between the GOJ and the Government of the recipient country to make a plead for assistance, which is followed by the conclusion of the G/A between JICA and the Government of the recipient country to define the necessary articles to implement the Project, such as payment conditions, responsibilities of the Government of the recipient country, and procurement conditions.

(2) Selection of Consultants

The consultant firm(s) used for the Survey will be recommended by JICA to the recipient country to also work on the Project's implementation after the E/N and the G/A, in order to maintain technical consistency.

(3) Eligible source country

Under the Japanese Grant Aid, in principle, Japanese products and services including transport or those of the recipient country are to be purchased. When JICA and the Government of the recipient country or its designated authority 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, constructing and procurement firms, and the prime consulting firm are limited to "Japanese nationals". (The term "Japanese nationals" means persons of Japanese nationality or Japanese corporations controlled by persons of Japanese nationality.)

(4) 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 JICA. This "Verification" is deemed necessary to secure accountability to Japanese taxpayers.

(5) Major undertakings to be taken by 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 Annex.

(6) "Proper Use"

The Government of recipient country is required to maintain and use the facilities constructed and the 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.

(7) "Export and Re-export"

The products purchased under the Grant Aid should not be exported or re-exported from the recipient country.

(8) Banking Arrangements (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"). JICA 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 JICA under an Authorization to Pay (A/P) issued by the Government of the recipient country or its designated authority.

(9) Authorization to Pay (A/P)

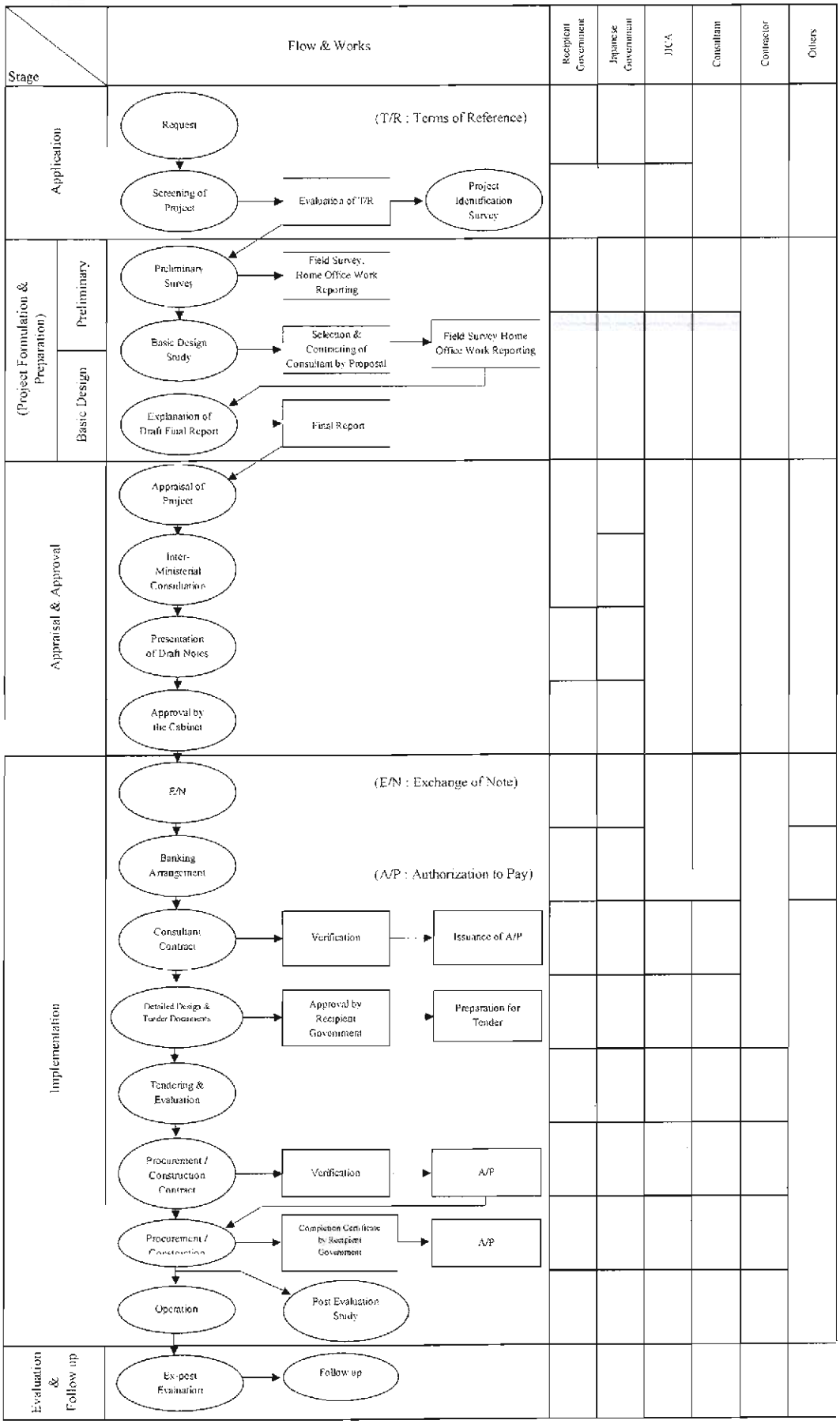
The Government of the recipient country should bear an advising commission of an Authorization to Pay and payment commissions to the Bank.

(10) Social and Environmental Considerations

A recipient country must ensure the social and environmental considerations for the Project and must follow the environmental regulation of the recipient country and JICA socio-environmental guideline.

(End)

Attachment 1 FLOW CHART OF JAPAN's GRANT AID PROCEDURES



Attachement-2

Major Undertakings to be taken by Each Government

No.	Items	To be Covered by Grant Aid	To be Covered by Recipient Side
1	To secure land		●
2	To clear, level and reclaim the site when needed		●
3	To construct gates and fences in and around the site		●
4	To construct parking lot	●	
5	To construct roads		
	1) Within the site	●	
	2) Outside the site		●
6	To construct the building	●	
7	To provide facilities for the distribution of electricity, water supply, drainage and other incidental facilities		
	1) Electricity		
	a. The distributing line to the site		●
	b. The drop wiring and internal wiring within the site	●	
	c. The main circuit breaker and transformer	●	
	2) Water Supply		
	a. The city water distribution main to the site		●
	b. The supply system within the site (receiving and elevated tanks)	●	
	3) Drainage		
	a. The city drainage main (for storm sewer and others to the site)		●
	b. The drainage system (for toilet sewer, ordinary waste, storm drainage and others) within the site	●	
	4) Gas supply		
	a. The city gas main to the site		●
	b. The gas supply system within the site	●	
	5) Telephone System		
	a. The telephone trunk line to the main distribution frame/panel (MDF) of the building		●
	b. The MDF and the extension after the frame/panel	●	
	6) Furniture and Equipment		
	a. General furniture		●
	b. Project equipment	●	
8	To bear the following commissions to the Japanese bank for the banking services based upon the B/A		
	1) Advising commission of A/P		●

	2) Payment commission		●
9	To ensure unloading and customs clearance at port of disembarkation in the 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	(●)	(●)
10	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		●
11	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 contracts		●
12	To maintain and use properly and effectively the facilities constructed and equipment provided under the Grant Aid		●
13	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 : Banking Arrangement

A/P : Authorization to Pay

( ): To be discussed between the Study Team and Government of Rwanda

MINUTES OF DISCUSSIONS
IMPLEMENTATION REVIEW STUDY ON THE PROJECT FOR RURAL WATER SUPPLY IN THE REPUBLIC OF RWANDA

(Explanation of Draft Final Report)

In June 2009, the Japan International Cooperation Agency (hereinafter referred to as "JICA") dispatched the Implementation Review Study Team on the Project for Rural Water Supply (hereinafter referred to as "the Project") to the Republic of Rwanda (hereinafter referred to as "Rwanda"), and through discussion, field survey, and technical examination of the results of the survey in Japan, JICA prepared a Draft Final Report of the Implementation Review Study.

In order to explain and to consult with the concerned officials of the Government of Rwanda on the contents of the Draft Final Report, JICA sent to Rwanda the Draft Final Report Explanation Team (hereinafter referred to as "the Team"), which is headed by Dr. MARUO Yuji, Senior Advisor, JICA, from December 20 to 24, 2009.

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

Kigali December 23, 2009

Dr. Yuji MARUO
Leader,
Implementation Review Study Team,
Japan International Cooperation Agency (JICA)

Ms. Marie Claire MUKASINE
Permanent Secretary
MININFRA
Republic of Rwanda

Mr. Yussuf MUGIRANEZA
Executive Secretary
Eastern Province
Republic of Rwanda

Mr. Protais MURAYIRE
Mayor,
Kirehe District
Republic of Rwanda

Mr. François NIYOTWAGIRA
Mayor,
Ngoma District
Republic of Rwanda

ATTACHMENT

1. Acceptance of the Draft Final Report

The Ministry of Infrastructure (MININFRA), Eastern Province, Kirehe District and Ngoma District agreed and accepted in principle the contents of the Draft Final Report explained by the Team.

2. Japan's Grant Aid scheme

The Rwandan side understood the Japan's Grant Aid Scheme and would take the necessary measures and allocate necessary budget properly for smooth implementation of the Project, as a condition for the Japan's Grant Aid to be implemented. The Grant Aid Scheme and necessary measures were described in the Annex-2 of the Minutes of Discussions signed by both Japanese side and Rwandan side (hereinafter referred to as "both sides") on June 8, 2009 (hereinafter refereed to as "the Previous M/D") , which is attached to the Draft Final Report of the Implementation Review Study of the Project.

3. Schedule of the Study

JICA will complete the final report in accordance with the confirmed items and send it to the Rwandan side by the end of March 2010.

4. Other Relevant Issues

(1) Project Cost Estimation

The Team explained to the Rwandan side the estimated project cost to be born by the Japanese side as attached in Annex 1(A). Both sides confirmed that this estimated cost was provisional and would be examined further by the Government of Japan for its final approval.

Furthermore, both sides confirmed that this estimated project cost should never be duplicated in any form nor disclosed to any other party(s) until the relevant contracts are awarded by MININFRA. This confinement of the estimated project cost is necessary for securing fairness of tender procedure.

The Team explained the estimated project cost to be born by the Rwandan side as attached in Annex 1(B), and requested the Rwandan side to secure necessary counterpart budget for the project implementation and report the result of budget arrangement to JICA Rwanda Office in writing by the end of June, 2010. The Rwandan side accepted it.

(2) Final Components of the Project

The Team explained that the Government of Japan would examine the contents of the Final Report of the Implementation Review Study of the Project and the final components would be decided by the Government of Japan.

The Rwandan side understood and agreed to the above explanation made by the Team.

(3) Obligations of the Rwandan side

Both sides confirmed the obligations of the Government of Rwanda which were described in Annex-3 and the Rwandan side committed to take responsibility on the respective items.

(4) Procedure of Environmental and Social Consideration

The Team explained that the early commencement of environmental and social consideration

procedure was critical for smooth implementation of the Project. The Team requested MININFRA to complete and submit the "Project Brief" to RDB/REMA (Rwanda Development Board / Rwanda Environment Management Authority) by 15th of January 2010, referring to the Draft Final Report submitted by the Team. The Team will provide to MININFRA all the necessary information of the Project for preparation of the Project Brief and, if necessary, Environmental Management Plan. MININFRA committed to assign a staff for processing Environmental and Social Consideration Procedure.

(5) Project Title in the Implementation Stage

The Team delivered that the Ministry of Foreign Affairs of Japan was intending to change the title of the Project in implementation stage as "The Project for Rural Water Supply (Phase II)" just for avoiding any confusion.

The Rwandan side requested to change the project title as "The Project for Rural Water Supply in Eastern Province".

The Team will convey the request from the Rwandan side to the Government of Japan.

End

Annex-1: Project cost estimation

Annex-2: Obligation of the Government of Rwanda

Annex-2: Obligations of the Government of Rwanda

ITEMS	MININFRA	Districts
To secure land necessary for construction of an intake facility, distribution reservoir and road to be used for maintenance		○
Tree felling and rootage removal for the construction of maintenance roads		○
To construct fences for water facilities		○
To explain to users of water sources to be developed for the project and get their agreement in writing		○
To take necessary procedures for environmental and social consideration	○	
To secure safe drinking water for the relevant people during the rehabilitation of existing water supply facilities		○
To provide data and information necessary for the implementation of the project	○	○
To provide storage space for equipment and materials, and for temporary work space during the period of the implementation of the project		○
To maintain security in and around the project site		○
To bear the cost for Banking Arrangement (commissions for Authorization to Pay and Payment commissions)	○	
To arrange tax exemptions and smooth custom clearance for importing of equipment and materials necessary for the project	○	
To exempt Japanese nationals form custom duties, internal taxes and other fiscal levies which would be imposed in Rwanda with respect to the supply of the products and services under the verified contract	○	
To properly operate and maintain the water supply facilities constructed and rehabilitated under Japan's Grant Aid		○
To assign necessary numbers of counterpart personnel for the activities in the "soft component" during the implementation stage		○

APPENDIX 5

Soft Component Plan

Implementation Review Study on the Project for Rural Water Supply in the Republic of Rwanda
Soft Component Plan

1. Background of the Soft Component Programme

The Government of Rwanda has requested support in the establishment of an operation and maintenance system which will be managed by a private organization or Water Users Association (WUA)under the supervision of the officer in charge of infrastructure in the local government authority for smooth and effective operation and maintenance of the water supply facilities constructed and rehabilitated by the project. In the study, the national plan and policy concerning rural water supply sector were reviewed, and the current status and challenges of the operation and maintenance system managed by the private organization and the department in charge of water in the local government were scrutinized. As a result, it was concluded that the support of the organization related to the operation and maintenance is indispensable for sustainability of the water supply, in terms of the following points:

As of December 2009, both Ngoma and Kirehe districts are still under consideration of a better way to introduce privatization, and the time framework for this process was not prepared. Both districts have decided to introduce privatization. Even though operation and maintenance is conducted by WUA, the required basic capacity of WUA is similar. Therefore, support to enhance the capacity of the district office including establishment of a management system for privatization, and establishing institutional administration system in private organization or WUA by the district office are designed to be conducted in the soft component programme.

(1) Encouragement of Privatization of Operation and Maintenance by the Government

In Rwanda, the operation and maintenance of water supply facilities has been the responsibility of the WUA since 1994. In 2004, the operation and maintenance system was assessed by the Rwandan Government and was concluded to be not properly managed due to inappropriate management and skills which were caused by several reasons, that is: 1) less ownership of users of water supply facilities, 2) members of water users association are volunteers, 3) less participation of users in operation and maintenance, 4) less capacity of water users association to address technical issues and financial aspects.

In order to overcome these challenges, the Rwandan Government has decided to make use of private sectors in line with the policy of Public Private Partnership (PPP) as a part of the sector strategy for 2004 to 2007, based on the results of discussion about operation and maintenance systems. In accordance with this change, the 2nd version of the Water and Sanitation Policy set in the year 2004 is now under revision. In the policy, necessity of cooperation with the private sector to secure the sustainability of the procurement of fund may be stated.

The Kayonza district, which is one of the target districts in the study, has already adopted privatization for operation and maintenance system. As it is mentioned above, though the Ngoma and Kirehe districts have already scheduled adopting privatization by the end of 2010, both districts are still under consideration to find better way to privatization.

(2) Necessity of Establishment of the Institutional Management System of Private Organization

The entrusted private organization for operation and maintenance is given the responsibility to manage the collected water tariffs in accordance with the condition of the contract. Therefore, the collected tariffs can be utilized not only for operation and maintenance but also for the sensitization of communities for the purpose of improvement of services. Introducing the new system, it is expected to secure the reliance on water supply services by giving the responsibility of repair of the facilities to private organizations.

In the case of the Kayonza district, a cooperative was selected for the operation and maintenance of the facility. Most of the members of the cooperative consisting of the president, vice president, treasurer, secretary, operator, technician and security guard, are members of the former water users association in other areas. However, it was reported that the maintenance plan of the decrepit facilities was inappropriately formulated due to insufficient experience of the members[1]. Though the collected water tariff is able to cover the operation and maintenance costs such as personnel cost, fuel cost and minor repairs, the cost for the expansion and replacement of the network in the future is not possible to be covered. Besides, a system of communication with the communities and the sector offices[2] has not been properly established. Judging from the current status of the private organization, further improvement of capacity of operation and maintenance is required.

(3) Necessity of Establishment of Management System in the Local Government Authority

The local government authority is the owner of the water supply facilities and has contracted with a private organization for the operation and maintenance through the tendering procedure. The improvement of reliance upon the water supply condition has been expected by introducing privatization. However, it is a concern that a stable water supply will not be secured. One of the reasons that the adequate services will not be provided is due to lack of provision in the contract for the responsibility of the replacement and expansion of the facilities.

In the current tendering procedure, the tenderers are regarded to agree with the contents of the tender document composed of the instruction to tenderers, the form of contract and the list of water supply facilities, once they participate in the tendering. The water tariff is uniformly set in the Kayonza district by the type of facility such as 20 Rwf/jerrican for pumped up piped facility, 10 Rwf/jerrican for gravity piped facility, which does not reflect the necessary cost for operation and maintenance. It is reported that the private organization has faced difficulties to manage water supply facilities caused by insufficient perception of the condition of the facilities.

In order to secure the sustainability of the water supply, the tenderers are required to be well experienced in operation and maintenance and conversant with the current status of water supply in the target area. In addition, it is needed to take appropriate action considering the actual situation in the target area.

Therefore, the tender document should include the description to make the client understand to what extent the tenderer perceives the current condition of the water supply in the target area, and how the

[1] JICA(2009) The Study on Improvement of Rural Water Supply in the Eastern Province in the Republic of Rwanda, Progress Report

[2] The word “sector” is the administrative body under the district. Agronom in the sector is a parson in charge of water issue. The lowest administrative body, which is under sector is “cell”.

tenderer is going to approach the challenges. In addition, enhancement of the capacity of the district on preparation of the tender documents and the assessment of the capacity of tenderes is a key factor to select the eligible private organization.

The district is required to monitor and advise on the private organization as the owner of the water supply facilities. In the case of the Kayonza district, they assess the performance of the private organization and decide on the continuation of the contract with the private organization. Therefore, it is also necessary to enhance the capacity to assess the relevance of the evaluation criteria and revise it, if necessary.

2. Objectives of the Soft Component

The objectives of the soft component are to establish the institutional administration system in the private organization or WUA for the operation and maintenance, and the system of management of the private organization or WUA in the district, in order to secure the sustainability of the project purpose of supplying safe drinking water to the residents in the project area, in conformity with the national policy of privatization of operation and maintenance of the water supply facilities.

3. Output of the Soft Component

The expected direct effects (Output) of the soft component are described below.

1) The system of support and management of private organization or WUA is strengthened in the Ngoma and Kirehe districts

Strengthening the system of management of private organization in the district is achieved by the activities for the enhancement of capacities for selection of a private organization and monitoring and evaluation. Expected outputs are as follows:

2) The institutional administration system of the private organization or WUA for operation and maintenance of the water supply facilities to be constructed and rehabilitated by the project is strengthened.

Strengthening the institutional administration system of the private organization for operation and maintenance is achieved by the activities for the improvement of communication between the private organization and communities, and the district/sector, and enhancement of capacity of the private organization or WUA.

4. Means of Verification of the Achievement

The achievement of the outputs set in the section 3 is verified by the following means.

1) The management system of private organization or WUA is strengthened in the Ngoma and Kirehe districts

- The revised version of the performance indicators for operation and maintenance is drafted.
- The revised version of the contract document to be concluded between the district and the

private organization is drafted.

- The procedure of tendering to select the private organization is improved.
- The training manuals of operation and maintenance are developed.
- Training is provided by the district office.
- The monitoring and follow up system for private organization is strengthened in the district.

2) The institutional administration system of the private organization or WUA for operation and maintenance of the water supply facilities to be constructed and rehabilitated by the project is strengthened.

- Revised version of regulation for institutional administration and operation of the facility is drafted.
- System for the operation of facilities and repair is improved.
- Capacities for finance and accounting are improved.
- Form of accountability to the district is prepared.
- System of public relations for communities is established

5. Activities of the Soft Component (Input Plan)

In order to achieve the objectives of the soft component and outputs, plan of activities are prepared. Activities related to each output are described as follows:

1) The system of management of private organization or WUA is strengthened in the Ngoma and Kirehe districts

- Explanation of strategy of privatization of O&M system to the districts and sectors, and encouragement of establishment of the task force
- Establishment of the task force and follow up
- Preparation of draft of the contract document on O&M services rendered by the private organization
- Development of the training manuals for enhancement of the capacity of private organization or WUA on O&M services
- Explanation of introduction of privatization of O&M system and the indicators for evaluation of the private organization to the target sectors
- Selection of the private organization
- Implementation of training of private organization or WUA on operation and maintenance.
- Supervision and monitoring of the activities related to O&M of water supply system

2) Activities for strengthening the system of institutional administration of the private organization or WUA for operation and maintenance of the water supply facilities to be constructed and rehabilitated by the project

- Providing training with the private organization to enhance the capacity for O&M, and on-the-job training of the Task Force
- Follow up on the activities mentioned above by the Task Force

Detail contents of the soft components such as activities, outputs, targets are described in Table A5-1.

Table A5-1 Plan of Activities of Soft Component Programme

Activity	Output	Target	Means of Implementation	Period	Implementer [Responsibility]	Output of Submission
Stage1 : Preparation for Contract with the Private Organization on O&M of Water Supply System						
1-1) Explanation of strategy of privatization of O&M system to the Districts and Sectors, and encouragement of establishment of the Task Force	Establishment of the Task Force under the initiative of the head of infrastructure department in each district is encouraged by means of explanation of strategy of privatization to the districts and sectors.	Ngoma and Kirehe districts, 11 Sectors	- Consultation with MININFRA, - Request to Districts by MININFRA	3 days/district	Japanese Consultant NGO/Local Consultant [Japanese Side]	- Minutes of Meeting - Activity Report
1-2) Establishment of the Task Force and Follow Up	Preparatory work and its supervision for introduction of the privatization are smoothly implemented by the task force established under the initiative of the head of infrastructure department in each district.	Ngoma and Kirehe districts	- Encouragement from MININFRA and District	0.5 months/district	MININFRA, District [Rwandan Side]	Member List
1-3) Setting the performance indicators for the assessment of achievement of O&M to be conducted by the private organization [Indicators to be Included] ☐ Amount of water supplied, Water quality standard ☐ Tariff setting, Tariff collection rate, UFW ☐ Water supply period ☐ Standard for Staffing ☐ Standard for Financing and Accounting ☐ Standard for Repairs	Performance Indicators for the assessment of activities performed by the private organization are set, and adopted to the selection of the private organization, and supervision and monitoring to be conducted by the district and the sector	Task Force established in Ngoma and Kirehe districts	- Workshop - Seminar	5 days/District	Japanese Consultant NGO/Local Consultant [Japanese Side]	- Training Report - Performance Indicator
1-4) Preparation of draft of the Contract document on O&M services rendered by the private organization	Roles and responsibilities of the district/sector and the private organization become clearly. Draft of the Contract to be concluded between district and private organization is developed.	Task Force established in Ngoma and Kirehe districts	- Workshop - Seminar - Preparation of Final Draft - Encouragement of approval by the district	4 days/district	Japanese Consultant NGO/Local Consultant [Japanese Side]	- Draft of Contract Document

Table A5-1 Plan of Activities of Soft Component Programme

Activity	Output	Target	Means of Implementation	Period	Implementer [Responsibility]	Output of Submission
1-5) Development of the training manuals for enhancement of the capacity of private organization or WUA on O&M services [Contents of Manual] ☐ Institutional Administration ☐ Development of draft of regulation for institutional administration and operation of water supply facility ☐ Operation and maintenance of water supply facility ☐ Financing and accounting ☐ Accountability ☐ Publicity	Training manuals for enhancement of the capacity of the private organization or WUA on O&M is developed and utilized in the training	Task Force established in Ngoma and Kirehe districts	- Assessment of training needs - Preparation of Training Manual	10 days	Japanese Consultant NGO/Local Consultant [Japanese Side]	- Training Manual
Stage 2 : Selection of the Private Organization (Tendering)						
2-1) Explanation about introduction of the privatization of O&M system and the indicators for evaluation of the private organization to the target sectors	Introduction of the privatization of O&M system is explained and agreed by the community. Framework of monitoring to be conducted by the community is established by giving explanation of the performance indicator set in the item 1-3 above.	Communities of 11 Sectors	- Meeting	2 days/sector	Japanese Consultant NGO/Local Consultant Task Force [Japanese Side]	- Minutes of Meeting - Handout

Table A5-1 Plan of Activities of Soft Component Programme

Activity	Output	Target	Means of Implementation	Period	Implementer [Responsibility]	Output of Submission
2-2) Selection of the Private Organization ☐ Preparation of tendering document ☐ Preparation of tender announcement ☐ Tender announcement ☐ Tender opening ☐ Contract negotiation, setting performance indicator ☐ Conclusion of the contract and its notification to the community	The private organization is selected following necessary procedures such as tender announcement, tendering, evaluation of tender, contract negotiation and conclusion of contract.	7 schemes	-Preparation of Tendering -Document -Preparation of Tender Announcement -Tender Announcement -Tender opening -Negotiation -Agreement of the Contract -Notification to the Community	15 days/scheme	Japanese Consultant NGO/Local Consultant Task Force [Japanese Side]	- Tender Document - Minutes of Meeting - Report of Result of Tendering
Stage 3: Enhancement of Capacity of the Local Government and the Private Organization or WUA on the Privatization						
3-1) Providing training with the private organization or WUA to enhance the capacity for O&M, and on-the-job training of the Task Force [Contents of Training] ☐ Institutional Administration ☐ Development of draft of regulation for institutional administration and operation of water supply facility ☐ Operation and maintenance of water supply facility ☐ Financing and accounting ☐ Accountability ☐ Publicity	Capacity of the private organization on O&M is enhanced by providing training in O&M with manuals developed in the item 1-5 above. Capacity of the Task Force in each district is enhanced by conducting the on-the-job training.	Private Organization or WUA, Task Force of each District	- Workshop - Training	5 day/scheme	NGO/Local Consultant Task Force [Japanese Side]	- Training Report
3-2) Follow up on the activities mentioned on item 3-1)	Follow up activities for the enhancement of capacity of the private organization or WUA are conducted, based on the perception of the current status of the O&M performed by the private organization	Private Organization or WUA	-Assessment of Training needs - Workshop - Training	3 days/scheme	NGO/Local Consultant Task Force [Japanese Side]	Training Report

Table A5-1 Plan of Activities of Soft Component Programme

Activity	Output	Target	Means of Implementation	Period	Implementer [Responsibility]	Output of Submission
Stage 4: Supervision and Monitoring						
4-1) Supervision and monitoring of the activities related to O&M of water supply system	Supervision and monitoring of the activities performed by the private organization or WUA are conducted by the district/sector, in accordance with the performance indicator.	Private Organization or WUA	- Monitoring visit - Assessment of the result of monitoring	1 day/2months/ scheme	NGO/Local Consultant Task Force [Japanese Side]	- Monitoring Report

6. Procurement of Resources for the Soft Component

Soft component is designed to be conducted in the Ngoma and Kirehe districts in accordance with privatization which has been promoted by the Rwandan government. It is composed of 1) Enhancement of system of support and supervision of private organization or WUA by the district office, and 2) Strengthening institutional administration system of private organization or WUA by the district office. In order to implement the soft component programme effectively and to achieve the expected outputs, the programme is designed to be managed by the well experienced Japanese Expert for enhancement of the capacity of private organization or WUA together with the Rwandan Consultants who have experiences on enhancement of the capacity of private organization and WUA in Rwanda.

The required skills of the personnel for the implementation are mentioned below.

(1) He/she is required to have experiences of 1) working in the project under Japan's Grant Aid scheme, 2) activities related to enhancement of private organization or WUA on operation and maintenance, and 3) coordination with concerned organization of the recipient country and Japan.

(2) He/she is required to have experiences of 1) activities related to establishment and enhancement of the capacity of private organization or WUA such as training, monitoring and evaluation, and 2) smooth communication with communities.

During the implementation of the programme, the experts and consultants are required to keep frequently communication with MININFRA and to coordinate with the concerned parties in Rwanda. In order to secure the sustainability of operation and maintenance of water supply facilities after completion of the project, the activities in the soft component programme shall be continued under the initiative of a parson in charge of water in the district office.

The activities of the soft component are implemented by the personnel listed below.

(1) Japanese Consultant (Expert in Operation and Maintenance): 1 person

The Japanese consultant is responsible for planning and management of the soft component, report to the Government of Rwanda and Japanese parties concerned, discussion and coordination with the parties concerned to the soft component programme, coordination with the implementation schedule of the project and providing instruction to the local resource persons related to the implementation of the programme.

(2) Counterpart Personnel from the MININFRA: 1 person

The counterpart personnel assigned by the Ministry of Infrastructure (MININFRA) is responsible for the supervision of implementation of the programme together with the Japanese consultant, and coordination with and request to the parties of the Rwandan side.

(3) Local NGO/Consultant

The local NGO/consultant, which has experienced the training of private organization and

WUA in operation and maintenance, is engaged in implementation of the activities of the soft component programme in collaboration with the PEAMR in which one of the activities is the encouragement of privatization of operation and maintenance in the rural water supply sector.

The experts are required to have experience of similar activities in the target area, and to be able to smoothly communicate with the communities.

1) Programme Coordinator : 1 person

The programme coordinator is to lead the activities in the field under the supervision of the Japanese consultant, and to manage the means, progress and output of activities and to report to the Japanese consultant. The programme coordinator is also required to have experience of working with similar activities as a leader.

2) Facilitator : 1 person

The facilitator is to assist the programme coordinator and is in charge of the activities to be implemented for the districts and private organization or WUA. The facilitator is required to have experience of working in establishment of the system for privatization and enhancement of the capacity of monitoring and evaluation.

(4) Person in Charge of Infrastructure in Each District

The person in charge of infrastructure in the district will participate in not only the activities for establishment of the system of management of the private organization or WUA in the district but also the activities for establishment of the institutional administration in the private organization or WUA as a resource person. Applying the outputs achieved during the activities carried out for the district to the activities for the private organization, it is expected that the established management system in the district would be further strengthened.

In case the participation of the person in charge of infrastructure in the district is not arranged because of other duties, the other member of the task force shall be substituted. The person engaged in the activities is required to report to the other members on the task force in the meeting or by the any other effective means, in order to share the latest information on the operation and maintenance in their district.

7. Implementation Schedule of the Soft Component

Implementation of the soft component will be scheduled to be in conformity with the implementation schedule of the construction work. (temporary schedule of the soft component programme is attached)

8. Output of the Soft Component

The outputs of submission are the completion report on the soft component to be submitted to

the Government of Rwanda and Japanese parties concerned, the performance indicator, draft of the contract to be concluded between the district and the private organization, training manual for enhancement of capacity of private organization or WUA, minutes of meeting, training report, workshop report, monitoring report, etc. The progress and achievement of the output is verified by referring to the documents mentioned above.

9. Cost Estimation of the Soft Component

- Japanese Side: 23, 099,000 Japanese Yen

10. Obligation of the Government of Rwanda

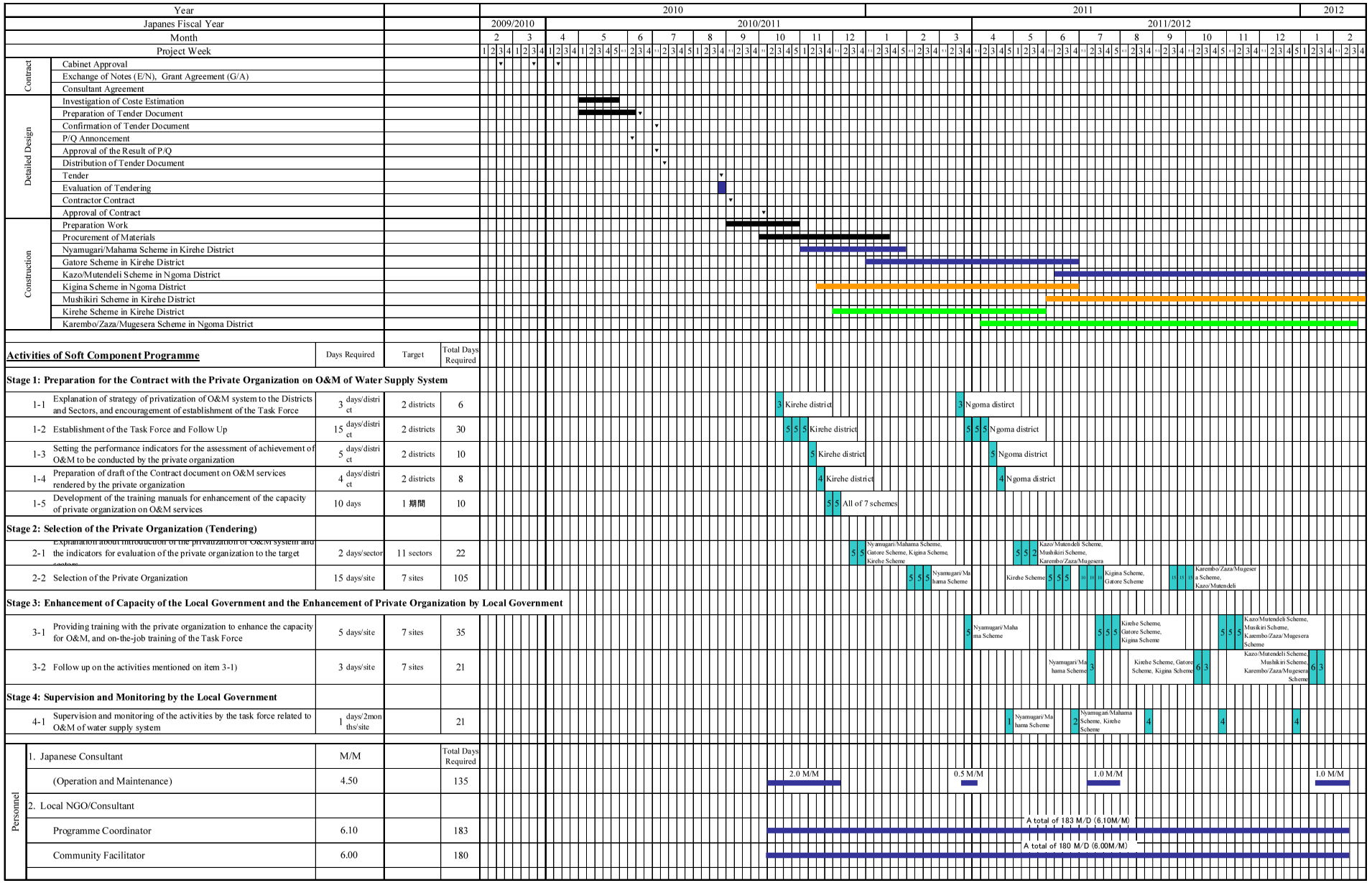
In order to secure the sustainability of operation and maintenance of the water supply facilities to be constructed and rehabilitated in the project, both the district and private organization or WUA are required to continue the activities related to the operation and maintenance based on what they have obtained from the soft component programme.

The district is required to provide support for the private organization or WUA depending on the status of operation and maintenance, conducting monitoring activities by the task force under the initiative of the person in charge of infrastructure. In addition, budget allocation for necessary activities is also a key factor to continue their tasks.

The private organization or WUA is required to improve the condition of operation and maintenance, adapting the change of socio-economic conditions to the current system, in addition to applying the skills and lessons learnt obtained from the soft component programme.

The MININFRA is required to improve the intercommunication mechanism between the MININFRA and local government authority by conducting not only the monitoring of conditions of operation and maintenance of the water supply facilities but also timely provision of national level information about the rural water supply sector.

Implementation Schedule for Soft Component Programme



APPENDIX 6

Other Relevant Data

(1) Technical Note
(2) Water Source Survey (Spring & Borehole)
(3) Geotechnical Investigation
(4) Possibility of Installation of Power Supply

Appendix 6. Other Relevant Data

(1) Technical Note

TECHNICAL NOTE
ON
THE IMPLEMENTATION REVIEW STUDY
ON
THE PROJECT FOR RURAL WATER SUPPLYIN THE REPUBLIC OF RWANDA

The Implementation Review Study Team (the Team) of Japan International Cooperation Agency (JICA) for the Project for Rural Water Supply in the Republic of Rwanda had a series of discussions on contents of the Study and matters related to the Project with MININFRA, based on provisional result of the Study.

As a result of the discussions, both parties agreed the following items.

1. Population growth rate

Though the population growth rate of 2.9% was agreed to apply to the Study in the Minutes of Discussion signed on 8th June 2009, the population growth rate applied to the Master Plan Study will be utilized for projection of the population in 2014 as shown Table 1. These rates are calculated in accordance with the population projected by the National Institute of Statistics in Rwanda.

Table 1 Population Growth Rate to be Applied to the Study

Year	2007～2012	2013～2017
Population Growth Rate (%/year)	2.40	2.12

2. Construction of water supply system for Kirehe Hospital and it's adjacent area

The Team will continue the Study on water supply scheme in Kirehe Sector including the Kirehe Hospital, since the specification of construction and schedule was not yet determined by the Rwandan Government. However, in case the Rwandan Government decides to implement the construction, the Team will be informed and the portion to be constructed by the Rwandan Government will be excluded.

3. Environmental Impact Assessment (EIA) procedure

The MININFRA will communicate with the Rwanda Environment Management Authority (REMA) to take necessary procedure for EIA after team have provided the MININFRA with the information necessary for the preparation of the Project Brief.

4. Water source for the water supply system in Gatore Sector

The Kirehe District will explain to the people who fetch water from the Samuko spring located in Gahara Sector that a portion of water will be transmitted to Gatore Sector, and get an agreement of them. The MININFRA will follow up this issue to ensure the water is supplied to Gatore Sector. The Team will make a design of tap near the water intake or receiving tank in accordance with the capacity of water source for the discussion among Japanese parties concerned.

5. Land Expropriation

Each District is responsible for land expropriation for the Project in accordance with the Law. The Team will inform each District through the MININFRA the necessary areas to be expropriated after the draft report is presented. The MININFRA will oversee this exercise .

Kigali, 23rd July 2009

山田洋史

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Ministry of Infrastructure

Appendix 6. Other Relevant Data

(2)Water Source Investigations（Spring）

1）Flow Rates of Springs

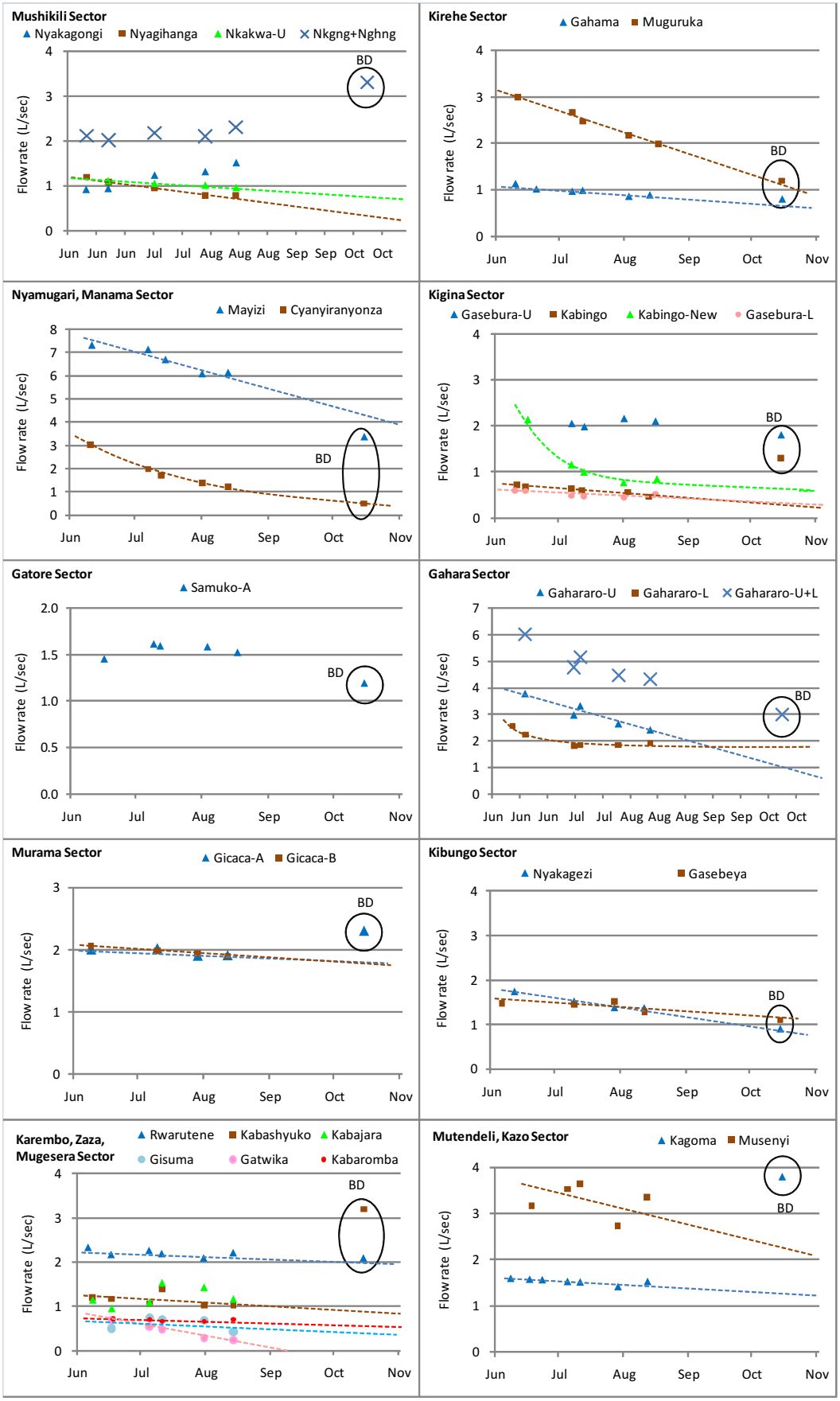
Measurement of flow rates of springs, which were selected as water sources in the Basic Design Study, were conducted in June 2009. It was observed that the flow rates of some springs were decreased compared to those measured in October 2005 during the Basic Design Study. In order to satisfy the necessary amount of water demand, measurement of flow rate and water quality analysis of 12 springs were conducted, in addition to the 14 springs selected in the Basic Design Study. In June, decreases of flow rates of springs were observed. Therefore, periodical measurement of 26 springs in total was conducted by the middle of August 2009, in order to observe the tendency of fluctuation of flow rates. The results of measurements are show in TableA6-1, and observed fluctuation of flow rate from June to August is shown with tendency line in Figure A6-1.

Table A6-1 Result of Flow Rate Measurement (1/2)

District	Sector	Spring	Latitude (South、degree)	Longitude (East、degree)	Elevation (m)	Flow rate(L/s) (date of meaasurement)	Flow rate measured in BD (L/s)	remarks
Kirehe	Mushikili	Nyakagongi	2.16604	30.72967	1581	0.92(09 Jun) 0.94(19 Jun) 1.24(10 Jul) 1.32(02 Aug) 1.52(16 Aug)	3.3	Only total yields of two spring was given in BD.
		Nyagihanga	2.16921	30.72712	1628	1.20(09 Jun) 1.08(19 Jun) 0.94(10 Jul) 0.78(02 Aug) 0.78(16 Aug)		
		Nkakwa-Upper	2.16008	30.72690	1627	1.12(19 Jun) 1.06(10 Jul) 1.02(02 Aug) 0.97(16 Aug)		Potential source. No information in BD.
	Kirehe	Gahama	2.26671	30.63568	1502	1.14(10 Jun) 1.02(20 Jun) 0.97(07 Jul) 0.99(12 Jul) 0.86(03 Aug) 0.89(13 Aug)	0.8	
		Muguruka	2.28619	30.70163	1555	2.99(11 Jun) 2.67(07 Jul) 2.47(13 Jul) 2.17(03 Aug) 1.99(17 Aug)	2.2	1.2L/sec was measured in June 2006.
	Nyamugari, Mahama	Mayizi	2.26057	30.74510	1513	7.34(11 Jun) 7.15(07 Jul) 6.72(15 Jul) 6.11(01 Aug) 6.16(13 Aug)	3.4	
		Cyanyiranyonza	2.26891	30.73481	1488	3.04(10 Jun) 1.98(07 Jul) 1.73(13 Jul) 1.39(01 Aug) 1.23(13 Aug)	0.5	
	Kigina	Kabingo	2.25660	30.73080	1579	0.72(11 Jun) 0.68(15 Jun) 0.64(07 Jul) 0.59(12 Jul) 0.56(03 Aug) 0.46(13 Aug)	1.3	
		Kabingo-New	2.29906	30.70778	1617	2.15(16 Jun) 1.16(07 Jul) 1.00(13 Jul) 0.77(01 Aug) 0.89(17 Aug)		Potential source. No information in BD.
		Gasebura-Upper	2.28819	30.71477	1522	2.05(07 Jul) 1.98(13 Jul) 2.16(01 Aug) 2.10(16 Aug)	1.8	
		Gasebura-Lower	2.28707	30.72487	1475	0.60(10 Jun) 0.58(15 Jun) 0.48(07 Jul) 0.47(13 Jul) 0.45(01 Aug) 0.52(16 Aug)		Potential source. No information in BD.
	Gatore	Samuko-A	2.34652	30.56853	1415	1.46(16 Jun) 1.62(09 Jun) 1.60(12 Jul) 1.59(03 Aug) 1.53(17 Aug)	1.2	
	Gahara	Gahararo-Upper	2.33734	30.51750	1349	3.78(16 Jun) 2.97(09 Jun) 3.32(12 Jul) 2.64(30 Jul) 2.41(14 Aug)	3.0	
		Gahararo-Lower	2.33525	30.51923	1347	2.56(10 Jun) 2.24(16 Jun) 1.81(09 Jul) 1.84(12 Jul) 1.84(30 Jul) 1.92(14 Aug)		Potential source. No information in BD.

Table A6-1 Result of Flow Rate Measurement (2/2)

District	Sector	Spring	Latitude (South、degree)	Longitude (East、degree)	Elevation (m)	Flow rate(L/s) (date of meaasurement)	Flow rate measured in BD (L/s)	remarks
Kayonza	Murama	Gicaca-A	2.09185	30.58697	1451	2.00(09 Jun) 2.02(10 Jul) 1.90(29 Jul) 1.91(12 Aug)	2.3	
		Gicaca-B	2.09230	30.58559	1446	2.06(09 Jun) 1.98(10 Jul) 1.94(29 Jul) 1.90(12 Aug)		Potential source. No information in BD.
Ngoma	Kibungo	Nyakagezi	2.10912	30.57676	1455	1.74(12 Jun) 1.52(10 Jul) 1.38(29 Jul) 1.37(12 Aug)	0.9	
		Gasebeya	2.11763	30.58045	1485	1.48(06 Jun) 1.46(10 Jul) 1.52(29 Jul) 1.28(12 Aug)	1.1	
	Karembo, Zaza, Mugesera	Rwarutene	2.13713	30.45503	1387	2.34(06 Jun) 2.18(17 Jun) 2.27(05 Jul) 2.20(11 Jul) 2.10(31 Jul) 2.22(14 Aug)	2.1	
		Kabashyuko	2.16403	30.44359	1362	1.20(08 Jun) 1.17(17 Jun) 1.06(05 Jul) 1.39(11 Jul) 1.03(31 Jul) 1.03(14 Aug)	3.2	
		Kabajara	2.16316	30.44449	1360	1.15(08 Jun) 0.96(17 Jun) 1.10(05 Jul) 1.53(11 Jul) 1.43(31 Jul) 1.17(14 Aug)		Potential source. No information in BD.
		Gisuma	2.16298	30.44968	1370	0.50(17 Jun) 0.74(05 Jul) 0.70(11 Jul) 0.69(31 Jul) 0.42(14 Aug)		Potential source. No information in BD.
		Gatwika	2.16241	30.45229	1374	0.70(17 Jun) 0.54(05 Jul) 0.48(11 Jul) 0.29(31 Jul) 0.24(14 Aug)		Potential source. No information in BD.
		Kabaromba	2.12242	30.42063	1377	0.72(18 Jun) 0.70(05 Jul) 0.67(11 Jul) 0.67(31 Jul) 0.71(14 Aug)		Potential source. No information in BD.
	Mutendeli, Kazo	Kagoma	2.23554	30.49630	1453	1.59(08 Jun) 1.57(17 Jun) 1.56(23 Jun) 1.52(05 Jul) 1.51(11 Jul) 1.41(29 Jul) 1.52(12 Aug)	3.8	
		Musenyi	2.25754	30.48394	1339	3.17(18 Jun) 3.53(05 Jul) 3.65(11 Jul) 2.74(29 Jul) 3.36(12 Aug)		Potential source. No information in BD.



Note: "BD" indicates the flow rate in October 2005

Figure A6-1 Chronological Change of Flow Rate of Springs

2）Development Potential of Spring

The development potential of spring was determined considering following standards.

i) The development potential should be the lowest flow rate among measurements in the Basic Design Study and Implementation Review Study in June to August 2009. During the Implementation Review Study, decrease of flow rate was observed in some springs. In this case, the estimated flow rate in October 2009 was compared to the flow rate measured in the Basic Design Study, and the lower rate should be utilized as development potential.

ii) The development potential is less than the flow rate in the Basic Design Study, other springs were added in order to cover the demand in the target area as much as possible. In case, the flow rate of a spring is expected to be low, the selection of the spring as the water source was determined considering the topographic characteristic of the location of spring.

The reason why the flow rate in October was regarded as the lowest rate is as follows.
The fluctuation of water levels of rivers and lakes in the study area is shown in Figure A6-2. The locations of gauging stations and catchment areas are shown in Table A6-2. As shown in Figure A6-2, the change of water levels corresponds to the precipitation. The water level of the Cyunuzi River, small and medium-sized rivers, changes about 1 month after the change of the precipitation. Meanwhile the highest levels in the lake or river with large catchment area appear 1 month after in May and the lowest levels appear 3 months after in October.

The flow rates of springs fluctuate corresponding to the fluctuation of precipitation like the water levels of rivers and lakes shown in Figure A6-2. The amplitude and the delay of phase of the flow rate of springs depend on the volume and character of their aquifer and recharge systems. The beginning of flow rate decreases were recognized in June at the springs with this decreasing tendency and change coinciding with the water levels of rivers and lake shown in Figure A6-1. Therefore it can be concluded that the lowest flow of the springs appear in October the same as those of the rivers and the lake.

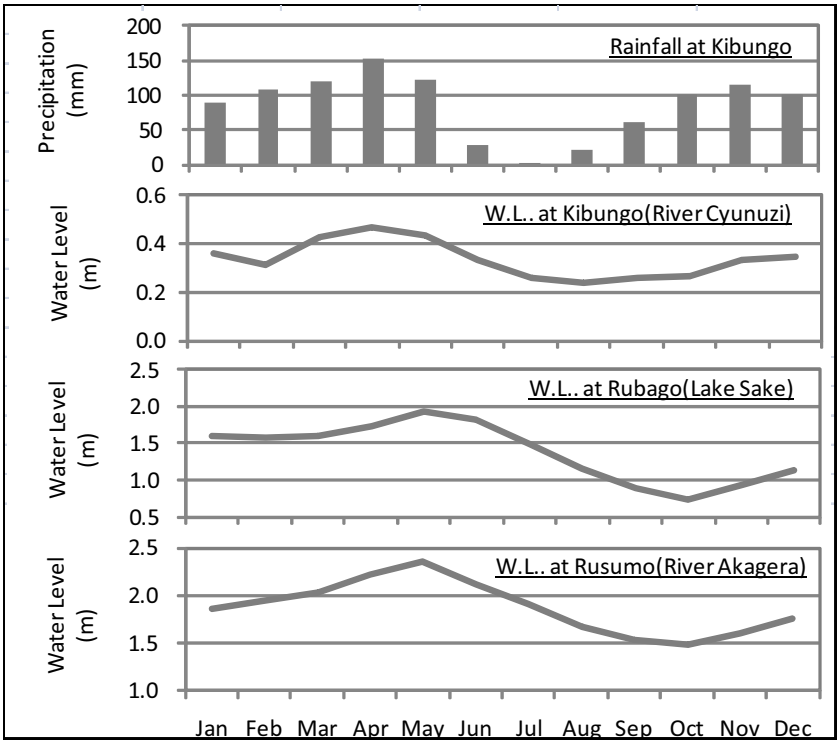


Figure A6-2 Relationship between Precipitation and Water Levels of River or Lake

Table A6-2 Location of Gauging Station and Catchment Area.

River/Lake	Station	Latitude (South)	Longitude (East)	Elevation (m)	Water collection area (km^2)	Duration of data
River Cyunuzi	Kibungo	2°16.30′	30°33.32′	1335	298	Oct 1995 - Feb 2000
River Akagera	Rusumo	2°22.92′	30°46.82′	1325	30200	Jan 1956 - Jun 1996
Lake Sake	Rubago	2°14.83′	30°24.13′	1337	58	Apr 1995 - Dec 2000 Nov 2007 - Dec 2007

The development potential of springs is shown in Table A6-3.

Table A6-3 Development Potential of Springs

District	Sector	Spring	Yield(L/sec)
Kirehe	Mushikili	Nyakagongi	0.9
		Nyagihanga	0.3
		Nkakwa-Upper	0.8
	Kirehe	Gahama	0.6
		Muguruka	1.1
	Nyamugari, Mahama	Mayizi	3.4
		Cyanyiranyonza	0.5
	Kigina	Gasebura-Upper	1.8
		Gasebura-Lower	0.3
	Gatore	Samuko-A	1.2
	Gahara	Gahararo Upper	1.0
		Gahararo Lower	1.8
Kayonza	Murama	Gicaca-A	1.8
		Gicaca-B	1.8
Ngoma	Kibungo	Nyakagezi	0.9
		Gasebaya	1.1
	Karembo, Zaza, Mugesera	Rwarutene	2.0
		Kabashuko	0.9
		Kabajara	1.0
		Gisuma	0.4
		Kabaromba	0.6
	Mutendeli, Kazo	Kagoma	1.2
		Musenyi	2.2

3） Water quality

The result of water quality analysis is shown in Table A6-4. Parameters shown in bold letters mean the parameters exceed WHO guideline for drinking water. Bacteria were detected in some springs and it was necessary to disinfect with chlorine to eliminate them.

Table A6-4 Result of Water Quality Analysis

Parameters	Water Temp.	pH	EC	Turbidity	Total Dissolved Solids	Alkalinity as CaCO3	Total Hardness as CaCO3	Calcium Hardness as CaCO3	Calcium as Ca2+	Magnesium as Mg2+	Hydrogen carbonate as HCO3-	Ammonium nitrogen as NH3-N	Nitrite Nitrogen as NO2-N	Nitrate as NO3-N	Fluoride as F-	Chloride as Cl-	Sulfate as SO42-	Iron as Fe	Manganese as Mn	Zinc as Zn	Salinity	Sodium as Na	Potassium as K	Lead as Pb	Feacal Coliforms	E. Coliforms
Unit	deg C		mS/m		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	mg/L	Cfu /100ml	Cfu /100ml
WHO Standard				5	1000							1.50	0.200	50.0	1.5	250.0	250.0		0.100	3.00		200.0		0.010	0	0
Nyakagongi	23.0	5.62	7.89	6	38	25.6	28	20	8	1.9	25.6	0.00	0.002	1.2	0.2	0.0	3.0	0.17	0.000	0.09	0.0	11.2	47.5	0.000	**80**	< 1
Nyagihanga	22.9	5.80	28.50	2	20	89.1	135	90	36	10.9	89.1	0.00	0.002	1.1	0.1	1.3	16.0	0.01	0.000	0.01	0.2	25.8	57.0	0.000	**> 100**	**> 100**
Nkakwa-Upper	22.9	5.11	3.87	3	16	19.5	10	9	4	0.2	19.5	0.00	0.002	1.0	0.0	0.0	0.0	0.02	0.005	0.25	0.0	8.9	18.6	0.000	**2**	< 1
Gahama	22.0	5.55	23.60	4	113	26.8	44	28	11	3.9	26.8	0.00	0.000	0.7	0.0	9.9	0.0	0.08	0.009	0.21	0.1	31.5	23.1	0.001	**20**	< 1
Muguruka	22.2	5.84	18.42	3	89	42.7	68	50	20	4.3	42.7	0.03	0.001	1.4	0.1	2.3	4.0	0.01	0.000	0.08	0.1	11.2	13.7	0.000	< 1	< 1
Mayizi	23.8	5.55	10.71	65	27	30.5	17	15	6	0.5	30.5	0.19	0.003	0.3	0.0	2.0	1.0	0.21	0.026	0.10	0.0	10.3	13.8	0.000	**10**	< 1
Cyanyiranyonza	24.0	4.97	2.45	6	10	13.4	7	5	2	0.5	13.4	0.03	0.001	1.4	0.1	2.3	4.0	0.01	0.000	0.08	0.1	3.5	14.4	0.000	**30**	< 1
Kabingo	23.3	5.64	5.80	4	27	25.6	20	12	5	1.9	25.6	0.00	0.000	0.5	0.2	0.1	1.0	0.04	0.008	0.14	0.0	17.4	11.4	0.000	**> 100**	**100**
Kabingo-New	20.9	5.74	3.93	9	18	12.2	20	11	4	2.2	12.2	0.02	0.001	0.7	0.1	1.1	0.0	0.13	0.030	0.14	0.0	11.5	9.5	0.000	**> 100**	< 1
Gasebura-Upper	24.8	5.56	5.46	9	26	20.7	21	12	5	2.2	20.7	0.00	0.001	1.0	0.0	2.0	1.0	0.05	0.000	0.10	0.0	8.4	13.0	0.000	< 1	< 1
Gasebura-Lower	23.5	5.36	5.72	1	25	15.4	17	8	3	2.2	15.4	0.00	0.000	1.1	0.0	2.1	0.0	0.02	0.010	0.19	0.0	5.5	13.8	0.000	**> 100**	< 1
Samuko-A	23.9	5.61	3.87	2	18	28.1	37	16	6	2.5	28.1	0.00	0.015	0.3	0.2	0.6	0.0	0.01	0.032	0.38	0.0	12.1	12.7	0.000	**> 100**	< 1
Gahararo-Upper	22.7	5.54	15.29	12	73	34.2	48	33	13	3.6	34.2	0.02	0.000	1.7	0.1	1.3	2.0	0.12	0.002	0.32	0.1	17.5	16.3	0.008	**1**	< 1
Gahararo-Lower	22.0	5.45	15.10	6	70	28.1	43	29	12	3.4	28.1	0.00	0.000	1.6	0.0	2.0	2.0	0.09	0.011	0.10	0.1	16.7	15.3	0.004	**10**	< 1
Gicaca-A	21.1	5.65	29.00	1	147	32.9	76	52	21	5.8	32.9	0.00	0.001	2.4	0.2	10.7	6.0	0.09	0.000	0.09	0.1	25.2	16.8	0.000	**40**	10
Gicaca-B	21.4	5.51	25.70	1	126	35.4	68	47	19	5.1	35.4	0.00	0.001	1.5	0.2	11.5	5.0	0.01	0.000	0.06	0.1	18.6	13.2	0.004	**7**	5
Nyakagezi	21.9	4.93	22.50	5	106	18.3	43	38	15	1.2	18.3	0.00	0.002	1.5	0.0	7.5	2.0	0.06	0.016	0.14	0.1	50.6	183.3	0.000	< 1	< 1
Gasebeya	21.5	5.63	28.20	2	137	48.8	67	43	17	5.8	48.8	0.00	0.001	1.8	0.1	7.3	4.0	0.12	0.000	0.45	0.1	27.7	13.0	0.000	**4**	< 1
Rwarutene	23.1	4.69	10.99	6	47	13.4	25	16	6	2.2	13.4	0.00	0.001	1.9	0.0	0.7	1.0	0.02	0.024	0.09	0.0	13.1	13.8	0.000	**9**	< 1
Kabashyuko	22.9	5.41	9.66	8	43	17.1	36	29	12	1.6	17.1	0.01	0.002	1.4	0.0	1.6	2.0	0.07	0.014	0.41	0.0	5.7	14.6	0.008	**6**	< 1
Kabajara	22.7	5.58	8.08	17	36	18.3	18	12	5	1.4	18.3	0.06	0.009	0.8	0.0	1.8	2.0	0.16	0.013	0.06	0.0	4.8	12.3	0.000	**> 100**	**> 100**
Gisuma	24.1	5.00	7.32	2	33	25.6	29	25	10	0.9	25.6	0.03	0.000	1.6	0.1	1.8	2.0	0.07	0.002	0.05	0.0	4.9	16.4	0.000	< 1	< 1
Gatwika	22.5	5.27	9.18	9	40	20.7	28	16	6	2.9	20.7	0.00	0.003	1.6	0.1	8.4	2.0	0.06	0.003	0.06	0.0	7.4	11.2	0.010	**20**	< 1
Kabaromba	23.1	5.36	17.25	5	82	22.0	39	24	10	3.6	22.0	0.01	0.002	1.1	0.1	3.3	3.0	0.07	0.020	0.45	0.0	14.8	17.5	0.000	< 1	< 1
Kagoma	22.9	4.93	12.65	0	52	14.6	27	18	7	2.3	14.6	0.01	0.001	2.2	0.0	0.3	2.0	0.03	0.000	0.74	0.0	48.7	82.5	0.000	< 1	< 1
Musenyi	22.0	5.58	13.29	6	69	20.7	41	23	9	4.4	20.7	0.00	0.001	1.9	0.1	1.2	3.0	0.07	0.006	0.12	0.1	24.3	19.9	0.003	< 1	< 1

(3)Water Source Investigation (Borehole)

Pumping test and water quality analysis of 1 existing borehole located in Gatore sector in Kirehe district were conducted in order to evaluate the possibility of utilization of the borehole for the replacement of hand pump. The coordinates of the borehole are E02.29710 and E30.56857. The purpose of pumping test is to confirm that whether the borehole has enough yield for hand pump operation.

The results of development by air lifting and step draw down test are shown in Table A6-5 and A6-6, respectively. The result of water quality analysis conducted by the laboratory of National University of Rwanda is shown in Table A6-7.

As results of the investigations, it was confirmed that the yield of borehole is at least 15 litres/minute, and it is enough capacity for the hand pump operation. This yield is also satisfied with the criteria given in the Basic Design Study which is 675 litres/hour(11.25 litres/minute). Water quality is satisfied with WHO drinking water standards.

Table A6-5 Result of Air Lifting

1.

Date : **13/ Juillet/2009** Type of Test : Airlift

Compressor Atlas Copco : 210l/s 14 bars

Static Water level Before Airlifting : **2.14 m** from **Top** Location GPS: 563181-9746311

Depth of PVC Pipe installation of 1" : 26,50m

Cock Time	Time after Pump started (min)	Water level S (m)	Draw Down S - S (m)	Yield (M3/ H)	Discharge Q (Lit/Min)	Remarks (color)
14h	0					
	0.5					
	1			1,8m3/h	30l/min	Brown color
	1.5					
	2					
	2.5			2,1m3/h	35l/min	Brown color
	3					
	3.5					
	4					
	4.5			1,860m3/h	31l/min	Brown color
	5					
	6					
	7					
	8					
	9			1,920m3/h	32l/min	Brown color
	10					
	12					
	14					
	16					
	18					
	20			1,8m3/h	30l/min	Brown color
	22					
	24			2,040m3/h	34l/min	White color
	26					
	28					
14h30	30					
	35			2,058m3/h	34,3l/min	White color
	40					
	45					
	50					
	55					
15h	60			1,986m3/h	33,1l/min	White color
	70					
	80					
15h30	90			2,034m3/h	33,8l/min	White color
	100					
	110					
16h	120			2,0374m3/h	33,8l/min	White color

Table A6-6(1) Step Drawdown Test (1st Step)

PUMPING TEST RECORD

Yield : 600ltr / hr

Date : **16/ Juillet/2009** Type of Test : **Step**

Pump Type : GRUNDFOS 3 " Submersible DEPTH : 27,00m Well N° :

Static Water level Before Pumping **2.18 m** from **Top** Location : RUREMBO 1

DISTRICT → KIREHE

Clock Time	Time after Pump started (min)	Water level S (m)	Draw Down S - S (m)	V notch Mesuring (mm)	Discharge Q (Lit/Min)	Remarks (Temperature,EC, PH)
11 h 15	0	2.18			8l/min	
	0.5	3.65	1.47			
11 h 16	1	3.77	1.59			
	1.5	3.85	1.67			
11 h 17	2	3.90	1.72			
	2.5	3.94	1.76			
11 h 18	3	3.93	1.75			T25°, EC 146,7, PH 5,88
	3.5	3.95	1.77			
11 h 19	4	3.98	1.80			
	4.5	4.00	1.82			
11 h 20	5	4.00	1.82			
11 h 21	6	4.01	1.83			
11 h 22	7	4.03	1.85			
11 h 23	8	4.05	1.87			
11 h 24	9	4.07	1.89			
11 h 25	10	4.08	1.90			
11 h 27	12	4.10	1.92			
11 h 29	14	4.28	2.10		11l/min	
11 h 31	16	4.54	2.36			
11 h 33	18	4.88	2.70			
11 h 35	20	4.96	2.78			
11 h 37	22	5.05	2.87		10l/min	
11 h 39	24	5.08	2.90			
11 h 41	26	5.10	2.92			
11 h 43	28	5.13	2.95			
11 h 45	30	5.15	2.97			T25°, EC 156, PH 5,87
11 h 50	35	5.18	3.00			
11 h 55	40	5.19	3.01			
12 h 00	45	5.23	3.05			
12 h 05	50	5.25	3.07			
12 h 10	55	5.26	3.08		10l/min	
12 h 15	60	5.27	3.09			T25°, EC 154, PH 5,81
12 h 25	70	5.30	3.12			
12 h 35	80	5.32	3.14			
12 h 45	90	5.32	3.14			
12 h 55	100	5.33	3.15			
13 h 05	110	5.34	3.16			
13 h 15	120	5.34	3.16			T25°, EC 157,5, PH 5,83

Table A6-6(2) Step Drawdown Test (2nd Step)

PUMPING TEST RECORD

900ltr / hr

Date : **16/ Juillet/2009**
Pump Type : GRUNDFOS 3 " Submersible DEPTH : 27,00m
Static Water level Before Pumping **2.18 m** from **Top**

Type of Test : **Step**
Well N° :
Location : RUREMBO 1
DISTRICT → KIREHE

Clock Time	Time after Pump started (min)	Water level S (m)	Draw Down S - S (m)	V notch Mesureing (mm)	Discharge Q (Lit/Min)	Remarks (Temperature,EC, PH)
13 h 15	0	5.34				T25°, EC 157,5, PH 5,83
	0.5	6.12	0.78		15l/min	
13 h 16	1	6.11	0.77			
	1.5	6.16	0.82			
13 h 17	2	6.22	0.88			
	2.5	6.27	0.93			
13 h 18	3	6.30	0.96			
	3.5	6.33	0.99			
13 h 19	4	6.35	1.01			
	4.5	6.37	1.03			
13 h 20	5	6.39	1.05			
13 h 21	6	6.42	1.08			
13 h 22	7	6.43	1.09			
13 h 23	8	6.45	1.11			
13 h 24	9	6.47	1.13		15l/min	
13 h 25	10	6.48	1.14			T25°, EC 155,9, PH 5,65
13 h 27	12	6.50	1.16			
13 h 29	14	6.51	1.17			
13 h 31	16	6.53	1.19			
13 h 33	18	6.54	1.20			
13 h 35	20	6.55	1.21			
13 h 37	22	6.56	1.22			
13 h 39	24	6.56	1.22			
13 h 41	26	6.59	1.25			
13 h 43	28	6.59	1.25			
13 h 45	30	6.59	1.25			T25°, EC 149,1 PH 5,76
13 h 50	35	6.59	1.25			
13 h 55	40	6.60	1.26			
14 h 00	45	7.01	1.67			
14 h 05	50	7.46	2.12			
14 h 10	55	7.56	2.22			
14 h 15	60	7.59	2.25		15l/min	T25°, EC 155,7 PH 5,71
14 h 25	70	7.61	2.27			
14 h 35	80	7.67	2.33			
14 h 45	90	7.66	2.32			
14 h 55	100	7.67	2.33			
15 h 05	110	7.67	2.33			
15 h 15	120	7.68	2.34			

Table A6-6(3) Step Drawdown Test (3rd Step)

PUMPING TEST RECORD

1800ltr / hr

Date : **16/ Juillet/2009**
Pump Type : GRUNDFOS 3 " Submersible DEPTH : 27,00m
Static Water level Before Pumping **2.18 m** from **Top**

Type of Test : **Step**
Well N° :
Location : RUREMBO 1
DISTRICT → KIREHE

Cock Time	Time after Pump started (min)	Water level S (m)	Draw Down S - S (m)	V notch Mesureing (mm)	Discharge Q (Lit/Min)	Remarks (Temperature,EC, PH)
15 h 15	0	7.68				
	0.5	8.22	0.54		30l/min	
15 h 16	1	8.56	0.88			
	1.5	8.72	1.04			
15 h 17	2	8.81	1.13			
	2.5	8.97	1.29			
15 h 18	3	9.11	1.43			
	3.5	9.27	1.59			
15 h 19	4	9.46	1.78			
	4.5	9.70	2.02			
15 h 20	5	10.10	2.42			T25°, EC 149,9, PH 5,63
15 h 21	6	10.50	2.82			
15 h 22	7	10.90	3.22			
15 h 23	8	11.16	3.48			
15 h 24	9	11.30	3.62			
15 h 25	10	11.39	3.71		30l/min	T25°, EC 149,1, PH 5,57
15 h 27	12	11.53	3.85			
15 h 29	14	11.60	3.92			
15 h 31	16	11.65	3.97			
15 h 33	18	11.85	4.17			
15 h 35	20	11.90	4.22			
15 h 37	22	11.95	4.27			
15 h 39	24	11.99	4.31			
15 h 41	26	12.02	4.34			
15 h 43	28	12.07	4.39			
15 h 45	30	12.08	4.40			T25°, EC 147,8 PH 5,56
15 h 50	35	12.23	4.55			
15 h 55	40	12.27	4.59			
16 h 00	45	12.30	4.62		30l/min	
16 h 05	50	12.33	4.65			
16 h 10	55	12.34	4.66			
16 h 15	60	12.35	4.67			T25°, EC 144,6 PH 5,97
16 h 25	70	12.62	4.94			
16 h 35	80	12.65	4.97			
16 h 45	90	12.67	4.99			
16 h 55	100	12.67	4.99			
17 h 05	110	12.69	5.01			
17 h 15	120	12.70	5.02		30l/min	T25°, EC 153,4 PH 5,72

Water analysis report

GROUND WATER

1 Sampling Point : BOREHOLE RUREMBO
2 Sector : GATORE
3 District : KIREHE
4 Date of sampling : 16 – 07 – 2009
5 Date of analysis : 20 – 07 – 2009
6 Code : Nº 27

Table A6-7 Result of Water Quality Analysis (Borehole)

	Parameters physico-chemical and bacteriolocal	Unit	Result	Rwanda Standards for Drinking water
1.	Turbidity	FTU	0	5
2.	Total Dissolved Solids	mg/l	478	500
3.	Alkalinity	mg/l $CaCO_3$	61	
4.	Total Hardness as $CaCO_3$	mg/l $CaCO_3$	42	250
5.	Calcium Hardness as $CaCO_3$	mg/l $CaCO_3$	23	200
6.	Calcium as Ca^{2+}	mg/l Ca^2	9.2	80
7.	Magnesium as Mg^{2+}	mg/l Mg^2	4.6	12
8.	Hydrogen carbonate as HCO_3^-	mg/l HCO_3	61	
9.	Ammonium nitrogen as NH_3-N	mg/l	0.01	0.5
10.	Nitrite Nitrogen as NO_2^--N	mg/l	0.003	0.1
11.	Nitrate as NO_3^- - N	mg/l	0.8	10
12.	Fluoride as F^-	mg/l	0.22	1.5
13.	Chloride as Cl^-	mg/l	8.0	250
14.	Sulfate as SO_4^{2-}	mg/l	1	250
15.	Iron as Fe	mg/l	0.04	0.3
16.	Manganese as Mn	mg/l	0.001	0.1
17.	Zinc as Zn	mg/l	0	3
18.	Salinity	‰	0.1	
19.	Sodium as Na	mg/l	21.000	200
20.	Potassium as K	mg/l	13.965	12
21.	Lead as Pb	mg/l	0.000	0.01
22.	Feacal Coliforms	Cfu/100ml	< x 10^0 Cfu/100ml	0
23.	E. Coli	Cfu/100ml	< x 10^0 Cfu/100ml	0

(3) Geotechnical Investigations

Table A6-8 Summary

No.	Spring	Scheme	UTM Zone	UTM Easting	UTM Northing	Distance of Digging Point From Target Intake as 'Z1' (m)	Water Level (in Dig Point) (m)	Basement Rock Level (in Dig Point)(m)	Distance of Testing Point From Target Intake as 'Z2' (m)	Water Level 'J' at Testing Point (m)	Water Level 'H' at Target Point Intake (m)	Basement Rock Level (in Testing Point)(m)	Depth range (m)	Characteristic of Soil at Testing Point	Color of Soil at Testing Point	Color Code at Testing Point	Note
01	NYAKAGUNGA		56M	247626,34	9960485,64	600,0	-1,0	No Rock	8,0	0,0	On Surface	No Rock	0,00 - 0,30	silty clay soil	Dark grayish brown	5YR4/2	
02	NYAGIHANGA	Mushikiri	56M	247245,34	9965487,64	No Dig Point	No Water	No Water	8,0	No Water	On Surface	No Rock	0,00 - 0,90	silty clay soil above sub rounded rock	Dark brown	5YR2/3	
03	NKAKWA UPPER		56M	233455,64	9961287,63	No Dig Point	No Dig Point	No Dig Point	6,0	-1,0	On Surface	No Rock	0,00 - 0,60 0,60 - 1,20	silty clay soil organic matter and clay soil	Dark brown Brownish black	5YR3/4 5YR1.7/1	No Rock encountered at Dig Point
04	GAKAMA	Kirehe	56M	237036,45	9949659,23	200,0	-2,0	No Rock	8,0	0,6	On Surface	0,5	0,00 - 0,60	Hard laterite soil	Dark brown	5YR2/3	
05	MUGURUKA		56M	231404,72	9944170,48	20,0	No Water	Very Hard Soil									
06	KAFINGO		56M	247625,33	9950391,42	13,0	-2,0	-2,0	8,0	-2,0	On Surface	-2,0	0,00 - 1,30 1,30 - 2,00	Silty Sand Soil Sub rounded quartzite rocks	Dark grayish brown	5YR2/1	
07	GASEBURA UPPER	Kigina	56M	246858,26	9946890,74	No Dig Point	No Dig Point	No Dig Point	10,0	1,0	On Surface	[illegible]	0,00 - 0,80 0,80 - 1,70	Sandy Clay Soil Soil within quartzite sub rock	Dark grayish brown	5YR3/2	
08	GASEBURA-LOWER		56M	247087,56	9944032,65	10,0	-2,0	-3,0	5,0	-1,0	On Surface	[illegible]	0,00 - 0,60 0,60 - 1,40	Silty Sand Soil Sub Rounded quartzite rocks	Brownish Brownish black	5YR3/4 5YR1.7/1	Water and gravel were found in dig point bottom at 3m
09	KALINGO NEW		56M	247600,42	9950420,82	No Dig Point	No Dig Point	No Dig Point	8,0	2,0	On Surface	2,0	0,00 - 1,30 1,50 - 2,00	Silty Sand Soil Sub rounded quartzite rocks	Dark grayish brown	5YR2/1	
10	GALARAKO UPPER	Gahara	56M	223928,98	9944428,65	No Dig Point	No Dig Point	No Dig Point	7,0	-0,6	On Surface	No Rock	0,00 - 0,60 0,60 - 1,20	Plastic Clayey Soil Unknown	Grayish brown Unknown	5YR4/1	
11	GALARAKO LOWER		56M	224169,29	9944647,65	15,0	-1,0	No Rock	6,0	0,5	On Surface	No Rock	0,00 - 0,50 0,50 - 2,00	Plastic Clayey Soil Unknown	Grayish brown Unknown	5YR4/1	
12	SAMUKO A	Gatore	56M	229586,43	9940405,29	5,0	-1,0	-1,2	8,0	1,2	On Surface	-1,2	0,00 - 0,40 0,40 - 0,90 0,90 - 1,20	Clayey Soil (With banana tree roots) Clayey Soil (No banana tree roots) Quartzite Rock in bottom of borehole	Dark grayish brown Dark grayish brown	5YR3/2 5YR3/3	
13	NYAKAGEZI	Kibungo	56M	230295,34	9967355,85	100,0	-1,0	No Rock	7,0	0,6	On Surface	No Rock	0,00 - 0,20 0,20 - 0,60 0,60 - 2,60	Clayey Soil organic matter and clay soil Unknown	Dark grayish brown Brownish black Unknown	5YR3/3 5YR1.7/1	Dig point up to 2m but water found at 1m depth
14	CASERAYA		56M			No Dig Point	No Dig Point	No Dig Point	7,0	-0,5	On Surface	No Rock	0,00 - 0,45 0,45 - 1,30	Clayey Soil Unknown	Dark grayish brown Unknown	5YR2/2	
15	KAMUTENA		56M	217046,77	9968550,68	8,0	No Water	-4,0									Dig point up to 4m but no water
16	KABASHUKO		56M	219041,65	9960553,44	6,0	-2,5	-2,6	6,0	-0,7	On Surface	No Rock	0,00 - 0,70 0,70 - 1,60	Clayey Soil Unknown	Brown Unknown	5YR3/4	
17	KADAJARA	Karambo, Zaza, Mugesera	56M	215742,26	9960669,58	No Dig Point	No Dig Point	No Dig Point	5,0	1,0	On Surface	No Rock	0,00 - 0,20 0,20 - 0,60 0,60 - 1,20	Embankment from mining work Clayey Soil Organic Sandy clayey soil	 Grayish brown Dark grayish brown	 5YR5/2 5YR5/2	
18	GISUMA		56M	216325,47	9960639,93	No Dig Point	No Dig Point	No Dig Point	4,0	0,0	On Surface	No Rock	0,00 - 1,70 1,70	Sandy Clay Soil Unknown	Dark grayish brown Unknown	5YR5/1	Pebble stones found after
19	GATWUIKA		56M	216607,20	9960745,14	No Dig Point	No Dig Point	No Dig Point	5,0	0,4	On Surface	No Rock	0,00 - 0,40 0,40 - 3,40	Clayey Soil Unknown	Dark grayish brown Unknown	5YR3/3	
20	KAKAROMBA		56M	213078,70	9965165,67	25,0	-1,2		7,0	-0,6	On Surface	No Rock	0,00 - 1,60	Clayey Soil	Gravel soil lying on a dark grayish brown sandy clay	5YR4/6	
21	KAGUMA	Mutendeli, Kazo	56M	221488,63	9952670,92	15,0	-1,5	-1,0									Water/Stones at 2m
22	MUSENYI		56M	220137,22	9950228,88	7,0	-1,5		8,0	-0,5	On Surface	-2,6	0,00 - 2,60	Sandy Silt Soil lying on a lateritic soil	Grayish brown	5YR5/1	
23	GICACA A		56M			No Dig Point	No Dig Point	No Dig Point	6,0	0,3	On Surface	0,9	0,00 - 0,90	Sandy Clay Soil within pebble rocks	Grayish brown	5YR2/2	
24	GICACA-B	Murama	56M			16,0	-0,8	-1,0	10,0	-0,6	On Surface	No Rock	0,00 - 0,60 0,65 - 1,50 1,00 - 1,60	Silty Clayey Soil Plant rubbish Clay lying on a grayish brown soil	Dark grayish brown Brownish black Dark grayish brown to Grayish green	5YR3/2 5YR1.7/1 5YR2/1 to 5YR4/1	

Table A6-9 Result of Soil Analysis

		Grain Size															Plastisity %					Solidity	
Spring	Depth of Sampling	>63.5	63.5 - 50.8	50.8 - 38.1	38.1 - 25.4	25.4 - 19.1	19.1 - 12.7	12.7 - 9.52	9.52 - 4.76	4.76 - 2.38	2.38 - 1.19	1.19 - 0.59	0.59 - 0.297	0.297 - 0.149	0.149 - 0.074	<0.074	Liquid Limit	Plastic Limit	Plasticity Index	Natural Water Content	Consistency Index	Specific gravity	Coefficient of Permeability
	m	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm						g/cm^3	cm/sec
																	WL	WP	IP	W	Ic	Gs(ρ s)	k
Rwarutene	1	0	0	0	0	0	0.33	0.44	1.23	1.41	1.27	1.59	6.41	7.74	5.25	74.33	23.7	18.3	5.4	10.87	2.38	2.13	$1.44*10^{-9}$
	2	0	0	0	0	6.56	3.2	4.28	10.86	9.8	7.57	4.86	6.49	5.05	6.38	34.95	19.3	13.2	6.1	11.49	1.28	2.21	$1.4*10^{-7}$
	3	0	0	0	0	0	0	0	0.08	0.24	0.68	1.38	6.2	7.01	7.44	76.98	26.15	18	8.15	16.12	1.23	2.43	$9.05*10^{-10}$
	4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	24.5	18.5	6	14.30	1.7	2.47	$9.8*10^{-9}$
Kabashuko	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	26.4	18.3	8.1	11.94	1.79	2.07	$5*10^{-9}$
	1.5	0	0	0	0	0	0	0	0.04	0.11	0.5	1.31	4.78	14.02	13.65	65.61	21.5	16.8	4.7	29.51	2.7	1.89	$3.4*10^{-10}$
	3	0	0	0	0	0	0	0	0.1	0.1	0.66	2.51	8.35	20.56	14.44	53.28	17.7	14.3	3.4	23.97	2.84	1.95	$6*10^{-11}$
Musenyi	1	0	0	0	0	0	0	0	0.18	0.38	1.25	5.01	16.72	9.83	11.01	55.63	19.9	14.7	5.2	16.15	0.72	1.96	$2.87*10^{-10}$
	2	0	0	0	0	0	0	0	0.18	0.72	1.97	5.05	12.05	9.53	17.94	52.55	22.5	16.6	5.9	18.81	0.63	1.73	$4.1*10^{-8}$
	3	0	0	0	0	0	0	0.29	5.39	8.84	7.33	3.28	8.91	5.62	5.38	54.96	27.75	25	2.75	30.29	1.92	1.62	$2.32*10^{-10}$
Kabaromba	1	0	0	0	0	0	0	0.33	0.31	0.29	2.75	7.59	27.88	12.39	3.92	44.53	21.5	17.6	3.9	12.88	2.21	2.14	$2.74*10^{-10}$
	2	0	0	0	0	0	0	0	0	0.12	2.01	4.81	13.89	11.65	4.19	63.32	29.7	23.67	6.03	19.81	1.64	2.25	$8.2*10^{-11}$
	3	0	0	0	0	0	0	0.61	0.53	0.89	4.29	6.61	16.73	11.83	3.92	54.59	29.1	21.26	7.84	24.72	0.56	2.28	$5.8*10^{-11}$
Kagoma	1	0	0	0	0	0.68	0.51	0.33	1.41	1.16	1.99	4.42	12.05	12.53	10.95	53.97	19.7	17.4	2.3	12.81	3	2.24	$2.3*10^{-8}$
	2	0	0	0	3.97	0.65	6.01	2.19	4.73	3.91	7.16	15.85	26.49	9.77	3.61	15.67	-	-	-	-	-	2.59	$1.2*10^{-7}$
	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2.62	$1.34*10^{-8}$
Gicaca B	1	0	0	0	0	0	0	0	0.31	0.13	0.54	6.24	42.39	16.19	5.26	28.95	-	-	-	-	-	2.17	$2.5*10^{-10}$
	2	0	0	0	0	0	0	0.22	0.2	0.24	0.79	6.66	35.66	16.59	6.83	32.81	16.4	13.8	2.6	19.29	2.11	1.92	$1.37*10^{-10}$
	3	0	0	0	0	0	0.52	0.27	0.73	1.12	1.32	1.39	3.4	8.66	7.06	75.53	23.9	18.4	5.5	22.26	0.7	1.85	$4.85*10^{-11}$
	4	0	0	0	0	0	0.43	0.74	2.38	2.36	1.77	1.55	2.43	5.67	7.49	75.18	22.7	16.4	6.3	25.41	1.43	1.98	$4.76*10^{-11}$
Gasebura	1	0	0	0	2.01	2.24	0.26	0.74	1.35	0.75	0.74	2.68	21.97	16.66	7.34	43.24	19.4	15.5	3.9	14.16	1.34	1.99	$3.14*10^{-8}$
	2	0	0	0	4.77	5.96	1.12	1.37	1.4	0.99	0.82	2.54	16.32	13.85	7.05	43.8	22.35	15.9	6.45	12.75	1.49	2.37	$7.5*10^{-9}$
	3	0	0	0	0.83	3.22	5.65	1.32	2.04	1.53	1.23	2.06	6.94	2.95	1.56	54.06	37.15	30	7.15	31.18	0.17	2.59	$6.87*10^{-9}$
Nyakagongi	1	0	0	0	0	0	0	0	0.41	0.63	0.79	1.26	3.07	13.67	4.57	75.59	24.15	15.17	8.98	23.24	0.90	2.03	$7.4*10^{-10}$
	2	0	0	0	0	0	0	0	0.43	0.13	0.16	0.21	0.6	3.57	11.99	82.92	23.6	15.9	7.7	31.41	2.01	2.24	$2.08*10^{-10}$
	3	0	0	0	0	0	0.5	0.13	0.14	0.12	0.89	7.06	25.85	20.28	10.24	34.8	19.95	12.7	7.25	21.16	1.17	2.2	$1.2*10^{-10}$
Gahararo	1	0	0	0	0	0	0.37	0.32	1.2	1.24	1.37	0.92	1.38	2.91	4.06	86.22	27.5	20	7.5	28.73	1.16	2.35	$2.7*10^{-10}$
Gahama	1	0	0	0	0	1.12	0.89	1.32	3.44	3.95	3.37	1.61	1.31	1.5	2.11	79.8	27.7	19.8	7.9	19.90	0.99	2.12	$5.5*10^{-10}$
	2	0	0	0	1.2	4.7	6	4.34	10.54	9.83	6.9	3.14	1.85	1.65	1.65	39.31	25.1	15.05	10.05	20.42	0.53	2.16	$2.7*10^{-9}$
Nyakagezi 1	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2.43	$1.87*10^{-9}$
	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	24.8	13.6	11.2	34.18	1.84	2.34	$7.3*10^{-10}$
Nyakagezi 2	1	0	0	0	0	0	0	0	0	0.17	0.52	1.17	1.75	2.65	4.85	88.88	24.5	16.7	7.8	11.95	1.61	2.37	$5.01*10^{-10}$
	2	0	0	0	0	0	0.32	0.48	2.65	3.73	3.91	0.75	2.31	2.31	5.47	78.07	24.15	19.2	4.95	17.19	1.41	2.37	$4.14*10^{-10}$
Muguruka	1	0	0	0	0	5.34	13.76	15.21	25.9	16.87	6.84	1.38	0.86	0.65	0.78	12.42	28.7	20.4	8.3	2.12	3.2	2.33	$5.5*10^{-8}$
Samuko A	1	0	0	0	0	0	0	0	0	0.25	1.43	5.39	23.12	18.4	6.54	44.87	20.8	15.9	4.9	4.68	3.29	2.46	$1.1*10^{-9}$
Kabingo	2	0	0	0	5.26	3.76	5.11	5.17	7.56	2.01	0.83	2.11	11.8	24.87	11.59	19.93	20.7	15.5	5.2	7.60	2.52	1.94	$3.6*10^{-8}$

Figure A6-3 Location Map of Geotechnical Investigations

Appendix 6. Other Relevant Data

(4) Possibility of Installation of Commercial Power Supply

The cost of installation of commercial power line to each project site was estimated so as to evaluate the possibility of the installation of the lines prior to the commencement of the Project. The study team provided the Electrogaz with the coordinates of springs for the calculation of distance between the existing power line and springs. The unit cost of installation of medium voltage line is 120,000 US$/km, and that of low voltage line is 70,000 US$/km. Based on the distance and unit cost provided by Electrogaz, the study team calculated the installation cost for each project site. The result is shown in Table A6-10.

In Kirehe district, installation of national grid is under progress as of December 2009. The distance from planned power line to the springs will be 1 to 2 km in some schemes, and installation cost of additional power line to those springs is expected to be relatively lower. Since installation of power line is not completed as of December 2009, generators will be installed.

Table A6-10 Cost for Installation of Power Line

District	Sector	Spring	Dist(km)	Middle Voltage	Low Voltage	US$	Yen
				120,000 US$/km	70,000 US$/km		93.94673
Ngoma	Kibungo	Nyakagezi	9.7	1,044,000	70,000	1,114,000	104,656,657
	Karembo,Zaza	Kabashuko	13	1,440,000	70,000	1,510,000	141,859,562
	Mugesera	Kabaromba	16	1,800,000	70,000	1,870,000	175,680,385
	Mutendeli,Kazo	Kagoma	8	840,000	70,000	910,000	85,491,524
		Musenyi	9	960,000	70,000	1,030,000	96,765,132
Kayonza	Murama	Gicaca-A	16	1,800,000	70,000	1,870,000	175,680,385

As shown in Table A6-8, the cost for installation of power line was estimated at 100 to 200 million Japanese Yen per spring. The direct cost for installation of generator with the capacity of 50kVA is estimated at 5 million Japanese Yen. Considering the difference between 2 sorts of power sources, relevance of installation of power line is evaluated as lower, from the view point of initial cost investment.

The study team asked MININFRA the possibility of installation of power line by own fund. MININFRA responded that it was impossible to install it since no budget was allocated in this period. They expressed opinion that generator is needed to be installed in the project, and installation of power line would be discussed by MININFRA with consideration of availability of budget since the water user fee would become lower if power was supplied from power line.

Consequently, electric power for operation of pump in most of schemes will be supplied by generator excluding the Rwarutene water source in Karembo/Zaza/Mugesera scheme.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