Chapter 3
Project Evaluation and Recommendation

CHAPTER 3
PROJECT EVALUATION AND RECOMMENDATIONS

3-1 Project Effect

3-1-1 Effects of Implementation of the Project and Improvements

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

Table 3.1 Effects of Implementation of the Project and Improvements

Current Situation and Problems	Measures for the Project	Effects and Improvements
In the target communities of 124, the current domestic water sources are dependent on river water, rain water, shallow wells. During the dry season, these water sources are dried up and therefore, residents, mainly women and children, have to take water far from the residential areas. Under the above-mentioned situation, stable and safe water source and reduction of work load for women and children are one of important issues to be solved. In addition, learning of technology and know-how for operation and maintenance and improvement of sanitation situation in these communities are required for ensuring sustainability of the Project.	Construction of water supply facilities with water source of boreholes and spring water in the 124 target communities of 4 districts in the study area Technical guidance / support for operation and maintenance by Soft-component Scheme	Population of 150,700 in the target communities of 124 is able to access safe and stable water sources for domestic use.

3-1-2 Direct Effects

(1) Increase of served population, service ratio, and stable and safe water

The estimated incremental population with safe drinking water source is worked at 150,700 by the implementation of the Project, and the service ratio is raised to 31.3 % from the current 27.6 %.

Table 3.2 Parameters of Existing and Planned Water Supply Condition

Parameters	Existing Condition in 2001		Planned Condition in 2008
Served Population (1000 persons)	Machakos	330.0	374.7
	Kitui	50.5	91.3
	Makueni	109.6	138.7
	Mwingi	29.8	65.9
Total of 4 Districts		519.9	670.6
Service Ratio (%)	Machakos	36.4	41.3
	Kitui	9.8	17.7
	Makueni	14.2	18.0
	Mwingi	9.8	21.7
Average of 4 Districts		27.6	31.3

(2) Reduction of walking distance to water point and work load to women and children

An average distance to water point is 5.2 km in accordance with the District Development Plan (2002-2008), and planned to be reduced to 4.4 km, shortening distance of 0.8 km.

Table 3.3 Parameters of Existing and Planned Distance to Water Point

Parameters	Existing Condition in 2001		Planned Condition in 2008
Average Distance to Water Point (km)	Machakos	5.0	4.6
	Kitui	5.0	3.2
	Makueni	4.5	3.9
	Mwingi	10.0	5.7
Average of 4 Districts		5.2	4.4

3-1-3 Indirect Effects

1) Improvement of community ownership and participation,

2) Enhancement of capacity and skills of local administration to support communities in establishment of community-based operation and maintenance system,

3) Development of capacity of target communities in operation and maintenance of improved water supply system,

4) Increase of community awareness in personal health and sanitation, and understanding of correlation with safe water use, and

3-2 Recommendations

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

1) Immediate organization of water users association

In order to ensure smooth and sustainable operation and maintenance of the

water supply facilities to be provided by the Project, it is required to provide technical guidance and sensitization for water users associations (WUA) of the target communities. Therefore, MOWI should closely coordinate with the agencies concerned, and organize WUA at each target community immediately after the Exchange of Notes for the Project, in order to ensure smooth commencement and effective operation of these activities.

It is confirmed through the Study that the WSPs of 59 target communities in Kitui and Mwingi districts are organized by Tana WSB. While, the Athi WSB is under preparation of plan for establishment of WSPs in Machakos and Makueni districts.

2) Land acquisition at facility site

In order to drill boreholes and construct water supply facilities smoothly, the captioned work, which is undertakings of Government of Kenya, should be completed till the end of the detailed design.

3) Community's undertakings for construction of fence and pipelines

It is required to take consent for the captioned undertakings of communities. This consent shall be ensured by MOWI till the end of the detailed design of the Project, as well as organization of WUA.

4) Preparation of business plan including operation and maintenance plan

It is sure that the WUA is required to prepare the captioned plans, which is obligation of water service provider (WSP), as result of the water sector reform for ensuring sustainability of the water scheme. Therefore, MOWI shall provide support to WUA of the target communities during and after the implementation of the Project.

5) Securing staff and budget for undertakings of Government of Kenya

It is requested for MOWI to execute appropriate preparation for securing staff and budget for undertakings of Government of Kenya, described in the section 3.5.

3-3 Project Justification

The Project is justified for implementation under the Grant Aid Scheme fro the following aspects:

1) The target communities of 155, which could not have stable and safe water source in vicinity area, enable to have safe and stable water supply in their community areas by implementation of the Project.

2) The Project aims to improvement of water service ratio by construction of water supply facilities with boreholes or spring water, and to shorten the long access distance to water points. The Project contributes to improvement of extremely poor water supply condition for population of 150,700.

3) It is possible for the Kenyan side to operate and maintain the water supply facilities because of no requirement for complicated engineering.

4) This Project contributes to the rural area development and eradication of poverty in the ninth national development plan 2002-2008 and consistent with the national policy of the Government of Kenya.

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

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

3-4 Conclusion

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

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

1) In order to establish sustainable operation and maintenance of the target communities, MoWRMD should organize the water users associations (WUA) of these communities, and facilitate to transfer WUA to the water service provider (WSP)

2) MoWRMD should improve ownership of the communities for the water supply facilities through the support to the target communities and raise sustainability of the Project.

3) Monitoring of performance by the target communities for operation and maintenance should be done to clarify the effects of the Project and improve the operational performance continuously.

Appendices

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

Appendix-1
Member List of the Study Team

Appendix-1：Member List of the Study Team

Name	Position	Affiliation
INAMURA, Jiro	Team Leader (Discussion on the Inception Report)	Deputy Resident Representative, JICA Kenya Office
TOKUHASHI, Kazuhiko	Team Leader (Discussion on the Technical Note)	Deputy Resident Representative, JICA Kenya Office
KINOMOTO, Hiroyuki	Team Leader (Explanation of the Draft Final Report)	Team Director, Environmental Management Team, Project Management Group III, Grant Aid Management Department, JICA
KENMIYA, Misa	Planning Management Officer (Discussion on the Inception Report)	Assistant Resident Representative, JICA Kenya JICA
ESAKI, Chie	Planning Management Officer (Discussion on the Technical Note)	Assistant Resident Representative, JICA Kenya JICA
MURAKAMI, Jun	Planning Management Officer (Explanation of the Draft Final Report)	Environmental Management Team, Project Management Group III, Grant Aid Management Department, JICA
SAKAMOTO, Masanobu	Chief Consultant/Rural Water Supply Planner	Nippon Koei Co., Ltd.
KAMO, Hajime	Structural Designer/Tender Document Specialist	Nippon Koei Co., Ltd.
YAMADERA, Akira	Pipeline Designer/Cost Estimator/Procurement Planner	Nippon Koei Co., Ltd.
KANAI, Shigeru	Electrical Engineer/Mechanical Engineer	Nippon Koei Co., Ltd.
KIKUCHI, Seiji	Operation and Maintenance Planning Specialist	Nippon Koei Co., Ltd.

Appendix-2
Survey Itinerary

Appendix-2: Survey Itinerary

1. 1st Field Survey (December 4, 2005 to March 25, 2006)

No	Date	Member	Activities	Stay
1	Dec 4 (Sun)	Sakamoto	Move (Tokyo – Dubai)	On board
2	5 (Mon)	Sakamoto	Move (Dubai – Nairobi)	
		Inamura/Sakamoto	Courtesy Call to Japanese Embassy/JICA Kenya Office	Nairobi
3	6 (Tue)	Inamura/Sakamoto	Discussion with MoWI	Nairobi
4	7 (Wed)	Inamura/Sakamoto Kamo	Discussion with MoWI Move (Tokyo – Dubai)	Nairobi
5	8 (Thu)	Inamura/Sakamoto Kamo	Signing on the Minutes of Discussion Move (Dubai – Nairobi)	Nairobi Nairobi
6	9 (Fri)	Sakamoto/Kamo	Discussion with Mwingi District Water Office	Nairobi
7	10 (Sat)	Sakamoto Kamo	Move (Nairobi – Dubai) Investigation and Analysis	Nairobi
8	11 (Sun)	加茂	Investigation and Analysis	ﾅｲﾛﾋﾞ
・				
38	Jan20(Tue)	Kamo/Yamadera	Move (Tokyo – Dubai)	On board
39	21 (Wed)	Kamo/Yamadera	Move (Dubai – Nairobi)	Nairobi
40	22 (Thu)	Kamo/Yamadera	Investigation and Analysis	
・				
57	29 (Tue)	Kamo/Yamadera	Investigation and Analysis	Nairobi
58	30 (Mon)	Kamo/Yamadera Kanai	Investigation and Analysis Move (Tokyo – Dubai)	Nairobi On board
59	31 (Tue)	Kamo/Yamadera Kanai	Investigation and Analysis Move (Dubai – Nairobi)	Nairobi
60	Feb1 (Wed)	Kamo/Yamadera/Kanai	Investigation and Analysis	Nairobi
・				
71	12 (Sun)	Yamadera/Kanai Kamo	Investigation and Analysis Move (Nairobi – Dubai)	Nairobi On board
72	13 (Mon)	Yamadera/Kanai Kamo	Investigation and Analysis Move (Dubai – Tokyo)	Nairobi
73	14 (Tue)	Yamadera/Kanai	Investigation and Analysis	Nairobi
74	15 (Wed)	Yamadera/Kanai	Investigation and Analysis	Nairobi

No	Date	Member	Activities	Stay
75	16 (Thu)	Yamadera/Kanai	Investigation and Analysis	Nairobi
76	17 (Fri)	Yamadera/Kanai	Investigation and Analysis	Nairobi
77	18 (Sat)	Kamo/Yamadera Kanai	Investigation and Analysis Move (Nairobi – Dubai)	Nairobi On board
78	19 (Sun)	Kamo/Yamadera Kanai	Investigation and Analysis Move (Dubai – Tokyo)	Nairobi
79	20 (Mon)	Kamo/Yamadera	Investigation and Analysis	Nairobi
・				
93	Mar6 (Mon)	Kamo/Yamadera Sakamoto	Investigation and Analysis Move (Tokyo – Dubai)	Nairobi On board
94	7 (Tue)	Kamo/Yamadera Sakamoto	Investigation and Analysis Move (Dubai – Nairobi)	Nairobi
95	8 (Wed)	Tokuhashi/Esaki/Sakamoto/ Kamo/Yamadera	Discussion on Technical Note	Nairobi
96	9 (Thu)	Tokuhashi/Esaki/Sakamoto/ Kamo/Yamadera	Preparation of Minutes of Discussion	Nairobi
97	10 (Fri)	Kamo/Yamadera	Investigation and Analysis	Nairobi
・				
105	18 (Sat)	Kamo/Yamadera	Investigation and Analysis	Nairobi
106	19 (Sun)	Yamadera Kamo	Investigation and Analysis Move (Nairobi – Dubai)	Nairobi On board
107	20 (Mon)	Yamadera Kamo	Investigation and Analysis Move (Dubai – Tokyo)	Nairobi
・				
110	23 (Thu)	Yamadera	Investigation and Analysis	Nairobi
111	24 (Fri)	Yamadera	Move (Nairobi – Dubai)	On board
112	25 (Sat)	Yamadera	Move (Dubai – Tokyo)	

2. 2nd Field Survey (April 26, 2006 to June 4, 2006)

No	Date	Member	Activities	Stay
1	Apr26 (Wed)	Kikuchi	Move (Tokyo – Dubai)	On board
2	27 (Thu)	Kikuchi	Move (Dubai – Nairobi)	Nairobi
3	28 (Fri)	Kikuchi	Discussion with MoWI	Nairobi
・				
40	Jun4 (Sun)	Kikuchi	Investigation and Analysis	Nairobi

3. Explanation of Draft Final Report (June 5, 2006 to June 10, 2006)

No	Date	Member	Activities	Stay
1	Jun5 (Mon)	Sakamoto Sakamoto/Kikuchi	Move (Dubai – Nairobi) Meeting with Kenya JICA Office, Courtesy Call to Japanese Embassy and MoWI, Submission of the Draft Final Report	On board Nairobi
2	6/6 (火)	Kinomoto/Murakami Sakamoto/Kikuchi	Move (Tokyo – Dubai) Explanation of the Draft Final Report	Nairobi
3	6/7 (水)	Kinomoto/Murakami Sakamoto/Kikuchi	Move (Dubai – Nairobi) Internal Meeting and Discussion with Kenya JICA Offiede	Nairobi Nairobi
4	6/8 (木)	Kinomoto/Murakami/Sakamoto/Kikuchi	Discussion on the Minutes of Discussion	Nairobi
5	6/9 (金)	Sakamoto/Kikuchi	Signing of the Minutes of Discussion, Report to the Kenya JICA Office Move (Nairobi – Dubai)	Nairobi
6	6/10 (土)	Sakamoto/Kikuchi	Move (Dubai – Tokyo)	

Appendix-3
List of Parties Concerned

Appendix-3:List of Parties Concerned

Ministry of Water and Irrigation
<Headquarter>

Hon. Mutua Katuku	Minister
Eng. Mahboub M. Maalin	Permanent Secretary
Eng. R. N. Gakubia	Director, Water Development
Mr. C. N. Irungu	Director, Water Resources
Mr. F. Mwango	Senior Deputy Director, Groundwater
Eng. C. M. Mimano	Deputy Director, Operation & Maintenance
Mr. T. R. Nyaoro	Register of Water Rights
Mr. I. G. Kimani	Desk Officer, JICA Desk
Mr. C. N. Gitahi	Engineer, JICA Desk
Mr. Kimani Ndegwa	Chemist, Water Quality and Pollution Control
Mr. L. Kilonzo	Deputy Director, Water Quality and Pollution Control

<Eastern Provincial Water Office>

Eng. Diru Magomere	Provincial Water Officer

<Machakos District Water Office>

Mr. Mutua Kilonzo	District Water Officer
Mr. C. K. Muriga	Geologist

<Makueni District Water Office>

Mr. J. W. Gnyo	District Water Officer
Mr. Jonathan Moki	Geologist

<Kitui District Water Office>

Mr. Mujuku Nzesya	District Water Officer
Mr. G. Wotuku	Geologist

<Mwingi District Water Office>

Mr. J. K. Muindi	District Water Officer
Mr. H. K. Muriuki	Geologist

National Water Conservation and Pipeline Corporation（NWCPC）

Mr. Japheth Mutai	Deputy Managing Director

Ministry of Health
<Machakos District Office>

Mr. Julius K. Inyingi	District Public Health Officer

<Makueni District Office>

Mr. Joseph Matheka	District Public Health Officer
Mr. Mutua Mailu	Health Administrative Officer

<Kitui District Office>

Mr. Richard M. Luusah	Deputy District Public Health Officer

<Mwingi District Office>

Ms. Catherine N. Ndiso	District Public Health Officer

NGO

World Vision

James THUKU	National Water Manager
Tobias OLOO	Program Manager, Makueni Area Development Program
William KIPETU	Program Manager, Makueni Area Development Program

Christian Children's Fund

Ogada KOJWANG	National Director
Ben Nganga	Regional Team Leader, Eastern Region
Titus MUTIA	Education Coordinator
Patricia KIMATRA	SR Mobilizer, Makueni

Adventist Development and Relief Agency

Onywoki MOKENYE	Water Officer, DAP Project
Jessica MASIRA	Health and Nutrition Coordinator

African Medical and Research Foundation

Denge LUGAYU	Project Manager, Kitui Water and Sanitation Project
Anthony MONDOH	Project Manager, Makueni Water and Sanitation Project
Peter GITHINJI	Water and Sanitation Technician, Makueni Water and Sanitation Project

Action Aid

Angelina MBULA	Community Development Facilitator

Red Cross

Anges NGANGA	Branch Manager, Machakos

GENESIS

Robert MUTUA	Executive Director

NETWAS

Joyce MBARE	Principal Programme Officer

Relevant Project

Water User Association Support Program (WUASP)

J. NDERI	Program Manager, WUASP
W. BONDO	Team Leader, Makueni WUASP
Fredrick GATHOGO	Water Technical Officer, Makuni WUASP

Embassy of Japan in Kenya

Miyamura, Satoru	Ambassador Extraordinary
Masuyama, Toshimasa	Second Secretary

JICA Kenya Office

Otsuka, Masaaki	Resident Representative
Kano, Yoshiaki	Resident Representative
Inamura, Jiro	Deputy Resident Representative

Tokuhashi, Kazuhiko	Deputy Resident Representative
Kenmiya, Misa	Assistant Resident Representative
Esaki, Chie	Assistant Resident Representative
Mr. Elijah Kinyangi	Administration Officer

Appendix-4
Minutes of Discussion

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

Based on the results of the Basic Design Study, the notes on the grant aid for the Project for Rural Water Supply (hereinafter referred to as "the Project") were exchanged between the Government of the Republic of Kenya (hereinafter referred to as "Kenya") and the Government of Japan. However, due to the failure of the tendering process the Project could not enter into the construction stage.

In order to promote the realization of the Project, the Government of Japan decided to conduct an Implementation Review Study (hereinafter referred to as "Study") on the Project and entrusted the Study to the Japan International Cooperation Agency (hereinafter referred to as "JICA").

JICA sent to Kenya the Implementation Review Study Team (hereinafter referred to as "the Team"), which is headed by Mr. Jiro Inamura, Deputy Resident Representative of JICA Kenya Office, , and is scheduled to stay in the country from December 5, 2005 to February 18, 2006.

The Team held discussions with the officials concerned of the Government of Kenya.

In the course of the discussions, both parties confirmed the main items described on the attached sheets. The Team will proceed to further works and prepare the Implementation Review Study Report.

Nairobi. December 8, 2005

Mr. Jiro Inamura
Leader
Implementation Review Study Team
Japan International Cooperation Agency
Japan

Eng. Mahboub M. Maalim, OGW
Permanent Secretary
Ministry of Water and Irrigation
Republic of Kenya

THE IMPLEMENTATION REVIEW STUDY
ON
THE PROJECT FOR RURAL WATER SUPPLY
IN THE REPUBLIC OF KENYA

Memorandum on
Provision of Hand-pump Water Supply Facility at Test Boreholes

During the meeting held on 6th December 2005 to discuss the Inception Report on the above-mentioned study, the Kenyan Side requested the Study Team to equip the four (4) test boreholes to be drilled under the study with water supply facilities. This would supply water to the respective area residents currently suffering from serious shortage of potable water in Kitui and Mwingi Districts.

The Study Team agreed to install a hand-pump and to construct apron facility for each of the successful test boreholes under the Study.

Both Sides agreed that the water supply facilities at test boreholes should be handed over to the Kenyan Side at the completion of the work during the Study.

Nairobi, December 8, 2005

Mr. Jiro Iramura
Leader
Implementation Review Study Team
Japan International Cooperation Agency,
Japan

Eng. Mahboub M. Maalim, OGW
Permanent Secretary
Ministry of Water and Irrigation
The Republic of Kenya

ATTACHMENT

1. Objective of the Project

The objective of the Project is to improve the health and living standards of the people in the target areas by providing potable water through the construction of water supply facilities and the procurement of equipment related to groundwater development.

2. Project sites

The requested sites of the Project are located in the four districts of Machakos, Kitui, Makueni and Mwingi as shown in Annex-1.

3. Responsible and Implementing Agency

The Ministry of Water and Irrigation is the Responsible and Implementing Agency. The Ministry shall be responsible for organizing a Project Management Unit (PMU) to be comprised of the related Water Service Boards (WSBs), and the District Water and Sanitation Teams (DWST) in the 4 Districts, during the implementation period of the Project, as stated in the Minutes of Discussions agreed on September 9, 2004.

4. Items requested by the Government of Kenya

The Study will be conducted based on the requested items described in Annex-2. JICA will assess the appropriateness of the request, make the Basic Design and a part of the Detailed Design of the Project, and make recommendation to the Government of Japan for approval.

5. Japan's Grant Aid Scheme

5-1. The Kenyan side understands the Japan's Grant Aid Scheme explained by the Team, as described in Annex-3.

5-2. The Kenyan side will take the necessary measures for smooth implementation of the Project, as a condition for the Japanese Grant Aid to be implemented.

6. Schedule of the Study

6-1 The consultants will proceed with further studies in Kenya until 18th February, 2006 for the field survey.

6-2. JICA will prepare the draft report in English and dispatch a mission to Kenya in order to explain its contents around May 2006.

6-3 In case that the contents of the report are accepted in principle by the Government of Kenya, JICA will complete the final report and send it to the Government of Kenya by August 2006.

7. Other relevant issues

7-1. Scope of the Project

Since the Basic Design Study Report for the Project was prepared by JICA and submitted to the Government of Kenya in October 2004, the Team will conduct the Study basically in line with the scope of the Project set by the previous basic design.

However, the Team explained that the scope might be changed, if necessary, considering following factors:

(1) There may be changes of water supply conditions and socio-economic situations of the project sites (villages) over time such as project duplication with other donors, NGOs or self-help efforts; and

(2) The Project should go through the approval process of the Government of Japan again, which retains the possibility of modification due to government's policies and financial situation.

In addition, the implementing schedule and cost estimation inevitably need to be revised.

7-2. Scope of the Study

The Team explained the scope of the Study as below:

(1) Confirmation of the latest situations of the project sites;

(2) Revision of the implementation schedule and cost estimation for the 4 Distrcts of Kitui, Mwingi, Machakos and Makueni; and

(3) Detailed Design for the Kitui and Mwingi districts, including preparation of draft tender documents.

7-3. Cost estimation

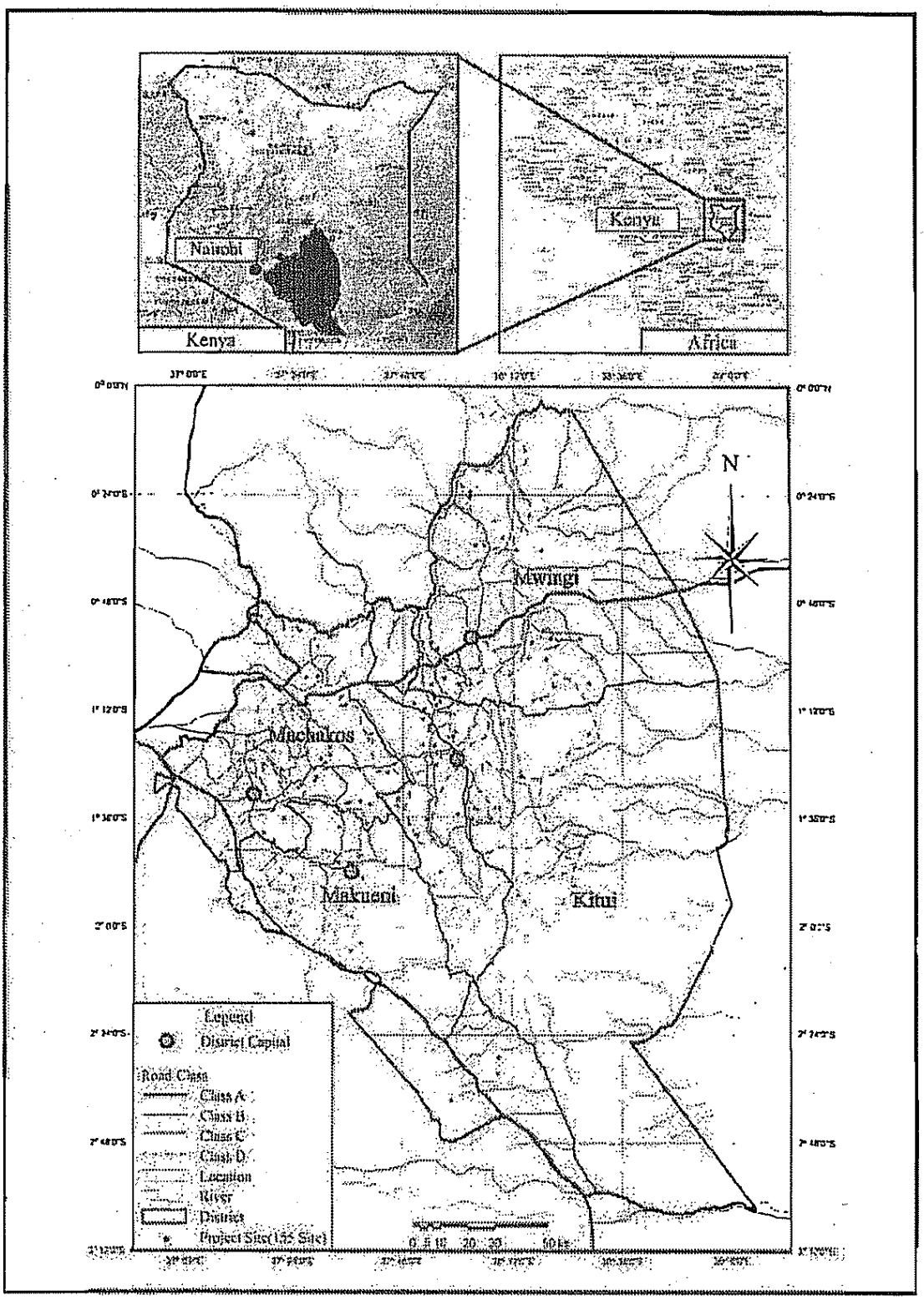
The Team explained the presumed main reasons of the unsuccessful tendering as follows:

(1) Rapid rise in oil price and its influence on construction material prices and transportation; and

(2) Weakening of the yen against the Kenyan Shilling.

The Team will investigate market prices and exchange rates to revise the cost estimation.

ANNEX-1 : Project Site



ANNEX-2 : Items requested by the Government of Kenya

1. Construction of fifty-six water supply facilities with handpumps
2. Construction of eighty-eight water supply facilities with submersible pumps (including one borehole which was drilled during the basic design study)
3. Construction of ten water supply facilities with windmill pumps
4. Development of one spring water supply facility
5. Procurement of equipment as follows;
   (1) five numbers of 4x4 WD pick-up trucks
   (2) eight numbers of motor bikes
   (3) one number of electric sounding equipments
   (4) four numbers of portable water quality test kits
   (5) four numbers of Mega ohm testers and three numbers of maintenance kit for windmill pumps
6. Support on community enlightenment, sanitation and hygiene education and education for facility operation, maintenance and management by communities ("Soft Component")

ANNEX-3 : JAPAN'S GRANT AID SCHEME

1. Grant Aid Procedure (Attachment 1)

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

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

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

Secondly, JICA conducts the study (Basic Design Study), using Japanese consulting firms.

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

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

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

2. Basic Design Study

1) Contents of the Study

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

a) confirmation of the background, objectives and benefits of the Project and also institutional capacity of agencies concerned of the recipient country necessary for the Project's implementation;
b) evaluation of the appropriateness of the Project to be implemented under the Grant Aid Scheme from the technical, social and economic points of view;

c) confirmation of items agreed on by both parties concerning the basic concept of the Project;
d) preparation of a basic design of the Project; and
e) estimation of costs of the Project.

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

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

2) Selection of Consultants

For the smooth implementation of the Study, JICA uses a consulting firm selected through its own procedure (competitive proposal). The selected firm participates the Study and prepares a report based upon the terms of reference set by JICA.

At the beginning of implementation after the Exchange of Notes, for the services of the Detailed Design and Construction Supervision of the Project, JICA recommends the same consulting firm which participated in the Study to the recipient country, in order to maintain the technical consistency between the Basic Design and Detailed Design as well as to avoid any undue delay caused by the selection of a new consulting firm.

3. Japan's Grant Aid Scheme

1) What is Grant Aid?

The Grant Aid Program provides a recipient country with non-reimbursable funds 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. Grant Aid is not supplied through the donation of materials as such.

2) Exchange of Notes (E/N)

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

3) "The period of the Grant" means the one fiscal year which the Cabinet approves the project for. Within the fiscal year, all procedure such as exchanging of the Notes, concluding contracts with consulting firms and contractors and final payment to them must be completed.

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

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

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

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

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

6) Undertakings required to the Government of the recipient country (Attachment 2)

a) to secure a lot of land necessary for the construction of the Project and to clear the site;
b) to provide facilities for distribution of electricity, water supply and drainage and other incidental facilities outside the site;
c) to ensure prompt unloading and customs clearance at ports of disembarkation in the recipient country and internal transportation therein of the products purchased under the Grant Aid;
d) to exempt Japanese nationals from customs duties, internal taxes and fiscal levies which may be imposed in the recipient country with respect to the supply of the products and services under the verified contracts;
e) to accord Japanese nationals whose services may be required in connection with the supply of the products and services under the verified contracts such as facilities as may be necessary for their entry into the recipient country and stay therein for the performance of their work;
f) to ensure that the facilities constructed and products purchased under the Grant Aid be maintained and used properly and effectively for the Project; and
g) to bear all the expenses, other than those covered by the Grant Aid, necessary for the Project.

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

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

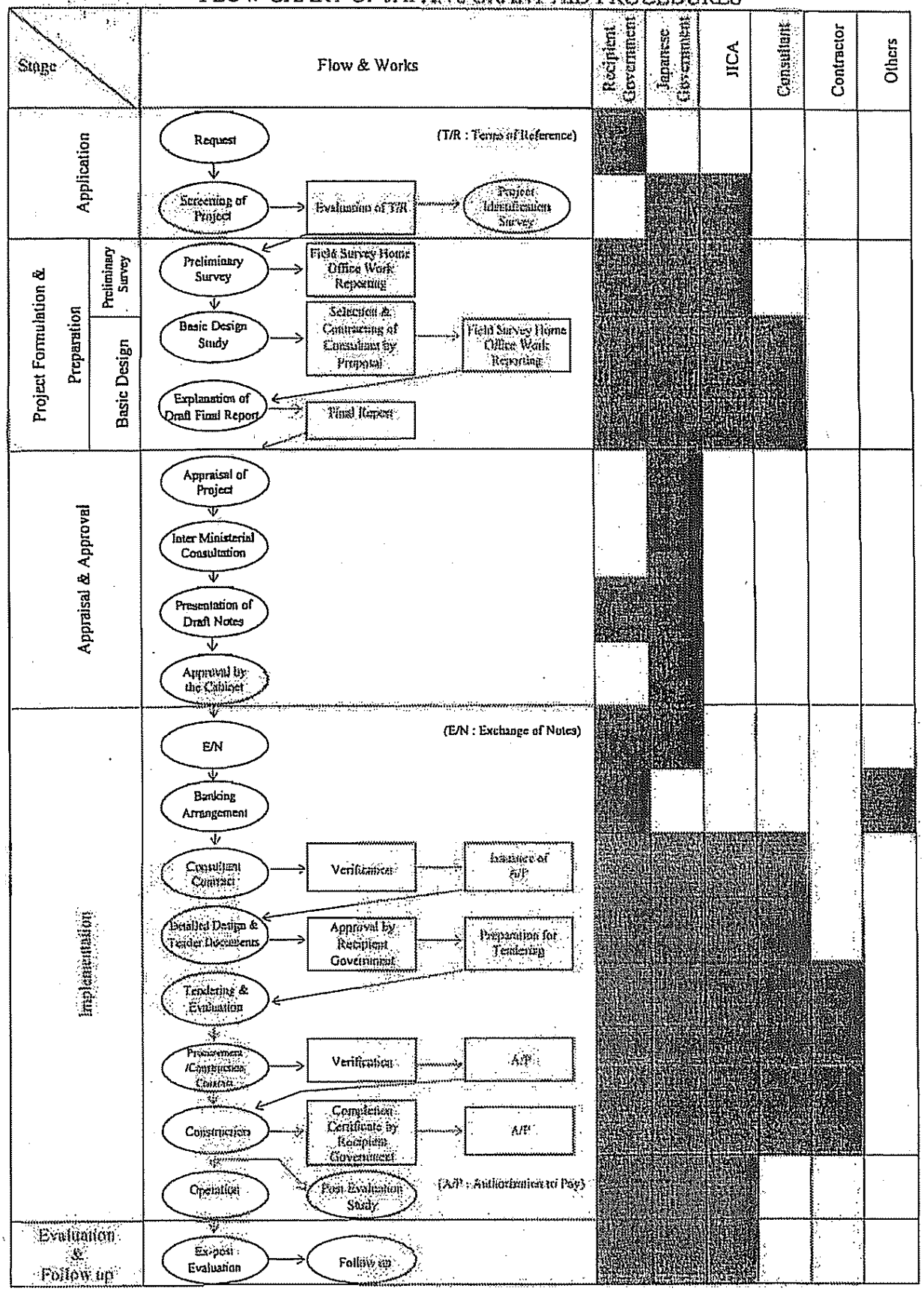
9) Banking Arrangement (B/A)

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

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

Attachment 1 for Annex-3

FLOW CHART OF JAPAN's GRANT AID PROCEDURES



Attachment 2 for Annex-3

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 the 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/or elevated	●	
	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 a bank of Japan for the banking services based upon the B/A		
	1) Advising commission of A/P		●
	2) Payment commission		●

9	To ensure prompt unloading and customs clearance at the port of disembarkation in recipient country		
	1) Marine(Air) transportation of the products from Japan to the recipient country	●	
	2) Tax exemption and customs 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 contract 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 contract		●
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		●

(B/A: Banking Arrangement, A/P: Authorization to Pay)

Minutes of Discussion on Technical Note
for Implementation Review Study
on the Project for Rural Water Supply

The JICA Study Team has explained the contents of Technical Note, and the contents were accepted by Ministry of Water and Irrigation (MoWI). The MoWI and JICA Study Team agreed through the discussion that these contents should be finalized on the basis of further studies and analysis in Japan for data and information collected through the field survey.

The following issues were discussed in the Meeting:

(1) Finalization of Target Communities for the Project

The Study Team reported that twenty eight (28) communities among the 155 target communities in Basic Design Study have been equipped with the water supply facilities by the other donors including Ministry of Water and Irrigation due to serious drought.

The both sides agreed that these 28 communities should be excluded from the target communities for the Project. The four (4) communities, where the test boring is being done by the Study Team, should also be excluded from the target communities.

Consequently, both sides agreed that the number of target communities be fixed at 123, if test drilling at the 4 sites in Mwingi and Kitui is successful. Any unsuccessful site among the four will be added on this number to a maximum of 127.

(2) Operation and Maintenance Equipment

The Study Team explained that there is a high possibility for the rejection of request of Kenyan Government about five (5) vehicles and eight (8) motor bikes by Government of Japan.

The Kenyan side, however, insisted that these are indispensable for operation and maintenance, as the Project covers the wide area consisting of Machakos, Kitui, Mwingi and Makueni Districts, and that this concept was agreed by both sides in the Minutes of Discussions dated on September 9th 2004.

The Study Team replied that this strong request of Kenyan Side should be conveyed to JICA Headquarter.

Nairobi, March 8, 2006

Mr. Masanobu SAKAMOTO
Chief Consultant
Implementation Review Study Team
The Project for Rural Water Supply

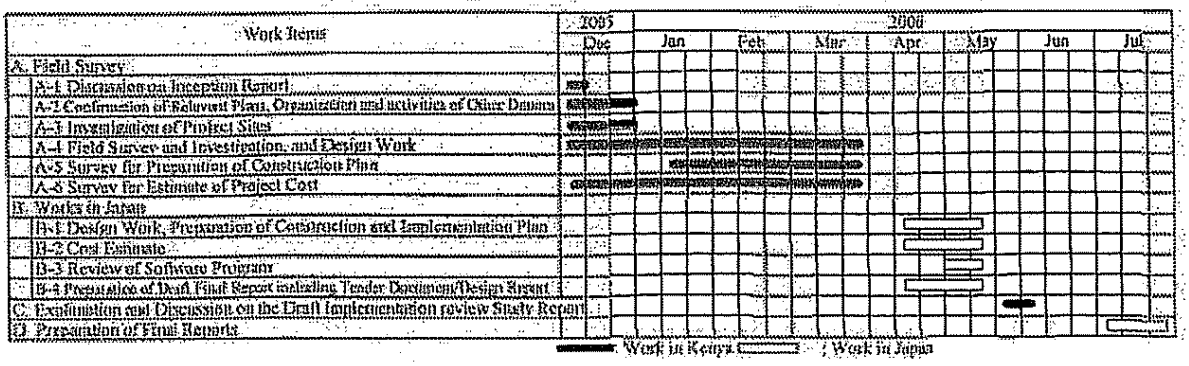
Eng. Mahboub M. Maalim, CBS
Permanent Secretary
Ministry of Water and Irrigation
The Republic of Kenya

LIST OF ATTENDANCE
FOR
MEETING REGARDING TARGET COMMUNITIES

Date : March 8th, 2006
Time : 11:00 a.m.
Place : Ministry of Water and Irrigation

No.	Name	Designation	Organization
1.			
2.	MAHBOUB Maman	PS	MWI
3.	FRED. K Mwangi	Senior Deputy Director	MWI
4.	Julius L. Mwindi	DWO (Mwingi)	Water (Mwingi)
5.	C. N. Gichuhi	Engineer	ANRB
6.	I. G. Kimani	DO	
7.	J. N. Maki	Geologist (Makueni)	Water (Makueni)
8.	OKULE NGATA	Deputy Director, Drilling	MWI
9.	J.Ba Nganga	Geologist (Machakos)	Water (MKS)
10.	A. Yamadera	Engineer	Nippon Koei JICA Study Team
11.	H. KANO	"	"
12.	M. SAKAMOTO	Chief Consultant	"
13.	C. EBAKI	JICA ARR	JICA
14.	ENG. C.M. MUMANG	DEPUTY DIRECTOR	MWI
15.	J. M. Kamau	ADMA	MWI
16.			
17.			
18.			
19.			
20.			

1. Status of the Implementation Review Study



The Implementation Review Study has been executed since December in 2005, based on the agreed "Minutes of Discussion on Inception Report", focusing on the following issues:

(1) Confirmation of Relevant Plans; Organizations, and Activities of Other Donors,
(2) Investigation of Projects Sites and Target Communities of the Project
(3) Field Survey and Investigations, and Design Works,
(4) Survey for Preparation of Construction Plan, and
(5) Survey for Estimate of Project Cost.

This Technical Note aims to report result of the progress of the Study including the tentative Project Cost and the existing water supply facilities where are to exclude the scope of work to adjust the Budget of the Project.

2. Progress of the Study

2.1 Confirmation of Relevant Plans, Organizations, and Activities of Other Donors

Water Sector Reform is gradually proceeding and remarkable transformation is not seen. These issues will be finally confirmed through questionnaire to the Department of Water Development that was requested by the Study Team. The answer has been prepared by the DWD.

2.2 Investigation of Project Sites and Target Communities of the Project

The latest water supply conditions at Project sites, especially activities and supports by NGOs or Government were confirmed through questionnaire to and field trip in collaboration of District Water Offices and joint investigation by the Team and the staff of DWD. The result is described in Items 3.2 and 3.3 of this Technical Note and summarized in the **Atacchement-1-1** and **-2**

2.3 Field Survey and Investigations, and Design Works

This consists of (1) Topographic survey, (2) Geo-technical investigation, (3) Test well drilling including installation of hand-pump water supply facilities, and (4) Detailed design of water supply facilities in the targeted communities in Kitui and Mwingi Districts to be executed in the first phase of the Project. The result and the progress are as follows,

(1) Topographic survey

This consists of Profile Survey along the transmission and distribution pipelines and Topographic mapping for water tank sites at the target 46 communities in Kitui and Mwingi Districts. Site survey work will be completed by 12th March 2006.

(2) Geo-technical investigation

Target sites for elevated water tank are 8 (7 communities) and the site work was completed. The laboratory test and preparation of the report are going on.

(3) Test well drilling and hand-pump installation

Targeted boreholes are two in Mwingi and two in Kitui, four in total. As of 5th March 2006, drilling work at 1st site, No. 95, Kyuso Division, Mwingi District is going on. It is estimated that two boreholes will be drilled by the end of this month. The work will be interrupted in this month but resumed in next month due to budget allocation.

(4) Detailed design

For 46 water supply facilities equipped with submersible and/or windmill pump in Mwingi and Kitui Districs, Detailed design work is going on. The design work will be continued by the end of this month and finalized in Japan

2.4 Survey for Preparation of Construction Plan

In order to shorten construction period, reduce construction cost and complete the Project works in the fiscal year of 2008/2009, it is recommended to apply two phase development instead of three phase development in the Basic Design. This recommendation will be finalized by the discussion with the Japanese Government in Japan.

2.5 Survey for Estimate of Project Cost

(1) Market Price

The market prices of facilities and procurement and equipment to meet the items of the Basic Design have investigated in Kenya, especially in Nairobi City. The recent prices are risen as compared with the Basic Design stage and the typical items in the Project are shown in below:

Item	Spec.	Price (Ksh)		(2) / (1)
		(1) Basic Design	(2) Implementation Review Study	
- uPVC Pipe 50mm dia.	6m in length	479	800	1.67
- Well Development	100m in depth	885,000	1,111,500	1.26
- Steel Panel Tank	ground level of 50m3	670,000	960,000	1.43

(2) Exchange Rate

The exchange rate has fluctuated between the Basic Design and the Implementation Review Study as follows:

Basic Design 1 Ksh = JPY 1.41

Implementation Review Study 1 Ksh = JPY 1.60 (as of February, 2006)

The construction material and equipment is planned to be procured in Kenya and this exchange rate affects to the total of direct cost in Japanese Yen basis. The exchange rate will be further monitored by the end of April 2006.

(3) Estimate of Tentative Project Cost

According to the increase of market price and foreign exchange fluctuation, the Project Cost is tentatively estimated as shown in the following table. The cost is increased about 33% of the Basic Design Stage.

Item	Estimated Project Cost (Million JPY)			
	Basic Design	Implementation Review Study		
		3 phases	2 phases	2 phases*1
(1) Direct Cost	551	841	841	666
(2) Indirect Cost	257	286	200	200
(3) Procurement and Equipment	37	33	33	20
(4) Detailed Design, Construction Supervisor, and Capacity Development	218	240	190	190
Total Cost	1,053	1,400	1,264	1,076

*1: excluding the cost for procurement of vehicles and motor bikes, and water supply facilities at 28 villages

To compress the implementation phases from 3 phases to 2 pahses, the cost becomes about JPY 1,264 million because the indirect cost and detailed design, construction supervisor and institution development are able to cut down. Furthermore, the procurement of vehicles and motor bikes and water supply facilities at 28 villages, where are reported as the above item 2.2, are excluded from the scope of the work, the cost comes close to the Budget of the Project.

3. Final Target Communities

3.1 Proposed Water Supply Facilities and Target Communities by Basic Design

Proposed Water Supply Facilities by Basic Design

District	No. of Target Communities	Borehole Water Supply Facility			Rehabilitation of Spring Water Supply Facility
		Hand Pump	Motor Pump	Windmill Pump	
Machakos	44	12	28	4	0
Kitui	45	14	28	3	0
Mwingi	35	19	15	0	1
Makueni	31	11	17	3	0
Total	155	56	88	10	1

3.2 Affected Communities by Other Organizations (26 communities)

As a result of Investigation of Project Sites above Item 2.2, it is confirmed that 26 communities in four districts excluding No. 85, Ndathani, Mumoni Division, Mwingi District are being served with water or water supply facilities are under construction by other organizations. The organizations are National Water Conservation and Pipeline Cooperation, Constituency Development Fund, DANIDA, ADRA, Red Cross and Christian Children Fund.

3.3 Communities having Water Supply Plan (2 communities)

As a result of Investigation of Project Sites above Item 2.2, it is confirmed that 2 communities have water supply plan.

3.4 Recommended Target Communities

Taking into account the result of investigation for the target communities, the following communities are recommended to be included in the Project.

Proposed Water Supply Facilities by Implementation Review Study

District	No. of Target Communities	Borehole Water Supply Facility			Rehabilitation of Spring Water Supply Facility
		Hand Pump	Motor Pump	Windmill Pump	
Machakos	38	12	22	4	0
Kitui	27	11	16	0	0
Mwingi	35	19	15	0	1
Makueni	27	10	14	3	0
Total	127	52	67	7	1

The mentioned communities of 127 in total include 4 communities where the test drilling is being executed. In accordance with the result of test drilling, these will be further excluded from the target communities.

Proposed borehole site affected (On water supply and under construction)

Attachment-1-1

Pump type: S: Submergible pump W: Windmill pump H: Handpump

S. No.	District	Division	Community name	No. of beneficiaries	Pump type	Proposed B/H site situation							
						Water is supplied?	Name of supplier	W. supply is planned ?	Name of planner	Name of fund	Water supplied population	Remarks	
1	Kitui	Chuluni	Kimuuni/ Katwala	2,300	S	Not supplied but the survey is done for pipeline	Kisasi/Mbitini pipeline by DANIDA	Yes (Pipeline)	DANIDA	DANIDA	900	1. A WI 1.7km away from the proposed B/H site, and the pipeline may be extended to the community. 2. The B/H is situl on private land, which is being developed.	1
3	Kitui	Chuluni	Kisasi market	4,000	S	Yes (Pipeline)	Kisasi/Mbitini pipeline by DANIDA	Yes	DANIDA	DANIDA	4,000	The market is adequately served.	2
5	Kitui	Chuluni	Mbitini	4,000	S	Yes (Pipeline)	Kisasi/Mbitini pipeline by DANIDA	Yes	DANIDA	DANIDA	3,800	The market and surrounding community is adequately served.	3
6	Kitui	Chuluni	Mosa	1,000	S	No, but pipeline survey from B/H is in progress	CDF to do the pipeline	Yes (B/H)	DANIDA/community	DANIDA	Borehole is not equiped but has capacity for 5,300 people according to our project design	1. A WH only drilled by DANIDA and with 10m3/h 2km away from Mosa market. The community prepares money to procure pump. 2. Mosa sec. school is planned to serve water by the Project but also by the DANIDA -funded B/H.	4
7	Kitui	Chuluni	Katwala	2,300	S	Yes (Pipeline)	Kisasi/Mbitini pipeline by DANIDA	Yes	DANIDA	DANIDA	2,300	The community is adequately served.	5
12	Kitui	Mutonguni	Mulanda	2,500	S	Yes (Pipeline)	NWC&PC	NWC&PC	NWC&PC	NWC&PC	1,000		6
17	Kitui	Mutonguni	Kalimiliti	2,000	W	Yes (Pipeline)	NWC&PC	Yes (Pipeline)	NWC&PC	NWC&PC	1,200	Confirmed reservation for pipeline from Mutinga/Kitui. The distance from B/H is around 200m	7
22	Kitui	Ikutha	Kithumubini	700	H	Yes (Pipeline)	Mutha/Kalambani pipeline by DANIDA	Yes	DANIDA	DANIDA	600	Almost adequately served	8
34	Kitui	Yatta	Ikulumbuluni	480	H	Yes (B/H)	ADRA	ADRA	ADRA	ADRA	300	B/H drilled by ADRA and serves the community	9
35	Kitui	Yatta	Kataiko	900	H	Yes (B/H)	ADRA	ADRA	ADRA	ADRA	600	The community is well served.	10
36	Kitui	Yatta	Uvu secondary school	2,500	S	Yes (Pipeline)	NWC&PC	NWC&PC	NWC&PC	NWC&PC	1,000	Pipe laying not completed.	11

Proposed borehole site affected (On water supply and under construction)

Attachment-1-1

Pump type; S: Submergible pump, W: Windmill pump, H: Handpump

S.No	District	Division	Community name	No. of beneficiaries	Pump type	Proposed B/H site situation							
						Water is supplied?	Name of supplier	W. supply is planned ?	Name of planner	Name of fund	Water supplied population	Remarks	
40	Kitui	Mulinyani	Kalimilila	2,000	S	Yes (Pipeline)	NWC&PC	Yes (Pipeline)	NWC&PC	NWC&PC	2,000	Survey for pipeline laying done, then might be served.	12
44	Kitui	Mutengini	Mutini sec. school	2,400	S	Yes (Pipeline)	NWC&PC	NWC&PC	NWC&PC	NWC&PC	2,000	WK from Maninga/Kitui is already constructed.	13
45	Kitui	Mumoni	Kwa Nyingi Pri.	1,700	S	Yes (Pipeline)	NWC&PC	NWC&PC	NWC&PC	NWC&PC	1,500	WK from Maninga/Kitui is already constructed.	14
47	Kitui	Ikutha	Ikutha market	4,500	S	Yes (1B/H for Girls sch and 1 shallow well for Boys sec sch)	1 B/H by DANIDA and 1 Shallow well by Boys school	Yes (1B/H for dispensary by EU but informally)	EU	EU	1) Girls Sch. and surrounding area from Girls Sch. B/H, 2)Boys sch (500 people) from shallow well 3)Girls Sch. B/H has capacity for 1,000 people according to our project design	1) Ikutha Girls Sch. B/H with 2.0m³/h and a WK is 1km away from the proposed B/H site. 2) Shallow well of Boys Sch. fix only Handwelf fax pump, treatment facility and pipeline	15
48	Kitui	Ikutha	Kitui secondary school	1,000	W	Yes (B/H)	NWC&PC	NWC&PC	NWC&PC	NWC&PC	600	A B/H with assumed 0.5m³/h. The pump house is under construction.	16
49	Kitui	Ikutha	Kanuni	1,500	S	Yes (B/H)	NWC&PC	Yes (B/H)	EU	NWC&PC, EU	1,500	The B/H site has been drilled by NWC&PC, 4km away from trading center, a plan to sink a B/H by funds from European Union. The B/H is earmarked to serve dispensary, trading center and the environs.	17
55	Kitui	Mwitika	Nguka	2,400	W	Yes (B/H)	NWC&PC	NWC&PC	NWC&PC	NWC&PC	2,200	The community is adequately served.	18

Proposed borehole site affected (On water supply and under construction)

Attachment-1-1

Pump type: S: Submergible pump, W: Windmill pump, H: Handpump

S. No.	District	Division	Community name	No. of beneficiaries	Pump type	Proposed B/H site situation						
						Water is supplied?	Name of supplier	W. supply is planned ?	Name of planned	Name of fund	Water supplied population	Remarks
285	Mwingi	Nuimani	Ndathani	1,500	S	Yes (Rock catchment)	DANIDA			DANIDA	Seasonal supply	100m away from B/H site, there is a Water kiosk of Kangii WS (Water source is rock catchment). But water supply is limited for 2 months after rainfall. Proposed service area is 2km away from the Kiosk.

19

Proposed borehole site affected (On water supply and under construction)

Attachment-1-1

Pump type: S: Submersible pump, W: Windmill pump, H: Handpump

S. No.	District	Division	Community name	No. of beneficiaries	Pump type	Proposed BH site situation							
						Water is supplied?	Name of supplier	W. supply is planned ?	Planne of planner	Name of fund	Water supplied population	Remarks	
101	Makueni	Wote	Nthangu pri.	250	H	Yes (D/H)	CDF	Yes (D/H)	CDF	CDF	300		20
126	Makueni	Kilome	Kitalingo secondary school	1,000	S	Yes (D/H)	CDF	Yes (D/H)	CDF	CDF	600		21
129	Makueni	Kasikeu	Kasikeu market	3,600	S	Yes (D/H)	CDF	Yes (D/H)	CDF	CDF	3,000		22
136	Makueni	Nguu	Ivaani	1,200	S	Yes (?)	GOK	Yes (?)	GOK	GOK	360		23

Proposed borehole site affected (On water supply and under construction)

Attachment-1-1

Pump type: S: Submergible pump, W: Windmill pump, H: Handpump

S. No.	District	Division	Community name	No. of beneficiaries	Pump type	Proposed B/H site situation							
						Water is supplied?	Name of supplier	W. supply is planned ?	Name of planner	Name of fund	Water supplied population	Remarks	
149	Machakos	Masinga	Kwa wambo	2,250	S	Not yet (But B/H is drilled)	Red Cross	Yes	Red Cross/community	Red Cross/community	Yield is 16.8m3/h. The B/H has capacity for 9,600 people according to our project design.	B/H Depth: 90m. Pump house, Water tank and Pipeline are installed. But connection between riser pipe and pump has not been done yet.	24
150	Machakos	Masinga	Elulukani	2,000	S	Not yet (But B/H is drilled)	CDF	Yes	CDF	CDF	Yield is 8.5m3/h and the B/H has capacity for 2,900 people according to our project design.	Pump house is under construction.	25
155	Machakos	Katangi	Kwaisui secondary school	1,000	S	Yes (B/H)	CDF			CDF	1,800(including Sue&Prim schools). Yield is 6m3/h and the B/H has capacity for 3,200 people according to our project design.	Pump house, Water tank and pipeline are installed. B/H is located 1.5km away from schools	26
169	Machakos	Kathiani	Kamuvoa	1,800	S	Not yet (But B/H is drilled)		yes	CCF (Catholic Children Fund)	CCF	Yield is 8.0m3/h (Managing Director of CCF-Water drilling on 3rd Mar. 2006) and the B/H has capacity for 1,600 people according to our project design.	Open hole (not cased). Total depth: 110m and SWL: 9.6m. PH and watchmen shed under construction but no pump. B/H is located 2.5km away from community.	27

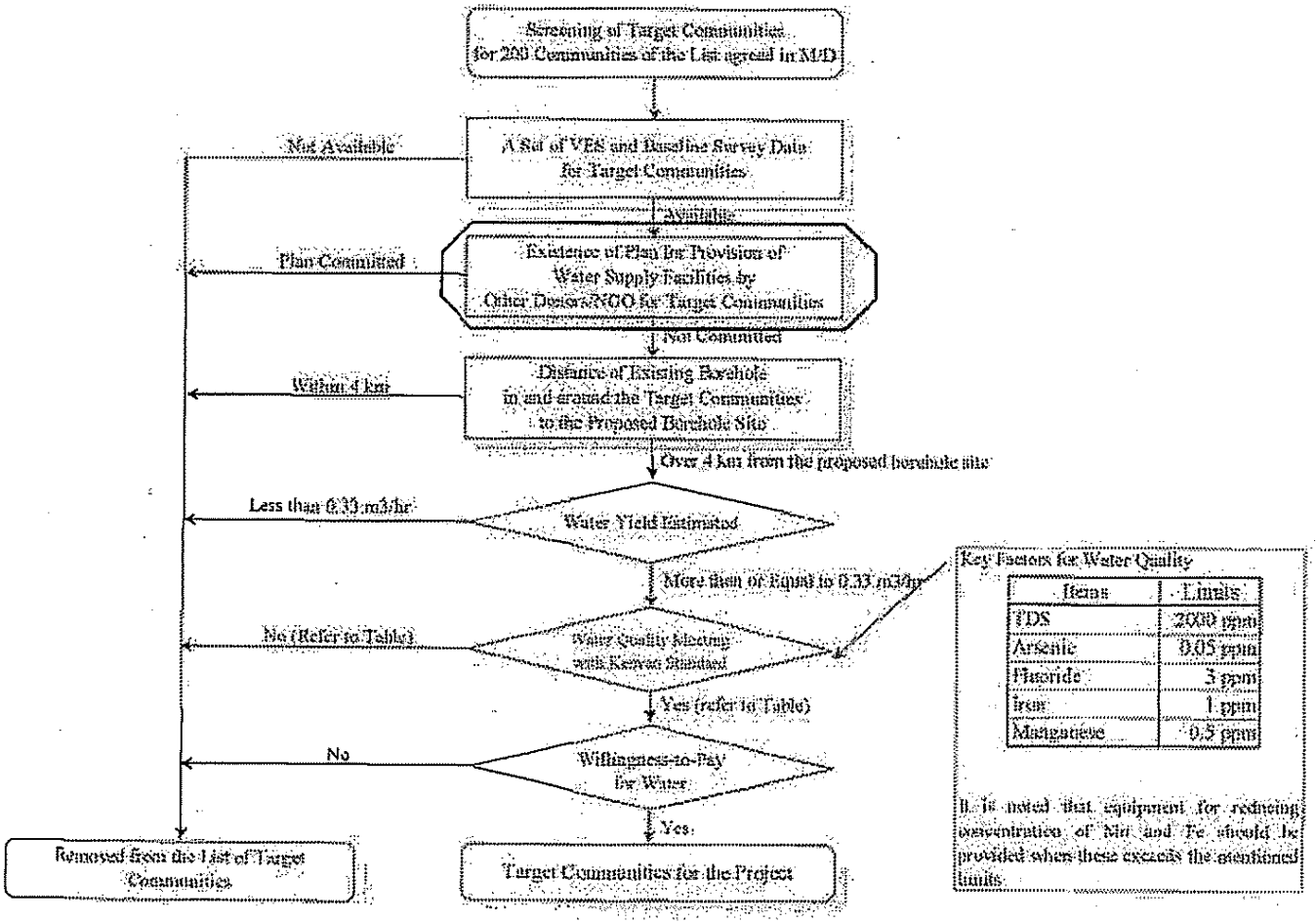
Attachment-1-2

Proposed borehole site having water supply plan

Pump type: S: Submersible pump, W: Windmill pump, H: Handpump

S. No.	District	Division	Community name	No. of beneficiaries	Pump type	Proposed B/H site situation						
						Water is supplied?	Name of supplier	W. supply is planned?	Name of planner	Name of fund	Water supplied population	Remarks
153	Machakos	Yatta	Kivandini	2,300	S	No		Yes (B/H)	CDF	CDF	?	2 proposed B/H sites are located in Kivandini Sec. school compound. 1
160	Machakos	Katangi	Ikombe	700	S	No		Yes				Drilled by CDF but dry B/H. DWO will find another point. 2

Extracted from Basic Design Report, October 2004



Flow Diagram for Selection of Target Communities

capped without backfilling and transferred to the Kenyan Government.

(b) Selection Criteria of Type of Water Supply Facility in Respective Target Communities

Unit water consumption in the target communities is based on the criteria of design manual which is prepared and applied for the existing water supply facilities by MoWRMD. Water supply plan is prepared by using these criteria describing the unit water consumption of 15 l/day/capita in ASAL area with an annual rainfall of 500m to 1000mm.

The study area locates at vicinity of the capital of Kenya, Nairobi. Since an average population per target community, therefore, is 1300 persons over the population of 500 applicable for hand pump facility, water supply facility with motorized pump is included in planning.

The requested windmill pump has popularized in Kenya after 1990's because of cheaper operation and maintenance cost. Therefore, windmill and submersible pumps are proposed as alternatives of motorized pumps in the basic design study.

It is assumed in planning that drilling for boreholes using motorized pumps is executed prior to those for hand pumps, and that optimum water supply facilities are designed to meet water yield, hydraulic head and demand in detailed design stage. In the basic design study, therefore, the facilities are preliminarily designed by applying surveyed population and the criteria in the manual. In detailed design, optimum type will be re-evaluated, taking into account capacity of community for sustainable operation and maintenance for actual water yield and facilities, and discussing with residents of communities.

Measures for excessive use of facilities will be examined and executed under sanitation education program for residents of communities in the software program of the Project, when actual water yield is significantly less than water demand. Possible measures such as "Control of Water Consumption", "Restriction of Water Use by Water Kiosk Keeper", and so on will be discussed with the residents and applied to communities.

1-3) Spring Water Supply Facility

Currently twelve communities use spring water for domestic water supply. Of these, only the Mora spring of Kathanze community in Mwingi district is available throughout the year and is also sufficient to meet water demands. However, raw spring water needs treatment as it contains bacteria and colon bacillus.

Taking into account the population of 4,400 in this community, borehole development with a submersible pump water supply facility might be appropriate. However, rehabilitation of the existing facility is recommended from the viewpoint of its ease and lower operation and maintenance costs.

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

In December 2005, the Japan International Cooperation Agency (hereinafter referred to as "JICA") dispatched a Implementation Review Study Team on the Project for Rural Water Supply (hereinafter referred to as "the Project") to the Government of the Republic of Kenya (hereinafter referred to as "Kenya"). and through discussion, field survey. and technical examination of the results in Japan, JICA prepared a draft report of the study.

In order to explain and consult with the Kenyan side on the components of the draft report. JICA sent to Kenya the Draft Report Explanation Team (hereinafter referred to as " the Team "). which was headed by Mr. Hiroyuki Kinomoto, Team Director. JICA. from 5th June to 9th in June, 2006.

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

Nairobi, June 9, 2006

木野本 浩之

Mr. Hiroyuki Kinomoto
Leader
Implementation Review Study Team
Japan International Cooperation Agency
Japan

Eng. Mahboub M. Maalim. CBS
Permanent Secretary
Ministry of Water and Irrigation
Republic of Kenya

ATTACHMENT

1. Components of the Draft Report

Kenyan side agreed and accepted in principle the components of the draft report explained by the Team, including the number of target communities, contents of operation and maintenance (O&M) equipments to be procured by the project, implementation schedule, project cost, and undertakings by Kenyan side.

2. Japan's Grant Aid scheme

The team explained the Japan's Grant Aid Scheme and the necessary measures to be taken by the Government of Kenya as described in Annex-3 of the Minutes of Discussions signed by both parties on December 8, 2005.

The Kenyan side understood and will take the necessary measures for smooth implementation of the Project, as a condition for the Japanese Grant Aid to be implemented.

3. Schedule of the Study

Following acceptance of The Draft Final Report by the Ministry of Water & Irrigation on behalf of the Government of Kenya, JICA will finalize the final report and send it to the Ministry by August 2006.

4. Project sites

The requested sites of the Project are located in the four districts of Machakos, Kitui, Makueni and Mwingi as shown in Annex-1.

The Team reviewed the present situation of these sites and confirmed that twenty eight (28) communities, which were among the list of 155 in the original Basic Design Report of 2004, have already been supplied with water facilities as part of the Ministry's drought intervention program in 2005/2006. Hence, these 28 communities are excluded from the target communities. In addition, the Team carried out test drilling on four (4) sites during their implementation of the review study. Among them, three boreholes, one in Mwingi and two in Kitui districts were confirmed successful in terms of the capacity of the wells and water quality. The other one in Mwingi was unsuccessful as it turned out to be dry. The three successful wells are equipped with hand pumps and are also excluded from the project. The Team requested the Kenyan Side to confirm the alternative site for the unsuccessful one and communicate this to the Team by the end of June 2006.

Therefore, the total number of water supply facilities to be constructed by the project was confirmed as on the following table.

Table-1 Type and No. of Water Supply Facilities to be constructed by the Project

Districts	No. of Communities	Type of Pumps			Rehabilitation of Spring Water Supply Facilities
		Hand-pump	Submersible Pump	Windmill Pump	
Machakos	38	12	22	4	0
Kitui	25	9	16	0	0
Mwingi	34	18	15	0	1
Makueni	27	10	14	3	0
Total	124	49	67	7	1

5. Other relevant issues

5-1 Operation and Maintenance Equipment

The Team confirmed that operation and maintenance equipment previously owned by District Water Offices (DWOs) in the four target districts, and reported in the original Basic Design Study. are under the responsibility of Athi and Tana WSBs. This equipment is for use by each district level WSB officers for the purpose of supporting the communities on operation and maintenance of water supply facilities. The Team also confirmed the necessity of procuring O & M equipment as shown on the table below.

Table-2 Equipment to be procured by the Project

O&M Equipment	Specification	Nos.
1. Vehicle	4WD Pick-up	5
2. Motor Bike	125cc, Off-Road Type	8
3. Electric Sounding Equipment	Use for Vertical Sounding, 2-D Sounding	1
4. Water Test Equipment	Mobile kit	4
5. O&M Tool	Mega Ohm Tester Windmill Pump O&M Tools	4 2

5-2 Organization for Implementation of the Project

The Team received explanation on the progress of Water Sector Reform from the Kenyan side. Through explanation, the Team confirmed that functions and rules previously borne by DWO have been transferred each WSB.

The Team and the Kenyan Side further discussed the re-organization of Project Management Unit (PMU) and District Water and Sanitation Team (DWST) for the Implementation of the Project in accordance with the progress of Water Sector Reform.

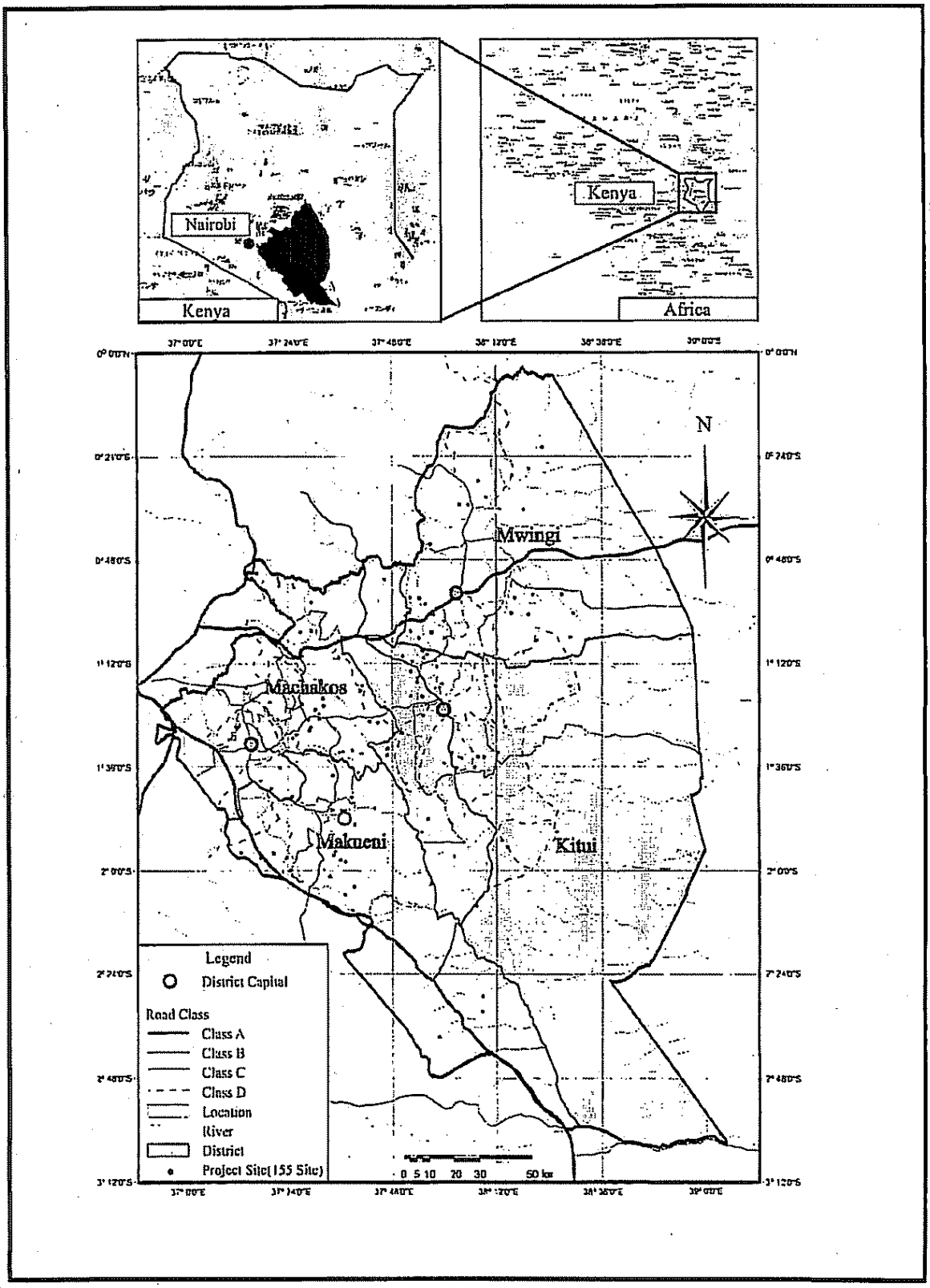
As a result. the Kenyan side agreed to formulate PMU and DWST based on the organization structure presented on Annex-2.

5-3 Undertakings of the Kenyan Side

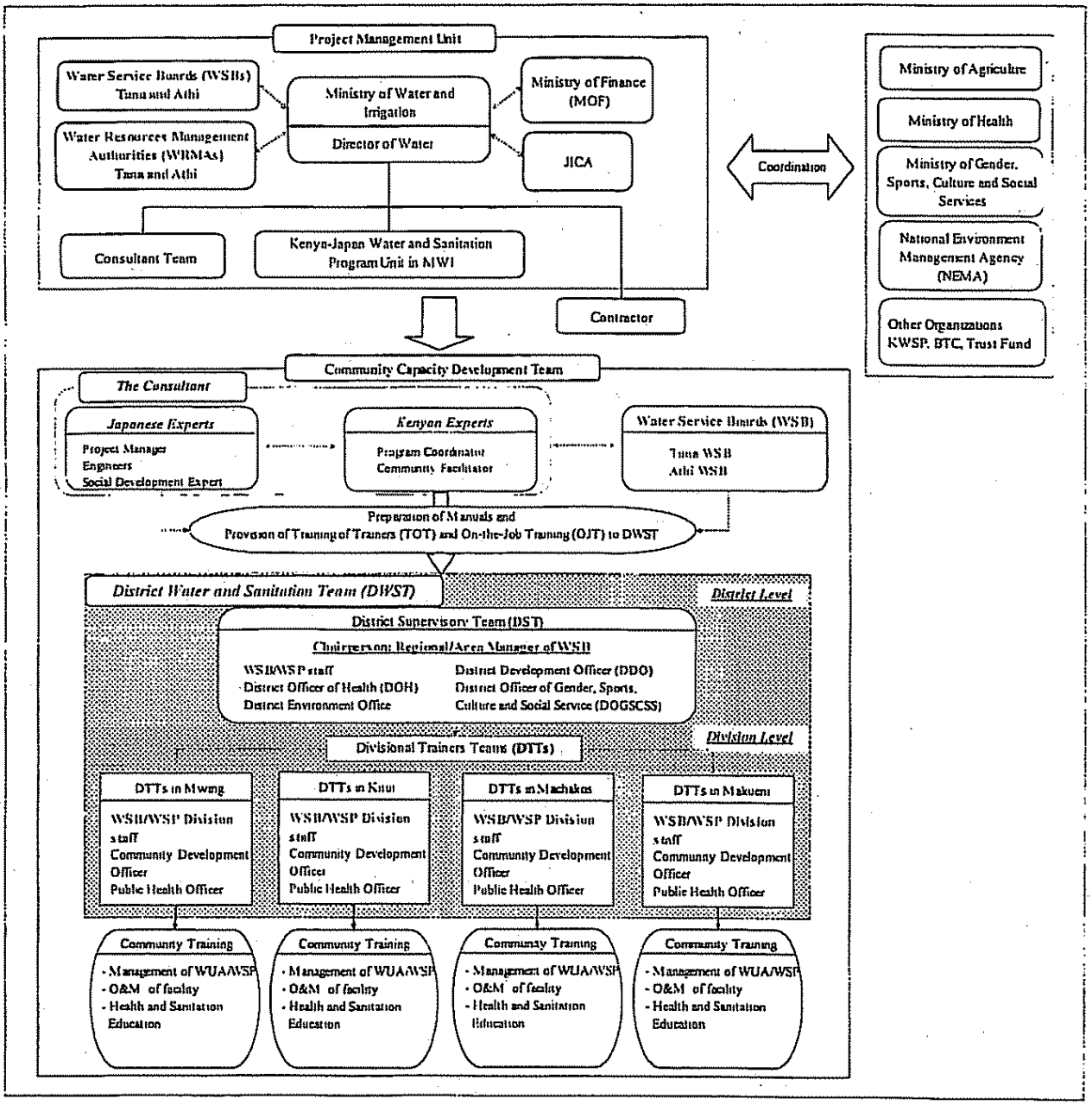
The Team requested the following undertakings by the Kenyan side during implementation of the Project and the Kenyan side agreed with the undertakings:

1) Provision and arrangement of land necessary for implementation of the Project,
2) Provision of access to construction sites, including cutting of bushes and leveling,
3) Explanation of works to inhabitants, and requesting their cooperation in the construction,
4) Acquisition of authorizations for the construction works and payment of necessary expenses, and
5) Arrangement of necessary counterpart budget and personnel.

ANNEX-1: Location Map



ANNEX-2: Organization Structure for Project Implementation



Appendix-5 Other Relevant Data

5.1 Existing Borehole Database

5.2 Result of Water Quality Survey Conducted by Basic Design

5.3 Selection of Target Communities of the Project

5.4 Criteria for Successful Borehole and Success Rate of Borehole

5.5 Result of One Dimensional Electric Sounding Survey for 153 Target Communities

5.6 Borehole Columnar Sections in 153 Target Communities

5.7 Result of Two Dimensional Electric Sounding Survey for 18 Target Communities

5.8 Result of Test Drilling at 3 Target Communities

5.9 Result of Wind Velocity Survey

5.10 Result of Supplemental Social Survey and Capacity to Pay-for-Water of Target Communities

5.11 Hydro-geological Data of the Target Communities

5.12 Basic Design Drawings

5.13 List of Alternative Communities

5.1
Existing Borehole Database

No.	District	BH No.	Location Name	Map sheet	Longitude E	Latitude N	X grid (km)	Y grid (km)	Altitude (m)	Completion date	Litho-logy	Drilling depth (GL-m)	Depth of Aquifer (GL-m)	Static Water Level (GL-m)	Pumping Water Level (GL-m)	Draw-down (m)	Pumping rate (m3/h)	Level Type
MC-001	Machakos	C401	KANGUNDO	149/4			316.4	9858.1	1560	1946/1/20	3	34.0	29.0				17.04	
MC-002	Machakos	C436	TALA TOWNSHIP	149/4			310.8	9859.9	1520	1946/3/3	3	122.0	23.0	7.0			10.50	
MC-003	Machakos	C473	POTHA	163/4			368.4	9802.9	1722	1946/9/22	2	61.0	14.0	8.0			6.54	
MC-004	Machakos	C492	ATHI RIVER	182/2			377.7	9710.7	1219	1946/10/8	2	28.0						
MC-005	Machakos	C1133	YATTA	149/2			325.7	9869.2	1280	1950/6/10	3	153.0	121.0	23.0			14.40	
MC-006	Machakos	C1430	KINYATTA	150/3			348.8	9851.5	1301	19519	3	98.0	70.0	19.0			7.50	
MC-007	Machakos	C1493	YATTA	149/2			327.5	9869.2	1341	1951/7/14	3	64.0	30.0	24.0			4.56	
MC-008	Machakos	C1507	YATTA	150/2			364.6	9885.8	1228	1951/8/14	3	111.0	44.0	38.0			0.72	
MC-009	Machakos	C1508	YATTA	150/1			357.2	9874.7	1249	1951/8/20	3	113.0	98.0	49.0			3.90	
MC-010	Machakos	C1571	YATTA	136/3			347.9	9893.1	1067	1951/10/16	9	34.0	29.0	23.0			4.56	
MC-011	Machakos	C1572	YATTA	150/4			368.4	9856.3	1155	1951/9/28	9	91.0						
MC-012	Machakos	C1595	YATTA	150/1			351.6	9878.4	1264	1951/9/29	9	82.0	64.0	30.0			10.92	
MC-013	Machakos	C1632		149/4			311.3	9859.8										
MC-014	Machakos	C1864	KANGUNDO	149/4			318.3	9854.4	1615	1952/11/15	3	98.0	55.0	26.0			3.78	
MC-015	Machakos	C1949	KANGUNDO	149/4			318.3	9858.1	1615	1953/4/30	3	119.0	119.0	47.0		60.0	4.08	
MC-016	Machakos	C1972	MUMBUNI	150/3			355.4	9848.9	1176	1953/5/9	3	92.0	64.0	62.0		28.0	0.12	
MC-017	Machakos	C1973	YATTA	150/1			344.2	9882.1	1189	1953/5/27	3	121.0	111.0	16.0		92.0	2.82	
MC-018	Machakos	C1989		149/2			315.1	9875.1			9	104.0	68.0	37.0			9.00	
MC-019	Machakos	C2019	YATTA	150/1			335.0	9867.3	1311	1953/8/26	3	160.0	110.0	17.0		120.0	0.60	
MC-020	Machakos	C2024	MAKAPEZI	150/1			338.7	9867.3	1226	1953/7/30	3	138.0	90.0	9.0		83.0	1.44	
MC-021	Machakos	C2041	KATHINGIRI	136/3			357.2	9896.8	1067	1953/10/15	3	122.0	117.0	76.0		41.0	0.18	
MC-022	Machakos	C2132		149/2			310.3	9873.3			9	122.0	120.0	55.0			9.00	
MC-023	Machakos	C2266	KAPITI	149/4			325.7	9839.7	1311	1957/1/15	3	109.0	90.0	10.0		63.1		II
MC-024	Machakos	C2333	ATHI RIVER	149/4			333.1	9834.2	1134	1955/2/6	3	107.0	103.0	3.0		1.5	18.18	
MC-025	Machakos	C2357	ITHANGA	150/1			342.4	9885.8	1143	1955/4/8	3	110.0	84.0	20.0		83.5	3.90	I
MC-026	Machakos	C2406	SIATHANI	149/4			327.5	9850.7	1219	1955/7/12	3	93.0	90.0	19.0		60.6	4.56	
MC-027	Machakos	C2407	MBIUNI	149/4			331.3	9848.9	1219	1955/7/6	3	104.0	88.0	20.0		37.4	0.84	
MC-028	Machakos	C2427	MBAIKINI	150/3			338.7	9845.2	1262	1955/9/30	3	93.0	87.0	76.0			0.06	
MC-029	Machakos	C2474	ATHI RIVER	162/2			333.1	9830.5	1237	1956/1/13	3	107.0	101.0	2.0		7.9	6.78	
MC-030	Machakos	C2731	KANGUNDO	162/4			333.2	9788.1	1638	1957/12/6	3	75.0	66.0	2.0		65.8	3.66	
MC-031	Machakos	C2815		149/2			313.1	9877.2			9			40.0			4.50	
MC-032	Machakos	C2943		149/2			313.4	9878.1			9	106.7	21.0	14.0			10.50	
MC-033	Machakos	C3124		149/2			310.6	9889.1			9	61.0	18.2	16.0			0.60	
MC-034	Machakos	C3151	BESTOWS (MKANGA)	183/3			409.2	9690.5	610	1961/11/9	3	52.0	37.0	33.0		3.7	8.10	
MC-035	Machakos	C3453	MACHAKOS	150/3			336.8	9836.0	1308	1967/7/30	3	89.0	82.0	17.0		69.1	8.16	
MC-036	Machakos	C3454	MACHAKOS	162/2			329.4	9832.3	1234	1967/8/24	3	91.0	43.0	29.0		56.9	3.30	
MC-037	Machakos	C3679	KIMA	162/3			303.5	9782.5	1701	1970/6/1	3	153.0	57.0	50.0		44.0	1.02	
MC-038	Machakos	C3776	KANGUNDO	149/4			316.4	9858.1	1560	1971/4/17	3	168.0	163.0	5.0		145.9	5.46	
MC-039	Machakos	C3842	ATHI RIVER	149/4			320.1	9850.7	440	1972/6/6	3	70.0				28.6	8.58	
MC-040	Machakos	C3957	KAANI	149/4			316.4	9834.1	1370	1973/1/23	3	167.0	128.0	69.0		91.1	0.30	
MC-041	Machakos	C3967	MAKUTANO	149/4	37.47	-1.40	329.4	9837.8	1230	27030	3	182.0	39.0	22.0		130.2	4.08	
MC-042	Machakos	C3997	ATHI RIVER	173/2			310.9	9762.3	1240	1973/12/6	3	214.0	35.0	19.0		35.4	4.26	
MC-043	Machakos	C4000	KDO(MATHENI)	149/2			312.7	9867.3	1448	1974/5/25	3	123.0	30.0	4.0		70.1	9.06	
MC-044	Machakos	C4039	MAKUTANO	149/4			327.6	9843.4	1300	1974/8/1	3	92.0	74.0	10.0		10.5	8.16	
MC-045	Machakos	C4162	DITHINI	135/4			331.2	9898.6	1133	1975/10/23	3	200.0	111.0	40.0		139.1	0.30	
MC-046	Machakos	C4295	MUNGEY FARM	162/1			371.2	9811.2	1720	1977/3/22	3	206.0	105.0	47.0		66.3	2.10	
MC-047	Machakos	C4452	MWALA	149/4			325.7	9852.6	1249	1978/2/10	3	150.0	103.0	18.0		90.0	3.00	II
MC-048	Machakos	C4483	KAWETHEI	149/4			312.7	9852.6	1480	1978/5/6	3	130.0	66.0	10.0		22.0	9.84	
MC-049	Machakos	C4541	MANYATTA	149/4			322.0	9850.7	1413	1978/7/21	3	81.0	45.0	62.0		59.0	7.08	II
MC-050	Machakos	C4978	MBITINI	174/1			335.0	9778.9	1025	1981/8/8	3	68.0	18.0	2.0		22.0	2.40	
MC-051	Machakos	C5004	KINGATUNI	149/4			328.9	9841.0		29921	3	100.0	48.0	3.0				
MC-052	Machakos	C5255	KATINE	149/4			312.7	9859.9	1530	30305	3	120.0	22.0	15.0		87.0	3.00	
MC-053	Machakos	C5256	MATUNGULU	149/4			312.7	9852.6		1983/1/15	3	10.0	1.0	1.0		1.0	11.22	
MC-054	Machakos	C5440	Kitangani Sec School		37.65	-1.04	350.0	9885.6										
MC-055	Machakos	C6035		149/4			313.5	9861.4			9	100.0	70.0	12.0				II
MC-056	Machakos	C6038	KYAMULENDU	149/4			312.7	9858.1		1985/3/3	3	88.0	36.0	3.0		72.0	1.20	
MC-057	Machakos	C6301	KAVINGONI	163/3			353.6	9784.4	1060	1985/10/17	3	120.0	90.0	46.0		12.0	5.28	
MC-058	Machakos	C6890	MUISUNI KANGUNDO H/S	149/4			319.0	9854.8		31594	9	83.0	52.0	19.0			3.30	
MC-059	Machakos	C9473	KANGUNDO	149/4			320.2	9856.3	1554	1991/3/30	9	72.0	43.0	13.0				
MC-060	Machakos	C10622	MAVOLINI	149/2			320.7	9797.3		1994/1/13	1	51.0	42.0					
MC-061	Machakos	C10875	VYULYA	149/4			320.2	9846.0		34516	2	61.0	47.0	0.0		17.2	8.40	
MC-062	Machakos	C11092	UTITHINI	149/4			326.7	9836.0		1995/3/9	2	71.0	32.0	2.8			20.00	
MC-063	Machakos	C11274	VYULYA	149/4			321.2	9840.6		1995/10/1	1	68.0	18.0	5.0				
MC-064	Machakos	C11434	MUISUNI	149/4			317.4	9854.4		1996/6/28	3	100.0	12.0	8.7		64.2	14.40	
MC-065	Machakos	C11619		149/2			326.4	9869.8			9	120.0	118.0	13.0			7.50	
MC-066	Machakos	C11696		150/3			357.3	9839.3			9	120.0	35.0	31.0			13.00	
MC-067	Machakos	C11854	YATHUI				342.3	9839.7				80.0						
MC-068	Machakos	C11856		149/4			315.8	9852.8			9	80.0	6.0	24.0			3.00	II
MC-069	Machakos	C11923	IKATINI				336.3	9881.6				80.0	20.0	22.0			2.00	
MC-070	Machakos	C11926					311.6	9863.9	35886									
MC-071	Machakos	C11936	TALA	149/4			332.1	9860.5	1540	35835	3	150.0	24.7	0.0		62.0	21.60	II
MC-072	Machakos	C11942	UVAINI	150/3			333.8	9846.4			9	102.0	60.0	40.0			2.00	II
MC-073	Machakos	C11943	WAMUNYU	150/3			340.2	9844.1			9	41.0	12.0	2.0			3.00	
MC-074	Machakos	C11976	MASII	149/4			326.7	9839.0			9							
MC-075	Machakos	C12053	MUKALWA				311.6	9863.9				110.0	72.0					II
MC-076	Machakos	C12060	KINYAATA	150/3	37.64	-1.34	348.8	9851.5	1294	1998	9	75.0	30.0	2.0			4.00	
MC-077	Machakos	U1	MIUMBINI	149/4			310.0	9849.3	1460	37437		82.0	50.0	32.0			3.00	
MC-078	Machakos	U3	MUUSINI	150/3			351.4	9849.0	1280	37529		78.0	48.0	38.0			5.00	
MC-079	Machakos	-	Kithimani Mixed Sec. School		37.45	-1.19	327.3	9869.0										
MC-080	Machakos	-	Mwala Mixed Sec. School		37.45	-1.36	327.7	9850.2										
MC-081	Machakos	-	Kwa Maung Water Project		37.57	-1.40	340.4	9845.0										
MC-082	Machakos	-	Ngangani B/H		37.65	-1.04	349.4	9885.5										
MC-083	Machakos	-	Katangi High School		37.69	-1.41	353.4	9844.8										
MC-084	Machakos	-	KATANGI SCH	150/3			353.8	9844.4	1285									II
MC-085	Machakos	TW-1	JICA-BD		37.41	-1.23	322.8	9864.7				103.0		17.5		39.0	1.80	

No.	District	BH No.	Location Name	Map sheet	Longitude E	Latitude N	X grid (km)	Y grid (km)	Altitude (m)	Completion date	Litho-logy	Drilling depth (GL-m)	Depth of Aquifer (GL-m)	Static Water Level (GL-m)	Pumping Water Level (GL-m)	Draw-down (m)	Pumping rate (m3/h)	Level Type
KT-001	Kitui	C95	Ndolo's Corner	150/2	37.85	-1.22	379.5	9863.7	1372	11688	2	92.0	88.0	16.0			4.92	
KT-002	Kitui	C135	Kabati	150/2			379.5	9869.2	991	13545	2	66.0	37.0	19.0			8.10	II
KT-003	Kitui	C425	Kitui Town	151/3			390.6	9850.8	1159	16984	2	122.0	9.0	5.0			0.36	
KT-004	Kitui	C438	KITUI TOWN	150/4			368.4	9839.7	1097	1972/10/1	2	83.0	54.0	35.0			9.54	
KT-005	Kitui	C452	Mutomo	164/3			411.0	9793.7	914	17076	2	88.0		6.4		28.1	8.40	
KT-006	Kitui	C464	MUTOMO	164/3			411.0	9797.4	1097	1962/4/1	2	83.0	53.0	35.0			4.98	
KT-007	Kitui	C496	KANZIKO	164/4			425.9	9788.1	762	1947/5/1	2	131.0	88.0	12.0			1.08	
KT-008	Kitui	C538	MUTHA	164/4			437.0	9799.2	732	1951/1/1	2	153.0	143.0	65.0			1.44	
KT-009	Kitui	C1300	Endau	175/1			390.6	9777.1	1097		2	97.0	11.0	8.0			1.50	
KT-010	Kitui	C1452	Katutu Secondary School		37.82	-1.17	368.0	9870.6										
KT-011	Kitui	C1521	PWD	164/3			394.3	9802.9	1219	1951/8/1	2	101.0		72.0			0.18	
KT-012	Kitui	C1522	PWD	164/3			401.8	9784.5	1067	18872	2	43.0				DRY	0.00	
KT-013	Kitui	C1543	Endau	163/2			385.1	9825.0	1372		2	83.0	79.0	24.0			2.00	
KT-014	Kitui	C1622	KITUI MOWD	150/4			386.9	9848.9	1152	1952/4/1	2	134.0	53.0	43.0			0.42	
KT-015	Kitui	C1738	Kitui Town	150/4			385.0	9848.9	1128	19450	2	63.0	35.0	35.0			11.34	
KT-016	Kitui	C2179	Nzambani	151/3	38.06	-1.43	388.8	9843.4	1091	19815	2	56.0	55.0	5.0		46.0	2.70	
KT-017	Kitui	C2191	Mutunguni	150/2			366.5	9872.9	1311	19968	2	122.0	104.0	55.0		31.0	6.24	
KT-018	Kitui	C2260	ADC MUTOMO	164/3			405.5	9804.7	914	1962/7/1	1	172.0	49.0	49.0		118.6	2.04	
KT-019	Kitui	C3198	Mukomo	164/3			398.0	9790.0	914	23012	2	75.0	49.0	1.0		30.2	5.88	
KT-020	Kitui	C3242	Mutha	164/4			437.0	9801.0	762	63	2	40.0	17.0	5.0			12.66	
KT-021	Kitui	C3326	Ithokwe	150/4			386.9	9848.9	1140	23802	2	62.0	5.0	5.0			0.24	
KT-022	Kitui	C3328	ITHOKWE	150/4			386.9	9848.9	1158	1971/7/1	2	45.0	37.0				0.06	
KT-023	Kitui	C3760	Kongondi	150/1			344.2	9880.2	1204	26146	2	198.0	61.0	28.0		77.4	0.30	
KT-024	Kitui	C3766	Kongondi	150/1			347.9	9880.2	1234	27973	2	152.0	91.0	23.0		119.2	1.50	
KT-025	Kitui	C3795	Kitui Town	150/4			386.9	9847.1	1008	26604	2	60.0	48.0	44.0		6.0	4.56	
KT-026	Kitui	C3883	Ikanga 1	164/1			394.3	9815.8	860	26604	2	82.0	6.0	4.0		65.9	2.70	
KT-027	Kitui	C3884	Ikanga 2	164/1			392.5	9812.1	860	26724	2	37.0	3.0	4.0		25.9	0.96	
KT-028	Kitui	C3907	Ikoo 2	151/1			407.3	9871.0	823	26696	2	92.0	19.0	5.0		40.3	3.48	
KT-029	Kitui	C3913	Ikoo 1	151/1			407.3	9871.0	823	27242	2	42.0	DRY	R		DRY	0.00	
KT-030	Kitui	C4028	Kitui	150/4			386.9	9848.9	1095	27273	2	152.0	20.0	4.0		132.1	0.42	
KT-031	Kitui	C4059		150/4			385.0	9847.1	1137	1975/10/1	5	120.0	68.0	27.0		85.0	0.24	
KT-032	Kitui	C4136	Kitui Town	150/4			385.0	9847.1	1152	27729	2	94.0	50.0	40.0		9.1	20.52	II
KT-033	Kitui	C4183	Ithokwe	150/4			385.0	9847.1	1120	75	5	110.0	55.0	41.0		58.4		
KT-034	Kitui	C4299	Ithokwe	150/4			386.9	9848.9	1260	28307	2	120.0	51.0	45.4			5.22	
KT-035	Kitui	C4355	Ithokwe	150/4			387.6	9846.5			2	44.0	9.0	6.0			6.00	
KT-036	Kitui	C4729	Ikanga Water Supply Prohect		38.05	-1.70	393.9	9812.3										
KT-037	Kitui	C5243	MUTOMO	164/3			412.9	9804.7	850	1983/12/23	8	100.0	24.0	15.0		76.0	3.72	II
KT-038	Kitui	C5902	Inyuu	151/3			403.6	9843.4	1000	30956	5	42.0	11.0	4.0		6.0	37.14	I
KT-039	Kitui	C6011	Inyuu	151/3			403.6	9843.4	1100	31472	2	9.2	4.5	4.0				I
KT-040	Kitui	C6628	Mutonguni Secondary School		37.98	-1.18	385.7	9869.8										
KT-041	Kitui	C7313	Mutha	164/4			420.3	9804.7	732	32144	6	75.0	38.0	13.0		57.0	5.82	
KT-042	Kitui	C7730	Mulango-2	151/3			390.3	9843.4	1089	32174	1	66.0	57.0	8.6		21.2	4.38	
KT-043	Kitui	C8307	Mutomo Hosp.		38.21	-1.83	411.4	9797.3										
KT-044	Kitui	C9470	Mutune	151/3			390.2	9854.5	1218	33393	2	50.0	32.0	6.0			0.50	
KT-045	Kitui	C9654	Kabati	150/2			377.8	9863.1	1224	33414	2	105.0	52.0	26.0			7.00	
KT-046	Kitui	C10198	Matinyani	150/4	37.97	-1.31	388.2	9856.4	1200	93	2	100.0	56.0	11.6		46.1	13.80	III
KT-047	Kitui	C10392	Kangii				382.0	9875.0		98	9	102.0	30.0	56.5			4.50	II
KT-048	Kitui	C10418	Emiria				369.0	9870.0		34621	9	100.0	28.0	5.7			2.50	II
KT-049	Kitui	C10929	KEFRI	151/3			390.4	9849.2	1120	34697	2	250.0	48.0	4.0		87.0	4.80	II
KT-050	Kitui	C11043	WIKILIYE				390.1	9842.5		1995/6/10	3	70.0	59.0	24.7		16.7	1.44	
KT-051	Kitui	C11137	Kitui Town	151/3			389.7	9848.5		35151	2	96.0	84.0	6.0			4.00	
KT-052	Kitui	C11319	Kyondoni	150/2			379.9	9864.8	1200	35341	3	100.0	68.0	31.0		3.0	5.50	II
KT-053	Kitui	C11492	Mutune Sch.	151/3			390.5	9854.2	1120	96	3	130.0	28.0	28.8		25.7	6.00	II
KT-054	Kitui	C11810	Mbitini Girls Secondary School		38.12	-1.59	401.4	9824.2										
KT-055	Kitui	C11818	Kanyangi		37.91	-1.77	378.0	9805.0		97	9	133.0	66.0	48.0			16.00	II
KT-056	Kitui	C11821	Mulutu				383.0	9851.0		97	9	124.0	70.0	50.0			9.00	
KT-057	Kitui	C11823	Kaveta/Voo				423.8	9816.6			9	140.0	Dry				-	
KT-058	Kitui	C11824	KALAMBANI				441.0	9817.0			9	51.2		4.8				
KT-059	Kitui	C11848	Mamole		37.80	-1.47	366.1	9837.9										
KT-060	Kitui	C11931					336.3	9881.6	35855									
KT-061	Kitui	C12062	Mulutu				383.4	9850.9		35735		124.0	70.0	51.0			9.00	
KT-062	Kitui	C13236	Malik Market (ICA-C13522)				379.0	9825.0		37302		134.0	32.0	26.4	97.9		1.50	
KT-063	Kitui	C13601	Itoleka (ICA-C13523)		37.94	-1.41	382.0	9839.0		37508		130.0	31.0	18.7	47.8		2.60	
KT-064	Kitui	C13602	Kakuuni (ICA)				382.0	9838.0		37492		182.0	54.0	58.4	149.9		3.30	
KT-065	Kitui	C13603	Kavuta (ICA)				378.0	9836.0		37512	9	127.0	31.0	25.0	70.1		18.40	
KT-066	Kitui	C13604	Ivovoani Village(ICA)				377.0	9827.0		37506	9	170.0	50.0	45.9	139.8		0.70	
KT-067	Kitui	C13605	Kavisuni(ICA)				381.0	9819.0		37474	9	158.0	26.0	19.6	122.3		1.20	
KT-068	Kitui	C13606	Kyambusya (ICA)				379.0	9827.0		37518	9	77.0	15.0	8.2	55.3		20.80	
KT-069	Kitui	C13607	Maliku South-Sendi (ICA)		37.90	-1.62	379.0	9824.0		37521	9	118.0	34.0	35.4	73.8		11.50	
KT-070	Kitui	C13608	Kathungu Village(ICA)				382.0	9834.0		37423	9	126.0	54.0	36.2	59.3		7.20	
KT-071	Kitui	C13609	Kathungi (ICA)				379.0	9831.0		37446	9	174.0	48.0	38.7	144.9		5.30	
KT-072	Kitui	P180	Kitui	151/3			390.5	9850.0		13605	2	54.0						
KT-073	Kitui	P181	Kitui	151/3			390.5	9850.0		37	2	64.0						
KT-074	Kitui	U12	Zombe Girls	151/3			415.9	9840.6	1080	37495		100.0	56.0	40.0			2.00	
KT-075	Kitui	U13	Makongo	151/3			430.5	9840.7	1080	37499		82.0	40.0	30.0			5.00	
KT-076	Kitui	U14	Itoleka	150/4			383.6	9799.4	1020	37503		100.0	60.0	50.0			10.00	
KT-077	Kitui	-	Zombe Girls Secondary School		38.25	-1.45	415.4	9840.0										
KT-078	Kitui	-	Makongo		38.37	-1.44	429.5	9841.2										
KT-079	Kitui	-	Gozini Spring		38.43	-1.79	435.2	9801.8										

No.	District	BH No.	Location Name	Map sheet	Longitude E	Latitude N	X grid (km)	Y grid (km)	Altitude (m)	Completion date	Litho-logy	Drilling depth (GL-m)	Depth of Aquifer (GL-m)	Static Water Level (GL-m)	Pumping Water Level (GL-m)	Draw-down (m)	Pumping rate (m3/h)	Level Type
MW-001	Mwingi	C104	Mwingi	137/3			393.6	9896.6	914	14824	2	91.0		8.0			0.84	
MW-002	Mwingi	C127	Kaliluni	150/2			375.7	9887.6	914	15008	2	25.0						
MW-003	Mwingi	C128	Kithioko	150/2			372.0	9883.9	1152	15036	2	22.0	18.0	13.0			0.90	
MW-004	Mwingi	C573	Waita	137/3			398.0	9906.0	914	17380	2	153.0	20.0	48.0			0.36	
MW-005	Mwingi	C2196	Migwani	150/2	37.89	-1.03	375.7	9887.6	1113	19845	2	67.0	36.6	24.0		2.0	9.00	
MW-006	Mwingi	C3922	Enziu				416.7	9905.5		1973		58.0	18.0	5.5				
MW-007	Mwingi	C4223	Migwani	151/1			398.0	9880.3	1160	27699	2	130.0	119.0	11.0			8.20	
MW-008	Mwingi	C4363	Nzeluni				400.6	9881.5	1100	28338		151.0	2.0	3.0			0.22	
MW-009	Mwingi	C4887	Migwani	151/1	38.02	-1.09	393.8	9880.0		29646	1	101.0	20.0	5.0			10.90	II
MW-010	Mwingi	C4888	Migwani	151/1			393.8	9879.8		29677	1	102.0	3.0	0.8			15.90	II
MW-011	Mwingi	C4930	Migwani	151/1			390.8	9879.8		29721		120.0	84.0	6.5		61.5	3.64	II
MW-012	Mwingi	C4988	Migwani	151/1			393.4	9884.8				108.0	3.0	0.6			18.20	II
MW-013	Mwingi	C5673	Mtwangombe	152/3			406.0	9801.8		30773		103.0		DRY		DRY	0.00	
MW-014	Mwingi	C8755	Mwingi	137/3			393.9	9896.4		32717	2	13.5	3.0	3.8			3.30	
MW-015	Mwingi	C8756	Mwingi	137/3			393.8	9896.2		32707	2	17.8	6.0	3.5			2.18	
MW-016	Mwingi	C9471	Mwingi	137/1			395.8	9897.8	1005	33255	2	60.0	15.0			49.8	0.16	I
MW-017	Mwingi	C9652	Mission CPD	151/2			429.0	9877.5		33318	2	68.5	42.0				0.50	
MW-018	Mwingi	C9653	Migwani	151/1			390.5	9879.5	1235	33351	2	90.0	65.0	19.0		39.4	4.20	
MW-019	Mwingi	C9472	Kimangao	137/1	38.14	-0.51	404.1	9943.2	820	33305	2	48.0	37.0	10.9		16.1	2.94	II
MW-020	Mwingi	C11172	Kyuso	137/1	38.21	-0.56	412.4	9939.1	3845	34929	2	85.0	64.0	37.0		9.0	1.14	II
MW-021	Mwingi	C11851	Musavani				417.8	9871.3		35827		90.0	5.0	-			6.00	
MW-022	Mwingi	C13258	Kairungu (Kiomo)	136/4			371.4	9893.2	1250	37044		90.0	24.0	11.2	50.6		14.60	
MW-023	Mwingi	C13260	Musuani	151/1			390.3	9887.7	1180	37043	2	106.0	22.0	7.4	96.3		1.20	
MW-024	Mwingi	U16	Kanyaa	150/2			385.9	9878.6	1375	37470		70.0	28.0	25.0			2.00	
MW-025	Mwingi	U17	Mumbuni	151/1			399.5	9884.5	1080	37479		80.0		DRY		DRY	0.00	
MW-026	Mwingi	U18	Mumbuni II	137/4			398.4	9882.3	1069	37517		74.0	35.0	4.0			25.00	
MW-027	Mwingi	U19	Kyamwenze	151/1			409.6	9883.8	740	37484		110.0		DRY		DRY	0.00	
MW-028	Mwingi	-	Bishop Kiunzi's Provate B/H		37.91	-0.94	377.8	9896.2										
MW-029	Mwingi	-	Kasanga, Mr.Mzomo Well		37.94	-1.09	381.7	9880.0										
MW-030	Mwingi	-	Itoloni		38.04	-1.09	392.1	9879.7										
MW-031	Mwingi	-	Mukuyuni Tube Well		38.18	-1.03	407.8	9885.8										
MW-032	Mwingi	-	Ilekye/ Munyuni (S/Well)		38.19	-1.08	408.8	9880.7										
MW-033	Mwingi	-	Mukusyoni (S/Well)		38.22	-1.11	412.3	9877.4										
MW-034	Mwingi	-	Nuu (Spring)		38.35	-1.06	427.3	9883.5										
MW-035	Mwingi	-	Imba Farm, Belgian Project		38.38	-0.87	430.0	9904.3										
MW-036	Mwingi	-	Katze Water Supply		38.08	-0.51	396.7	9943.8										
MW-037	Mwingi	-	Mugoo Well (Kimangao CDK)		38.17	-0.55	406.8	9939.8										
MW-038	Mwingi	TW-3	JICA-BD TW-3		37.90	-0.99	377.3	9890.5				90.0		9.1		3.7	12.57	

No.	District	BH No.	Location Name	Map sheet	Longitude E	Latitude N	X grid (km)	Y grid (km)	Altitude (m)	Completion date	Litho-logy	Drilling depth (GL-m)	Depth of Aquifer (GL-m)	Static Water Level (GL-m)	Pumping Water Level (GL-m)	Draw-down (m)	Pumping rate (m3/h)	Level Type
MK-001	Makueni	C6	KILIMA KIU	162/4	37.27	-1.83	307.2	9797.3	1524	12745	3	62.0	35.0	30.0			0.40	
MK-002	Makueni	C16	KIMA	162/3			303.5	9789.9	1524	12190	3	50.0						
MK-003	Makueni	C17	KIMA	162/3	37.23	-1.93	305.3	9786.2	1737	12208	3	38.0	30.0	19.0			7.60	
MK-004	Makueni	C18	KIMA	162/4	37.27	-1.95	307.2	9784.4	1585	12247	3	47.0	38.0	29.0			3.00	
MK-005	Makueni	C19	KIMA	162/4	37.27	-1.97	307.2	9782.5	1493	12269	3	64.0	25.0	20.0			3.80	
MK-006	Makueni	C33	MASONGALENI	175/3	38.05	-2.48	394.4	9725.5	878	13895	3	122.0		13.0			1.62	
MK-007	Makueni	C34	MASONGALENI	175/3	38.07	-2.48	396.2	9725.5	878	13927	3	77.0		1.2			2.21	
MK-008	Makueni	C51	EMALI	173/2	37.42	-2.03	325.8	9775.2	1234	14396	3	91.0	39.0	33.0			4.60	
MK-009	Makueni	C52	KILIMA KIU	162/3	37.20	-1.85	299.8	9795.4	1768	14447	3	68.0	55.0	37.0			8.70	
MK-010	Makueni	C55	SULTAN HAMUD	162/4			318.3	9778.9	1524	14488	3	122.0	37.0	32.0			0.20	
MK-011	Makueni	C60	KIMA	162/3	37.25	-1.93	305.3	9786.2	1433	12290	3	44.0	25.0	20.0			9.10	
MK-012	Makueni	C82	SULTAN HAMUD	173/2	37.37	-2.02	318.3	9777.0	1372	11322	3	24.0					0.00	
MK-013	Makueni	C120					307.2	9784.4										
MK-014	Makueni	C305	ULU	162/3	37.18	-1.85	297.9	9795.4	1646	16243	3	107.0	102.0	71.0			3.14	
MK-015	Makueni	C315	SULTAN HAMUD	173/2	37.37	-2.02	318.3	9777.0	1524	16301	3	59.0	50.0	48.0			0.28	
MK-016	Makueni	C328	SIMBA	174/1	37.67	-2.05	351.7	9773.4	1006	17290	3	76.0	48.0	42.0			5.00	
MK-017	Makueni	C359	SULTAN HAMUD	173/2	37.37	-2.02	318.3	9777.0	1524	16524	3	60.0	50.0	46.0			9.10	
MK-018	Makueni	C398	MAKUENI	163/3	37.70	-1.88	355.4	9791.8	1158	16834	3	145.0		1.0			0.00	
MK-019	Makueni	C414	MAKUENI	163/3	37.72	-1.90	357.3	9790.0	1189	16947	3	135.0	84.0	47.0			4.80	II
MK-020	Makueni	C427	KIU	162/3	37.17	-1.90	296.1	9789.9	1460	16981	3	85.0		7.0			9.10	
MK-021	Makueni	C437	KEITA RIVER	163/3	37.60	-1.78	344.3	9804.7	1220	16895	3	123.0	115.0	15.0			7.20	
MK-022	Makueni	C445	ULU	162/3	37.23	-1.85	297.9	9795.4	1585	17029	3	123.0	60.0	54.0			6.50	
MK-023	Makueni	C446	MAKUENI	163/3	37.60	-1.77	344.3	9804.7	1128	17015	3	123.0	109.0	18.0			6.40	I
MK-024	Makueni	C454	MAKUENI	163/3	37.73	-1.78	359.1	9802.9	1036	17059	2	84.0	84.0	16.0			4.87	
MK-025	Makueni	C461	MWANI SEC SCH	163/3	37.66	-1.75	351.7	9804.7	1067	16984	2	54.3	53.0	8.0			16.36	II
MK-026	Makueni	C469	KIU	162/3	37.15	-1.88	294.2	9791.7	1524	17076	2	63.0	33.0	24.0			12.72	
MK-027	Makueni	C474	MAKUENI	163/4	37.82	-1.78	368.4	9802.9	914	17087	2	41.0	41.0	10.0			3.98	
MK-028	Makueni	C482	EMALI	163/3			357.3	9790.0	1067	1946/6/1	2	135.0	84.0	47.0				
MK-029	Makueni	C488	MALIBANI	163/3	37.58	-1.78	342.4	9802.8	1158	17107	2	123.0	91.0	13.0			3.06	II
MK-030	Makueni	C500	MAKUENI	163/4			362.8	9784.4	1067	17168	2	67.0	12.0	9.0			5.83	
MK-031	Makueni	C518	MAKUENI	163/3			349.9	9782.6	990	17240	2	132.0	99.0	16.5				
MK-032	Makueni	C545	SIMBA	174/1	37.63	-2.12	348.0	9766.0	991	17312	2	83.0	76.0	17.0			5.53	
MK-033	Makueni	C603	KIMA	162/3	37.20	-1.92	299.8	9788.1	1524	17432	2	171.0	61.0	21.0			10.50	
MK-034	Makueni	C610	ULU	162/3			296.1	9791.7	1524	17486	2	109.0					0.00	
MK-035	Makueni	C612	ULU	162/3	37.15	-1.88	294.2	9791.7	1524	17500	2	30.0	9.0	9.0			9.10	
MK-036	Makueni	C687	ULU	162/3			303.5	9793.6	1524	17693		146.0					0.00	
MK-037	Makueni	C688	ULU	162/3	37.25	-1.87	305.3	9793.6	1585	17734		153.0	98.0	73.0			0.60	
MK-038	Makueni	C1004	KIBWEZI	175/3	38.05	-2.45	394.4	9729.2	838	18191		173.0	85.0	76.0			0.23	
MK-039	Makueni	C1005	KIBWEZI	175/3	38.05	-2.45	394.4	9729.2	838	18158		68.0	16.0	46.0			1.35	
MK-040	Makueni	C1053	MACHAKOS	162/4	37.30	-1.97	310.9	9782.5	1585	18095		52.0	43.0	34.0			0.38	
MK-041	Makueni	C1054	MACHAKOS	162/4			314.6	9778.9	1524	22372		123.0	113.0	38.0			9.08	
MK-042	Makueni	C1131	KIMA	162/4	37.30	-1.93	310.9	9786.2	1737	18430	3	80.0	52.0	41.0			6.80	
MK-043	Makueni	C1132	KIMA	162/4	37.28	-1.92	309.1	9788.1	1280	18378	3	134.0	46.0	40.0			0.14	
MK-044	Makueni	C1181	MTITO ANDEI	183/1	38.12	-2.75	401.8	9696.0	914	18543	3	139.0	31.0	27.0			1.60	
MK-045	Makueni	C1311	KIMA	162/3			305.3	9789.9	1630	18685	3	137.0	89.0	36.0			6.80	
MK-046	Makueni	C1376	KIMA	162/3			305.3	9793.6	1597	18717	3	122.0	67.0	59.0			2.70	
MK-047	Makueni	C1455	MTITO ANDEI	183/3			396.3	9692.3	975	18808	3	108.0	102.0	47.0			2.04	
MK-048	Makueni	C1485	KIMA	162/4			307.2	9786.2	1453	18816	3	159.0	85.2	42.0			0.19	
MK-049	Makueni	C1518	KITETA	162/2			333.1	9830.5	1280	18870	3	152.0	81.0	54.0			1.18	
MK-050	Makueni	C1557	MBITINI	173/2			331.3	9777.0	1234	18923	3	148.0	57.0	58.0			2.04	II
MK-051	Makueni	C1578	SULTAN HAMUD	163/3			351.7	9802.9	1158	18933		79.0	42.0	21.0			7.00	II
MK-052	Makueni	C1579	KIU	162/3			294.2	9791.7	1524	18863		122.0	36.0	10.0			18.20	
MK-053	Makueni	C1580	KAUMONI	163/1			340.6	9808.4	1463	18890		84.0	45.0	27.0			3.70	
MK-054	Makueni	C1667	DARANJANI	162/4			312.8	9802.8	762	18954		40.2					0.00	
MK-055	Makueni	C1668	DARANJANI	162/4			310.9	9802.8	762	19015		73.0					0.00	
MK-056	Makueni	C1802	SULTAN HAMUD	162/3			297.9	9786.2	1423	19080		17.0					0.00	
MK-057	Makueni	C1804	SULTAN HAMUD	162/4			312.8	9797.3	1231	19119		178.0	60.0	49.0			0.90	
MK-058	Makueni	C1835	EMALI	163/3			346.1	9797.3	1219	19259		91.0					0.00	
MK-059	Makueni	C1849	EMALI	163/3	37.71	-1.84	355.4	9797.3	1120	19278		76.0					0.00	
MK-060	Makueni	C1856	NGOSINI	163/3	37.71	-1.80	361.0	9801.0	1067	19294	3	68.0	61.0	18.0			0.73	
MK-061	Makueni	C1885	NZOENI	163/3			346.1	9797.3	1173	19299	3	134.0	116.0	65.0			39.30	
MK-062	Makueni	C1886	MASAU	163/3			351.7	9789.9	1186	19329	3	136.0	58.0	55.0			49.00	II
MK-063	Makueni	C1890	MAKUENI	163/3			355.4	9797.3	1219	1952/11/1	3	61.0						
MK-064	Makueni	C1945	MAKUENI	163/3			355.4	9797.3	1402	19448	3	122.0	88.0	6.0				
MK-065	Makueni	C2004	KIU	162/3			297.9	9791.7	1524	19589	3	64.0	64.0	27.0			4.50	
MK-066	Makueni	C2123	SULTAN HAMUD	162/4			312.8	9780.7	1265	19736	3	36.6	113.0	54.9			18.20	
MK-067	Makueni	C2130	SULTAN HAMUD	173/2			318.3	9777.0	1372	19701	3	78.0	63.0	52.0				
MK-068	Makueni	C2150	KIMA	162/3			299.8	9793.6	1707	19775		76.0	55.0	41.0			40.00	
MK-069	Makueni	C2182	SULTAN HAMUD	162/4			316.5	9778.9	1493	19819	3	85.0	67.0	30.0			0.03	
MK-070	Makueni	C2203	SULTAN HAMUD	162/4			316.5	9778.9	1524	19859	3	120.0	76.0	40.0		0.5	2.27	
MK-071	Makueni	C2232	SULTAN HAMUD	173/2			320.2	9777.0	1234	19903	3	90.0	81.0	41.0		0.0	7.26	
MK-072	Makueni	C2267	TAWA	162/2			327.6	9828.6	1470	20010	3	73.0	57.0	7.0		0.2	8.18	II
MK-073	Makueni	C2284	MIU	163/1			342.4	9832.3	1158	20037	3	134.0	55.0	8.0			4.09	
MK-074	Makueni	C2365	SULTAN HAMUD	173/2			318.3	9777.0	1372	20170	3	76.0	67.0	55.0				
MK-075	Makueni	C2370	SULTAN HAMUD	173/2			318.3	9777.0	1227	20181	3	76.0	62.0	46.0		1.0	8.17	
MK-076	Makueni	C2426	MBIUNI	163/1			342.4	9823.1	1280	20318	3	122.0	76.0	49.0		0.7	1.53	
MK-077	Makueni	C2451	KILALA	163/3			338.7	9804.7	1219	20382	3	78.0	42.0	6.0		0.1	6.50	II
MK-078	Makueni	C2452	YOANI	162/3			303.5	9795.4	1524	20390	3	107.0	85.0	70.0			1.80	
MK-079	Makueni	C2453	OKIA	162/4			333.1	9804.7	1317	20411	3	61.0						
MK-080	Makueni	C2454	NZIU	163/3			336.9	9799.1	1219	20412	3	110.0	105.0	6.1			2.70	II
MK-081	Makueni	C2476	CHYULU HILLS	183/1			388.8	9697.9	1067	1955/10/17	3	145.0	127.0	121.0				
MK-082	Makueni	C2477	CHYULU HILLS	183/1			392.5	9699.7	1006	20423	3	108.0	47.0	46.0				
MK-083	Makueni	C2498	SIMBA	174/1			351.7	9766.0	1204	20553	3	118.0					0.00	
MK-084	Makueni	C2515	KASIKEU MARKET	162/4			320.2	9784.4	1280	20625	3	55.0						
MK-085	Makueni	C2520	KILALA	162/4			333.2	9780.7	1234	20627	3	122.0	117.0	69.0			6.50	
MK-086	Makueni	C2556	KASIKEU	162/4			320.2	9784.4	1265	1956/7/27	3	21.0	15.0	3.0				
MK-087	Makueni	C2604	KASIKEU	162/4			320.2	9784.4	1737	1956/10/1	3	96.0						
MK-088	Makueni	C2695	SULTA HAMUD	173/2			310.9	9760.4	1311	21030	3	108.0	102.0	61.8		1.0	11.40	
MK-089	Makueni	C2747	MBOONI	162/3			305.3	9797.3	1372	21207	3	182.0	71.1	59.0			1.03	II
MK-090	Makueni	C2777	MTITO ANDEI	183/1			401.8	9697.9	930	21224	3	138.0	56.0	52.0			0.06	
MK-091	Makueni	C2778	MTITO ANDEI	183/3			396.3	9692.3	975	21238	3	52.0	43.0	27.0		5.0	4.68	
MK-092	Makueni	C2779	MTITO ANDEI	183/3			396.3	9692.3	975	21247	3	67.0	48.0	37.0			0.06	
MK-093	Makueni	C2824	YOANI	162/3			301.6	9795.4	1524	21415	3	116.0	73.0	60.0				
MK-094	Makueni	C2829	YOANI	163/1			336.8	9823.1	1920	21399	3	108.0	60.0	58.0			0.54	
MK-095	Makueni	C2849	ULU	162/3			303.5	9797.3	1707	21539	3	122.0						
MK-096	Makueni	C2855	YOANI	149/4			331.3	9839.7	1646	21556	3	92.0	78.0	59.0			3.60	
MK-097	Makueni	C2860	YOANI	162/3			305.3	9789.9	1646	21583	3	71.0	71.0	43.0			10.00	
MK-098	Makueni	C2896	KIMA	162/4			307.2	9789.9	1372	21639	3	65.0	55.0	43.0			18.20	
MK-099	Makueni	C2921	MTITO ANDEI	183/3			400.0	9694.2	853	21792	3	158.0	128.0	67.0				
MK-100	Makueni	C2944	MTITO ANDEI	183/3			396.3	9690.5	975	21843	3	76.0	69.0	39.0		3.0	13.10	
MK-101	Makueni	C2975		173/2			310.9	9764.1	1509	21855	3	213.0	95.0	85.0			9.12	
MK-102	Makueni	C3092	MTITO ANDEI	183/3			403.7	9675.8	914	22225	3	92.0	37.0	24.0			5.40	
MK-103	Makueni	C3116	MTITO ANDEI	183/3			407.4	9670.2	914	22302	3	10.0	10.0				5.94	
MK-104	Makueni	C3121	MTITO ANDEI	183/1			407.4	9703.4	701	22366	2	96.0	31.0	26.0			1.27	

No.	District	BH No.	Location Name	Map sheet	Longitude E	Latitude N	X grid (km)	Y grid (km)	Altitude (m)	Completion date	Litho-logy	Drilling depth (GL-m)	Depth of Aquifer (GL-m)	Static Water Level (GL-m)	Pumping Water Level (GL-m)	Draw-down (m)	Pumping rate (m3/h)	Level Type
MK-105	Makueni	C3128	MARWA EST.KIMA	162/3			299.8	9789.9	1524	22456	3	144.0	76.0	69.0			0.16	
MK-106	Makueni	C3132	MARWA EST.KIMA	162/3			303.5	9789.9	1524		3	158.0	137.0	41.0			2.60	
MK-107	Makueni	C3135	NGULIA.NO 2	183/3			407.4	9672.1	914	22512	3	74.0	42.0	27.4			0.02	
MK-108	Makueni	C3145	NDAWE	183/3			411.1	9673.9	1067	22558	3	141.0	29.0	5.0			1.68	
MK-109	Makueni	C3315	MACHAKOS	162/3			301.6	9793.6	1524	23638	3	114.0	53.0	5.0			0.58	
MK-110	Makueni	C3322	MTITO ANDEI	183/1			403.7	9701.6	762	23784	3	82.0	40.0	4.0			13.18	
MK-111	Makueni	C3323	KENANI HILL	183/4			420.3	9692.4	610	23804	3	57.0					0.00	
MK-112	Makueni	C3336	TSAVO PARK	183/4			427.8	9679.5	610	23897	3	85.0	43.0	35.0			1.38	
MK-113	Makueni	C3338	SULTAN HAMUD	173/2			310.9	9773.3	1528	23743	3	137.0	49.0	37.8			5.90	
MK-114	Makueni	C3347	TSAVO PARK	183/1			390.7	9721.8	884	23886	3	50.0	15.0	11.0			7.00	
MK-115	Makueni	C3356	NBI/MBS ROAD	183/4			420.3	9692.4	1615	23947	3	107.0	107.0	44.0			2.88	
MK-116	Makueni	C3510	MAKUENI	162/3			296.1	9791.7	1524	25073	3	84.0	78.0	14.0			13.00	
MK-117	Makueni	C3755	TAWA	162/2			327.6	9826.8	1301	26042	3	107.0	92.0	36.0				
MK-118	Makueni	C3977	KATHONZWENI	163/3			359.1	9788.1	1040	27048	3	152.0	94.0	41.0		42.0	4.27	
MK-119	Makueni	C4009	MAKUENI	163/3			349.8	9804.7	1066	27120	3	134.0	36.0	29.0		5.0	0.75	II
MK-120	Makueni	C4016	MAKUENI	163/3			349.8	9804.7	1066	27178	3	92.0	4.0	3.0		6.0	4.50	II
MK-121	Makueni	C4275	MATILIKU	163/3			336.9	9784.4	1040	28084	3	80.0	50.0	42.0		29.0	4.50	II
MK-122	Makueni	C4878	KAKO MUKA W/S	163/3			337.4	9797.7		29705	3	60.0	28.0	3.0		8.0	2.88	
MK-123	Makueni	C5054	MASONGALENI	175/3			403.6	9738.4	700	30022	3	26.0	18.0	7.0		5.0	2.52	
MK-124	Makueni	C5055	MASONGALENI	175/3			399.9	9738.4		30033	3	25.0	20.0	15.0			2.70	
MK-125	Makueni	C5067	KAKO-SAVANI VALLEY	149/			348.5	9811.8		30011	3	80.0	47.0					
MK-126	Makueni	C5095	MAKUENI	163/1			352.5	9807.7		30076	3	85.0					0.00	
MK-127	Makueni	C5110	KALAWA				356.5	9813.3		30121	3	64.0	56.0	49.0			18.00	
MK-128	Makueni	C5262					336.6	9785.2			3							
MK-129	Makueni	C5759	UNOA	163/3			346.6	9803.4	1250	31048	3	126.0	110.0	17.0			1.68	
MK-130	Makueni	C6009		162/4			317.3	9779.3				140.0					0.00	
MK-131	Makueni	C6010		162/4			317.3	9779.3				120.0	108.0	34.0				
MK-132	Makueni	C6036	EMALI	173/2			331.3	9771.5	1101	31099	3	124.0	96.0	55.0		8.0	1.50	
MK-133	Makueni	C4745	MATILIKU	163/3			336.1	9785.1	1160	29231	3	31.0	20.0	5.0				
MK-134	Makueni	C4753	KAKO				349.5	9811.0		29247	3	98.0	50.0					
MK-135	Makueni	C4772	KAKO	163/1			349.5	9848.0		29357	3	80.0	66.0					
MK-136	Makueni	C7294					305.8	9794.3	1500	1987/7/1	3	100.0	56.0	55.0				
MK-137	Makueni	C7963	KATHONZWENI	163/3	37.73	-1.92	358.4	9789.0	1090	32319	3	130.0	46.0	34.9		9.0		
MK-138	Makueni	C8144	KATHONZWENI	163/3	37.74	-1.92	351.8	9788.8	1015	33160	3	99.0	46.0	40.0		3.3		
MK-139	Makueni	C8519	KATHONWENI				358.1	9788.9										
MK-140	Makueni	C8745	WOTE	163/3	37.66	-1.76	351.1	9805.1	1100	32914	1	97.0	30.0	1.7	16.0	14.3	6.20	II
MK-141	Makueni	C9004	TSAVO LODGE		38.17	-2.68	406.7	9703.5	700	33350	9	57.0	46.0	14.0		7.0	26.00	
MK-142	Makueni	C9750	NGAAMBA	162/3			291.4	9790.5		33472	2	100.0	68.0	50.0			0.55	
MK-143	Makueni	C10036	MTITO ANDEI	183/1			404.7	9706.4				70.0	46.0	26.0	34.0	8.0	1.80	I
MK-144	Makueni	C10334	MTITO ANDEI	183/1	38.17	-2.69	407.3	9702.4	746	33924	8	75.0	38.0	16.9		12.0	6.30	
MK-145	Makueni	C10405	NTHONGONI	183/1			393.4	9700.2		34057	1	100.0	40.0	8.0		3.0	7.76	
MK-146	Makueni	C10406	MAKUTANO	183/1	38.05	-2.66	395.4	9712.1		34088	1	48.0		23.0				
MK-147	Makueni	C10667	KANDOLO	162/4	37.37	-1.95	317.7	9784.5	1100	34465	3	61.0	42.5	35.5			18.80	
MK-148	Makueni	C11153	MASONGALINI		38.50	-3.30	444.5	9634.8	4129	34902	1	87.5	70.0	18.3		1.5	1.20	
MK-149	Makueni	C11154	MASONGALENI		38.51	-3.68	334.6	9593.7	4129	34891	2	81.0	72.0	11.2		1.5	6.00	
MK-150	Makueni	C11353	DARAJANI	183/1			400.9	9714.7				125.0	48.0	36.0			1.26	II
MK-151	Makueni	C11615	KAMBU	183/1			395.6	9712.6				100.0	40.0	51.8			11.00	
MK-152	Makueni	C11673	MTITO ANDEI	183/3			406.4	9703.2										
MK-153	Makueni	C12054	HETANI	162/2			322.3	9826.2		36008	2	75.0	50.0	15.0			4.00	II
MK-154	Makueni	C12055	MALIVANI	163/3			341.0	9801.8		35916	2	100.0	70.0	8.0			7.00	II
MK-155	Makueni	C12056	KALAWA	163/3			355.5	9818.1		36008		96.0					0.00	
MK-156	Makueni	C12057	NZUENI	163/3			346.1	9797.3		36008	2	110.0	70.0	60.0			5.00	II
MK-157	Makueni	C12058	THAVU	163/3			362.8	9784.5		36008	2	34.0	11.0	4.0			5.00	II
MK-158	Makueni	C12238	KAITI	162/2			319.5	9809.7				114.0	40.0	30.0			0.80	I
MK-159	Makueni	C12239		162/2			324.7	9808.4										
MK-160	Makueni	C12339		163/3			344.3	9804.7										
MK-161	Makueni	C13126		163/3			347.1	9800.5									1.20	
MK-162	Makueni	C13262	KALAWA Divisiob Hqs	163/1	37.70	-1.65	356.3	9817.5	1160	37053		96.0	52.0	21.1	84.0		3.90	
MK-163	Makueni	C13263	Watema	162/2	37.26	-1.68	310.1	9811.9	1800	37072		130.0	43.0	18.8	99.0		0.66	
MK-164	Makueni	C13265	Mwanyani Dispensary	74/1&174	37.50	-2.03	333.5	9775.3	1190	37074		130.0	87.0	57.8	71.1		1.32	
MK-165	Makueni	C13509	MAKUTANO	183/3			407.3	9702.6										
MK-166	Makueni	P28	KIU STATION	162/3	37.16	-1.89	295.4	9790.6		10584	2	53.0	24.0	4.0			15.75	
MK-167	Makueni	P57	KILUNGU	162/4	37.28	-1.95	309.2	9784.2		10778	1	45.4	35.0	9.1			4.68	
MK-168	Makueni	P98	ULU	162/	37.19	-1.83	299.0	9798.0		11101	2	60.0	49.0	46.0			2.73	
MK-169	Makueni	P127	MACHAKOS/SIMBA	174/1	37.70	-2.08	355.7	9769.8		11323	2	36.0					0.00	
MK-170	Makueni	P143	SIMBA	174/1			349.3	9769.8		11571	2	60.0					0.00	
MK-171	Makueni	U4	KAMBU	183/1	38.03	-2.62	392.5	9710.2	930	20^may		70.0	10.0	4.0				
MK-172	Makueni	U6	MAKAME AMBEO	174/1	37.64	-2.08	349.1	9769.8	1040	37405		98.0	69.0	40.0			15.00	II
MK-173	Makueni	U8	MAIYANI	162/4	37.30	-1.92	311.2	9788.0	1970	37419		72.0	34.0	8.0			8.00	
MK-174	Makueni	U9	TAWA CENTER	162/2	37.45	-1.10	327.0	9878.7	1300	37424		80.0	32.0	12.0			5.00	
MK-175	Makueni	U10	KIVUTINI	163/3	37.57	-1.79	340.3	9802.7	1200	37432		52.0	20.0	6.0			30.00	
MK-176	Makueni	-	Maiani B/H		37.30	-1.85	311.0	9796.1										
MK-177	Makueni	-	Mwani B/H		37.37	-2.00	319.0	9778.9										
MK-178	Makueni	-	Maatha Water Project		37.51	-2.03	333.6	9775.5										
MK-179	Makueni	-	New Kilala Water Project		37.53	-1.77	336.6	9804.3										
MK-180	Makueni	-	Yandia River near 113		37.54	-1.99	337.0	9779.8										
MK-181	Makueni	-	Wamyatu		37.55	-2.00	338.0	9779.6										
MK-182	Makueni	-		182/2			388.5	9712.3										
MK-183	Makueni	-					305.8	9794.3	1500	31959	3	100.0	56.0	55.0				
MK-184	Makueni	-	Komboyo B/H		38.00	-2.61	388.7	9712.1										
MK-185	Makueni	-	Mbui Nzau B/H		38.07	-2.38	396.0	9736.9										
MK-186	Makueni	-	Umani Spring		37.91	-2.45	378.6	9728.9										
MK-187	Makueni	-	Msima Spring		38.02	-2.69	390.8	9702.4										
MK-188	Makueni	-	Mtiti-a-Ndei B/H		38.17	-2.69	406.7	9702.4										
MK-189	Makueni	TW-2	JICA-BD TW-2		37.60	-1.94	343.6	9785.6				103.0		9.1		86.6	0.18	

No.	District	BH No.	PH	COLOR	TURB	PV	COND	TDS	EC (µS/cm)	Fe (mg/l)	Mn (mg/l)	Ca (mg/l)	Mg (mg/l)	Na (mg/l)	K (mg/l)	THARD	TALK	Cl (mg/l)	F (mg/l)	SO4 (mg/l)	PO4 (mg/l)	FCO2 (mg/l)	CO3 (mg/l)	HCO3 (mg/l)	NO2 (mg/l)	NO3 (mg/l)	SiO2 (mg/l)
MC-001	Machakos	C401	7.3	5	0			282	470	0.2		60.0	11.0	25.0	7.0	198.0	273.0	18.0	0.2	14.0		13.0	0.0	273.0	0.0	0.0	70.0
MC-002	Machakos	C436	7.6	5	0			414	690	0.1		49.0	13.0	68.0	7.0	178.0	264.0	102.0	0.6	9.0		10.0	0.0	364.0	0.0	4.0	15.0
MC-003	Machakos	C473																									
MC-004	Machakos	C492																									
MC-005	Machakos	C1133																									
MC-006	Machakos	C1430																									
MC-007	Machakos	C1493	7.3	0	0			380	608	0.0		32.0	33.0			216.0	254.0	31.0	1.4	0.3			0.0	254.0	0.1	0.0	70.0
MC-008	Machakos	C1507	7.5					715	1144	0.2		86.0	33.0			351.0	426.0	62.0	2.3	80.0							74.0
MC-009	Machakos	C1508																	1.4								
MC-010	Machakos	C1571						960	1536	0.1		118.0	46.0			484.0	465.0	217.0	2.9	45.0							
MC-011	Machakos	C1572																									
MC-012	Machakos	C1595	7.2	0	0			879	1406	0.0		94.0	36.0			383.0	437.0	165.0	2.4	48.0			0.0	437.0	0.0	0.0	36.0
MC-013	Machakos	C1632																									
MC-014	Machakos	C1864																									
MC-015	Machakos	C1949																									
MC-016	Machakos	C1972																									
MC-017	Machakos	C1973																									
MC-018	Machakos	C1989																									
MC-019	Machakos	C2019																									
MC-020	Machakos	C2024																									
MC-021	Machakos	C2041																									
MC-022	Machakos	C2132																									
MC-023	Machakos	C2266																									
MC-024	Machakos	C2333																									
MC-025	Machakos	C2357																									
MC-026	Machakos	C2406	7.5	10	8	2.00		183	305	0.7	0.1	0.8	0.4	83.0		14.0	162.0	13.0		7.0							
MC-027	Machakos	C2407																									
MC-028	Machakos	C2427																									
MC-029	Machakos	C2474																									
MC-030	Machakos	C2731																									
MC-031	Machakos	C2815																									
MC-032	Machakos	C2943																									
MC-033	Machakos	C3124																									
MC-034	Machakos	C3151																									
MC-035	Machakos	C3453																									
MC-036	Machakos	C3454	7.6					1560	2496	0.0						1060.0	385.0	46.0		631.0							
MC-037	Machakos	C3679																									
MC-038	Machakos	C3776	7.2	35	14			220	260	0.0		28.0	10.0	26.0	4.0	110.0	173.0	7.0	0.4	3.0		30.0	0.0	173.0	2.3	2.7	60.0
MC-039	Machakos	C3842																									
MC-040	Machakos	C3957	7.5	0	0			1660	2656	4.0	0.0	252.0	78.0	95.0	54.0	955.0	264.0	110.0	0.3	1033.0					0.2	8.9	
MC-041	Machakos	C3967	7.6	5			800	540	864		0.1	88.0	30.0	48.0	12.0	346.0		42.0	0.5	50.0		23.0		249.0	0.0		30.0
MC-042	Machakos	C3997																									
MC-043	Machakos	C4000	6.9	0	0	0.20		290	315	0.4	0.1	26.0	7.0	32.0	3.0	94.0	163.0	16.0	1.5	8.0		9.0		163.0	0.0	0.0	100.0
MC-044	Machakos	C4039	7.2	5		0.20		575	1000	0.0	0.2	77.0	40.0	36.0	8.0	360.0	432.0	107.0	0.0	37.0		5.0		432.0	0.0	11.1	60.0
MC-045	Machakos	C4162																									
MC-046	Machakos	C4295	6.7	5	10	16.00		390	650	0.1						168.0	125.0	175.0	0.3								
MC-047	Machakos	C4452	8.0	5	5	6.00		888	1479	0.4	1.3					564.0	192.0	119.0	0.8	290.0							
MC-048	Machakos	C4483	7.2	5	15	28.00		990	1650	0.7	0.5					1000.0	214.0	200.0	0.4	624.0							
MC-049	Machakos	C4541	6.2	5	2				126	0.1		2.5	1.4	15.1				19.7	0.3						0.0	1.0	
MC-050	Machakos	C4978																									
MC-051	Machakos	C5004	8.0		4	7.90	980	588	941			94.0	30.0			358.0	280.0	82.0	1.1	37.0							
MC-052	Machakos	C5255	7.6		3	12.60	500	300	480	0.7	0.1	17.0	9.3					76.0	0.6	18.7				170.6			
MC-053	Machakos	C5256	6.0		21	6.32		90	150	1.1	0.1	0.9	1.4			32.0	26.0	18.0	0.2	0.6	0.1			31.7			
MC-054	Machakos	C5440	6.8					1086	1738	0.0	0.0								0.8								
MC-055	Machakos	C6035																									
MC-056	Machakos	C6038	8.2	30	25	0.30		498	830	4.5	0.3	47.0	82.0	150.0	8.9	364.0	205.0	115.0	1.1	216.0				250.0			
MC-057	Machakos	C6301																									
MC-058	Machakos	C6890																									
MC-059	Machakos	C9473	8.0	100	33	2.10		154	257	1.6	0.5	13.0	5.0	30.0	23.0	54.0	70.0	9.0	0.4	30.0	0.0	8.0			1.0		
MC-060	Machakos	C10622																									
MC-061	Machakos	C10875																									
MC-062	Machakos	C11092																									
MC-063	Machakos	C11274																									
MC-064	Machakos	C11434																									
MC-065	Machakos	C11619																									
MC-066	Machakos	C11696																									
MC-067	Machakos	C11854	7.3	5	1	0.40		360	520	0.2	0.0	65.6	21.6	110.6	12.3	254.0	274.0	86.0	2.0	60.0		5.0	0.0	274.0	0.1	0.0	40.0
MC-068	Machakos	C11856																									
MC-069	Machakos	C11923																									
MC-070	Machakos	C11926	7.5	5	1	0.75		4800	7000	0.0	1.0	200.0	90.0	620.6	15.8	900.0	400.0	1150.0	3.0	1500.0		5.0	0.0	400.0	0.0	0.0	20.0
MC-071	Machakos	C11936																									
MC-072	Machakos	C11942	7.2	5	1	2.30		800	1200	0.4	2.1	36.0	69.6	78.7	13.1	380.0	370.0	130.0	0.4	60.0		10.0	0.0	370.0	1.0	0.0	20.0
MC-073	Machakos	C11943																									
MC-074	Machakos	C11976																									
MC-075	Machakos	C12053																									
MC-076	Machakos	C12060																									
MC-077	Machakos	U1																									
MC-078	Machakos	U3																									
MC-079	Machakos	-	7.8					425	680	0.0	0.0								1.5								
MC-080	Machakos	-	7.5					1675	2680	0.0	0.0								0.0								
MC-081	Machakos	-	7.3					1275	2040	0.0	0.0								1.5								
MC-082	Machakos	-	7.0					1294	2070		1.0								0.8								
MC-083	Machakos	-	6.9					878	1405	0.0	0.0								0.4								
MC-084	Machakos	-																									
MC-085	Machakos	TW-1		0	5			3464	4100	0.6	0.1	290.0	571.0	851.0	9.9	175.0	495.0	151.0	1.1	193.0	1.1				0.2	0.0	33.6

No.	District	BH No.	PH	COLOR	TURB	PV	COND	TDS	EC (µS/cm)	Fe (mg/l)	Mn (mg/l)	Ca (mg/l)	Mg (mg/l)	Na (mg/l)	K (mg/l)	THARD	TALK	Cl (mg/l)	F (mg/l)	SO4 (mg/l)	PO4 (mg/l)	FCO2 (mg/l)	CO3 (mg/l)	HCO3 (mg/l)	NO2 (mg/l)	NO3 (mg/l)	SiO2 (mg/l)
KT-001	Kitui	C95	7.1					1214	1943	0.1	0.0								0.8								
KT-002	Kitui	C135																	2.0								
KT-003	Kitui	C425																									
KT-004	Kitui	C438																									
KT-005	Kitui	C452																									
KT-006	Kitui	C464																									
KT-007	Kitui	C496																									
KT-008	Kitui	C538																									
KT-009	Kitui	C1300																									
KT-010	Kitui	C1452	7.0					928	1485	0.0	0.0								0.8								
KT-011	Kitui	C1521																									
KT-012	Kitui	C1522																									
KT-013	Kitui	C1543																									
KT-014	Kitui	C1622																									
KT-015	Kitui	C1738																									
KT-016	Kitui	C2179	6.5	5	2	5.50	91	55	88			4.0	1.0	7.3	4.0	14.0	14.0	7.0	0.2	0.4	0.0	22.0			0.0		
KT-017	Kitui	C2191																									
KT-018	Kitui	C2260																									
KT-019	Kitui	C3198																									
KT-020	Kitui	C3242																									
KT-021	Kitui	C3326																									
KT-022	Kitui	C3328																									
KT-023	Kitui	C3760	7.6	15	50		410	246	394	0.0		97.0	16.0	27.0	6.0		246.0	25.0	1.3	60.0		5.0	0.0	246.0	0.0	0.0	
KT-024	Kitui	C3766	7.4	5	0		940	564	902	0.1		104.0	38.0	72.0	11.0	14.0	434.0	111.0	0.9	22.7		18.0	0.0	434.0	0.0	0.0	60.0
KT-025	Kitui	C3795	8.3	5	15	0.40	420	252	403							130.0	226.0	57.0	0.1		0.3						
KT-026	Kitui	C3883																									
KT-027	Kitui	C3884	8.2	5	0		920	620	992	0.0	0.0	30.0	38.0	134.0	3.0	232.0	472.0	23.0	1.4	24.0		0.0	0.0	472.0	0.0	0.8	70.0
KT-028	Kitui	C3907	7.8	5			520	320	512	0.3		32.0	16.0	61.0	3.0	148.0		36.0	1.0	17.0		16.0					40.0
KT-029	Kitui	C3913																									
KT-030	Kitui	C4028	8.4	5		0.20	900	550	880	0.0	0.4	41.0	28.0	98.0	9.0	218.0		76.0	0.2	40.0				317.0			35.0
KT-031	Kitui	C4059	7.7	60	45	5.40		455	650	18.0	6.0	51.0	17.0	51.0	11.0	198.0		58.0	0.4	33.0		7.0		312.0			35.0
KT-032	Kitui	C4136	8.3	10	15	0.10	585	351	562							212.0								242.0			
KT-033	Kitui	C4183	8.5	5		0.60	465	279	446							172.0								148.0			
KT-034	Kitui	C4299	8.1	5	1	9.00	400	240	384		0.1					172.0	184.0	186.0	0.1								
KT-035	Kitui	C4355	6.9	30	69	6.00	420	252	403	0.7	0.9					259.0	169.0	175.0	0.1								
KT-036	Kitui	C4729	8.2		330			421	674	0.0	1.3	107.0	37.0				217.0	24.0	1.5								
KT-037	Kitui	C5243	7.9		9	11.00		120	200			7.2	2.0			26.0	82.0	15.0	0.5	1.9	0.0						
KT-038	Kitui	C5902																									
KT-039	Kitui	C6011																									
KT-040	Kitui	C6628	6.9					342	547	0.0	0.0								0.0								
KT-041	Kitui	C7313																									
KT-042	Kitui	C7730																									
KT-043	Kitui	C8307	7.5					3950	6320	0.0	0.0								0.4								
KT-044	Kitui	C9470																									
KT-045	Kitui	C9654																									
KT-046	Kitui	C10198	6.8					854	1367	0.0	0.0								0.0								
KT-047	Kitui	C10392																									
KT-048	Kitui	C10418																									
KT-049	Kitui	C10929	7.6	5	2	0.80	1650	990	1584			3.4	149.0	49.0	7.7	1398.0	100.0	8.0	0.4	73.0	0.0	6.0			0.0		
KT-050	Kitui	C11043																									
KT-051	Kitui	C11137																									
KT-052	Kitui	C11319																									
KT-053	Kitui	C11492																									
KT-054	Kitui	C11810	7.7					2056	3290	0.0	0.0								0.4								
KT-055	Kitui	C11818	7.2	5	1	1.25		1300	1007	0.0	0.0	76.0	36.0	343.5	30.7	340.0	420.0	320.0	1.2	240.0		1.5	0.0	420.0	0.0	0.0	40.0
KT-056	Kitui	C11821	7.9	10		2.10		2650	3800	0.1	0.0	80.0	76.8	680.5	57.8	520.0	680.0	805.0	1.8	240.0		1.0	0.0	680.0	0.0	0.0	50.0
KT-057	Kitui	C11823																									
KT-058	Kitui	C11824	8.1	5	9	3.95		760	1130	0.7	0.0	12.0	34.0	200.0	12.0	170.0	290.0	205.0	1.5	13.6		4.0			0.0	6.5	
KT-059	Kitui	C11848	8.2					2363	3780	0.0	0.0								0.0								
KT-060	Kitui	C11931	8.3	5		0.50		310	440	0.8	0.1	61.6	16.3	108.8	9.5	222.0	336.0	55.0	2.5	70.0		0.0	68.0	268.0	0.1	0.0	10.0
KT-061	Kitui	C12062																									
KT-062	Kitui	C13236	8.4	5	0	0.30	1500	1000	1600	0.1	0.3	56.0	33.6	180.6	8.5	280.0	450.0	180.0	1.0	40.0			50.0	400.0	0.1	0.0	50.0
KT-063	Kitui	C13601	7.2	120	0	0.90	2050	1450	2320	0.3	0.2	108.0	144.0	144.3	12.3	870.0	420.0	300.0	10.0	200.0		2.0	0.0	420.0	0.0	0.1	45.0
KT-064	Kitui	C13602	8.2	30	0	0.70	2500	1750	2800	0.5	0.3	240.0	117.6	129.4	23.4	1090.0	420.0	500.0	0.2	200.0		3.0	0.0	420.0	0.1	0.9	40.0
KT-065	Kitui	C13603	8.3	5	0	0.20	1750	1200	1920	0.3	0.2	168.0	93.6	99.6	7.2	810.0	270.0	170.0	0.8	400.0		2.0	0.0	270.0	0.0	0.0	50.0
KT-066	Kitui	C13604	7.9	5	0	0.50	1200	950	1520	0.4	0.3	100.0	72.0	79.3	9.5	590.0	350.0	210.0	0.5	50.0		20.0	0.0	350.0	0.1	0.4	45.0
KT-067	Kitui	C13605	7.9	5	0	0.50	2500	1850	2960	0.3	0.5	196.0	158.4	147.6	15.6	420.0	420.0	650.0	1.2	26.0		18.0	0.0	420.0	0.0	0.0	40.0
KT-068	Kitui	C13606	8.1	5	0	0.20	3180	2200	3520	0.2	0.1	244.0	144.0	309.8	11.2	1210.0	510.0	590.0	4.0	350.0		3.0	0.0	510.0	0.1	0.0	50.0
KT-069	Kitui	C13607	7.5	5	0	0.60	1600	110	2600	2.0	0.0	180.0	76.8	138.0	8.0	770.0	180.0	90.0	0.4	700.0		0.0	30.0	150.0	0.0	0.0	35.0
KT-070	Kitui	C13608	7.9	5	0	0.60	3050	2150	3440	0.0	0.0	272.0	141.6	228.6	19.0	1270.0	480.0	710.0	0.8	120.0		9.0	0.0	480.0	0.0	0.0	40.0
KT-071	Kitui	C13609	7.9	5	0	0.60	2100	1500	2400	0.0	0.3	160.0	100.8	158.8	47.2	820.0	380.0	400.0	0.8	130.0		7.0	0.0	380.0	0.0	0.0	40.0
KT-072	Kitui	P180																									
KT-073	Kitui	P181																									
KT-074	Kitui	U12																									
KT-075	Kitui	U13	6.7	5	1	0.79		1285	2070	0.2		271.0	44.0	95.0	12.0	860.0	470.0	380.0	0.8	28.0		3.4			0.0		
KT-076	Kitui	U14																									
KT-077	Kitui	-	7.2					6631	10610	2.0	0.0								0.0								
KT-078	Kitui	-	7.4					2050	3280	0.0	0.0								0.8								
KT-079	Kitui	-	7.5					856	1370	0.0	0.0								1.5								

No.	District	BH No.	PH	COLOR	TURB	PV	COND	TDS	EC (µS/cm)	Fe (mg/l)	Mn (mg/l)	Ca (mg/l)	Mg (mg/l)	Na (mg/l)	K (mg/l)	THARD	TALK	Cl (mg/l)	F (mg/l)	SO4 (mg/l)	PO4 (mg/l)	FCO2 (mg/l)	CO3 (mg/l)	HCO3 (mg/l)	NO2 (mg/l)	NO3 (mg/l)	SiO2 (mg/l)
MW-001	Mwingi	C104																									
MW-002	Mwingi	C127																									
MW-003	Mwingi	C128																									
MW-004	Mwingi	C573																									
MW-005	Mwingi	C2196	8.2	5		0.30		826	1321	0.0	0.0					804.0			0.4					378.0			50.0
MW-006	Mwingi	C3922	7.3	5			1440			0.1		130.0	46.0	140.0	6.0	516.0		340.0	0.6	120.0		33.0			0.0		40.0
MW-007	Mwingi	C4223	7.9	5	8		1060	636	1018							446.0								376.0			
MW-008	Mwingi	C4363																									
MW-009	Mwingi	C4887	7.6	5	2	0.90	1400	840	1344	1.2	0.2	171.0	120.0	164.0	10.6	910.0	564.0	88.0	0.6	200.0	0.0						
MW-010	Mwingi	C4888																									
MW-011	Mwingi	C4930																									
MW-012	Mwingi	C4988																									
MW-013	Mwingi	C5673																									
MW-014	Mwingi	C8755																									
MW-015	Mwingi	C8756																									
MW-016	Mwingi	C9471																									
MW-017	Mwingi	C9652																									
MW-018	Mwingi	C9653	7.6	5	5		1900	1400	2240	0.2	0.2	187.0	55.0	157.0	9.6	696.0	428.0	250.0	0.2	200.0		10.0			0.0		60.0
MW-019	Mwingi	C9472	7.6					3950	6320	0.0	0.0								1.5								
MW-020	Mwingi	C11172	7.3					2156	3450	0.0	0.0								0.0								
MW-021	Mwingi	C11851	7.0	5	14	3.16		6440	9200			368.0	603.0	1100.0	21.0	3400.0	474.0	1900.0	2.5	2800.0		24.0			0.2		
MW-022	Mwingi	C13258	7.9	30	80	3.16		1897	3060	3.1	0.1	128.0	109.0	475.0	6.2	770.0	874.0	535.0	2.9	119.0		52.0			0.0	11.0	
MW-023	Mwingi	C13260																									
MW-024	Mwingi	U16																									
MW-025	Mwingi	U17																									
MW-026	Mwingi	U18																									
MW-027	Mwingi	U19																									
MW-028	Mwingi	-	6.9					775	1240	0.0	0.0								0.4								
MW-029	Mwingi	-	7.5					681	1090	0.0	0.0								0.8								
MW-030	Mwingi	-	7.0					406	650	0.0	0.0								0.4								
MW-031	Mwingi	-	6.9					555	888	0.0	0.0								0.0								
MW-032	Mwingi	-	7.1					504	807	0.1	0.0								0.4								
MW-033	Mwingi	-	7.2					1463	2340	0.1	0.0								0.8								
MW-034	Mwingi	-	4.5					134	214	0.0	0.0								0.0								
MW-035	Mwingi	-	7.5					558	892	0.0	0.0								0.8								
MW-036	Mwingi	-	7.6					716	1145	0.0	0.0								0.8								
MW-037	Mwingi	-	7.4					1550	2480	0.0	0.0								0.0								
MW-038	Mwingi	TW-3		0	20			1904	3400	1.1	0.6	188.0	1100.0	800.0	16.1	213.0	485.0	208.0	1.0	72.0	0.9				0.1	0.7	52.1

No.	District	BH No.	PH	COLOR	TURB	PV	COND	TDS	EC (µS/cm)	Fe (mg/l)	Mn (mg/l)	Ca (mg/l)	Mg (mg/l)	Na (mg/l)	K (mg/l)	THARD	TALK	Cl (mg/l)	F (mg/l)	SO4 (mg/l)	PO4 (mg/l)	FCO2 (mg/l)	CO3 (mg/l)	HCO3 (mg/l)	NO2 (mg/l)	NO3 (mg/l)	SiO2 (mg/l)
MK-001	Makueni	C6																									
MK-002	Makueni	C16																									
MK-003	Makueni	C17																									
MK-004	Makueni	C18																									
MK-005	Makueni	C19																									
MK-006	Makueni	C33																									
MK-007	Makueni	C34																									
MK-008	Makueni	C51																									
MK-009	Makueni	C52																									
MK-010	Makueni	C55																									
MK-011	Makueni	C60																									
MK-012	Makueni	C82	7.0					450	720	0.0		32.0				86.0	186.0	213.0	2.0	0.3			0.0	186.0		0.0	65.0
MK-013	Makueni	C120																	3.7								
MK-014	Makueni	C305																									
MK-015	Makueni	C315																									
MK-016	Makueni	C328	6.9	30				1960	3136	5.6		240.0	86.0			950.0	192.0	232.0		865.0			0.0	192.0	0.0	0.0	
MK-017	Makueni	C359																									
MK-018	Makueni	C398																									
MK-019	Makueni	C414																									
MK-020	Makueni	C427																									
MK-021	Makueni	C437	7.3									81.2	48.5			355.0	270.0	102.0	0.0	261.0			0.0	270.0	0.0	0.0	
MK-022	Makueni	C445																									
MK-023	Makueni	C446																									
MK-024	Makueni	C454																									
MK-025	Makueni	C461	7.9	5		0.10	1400	1125	1800	0.2	1.3	19.2	139.0	122.0	17.0	608.0		87.0	0.6	560.0		12.0		314.0	0.0		50.0
MK-026	Makueni	C469																									
MK-027	Makueni	C474																									
MK-028	Makueni	C482																									
MK-029	Makueni	C488	7.0	0	0		1641	985	1576	0.0		125.0	26.0			419.0	416.0	112.0	1.6	30.0			0.0	416.0	0.0	0.0	30.0
MK-030	Makueni	C500	7.2							0.0						1820.0	571.0	860.0	2.9	1640.0							
MK-031	Makueni	C518						5956	9530	0.0		617.0	254.0			2587.0	369.0	1688.0		1550.0							
MK-032	Makueni	C545	7.1					2757	4411			343.0	114.0			1326.0	307.0	210.0		1276.0					0.0	0.0	
MK-033	Makueni	C603																									
MK-034	Makueni	C610																									
MK-035	Makueni	C612																									
MK-036	Makueni	C687																									
MK-037	Makueni	C688																									
MK-038	Makueni	C1004																									
MK-039	Makueni	C1005																									
MK-040	Makueni	C1053																									
MK-041	Makueni	C1054																									
MK-042	Makueni	C1131																									
MK-043	Makueni	C1132																									
MK-044	Makueni	C1181																									
MK-045	Makueni	C1311																									
MK-046	Makueni	C1376	6.0					231	370							25.0	29.0	5.0	0.8						0.0		20.0
MK-047	Makueni	C1455																									
MK-048	Makueni	C1485	7.7	0	0			1775	2840	0.0		220.0	73.0			850.0		490.0	0.9	136.0					0.1	30.0	50.0
MK-049	Makueni	C1518																									
MK-050	Makueni	C1557																									
MK-051	Makueni	C1578	6.9	0	0			890	1424	0.1		44.0		121.0		483.0	304.0	98.0	1.6								
MK-052	Makueni	C1579																									
MK-053	Makueni	C1580																									
MK-054	Makueni	C1667	6.9	0	0			545	872	0.1		67.0	31.0			295.0	375.0	49.0	0.7	32.0					0.0	0.0	44.0
MK-055	Makueni	C1668																									
MK-056	Makueni	C1802																									
MK-057	Makueni	C1804																									
MK-058	Makueni	C1835																									
MK-059	Makueni	C1849																									
MK-060	Makueni	C1856																									
MK-061	Makueni	C1885																									
MK-062	Makueni	C1886																									
MK-063	Makueni	C1890																									
MK-064	Makueni	C1945																									
MK-065	Makueni	C2004																									
MK-066	Makueni	C2123																									
MK-067	Makueni	C2130																									
MK-068	Makueni	C2150																									
MK-069	Makueni	C2182																									
MK-070	Makueni	C2203																									
MK-071	Makueni	C2232																									
MK-072	Makueni	C2267																									
MK-073	Makueni	C2284																									
MK-074	Makueni	C2365																									
MK-075	Makueni	C2370																									
MK-076	Makueni	C2426																									
MK-077	Makueni	C2451																									
MK-078	Makueni	C2452																									
MK-079	Makueni	C2453																									
MK-080	Makueni	C2454																									
MK-081	Makueni	C2476																									
MK-082	Makueni	C2477																									
MK-083	Makueni	C2498																									
MK-084	Makueni	C2515																									
MK-085	Makueni	C2520																									
MK-086	Makueni	C2556																									
MK-087	Makueni	C2604																									
MK-088	Makueni	C2695	7.7	5	0		1000	470	752	0.3		16.0	40.0	74.0	20.0	198.0	270.0	50.0	0.1	110.0		10.0	0.0	270.0	0.0	0.0	40.0
MK-089	Makueni	C2747																									
MK-090	Makueni	C2777																									
MK-091	Makueni	C2778																									
MK-092	Makueni	C2779																									
MK-093	Makueni	C2824																									
MK-094	Makueni	C2829																									
MK-095	Makueni	C2849																									
MK-096	Makueni	C2855	7.5	0				1250	2000	0.7						558.0	512.0	98.0	0.6	329.0							
MK-097	Makueni	C2860																									
MK-098	Makueni	C2896																									
MK-099	Makueni	C2921																									
MK-100	Makueni	C2944	8.2	5	3	0.16	1900	1140	1824	0.1	0.0	100.0	68.0			380.0	390.0	100.0	0.5	34.0	0.0						
MK-101	Makueni	C2975																									
MK-102	Makueni	C3092																									
MK-103	Makueni	C3116																									
MK-104	Makueni	C3121	7.8	5	1	8.50	1400	840	1344	0.3	0.1	69.0	30.0	110.0		372.0	314.0	189.0	2.2	93.0							

No.	District	BH No.	PH	COLOR	TURB	PV	COND	TDS	EC (μS/cm)	Fe (mg/l)	Mn (mg/l)	Ca (mg/l)	Mg (mg/l)	Na (mg/l)	K (mg/l)	THARD	TALK	Cl (mg/l)	F (mg/l)	SO4 (mg/l)	PO4 (mg/l)	FCO2 (mg/l)	CO3 (mg/l)	HCO3 (mg/l)	NO2 (mg/l)	NO3 (mg/l)	SiO2 (mg/l)
MK-105	Makueni	C3128																									
MK-106	Makueni	C3132																									
MK-107	Makueni	C3135																									
MK-108	Makueni	C3145																									
MK-109	Makueni	C3315																									
MK-110	Makueni	C3322	7.5					926	1482			71.0	65.0	84.0	16.0	440.0	584.0	108.0	1.5								
MK-111	Makueni	C3323																									
MK-112	Makueni	C3336	7.6	0	0			4119	6590	0.0		293.0	388.0	592.0	34.0	2450.0		1720.0	1.5	151.0							60.0
MK-113	Makueni	C3338																									
MK-114	Makueni	C3347																									
MK-115	Makueni	C3356																									
MK-116	Makueni	C3510																									
MK-117	Makueni	C3755																									
MK-118	Makueni	C3977	7.3	0	0			1700	2720	0.0	0.0	247.0	74.0	182.0	11.0	920.0	441.0	740.0	0.5	70.0					0.1	33.0	
MK-119	Makueni	C4009	8.0	5		0.10	1100	740	1184	0.1	0.6	132.0	24.0	527.0	69.0	428.0		184.0	0.6	9.0				293.0	0.0	2.5	50.0
MK-120	Makueni	C4016	7.1	5		0.20	2800	2020	3232	0.2	3.3	358.0	66.0	280.0	16.0	1170.0		220.0		1040.0		8.0		390.0			60.0
MK-121	Makueni	C4275	8.1	5	45	2.00	1420	752	1203	0.8	0.3			30.0	7.0	178.0	132.0	192.0									
MK-122	Makueni	C4878																									
MK-123	Makueni	C5054	8.2	5	25	56.00	1900	1140	1824	4.7	0.4	133.0	100.0	1020.0	15.0	690.0	112.0	1140.0	1.7	109.0	0.1						
MK-124	Makueni	C5055																									
MK-125	Makueni	C5067	8.2		96	6.00	450	270	432			21.0	24.0			140.0	152.0	16.0	0.4	16.8	0.0						
MK-126	Makueni	C5095																									
MK-127	Makueni	C5110	8.2		10		2000	1200	1920			83.0	87.0			514.0	126.0	366.0	0.5	108.0	0.1						
MK-128	Makueni	C5262																									
MK-129	Makueni	C5759																									
MK-130	Makueni	C6009																									
MK-131	Makueni	C6010																									
MK-132	Makueni	C6036	8.0	60	67		840	504	806	7.6	0.3	35.0	90.0	130.0	9.4	368.0	227.0	110.0	1.3	168.0				277.0			
MK-133	Makueni	C4745																									
MK-134	Makueni	C4753																									
MK-135	Makueni	C4772																									
MK-136	Makueni	C7294	7.7	5				1150	1600		0.4	112.0	29.0	189.0	13.3	600.0	490.0	64.0	0.9	275.0		12.0					55.0
MK-137	Makueni	C7963																									
MK-138	Makueni	C8144																									
MK-139	Makueni	C8519																									
MK-140	Makueni	C8745	7.3	5	4	1.60	2000	1200	1920	0.1	2.0	279.0	168.0	160.0	15.0	1388.0	330.0	124.0	0.5	409.0	0.0	28.0			0.0		
MK-141	Makueni	C9004																									
MK-142	Makueni	C9750																									
MK-143	Makueni	C10036	6.9	5	1			630	900	0.0	0.5	60.0	55.2	53.0	5.4	380.0	330.0	111.0	0.7	30.0		9.0	0.0	330.0	0.1	0.0	120.0
MK-144	Makueni	C10334	7.9	5	24	6.30	6500	3900	6500			624.0	261.0	714.0	37.0	2630.0	230.0	234.0	1.0	1068.0	0.1	30.0			0.2		
MK-145	Makueni	C10405																									
MK-146	Makueni	C10406																									
MK-147	Makueni	C10667																									
MK-148	Makueni	C11153																									
MK-149	Makueni	C11154																									
MK-150	Makueni	C11353																									
MK-151	Makueni	C11615																									
MK-152	Makueni	C11673																									
MK-153	Makueni	C12054																									
MK-154	Makueni	C12055																									
MK-155	Makueni	C12056																									
MK-156	Makueni	C12057																									
MK-157	Makueni	C12058																									
MK-158	Makueni	C12238																									
MK-159	Makueni	C12239																									
MK-160	Makueni	C12339																									
MK-161	Makueni	C13126																									
MK-162	Makueni	C13262	7.0	5	6	2.37	3250	2275	3640	0.7	0.0	424.0	191.0	118.0	22.0	1844.0	198.0	550.0	1.0	1057.0		480.0			0.0	9.0	
MK-163	Makueni	C13263	7.8	15	48	2.37	1602	1113	1781	3.1	0.2	200.0	57.0	65.0	20.0	733.0	273.0	170.0	0.7	200.0		178.0			0.0	14.0	
MK-164	Makueni	C13265	6.9	5	0	1.58	2400	1674	2678	0.2	0.0	304.0	155.0	98.0	17.0	1396.0	354.0	200.0	0.1	857.0		1098.0			0.0	6.2	
MK-165	Makueni	C13509																									
MK-166	Makueni	P28																									
MK-167	Makueni	P57																									
MK-168	Makueni	P98																									
MK-169	Makueni	P127																									
MK-170	Makueni	P143																									
MK-171	Makueni	U4																									
MK-172	Makueni	U6																									
MK-173	Makueni	U8																									
MK-174	Makueni	U9																									
MK-175	Makueni	U10																									
MK-176	Makueni	-	7.7					130	208	2.0	0.0								0.8								
MK-177	Makueni	-	7.6					538	861	0.0	0.0								0.4								
MK-178	Makueni	-	8.2					1656	2650	0.0	0.0								0.4								
MK-179	Makueni	-	7.8					505	808	0.0	0.0								1.5								
MK-180	Makueni	-	7.4					658	1053	0.1	0.5								0.4								
MK-181	Makueni	-	7.4					111	177		0.0								0.4								
MK-182	Makueni	-																									
MK-183	Makueni	-																									
MK-184	Makueni	-	7.2					1507	942	0.0	0.0								0.8								
MK-185	Makueni	-	7.7					4560	2850	0.0	0.0								2.5								
MK-186	Makueni	-	7.9					973	608	0.0									2.0								
MK-187	Makueni	-	7.8					1013	633	0.0									3.0								
MK-188	Makueni	-	7.7					4560	2850	0.0	0.0								2.0								
MK-189	Makueni	TW-2		0	8			3711	4190	0.3	0.1	322.0	1562.0	1163.0	23.4	144.0	379.0	82.0	1.4	1232.0	0.5				0.1	0.0	

5.2
Result of Water Quality Survey Conducted by Basic Design

No.	Ref.No.	Date	District	Well Point	B/H No.	Southing					Easting					T	EC	pH	Mn	Fe	F	Col.	Bct.	Note
						deg.			min.	S	deg.				E	degree C.	microS/cm	–	mg/L	mg/L	mg/L	(Colonies/100mL)		
																	1,600	6.5-8.5	0.10	0.30	1.50	Nil	<100	Desirable (Kenya-WHO), (EC=TDS x 1.6)
																	2,400	6.5-9.2	0.50	1.00	3.00	–	–	Permissible (Kenya), (EC=TDS x 1.6)
1	MW-1	25-May-04	Mwingi	Thiani Girls Sec. School	C2196	1			1.916	-1.032	37			53.484	37.891	29.7	1,321	6.7	0.00	0.00	0.40	D'ted	D'ted	Yield=9m3/Hour
2	MW-2	25-May-04	Mwingi	Bishop Kiunzi's Private B/H	–	0			56.394	-0.940	37			54.340	37.906	28.3	1,240	6.9	0.00	0.00	0.40	N/D'ted	N/D'ted	Private well.
3	MW-3	26-May-04	Mwingi	Kyuso B/H	C11172	0			33.393	-0.557	38			12.841	38.214	26.7	3,450	7.3	0.00	0.00	0.00	D'ted	D'ted	Assisted by Action Aid. Water is too salty, only for dry season at the kiosk in the community. Not used at the B/H point. Yield=3.6m3/H(6hours)-1.7m3/H(constant)
4	MW-4	26-May-04	Mwingi	Mugoo Well (Kimangao CDK)	S/Well	0			32.719	-0.545	38			10.092	38.168	27.3	2,480	7.4	0.00	0.00	0.00	D'ted	D'ted	3m deep to WL.. Well for community
5	MW-5	26-May-04	Mwingi	Kimangao Girls Sec. School	C9472	0			30.833	-0.514	38			8.217	38.137	27.7	6,320	7.6	0.00	0.00	1.50	D'ted	D'ted	1 m dia. 28 feet deep. S/Well, Extremely high salinity. After 4 hours pumping, gets dry. Windmill arrangement failed due to improper design
6	MW-6	26-May-04	Mwingi	Katze Water Supply	–	0			30.550	-0.509	38			4.602	38.077	28.7	1,145	7.6	0.00	0.00	0.80	1 col.	13 col.	Pumping facility for community. 20 shs/20L.. Poor people fetch water from the river bed near by.
–	–	26-May-04	Mwingi	Munyuni	S/Well	1			6.192	-1.103	38			10.765	38.179	–	–	–	–	–	–	–	–	Installed in 2002 by GTZ. Out of order for a year. People fetch water from the river bed near by.
7	MW-7	26-May-04	Mwingi	Ilekye/Munyuni	S/Well	1			4.791	-1.080	38			11.140	38.186	27.5	807	7.1	0.00	0.05	0.40	D'ted	D'ted	5 m deep to WL.. Hand pump removed (broken).
8	MW-8	29-May-04	Mwingi	Migwani	C4887	1			5.500	-1.092	38			0.917	38.015	24.5	1,151	7.4	0.00	0.00	0.80	N/D'ted	N/D'ted	210 m deep. Water Quality checked at police post. Driven with commercial E. power
9	MW-9	29-May-04	Mwingi	Itoloni	–	1			5.350	-1.089	38			2.083	38.035	25.0	650	7.0	0.00	0.00	0.40	D'ted	D'ted	B/H near the D'ty Speaker House. Water quality checked at a kiosk closest to the B/H.
10	MW-10	30-May-04	Mwingi	kasanga, Mr.Mzomo Well	S/Well	1			5.133	-1.086	37			56.483	37.941	24.4	1,090	7.5	0.00	0.00	0.80	D'ted	D'ted	S/Well=40feet deep. 32 feet to WL.. VES done at New B/H site; S=1d04.55, E37d56.317
11	MW-11	30-May-04	Mwingi	Mukuyuni tube well	auger drilled	1			2.033	-1.034	38			10.633	38.177	28.4	888	6.9	0.00	0.00	0.00	N/D'ted	N/D'ted	by GTZ, 50 feet deep with hand pump. (Col., Bac., too many ?). 30 shs/mth/family
12	MW-12	30-May-04	Mwingi	Mukusyoni	S/Well	1			6.617	-1.110	38			13.100	38.218	26.7	2,340	7.2	0.00	0.05	0.80	D'ted	D'ted	S/well of colonial time. 8.2m to WL. Existing but abandoned B/H seen nearby. VES done at S1d6.667, E30d13.100
13	MW-13	30-May-04	Mwingi	Imba farm, Belgian Project	S/Well	0			52.017	-0.867	38			22.650	38.378	27.1	892	7.5	0.00	0.00	0.80	D'ted	D'ted	Constructed in 1989. Once a surface-type pump equipped.
–	–	30-May-04	Mwingi	Nuu, Cathric B/H	C9653	1			3.400	-1.057	38			21.517	38.359	–	–	–	–	–	–	–	–	Pump/Well not used (out of order). Pump house firmly closed (Spring water available in the are)
14	MW-14	30-May-04	Mwingi	Nuu	Spring	1			3.283	-1.055	38			21.150	38.353	29.5	214	4.5	0.00	0.00	0.00	D'ted	D'ted	Spring Intake/protection constructed
15	KT-1	31-May-04	Kitui	Katutu Secondary School	C1452	1			10.283	-1.171	37			49.000	37.817	27.3	1,485	7.0	0.00	0.00	0.80	D'ted	D'ted	
16	KT-2	31-May-04	Kitui	Kateka Secondary School	C95	1			13.300	-1.222	37			51.083	37.851	25.7	1,943	7.1	0.00	0.05	0.80	D'ted	D'ted	Driven with commercial E.. power
17	KT-3	31-May-04	Kitui	Mutonguni Secondary School	C6628	1			10.767	-1.179	37			58.600	37.977	25.7	547	6.9	0.00	0.00	0.00	D'ted	D'ted	Delivery Pipe being replaced (by GTZ). Well 240-300 ft deep
18	KT-4	31-May-04	Kitui	Matiyani Secondary School	C10198	1			18.567	-1.309	37			58.467	37.974	25.6	1,367	6.8	0.00	0.00	0.00	D'ted	D'ted	
–	–	1-Jun-04	Kitui	Mutha Kalambani		1			48.350	-1.806	38			25.583	38.426	–	–	–	–	–	–	–	–	Drilled a month ago. Pump yet to be installed. Well 42 m deep, Yield 15-17 m3/hour, SWL=14 m. Financed by Danish Embassy
19	KT-5	1-Jun-04	Kitui	Gozini Spring	Spring	1			47.633	-1.794	38			25.517	38.425	27.7	1,370	7.5	0.00	0.00	1.50	D'ted	D'ted	20 shs/year for member, 1500 shs/year for non-member.
20	KT-6	1-Jun-04	Kitui	Mutomo Hospital	C8307	1			50.033	-1.834	38			12.600	38.210	27.0	6,320	7.5	0.00	0.00	0.40	15 col.	5 col.	Only for floor cleaning. Windmill failed due to improper design. Another B/H near seen for community of EC=7060microS/cm.
21	KT-7	1-Jun-04	Kitui	Ikanga Water Supply Project	C4729	1	41	55	41.917	-1.699	38	3	5	3.083	38.051	26.5	674	8.5	0.00	0.00	1.50	N/D'ted	6 col.	Well 240 ft deep. Assisted by Action Aid. One B/H near by failed.
22	KT-8	2-Jun-04	Kitui	Kanyangi B/H	C11818	1	46	17	46.283	-1.771	37	54	21	54.350	37.906	27.8	1,007	7.2	0.00	0.00	0.40	N/D'ted	N/D'ted	Danish Aid, Water for 265 member
23	KT-9	2-Jun-04	Kitui	Mamole	C11848	1	28	2	28.033	-1.467	37	48	0	48.000	37.800	26.1	3,780	8.2	0.00	0.00	0.00	D'ted	N/D'ted	AMREF KENYA (NGO). A gen. set benign replaced from a small to a bigger one (KAP,
24	KT-10	2-Jun-04	Kitui	Itoleka (private well)	C13601	1	24	49	24.817	-1.414	37	56	5	56.083	37.935	26.6	2,910	7.0	0.00	0.20	0.40	D'ted	N/D'ted	The owner was told the water would be less salty as being used. Pipe to be lied for community by the owner
25	KT-11	2-Jun-04	Kitui	Mbitini Girls S. S	C11810	1	35	29	35.483	-1.591	38	7	7	7.117	38.119	26.3	3,290	7.7	0.00	0.00	0.40	N/D'ted	N/D'ted	EC=3200 when constructed('97). Well 84.6 m deep, SWL=21.2 m, PWL=35.11 m
26	KT-12	2-Jun-04	Kitui	Nzambani S. S	C2179	1	25	41	25.683	-1.428	38	3	24	3.400	38.057	26.8	83	7.4	0.00	0.00	0.40	1 col.	D'ted	Well 55 m deep. WSL=53-55 m, WRL 4 m. yield=2.7 m3/hour
27	KT-13	3-Jun-04	Kitui	Makongo	–	1	26	13	26.217	-1.437	38	22	23	22.383	38.373	28.2	3,280	7.4	0.00	0.00	0.80	8 col.	15 col.	By Egyptian. Demand=3-4m3/day for 100 people
28	KT-14	3-Jun-04	Kitui	Zombe Girls S. S	–	1	26	51	26.850	-1.448	38	14	45	14.750	38.246	30.2	10,610	7.2	0.00	2.00	0.00	N/D'ted	N/D'ted	The principal was told the water would be less salty as being used. Water in the bucket gets rusted (Fe).
29	KT-15	3-Jun-04	Kitui	Maliku south (ICA project)	C13607	1	37	17	37.283	-1.621	37	54	5	54.083	37.901	26.6	2,600	7.5	0.00	2.00	0.40	N/D'ted	N/D'ted	Water gets rusted due to Fe
30	MC-1	4-Jun-04	Machakos	Kyamuthinza Community	–	1	39	37	39.617	-1.660	37	15	52	15.867	37.264	23.4	2,620	7.3	0.00	0.00	0.80	N/D'ted	N/D'ted	
31	MC-2	4-Jun-04	Machakos	Wilson Kyalo B/H	–	1	31	45	31.750	-1.529	37	10	8	10.133	37.169	25.1	732	7.0	0.00	1.00	0.80	D'ted	D'ted	Private well for farm, community also fetch water
–	–	4-Jun-04	Machakos	Kalikya Primary School		–	–	–	–		–	–	–	–		–	–	–	–	–	–	–	–	Out of order
32	MC-3	4-Jun-04	Machakos	Mitaboni Girls Sec. School	C9379	1	22	19	22.317	-1.372	37	14	50	14.833	37.247	25.1	840	7.5	0.00	0.00	0.80	N/D'ted	N/D'ted	Only for the school. Well, gets dry sometimes
33	MC-4	4-Jun-04	Machakos	Kenol B/H	C13256	1	20	57	20.950	-1.349	37	13	11	13.183	37.220	24.3	695	7.2	0.00	0.00	0.80	N/D'ted	N/D'ted	10 m3/45min, 3shs/gerry-can
34	MC-5	5-Jun-04	Machakos	Mwala Mixed Sec. School	–	1	21	20	21.333	-1.356	37	27	7	27.117	37.452	19.2	2,680	7.5	0.00	0.00	0.00	D'ted	D'ted	B/H near by a river, Constructed by the school in 2003.
35	MC-6	5-Jun-04	Machakos	Makutano B/H	C3967	1	24	4	24.067	-1.401	37	27	57	27.950	37.466	25.5	970	7.4	0.00	0.00	0.00	10 col.	D'ted	Commercial E. power .For Community
–	–	5-Jun-04	Machakos	C. C. F. B/H		1	24	19	24.317	-1.405	37	33	52	33.867	37.564	–	–	–	–	–	–	–	–	Hand pumped.
36	MC-7	5-Jun-04	Machakos	Kwa Maungu Water Project	–	1	24	9	24.150	-1.403	37	34	0	34.000	37.567	23.5	2,040	7.3	0.00	0.00	1.50	D'ted	D'ted	Hand pumped. Out of order
37	MC-8	5-Jun-04	Machakos	Katangi High School	–	1	24	18	24.300	-1.405	37	41	5	41.083	37.685	25.5	1,405	6.9	0.00	0.00	0.40	N/D'ted	D'ted	
–	–	5-Jun-04	Machakos	Katangi Agriculture Project		1	24	16	24.267	-1.404	37	41	24	41.400	37.690	–	–	–	–	–	–	–	–	Wind Mill, Since '80. assisted by GTZ.
38	MC-9	5-Jun-04	Machakos	Kinyaata B/H	C12060	1	20	28	20.467	-1.341	37	38	25	38.417	37.640	25.8	729	7.1	0.00	0.00	0.80	N/D'ted	N/D'ted	Kenya Red Cross through Spanish Red Cross. Completed in 2002.
39	MC-10	5-Jun-04	Machakos	Kithimani Mixed Sec. School	–	1	11	8	11.133	-1.186	37	26	56	26.933	37.449	26.9	680	7.8	0.00	0.00	1.50	N/D'ted	3 col.	Water from a tap tested
–	–	5-Jun-04	Machakos	Kithyoko Community		–	–	–	–		–	–	–	–		–	–	–	–	–	–	–	–	Out of order
40	MC-11	5-Jun-04	Machakos	Kitangani Sec School	C5440	1	2	11	2.183	-1.036	37	39	14	39.233	37.654	27.5	1,738	6.8	0.00	0.00	0.80	6 col.	D'ted	By Egyptian. The gen. set out of order. A gen. set for school lightning is used.
41	MC-12	5-Jun-04	Machakos	Ngangani B/H	–	1	2	12	2.200	-1.037	37	41	38	41.633	37.694	26.3	2,070	7.0	1.00	–	0.80	N/D'ted	N/D'ted	Hand pumped. Iron rust on the apron
42	MK-1	7-Jun-04	Makeni	New Kilala Water Project	–	1	46	16	46.267	-1.771	37	31	58	31.967	37.533	23.3	808	7.8	0.00	0.00	1.50	N/D'ted	D'ted	Tunked Water tested
43	MK-2	7-Jun-04	Makeni	Maatha Water Project	–	2	1	54	1.900	-2.032	37	30	20	30.333	37.506	25.8	2,650	8.2	0.00	0.00	0.40	N/D'ted	N/D'ted	Tunked the day before
44	MK-3	7-Jun-04	Makeni	Mwani B/H	–	2	0	5	0.083	-2.001	37	22	26	22.433	37.374	26.7	861	7.6	0.00	0.00	0.40	N/D'ted	N/D'ted	
45	MK-4	7-Jun-04	Makeni	Maiani B/H	–	1	50	41	50.683	-1.845	37	18	2	18.033	37.301	24.3	208	7.7	0.00	2.00	0.80	N/D'ted	N/D'ted	Operated a week. Fresh water tested.
46	MK-5	8-Jun-04	Makeni	Kilili School (Spring)	–	1	54	16	54.267	-1.904	37	34	26	34.433	37.574	23.5	1,581	7.8	0.00	0.00	0.00	10 col.	83 col.	bottled. T=air temp.
47	MK-6	8-Jun-04	Makeni	Borehole near 102	C437	1	46	45	46.750	-1.779	37	35	45	35.750	37.596	23.6	1,513	7.4	1.00	0.00	0.00	N/D'ted	9 col.	bottled. T=air temp.
48	MK-7	9-Jun-04	Makeni	Yandia river near 114	–	1	59	36	59.600	-1.993	37	32	14	32.232	37.537	23.5	1,053	7.7	0.50	0.10	0.40	D'ted	D'ted	bottled. T=air temp.
49	MK-8	9-Jun-04	Makeni	Wamyatu Stream near 114	–	1	59	42.8	59.713	-1.995	37	32	46	32.760	37.546	23.8	177	7.4	0.00	–	0.40	D'ted	D'ted	bottled. T=air temp.
50	MK-9	10-Jun-04	Makeni	Komboyoo BH	–	2	36	19.6	36.327	2.605	38	0	13	0.213	38.004	25.5	942	7.2	0.00	0.00	0.80	D'ted	D'ted	collected from maji kiosk
51	MK-10	11-Jun-04	Makeni	Mbui Nzau BH	–	2	22	51.8	22.863	2.381	37	64	11	64.180	38.070	26.5	2,850	7.7	0.00	0.00	2.50	10 col.	10 col	collected from craft Market Bore
52	MK-11	11-Jun-04	Makeni	Umani Spring	–	2	27	9	27.150	2.453	37	54	47	54.782	37.913	25.6	608	7.9	0.00	–	2.00	D'ted	45 col	Out of Volcanics, sample collected from town water supply
53	MK-12	11-Jun-04	Makeni	Msima Spring	–	2	41	34.8	41.580	2.693	38	1	22	1.363	38.023	26.0	633	7.8	0.00	–	3.00	18 col	12 col	Mobasa water supply, flowing from the base of lava overlying basement
54	MK-13	11-Jun-04	Makeni	Mtito-a-Ndei BH		2	41	34.8	41.580	2.693	38	10	1.1	10.018	38.167	25.5	2,850	7.7	0.00	0.00	2.00	3 col	10 col	Bore located in Tsavo Inn

Standards for Water Quality in Kenya

Test Items	Unit	Kenyan Standard in Manual	
		Desirable	Permissible Level
1. Total Suspended Solids（TDS）	mg/l	1000	1500
2. Turbidity		5	25
3. Color		15	50
4. Taste		Inoffensive to most consumers	
5. Odour		Inoffensive to most consumers	
6. Conductivity(Estimated From TDS)		(1600)	(2400)
7. Total Hardness	mg/l	500	—
8. Arsenic (Ar)	mg/l	0.05	—
9. Cadmium (Cd)	mg/l	0.005	—
10. Chromium (Cr)	mg/l	0.05	—
11. Cyanide (Cn)	mg/l	0.1	—
12. Fluoride (F)	mg/l	1.5	3
13. Lead (Pb)	mg/l	0.05	—
14. Mercury (Hg)	mg/l	0.001	—
15. Nitrate (NO3)	mg/l	10	—
16. Selenium (Se)	mg/l	0.01	
17. Aluminum (Al)	mg/l	0.2	
18. Chloride (Cl)	mg/l	250	600
19. Copper (Cu)	mg/l	1	1.5
20. Iron (Fe)	mg/l	0.3	1
21. Manganese (Mn)	mg/l	0.1	0.5
22. Sodium (Na)	mg/l	200	—
23. Sulphate (SO4)	mg/l	400	—
24. Zinc (Zn)	mg/l	5	15

5.3
Selection of Target Communities of the Project

Selection Result of Project Target Communities and Water Supply Facility Type

1. Selection of Project Target Communities

The result are attached into (A5-3-2～A5-3-5).

In the attachment, the evaluation result on the target communities is given by “1: applied” and “0: not applied”.

2. Selection of Water Supply Type (Pump Type)

The result are as following attachments (A5-3-6～A5-3-9).

In the screenings 1 to 5, the code numbers with 1: Hand Pump; 2: Windmill Pump; 3: Submergible Pump; 4: Windmill or Submergible Pump, are applied in the course of selection of water supply type.

There is the type “Windmill Pump/Motor Pump (code: 4)” in Screening 1. This code means that there is possibility whether “Windmill Pump” or “Motor Pump” in communities with over 500 people because the community with less than 500 people are sifted from the target communities as “Hand Pump” in Screening 1. And this type is temporary classification.

Evaluation Result for Project Target Communities（1/4）

Serial No.	Village/Community Name	Placement				Lack of Data	Existence of Water Supply Project	Existing Borehole	Spring Water Facility	Yield (less than 0.33m3/h)	Water Quality (Fluoride)	Water Quality (TDS)	Willing to Pay for Water	Project Target Community
		District	Division	Location	Sub Location									
1	Kimuuni/ Katwala	Kitui	Chuluni	Mbitini	Katwala	0	0	0	0	0	0	0	0	1
2	Nzewani	Kitui	Chuluni	Nzambani	Maluma	0	0	0	0	1	0	0	0	0
3	Kisasi market	Kitui	Chuluni	Kisasi	Masimburi	0	0	0	0	0	0	0	0	1
4	Nguuni	Kitui	Chuluni	Mbusyani	Nguuni	0	0	0	0	0	0	0	0	1
5	Mbitini	Kitui	Chuluni	Mbitini	Mbitini	0	0	0	0	0	0	0	0	1
6	Mosa	Kitui	Chuluni	Mbitini	Mosa	0	0	0	0	0	0	0	0	1
7	Katwala	Kitui	Chuluni	Mbitini	Katwala	0	0	0	0	0	0	0	0	1
8	Kanzauwu	Kitui	Chuluni	Nzangathi	Kaluva	0	0	0	0	0	0	0	0	1
9	Kamulanbani					1	0	0	0	0	0	0	0	0
10	Kaluva secondary school	Kitui	Chuluni	Nzangathi	Kaluva	0	0	0	0	0	0	0	0	1
11	Kyangulu	Kitui	Mutonguni	Mutonguni	Mithini	0	0	0	0	0	0	0	0	1
12	Mutanda	Kitui	Mutonguni	Mutanda	Mutanda	0	0	0	0	0	0	0	0	1
13	Ilako Mututa secondary school	Kitui	Mutonguni	Kiatine	Kaui	0	0	0	0	0	0	0	0	1
14	Mithikwani	Kitui	Mutonguni	KuhMulorga	Mithkuwani	0	0	0	0	0	0	0	0	1
15	Kakeani secondary school	Kitui	Mutonguni	Kakeani	Kakeani	0	0	0	0	0	0	0	0	1
16	Kasakini	Kitui	Mutonguni	Katutu	Kasakini	0	0	0	0	0	0	0	0	1
17	Kalinditi	Kitui	Mutonguni	Kauwi	Kiseveni	0	0	0	0	0	0	0	0	1
18	Kasue secondary school	Kitui	Mutonguni	Mutonguni	Kaimu	0	0	0	0	0	0	0	0	1
19	Uae primary school	Kitui	Mutomo	Mutomo	Uae	0	0	0	0	1	0	0	0	0
20	St. Mary's Miambani	Kitui	Mutito	Miambani	Munganga	0	0	0	0	0	0	0	0	1
21	Kawala	Kitui	Mutito	Kaliku	Kawala	0	0	0	0	0	0	0	0	1
22	Kithumulani	Kitui	Ikutha	Ndakani	Kalia-Katune	0	0	0	0	0	0	0	0	1
23	Makutano	Kitui	Mutito	Zombe	Malatani	0	0	0	0	1	0	0	0	0
24	Kabati	Kitui	Mutito	Zombe	Malatani	0	0	0	0	0	0	0	0	1
25	Ithangathi	Kitui	Mutito	Zombe	Malatari	0	0	0	0	0	1	0	0	0
26	Ngungi	Kitui	Mutito	Nzombe	Ngungi	0	0	0	0	1	0	0	0	0
27	Katikoni	Kitui	Mwitika	Mwitika	Katikoni	0	0	0	0	0	0	0	0	1
28	Makongo	Kitui	Mwitika	Mwitika	Makongo	0	0	0	0	0	0	0	0	1
29	Kiseuni	Kitui	Yatta	Kiseuni	Magoudo	0	0	0	0	1	0	0	0	0
30	Kanyongonyo	Kitui	Yatta	Kanyongonyo	Kanyongonyo	0	0	0	0	0	0	0	0	1
31	Nthongoni	Kitui	Yatta	Nthongoni	Mvitha	0	0	0	0	0	0	0	0	1
32	Kalulini	Kitui	Yatta	Kanangi	Syomunyuu	0	0	0	0	0	0	0	0	1
33	Muselele	Kitui	Yatta	Lhika	Lhika	0	0	0	0	0	0	0	0	1
34	Ikulumbutani	Kitui	Yatta	Yatta	Ndunguni	0	0	0	0	0	0	0	0	1
35	Kateiko	Kitui	Yatta	Kanangi	Syomunyuu	0	0	0	0	0	0	0	0	1
36	Tiva secondary school	Kitui	Yatta	Kyangwithya West	Mulutu	0	0	0	0	0	0	0	0	1
37	Ngava	Kitui	Yatta	Yatta	Makusya	0	0	0	0	0	0	0	0	1
38	Katitika	Kitui	Matinyani	Kwa Muhingu	Kwa Muhingu	0	0	0	0	0	0	0	0	1
39	Kunikila	Kitui	Matinyani	Matinyani	Katheuni	0	0	0	0	0	0	0	0	1
40	Kalindilo	Kitui	Matinyani	Kathivo	Kalindilo	0	0	0	0	0	0	0	0	1
41	Kyaani secondary school	Kitui	Matinyani	Kithumula	Kasaini	0	0	0	0	0	0	0	0	1
42	Kakumuti	Kitui	Matinyani	Kithumula	Kasaini	0	0	0	0	0	0	0	0	1
43	Kwa Motonga	Kitui	Matinyani	Kwa Mutonga	Kwa Mutonga	0	0	0	0	1	0	0	0	0
44	Mutini sec. school	Kitui	Mutonguni	Kauwi	Kiseveni	0	0	0	0	0	0	0	0	1
45	Kwa Nyingi Pri.	Kitui	Mutonguni	Kauwi	Kauwi	0	0	0	0	0	0	0	0	1
46	Endau Sec School	Kitui	Mwitika	Endau	Ndetani	0	0	0	0	0	0	0	0	1
47	Ikutha market	Kitui	Ikutha	Ikutha	Maini/Ndili	0	0	0	0	0	0	0	0	1
48	Kituti secondary school	Kitui	Ikutha	Athi	Kituti	0	0	0	0	0	0	0	0	1
49	Kamutei	Kitui	Ikutha	Maluma	Maluma	0	0	0	0	0	0	0	0	1
50	Mwala	Kitui	Mutomo	Mutomo	Mwala	0	0	0	0	0	0	0	0	1
51	Kyatune	Kitui	Mutomo	Kyatune	Kavingoni	0	0	0	0	0	0	0	0	1
52	Yuku	Kitui	Mwitika	Endau	Yiuku	0	0	0	0	0	0	0	0	1
53	Ngaaka	Kitui	Mwitika	Mwitika	Kavingo	0	0	0	0	0	0	0	0	1

Evaluation Result for Project Target Communities（2/4）

Serial No.	Village/Community Name	Placement				Lack of Data	Existence of Water Supply Project	Existing Borehole	Spring Water Facility	Yield (less than 0.33m3/h)	Water Quality (Fluoride)	Water Quality (TDS)	Willing to Pay for Water	Project Target Community
		District	Division	Location	Sub Location									
54	Yenzuva	Mwingi	Mitiwani	Thaana Nzau	Yensuka	0	0	0	0	0	0	0	0	1
55	Winzeei	Mwingi	Migwani	Thaana Nzau	Winzyeeni	0	0	0	0	0	0	0	0	1
56	Katuyu	Mwingi	Mitiwani	Nguutani	Kakululo	0	0	0	0	0	0	0	0	1
57	Kakululo	Mwingi	Migwani	Nguutani	Kakululo	0	0	0	0	0	0	0	0	1
58	Makengekani	Mwingi	Mitiwani	Nzauni	Kikiini	0	0	0	0	0	0	0	0	1
59	Itumbi	Mwingi	Migwani	Migwani	Kaliluni	0	0	0	0	0	0	0	0	1
60	Kyusyani	Mwingi	Mitiwani	Thaana Nzau	Kyusyani	0	0	0	0	0	0	0	0	1
61	Kavaini	Mwingi	Mitiwani	Thiitani	Kavaini	0	0	0	0	0	0	0	0	1
62	Nzauni	Mwingi	Mitiwani	Nzauni	Nzauni	0	0	0	0	0	0	0	0	1
63	Migwani market	Mwingi	Migwani	Mingwani	Kyamboo	0	0	1	0	0	0	0	0	0
64	Kasanga	Mwingi	Migwani	Tithani	Kasanga	0	0	0	0	0	0	0	0	1
65	Mavui	Mwingi	Migwani	Thaana Nzau	Yenzuva	0	0	0	0	0	0	0	0	1
66	Ndaluni	Mwingi	Mitiwani	Kyome	Kyome	0	0	0	0	0	0	0	0	1
67	Katoteni	Mwingi	Mitiwani	Nguutani	Nzawa	0	0	0	0	0	0	0	0	1
68	Itiko	Mwingi	Mui	Kalitine	Itiko	0	0	0	0	0	0	0	0	1
69	Yumbu	Mwingi	Mui	Kalitine	Yumbu	0	0	0	0	0	0	0	0	1
70	Ngungi	Mwingi	Mui	Mui	Ngungi	0	0	0	0	0	0	1	0	0
71	Kathonzweni	Mwingi	Mui	Mui	Ngilomi	0	0	0	0	0	0	1	0	0
72	Kyamwenze secondary school	Mwingi	Mui	Mui	Ngoo	0	0	0	0	0	0	1	0	0
73	Kalitini	Mwingi	Mui	Kalitini	Hiko	0	0	0	0	0	0	1	0	0
74	Miambani	Mwingi	Mui	Mui	Ngoo	0	0	0	0	0	0	0	0	1
75	Mutula	Mwingi	Nuu	Nuu	Mwambiu	0	0	0	0	0	0	0	0	1
76	Yatwa	Mwingi	Nuu	Wingemi	Kyangati	0	0	0	0	0	0	0	0	1
77	Nyaani	Mwingi	Nuu	Nuu	Nyaani	0	0	0	0	0	0	0	0	1
78	Muangeni	Mwingi	Nuu	Mutyangome	Muangeni	0	0	0	0	0	0	0	0	1
79	Engamba	Mwingi	Nuu	Wingemi	Malawa	0	0	0	0	0	0	0	0	1
80	Ndunguni	Mwingi	Nuu	Wingemi	Malawa	0	0	0	0	0	0	0	0	1
81	Kathanze	Mwingi	Nuu	Wingemi	Malawa	0	0	0	1	0	0	0	0	0
82	Tyaa Kamuthale	Mwingi	Mumoni	Kakuyu	Tyaa Kamuthale	0	0	0	0	0	0	0	0	1
83	Ndatha	Mwingi	Mumoni	Katse	Katse	0	0	0	0	0	0	0	0	1
84	Gaukanga	Mwingi	Mumoni	Tharaka	Tharaka	0	0	0	0	0	0	0	0	1
85	Ndathani	Mwingi	Mumoni	Mutanda	Wangutu	0	0	0	0	0	0	0	0	1
86	Mbavani	Mwingi	Mumoni	Katse	Mbarani	0	0	0	0	0	0	1	0	0
87	Miramba Ikanba	Mwingi	Mumoni	Kanthungu	Kanthungu	0	0	0	0	0	0	0	0	1
88	Muruu	Mwingi	Kyuso	Kyso	Gai	0	0	0	0	0	0	0	0	1
89	Kamusiliu	Mwingi	Kyuso	Ngomeni	Kamusiliu	0	0	0	0	0	0	0	0	1
90	Kakongo	Mwingi	Kyuso	Mivukoni	Twimyua	0	0	0	0	0	0	1	0	0
91	Kamula	Mwingi	Kyuso	Mivukoni	Kamula	0	0	0	0	0	0	0	0	1
92	Twimiwa	Mwingi	Kyuso	Mivukoni	Twimyua	0	0	0	0	0	0	0	0	1
93	Maseki	Mwingi	Kyuso	Kimangao	Mareki	0	0	0	0	0	0	0	0	1
94	Kandwia	Mwingi	Kyuso	Kimagao	Kimu	0	0	0	0	0	0	0	0	1
95	Kyanika	Mwingi	Kyuso	Mivukoni	Kamula	0	0	0	0	0	0	0	0	1

Evaluation Result for Project Target Communities（3/4）

Serial No.	Village/Community Name	Placement				Lack of Data	Existence of Water Supply Project	Existing Borehole	Spring Water Facility	Yield (less than 0.33m3/h)	Water Quality (Fluoride)	Water Quality (TDS)	Willing to Pay for Water	Project Target Community
		District	Division	Location	Sub Location									
96	Muambani	Makueni	Wote	Wote	Kambi Mawe	0	0	0	0	0	0	0	0	1
97	West Ngosini	Makueni	Wote	Kikumini	Kikumini	0	0	0	0	1	0	0	0	0
98	Kithundi	Makueni	Kaiti	Kilala	Kaumoni	0	0	0	0	0	0	0	0	1
99	Utui wa wote	Makueni	Wote	Wote	Kamunyolo	1	0	0	0	0	0	0	0	0
100	Kyaume	Makueni	Wote	Kako	Kako	0	0	0	0	0	0	0	0	1
101	Nthangu pri.	Makueni	Wote	Wote	Unoa	0	0	0	0	0	0	0	0	1
102	Kithundi	Makueni	Kaiti	Ukea	Kilala	0	0	0	0	0	0	0	0	1
103	Kazokeani	Makueni	Kathonzweni	Kithuki	Kimundi	0	0	1	0	0	0	0	0	0
104	Kisau girls school	Makueni	Kisau	Kisau	Mukinmani	0	0	0	0	1	0	0	0	0
105	Kiteta girls school	Makueni	Kisau	Kiteta	Kiteta	0	0	0	0	1	0	0	0	0
106	Ngaa primary school	Makueni	Kisau	Kiteta	Ngilomi	0	0	0	0	1	0	0	0	0
107	Kyang'ondu primary school	Makueni	Kisau	Waia	Usalala	0	0	0	0	0	0	0	0	1
108	Kisau health center	Makueni	Kisau	Kisau	Usalala	0	0	0	0	0	0	0	0	1
109	Sakai	Makueni	Kisau	Waia	Sakai	0	0	0	0	1	0	0	0	0
110	Kanzili	Makueni	Matiliku	Kilili	Kanzili	0	0	0	0	0	0	0	0	1
111	Kilili secondary school	Makueni	Matiliku	Kilili	Kilili	0	0	0	0	0	0	0	0	1
112	Mulenyu	Makueni	Matiliku	Kilili	Mulenyu	0	0	0	0	0	0	0	0	1
113	Mboani	Makueni	Matiliku	Kilili	Mulenyu	0	0	0	0	0	0	0	0	1
114	Wemyatu	Makueni	Matiliku	Matiliku	Kwa Kukui	0	0	0	0	0	0	0	0	1
115	Tutini secondary school	Makueni	Mbitini	Emali	Emali	0	0	0	0	1	0	0	0	0
116	Ndwaani secondary school	Makueni	Mbitini	Mulala	Ngetha	0	0	0	0	1	0	0	0	0
117	Kavuthu health center	Makueni	Mbitini	Kavuthu	Vulueni	0	0	0	0	0	0	0	0	1
118	Kiumoni market	Makueni	Mbitini	Mulala	Ngetha	0	0	0	0	0	0	0	0	1
119	Mbuthani sec. sch	Makueni	Mbitini	Kavuthu	Mbukoni	0	0	0	0	1	0	0	0	0
120	Kalima pri.	Makueni	Mbitini	Mwala	Tutini	0	0	0	0	1	0	0	0	0
121	Ititu secondary school	Makueni	Kalawa	Katengine	Ititu	0	0	0	0	0	0	0	0	1
122	Musingini	Makueni	Kalawa	Katangine	Ndauni	0	0	0	0	1	0	0	0	0
123	Ngunini	Makueni	Kalawa	Kawala	Mbukoni	0	0	0	0	0	0	0	0	1
124	Kyamutuku	Makueni	Kalawa	Athi	Miangeni	0	0	0	0	0	0	0	0	1
125	Uiini	Makueni	Kalawa	Kathulumbi	Kathulumbi	0	0	0	0	1	0	0	0	0
126	Kitaingo secondary school	Makueni	Kilome	Kitaingo	Kitaingo	0	0	0	0	0	0	0	0	1
127	Kwekolya	Makueni	Kilome	Kiima-Kiu	Ngaamba	0	0	0	0	0	0	0	0	1
128	Enzae	Makueni	Kilungu	Mukaa	Maiani	0	0	0	0	0	0	0	0	1
129	Kasikeu market	Makueni	Kasikeu	Kasikeu	Kasikeu	0	0	0	0	0	0	0	0	1
130	Kwale health center	Makueni	Kasikeu	Kiou	Kwale	0	0	0	0	0	0	0	0	1
131	Kiou village	Makueni	Kasikeu	Kiou	Sultan Hamud	0	0	0	0	0	0	0	0	1
132	Iimbani	Makueni	Kasikeu	Kasikeu	Wathini	0	0	0	0	1	0	0	0	0
133	Mangala	Makueni	Kasikeu	Kasikeu	Wathini	0	0	0	0	0	0	0	0	1
134	Nguuni	Makueni	Kasikeu	Kiou	Muani	0	0	0	0	0	0	0	0	1
135	Kwa Munyali	Makueni	Nguu	Mueni	Vololo	0	0	0	0	1	0	0	0	0
136	Iviani	Makueni	Nguu	Nguu	Thungui	0	0	0	0	0	0	0	0	1
137	Muangeni	Makueni	Nguu	Nguu	Thungui	0	0	0	0	0	0	0	0	1
138	Kikumini	Makueni	Nguu	Kikumini	Kikumini	0	0	0	0	1	0	0	0	0
139	Kwa kaloki	Makueni	Nguu	Ithumba	Kakeli	0	0	0	0	1	0	0	0	0
140	Mbukani	Makueni	Nguu	Wdwa	Wolwa	0	0	0	0	0	0	0	0	1
141	Yindundu	Makueni	Mtito Adei	Kambu	Kitengei	0	0	0	0	1	0	0	0	0
142	Utu	Makueni	Mtito Adei	Nthunguni	Nthingumi	0	0	0	0	0	0	0	0	1
143	Nzoila	Makueni	Mtito Adei	Kathekani	Katekani	0	0	0	0	1	0	0	0	0
144	Nthunguni self help group	Makueni	Mtito Adei	Mtito Andei	Kathekani	0	0	0	0	1	0	0	0	0
145	Katulie self help group	Makueni	Mtito Adei	Ngnata	Mukange	0	0	0	0	0	0	0	0	1
146	Kitengei	Makueni	Mtito Adei	Kambu	Kitengei	0	0	0	0	0	0	0	0	1

Evaluation Result for Project Target Communities（4/4）

Serial No.	Village/Community Name	Placement				Lack of Data	Existence of Water Supply Project	Existing Borehole	Spring Water Facility	Yield (less than 0.33m3/h)	Water Quality (Fluoride)	Water Quality (TDS)	Willing to Pay for Water	Project Target Community
		District	Division	Location	Sub Location									
147	Kithyoko sec.	Machakos	Masinga	Kithyoko	Kithyoko	0	0	1	0	0	0	1	0	0
148	Kagonde primary school	Machakos	Masinga	Kangonde	Kangonde	0	0	0	0	0	0	0	0	1
149	Kwa wanzilu	Machakos	Masinga	Ikaatini	Itundumuni	0	0	0	0	0	0	0	0	1
150	Ekalakala	Machakos	Masinga	Masinga	Ekalakala	0	0	0	0	0	0	0	0	1
151	Kamunyu primary school	Machakos	Masinga	Kivaa	Kivaa	0	0	0	0	0	0	0	0	1
152	City cotton village	Machakos	Masinga	Kivaa	Iiani	0	0	0	0	0	0	0	0	1
153	Kivandini	Machakos	Yatta	Matuu	Katulani	0	0	0	0	0	0	0	0	1
154	Kyasioni secondary school	Machakos	Katangi	Ikombe	Kyasioni	0	0	0	0	0	0	0	0	1
155	Ukaa kani	Machakos	Yatta	Kithimani	Kambi Ndege	0	0	0	0	1	0	0	0	0
156	Nguumo primary school	Machakos	Yatta	Kithimani	Kithimani	0	0	0	0	0	0	0	0	1
157	Kilango Nditonya	Machakos	Yatta	MAtuu	Kakunrini	0	0	0	0	1	0	0	0	0
158	Movoloni secondary school	Machakos	Yatta	Mavoloni	Kisiiki	0	0	0	0	0	0	0	0	1
159	Kakongo village	Machakos	Masinga	Ithudununi	Lkaatini	0	0	0	0	1	0	0	0	0
160	Ikombe	Machakos	Katangi	Ikombe	Ikombe	0	0	0	0	0	0	0	0	1
161	Mweleki	Machakos	Katangi	Kyua	Kyua	0	0	0	0	0	0	0	0	1
162	Kikeneani	Machakos	Katangi	Kyua	Kyua	0	0	0	0	0	0	0	0	1
163	Matinga	Machakos	Katangi	Kyua	Syo Kisinga	0	0	0	0	0	0	0	0	1
164	Utithini primary school	Machakos	Katangi	Kyua	Kyua	0	0	0	0	0	0	0	0	1
165	Ndalani	Machakos	Yaata	Ndalani	Ndalani	0	0	0	0	0	0	0	0	1
166	Kwale public	Machakos	Kathiani	Mitaboni	Miumbuni	0	0	0	0	0	0	0	0	1
167	Mukukuni wp	Machakos	Kathiani	Mitaboni	Kinyau	0	0	0	0	0	0	0	0	1
168	Lower Kitanga	Machakos	Central	Kitawga	Katheka-Kai	0	0	0	0	0	1	0	0	0
169	Koma rock	Machakos	Kathiani	Mitaboni	Kinyau	0	0	0	0	0	0	0	0	1
170	Mwala girls secondary school	Machakos	Mwala	Mwala	Kibau	0	0	0	0	0	0	0	0	1
171	Makutano A.I.C.	Machakos	Mwala	Makutano	Makutano	0	0	0	0	0	0	0	0	1
172	Mbele wp	Machakos	Mwala	Masii	Embui	0	0	0	0	0	0	0	0	1
173	Iembeni s.h.g.	Machakos	Mwala	Masii	Mbaani	0	0	0	0	0	0	0	0	1
174	Maweli wp	Machakos	Mwala	Makutano	Maweli	0	0	1	0	1	0	0	0	0
175	Mango secondary school	Machakos	Mwala	Mango	Wetaa	0	0	0	0	0	0	0	0	1
176	Masii girls school	Machakos	Mwala	Masii	Mbaani	0	0	0	0	0	0	0	0	1
177	Kwendana self help group	Machakos	Mwala	Mwala	Myanyani	0	0	0	0	0	0	0	0	1
178	Kyawango self help group	Machakos	Mwala	Mwala	Kangii	0	0	0	0	0	0	0	0	1
179	Utethanyo wa kwelita	Machakos	Mwala	Kathama	Etikoni	0	1	0	0	0	0	0	0	0
180	Meka self help group	Machakos	Kangundo	Kakuyuni	Kyevaluki	0	0	0	0	0	0	0	0	1
181	Katulani	Machakos	Yathui	Kibauni	Itumbule	0	0	0	0	0	0	0	0	1
182	Ikaalasa	Machakos	Yathui	Ikalaasa	Ngungi	0	0	0	0	0	0	0	0	1
183	Miu secondary school	Machakos	Yathui	Miu	Makuhimo	0	0	0	0	0	0	0	0	1
184	Munyuni	Machakos	Yathui	Wamunyu	Kambiti	0	0	0	0	0	0	0	0	1
185	Makulumi	Machakos	Yathui	Miu	Kikulumi	0	0	0	0	0	0	0	0	1
186	Lema girls secondary school	Machakos	Yathui	Yathui	Kyamatula	0	0	0	0	0	0	0	0	1
187	Kilembwa	Machakos	Yathui	Wamunyu	Kilembwa	0	0	0	0	0	0	0	0	1
188	Kyususioti	Machakos	Ndithini	Muthesya	Kikule	0	0	0	0	0	0	0	0	1
189	Ndithini secondary school	Machakos	Ndithini	Ndithini	Ndithini	0	0	0	0	0	0	0	0	1
190	Munyiiki	Machakos	Ndithini	Muthesya	Muthesya	0	0	0	0	0	0	0	0	1
191	Manaja secondary school	Machakos	Ndithini	Mananja	Mananja	0	0	0	0	0	0	0	0	1
192	Nzii primary school	Machakos	Ndithini	Ndithini	Milaani	0	0	0	0	1	0	0	0	0
193	Muthesya	Machakos	Ndithini	Muthesya	Muthesya	0	0	0	0	1	0	0	0	0
194	Tana ranch primary school	Machakos	Ndithini	Ndithini	Kiatineni	0	0	0	0	1	0	0	0	0
195	Thayu wa ndela	Machakos	Ndithini	Mananja	Mananja	0	0	0	0	0	0	0	0	1
196	Milaani	Machakos	Ndithini	Ndithini	Milaani	0	0	0	0	0	0	0	0	1
197	Manaja center	Machakos	Ndithini	Mananja	Mananja	0	0	0	0	0	0	0	0	1
198	Kyawalia dispensary	Machakos	Kalama	Lumbwa	Muumandu	0	0	0	0	0	0	0	0	1
199	Iyuni	Machakos	Kalama	Kola	Iiyuni	0	0	0	0	0	0	0	0	1
200	Kyamutheke	Machakos	Kalama	Kalama	Nziuni	0	0	0	0	0	0	0	0	1
Evaluation Result						2	1	4	1	31	2	7	0	**154**

Yes = 1
No = 0

Result of Pump Type Selection
（1/4）

Serial No.	Village/Community Name	District	Beneficiary People	Screening 1	Possibility to Put Windmill regard with Topographical Condition	Screening 2	Comparison between Water Demand and Possible Volume to Pump up										Screening 3	Yield(m3/h)	Screening 4(Successful Borehole)	Screening 5(Capacity to Pay for Water)
							Demand(m3/day)	S.W.L (G.L., -m)	Draw Down (GL, -m)	Pump Head (GL, -m)	Possible Volume to Pump up with Windmill（m3/day）									
											Rotor Diameter : 12 ft	: 16 ft	: 20 ft	: 24 ft	: 26 ft	Type				
1	Kimuuni/ Katwala	Kitui	2,500	4	1	2	37.5	35.0	9.3	49.3	3.2	8.1	12.6	19.1	21.9	0	3	3.0	3	3
2	Nzewani	Kitui	3,000	0	0	0	45.0			5.0	7.3	18.1	28.0	43.9	50.6	26	0		0	0
3	Kisasi market	Kitui	4,000	4	1	2	60.0	35.0	9.3	49.3	3.2	8.1	12.6	19.1	21.9	0	3	3.0	3	3
4	Nguuni	Kitui	3,000	4	0	3	53.3	35.0	9.3	49.3	3.2	8.1	12.6	19.1	21.9	0	3	3.0	3	3
5	Mbitini	Kitui	4,000	4	1	2	60.0	35.0	9.3	49.3	3.2	8.1	12.6	19.1	21.9	0	3	3.0	3	3
6	Mosa	Kitui	1,900	4	1	2	28.5	35.0	9.3	49.3	3.2	8.1	12.6	19.1	21.9	0	3	3.0	3	3
7	Katwala	Kitui	2,500	4	1	2	37.5	35.0	9.3	49.3	3.2	8.1	12.6	19.1	21.9	0	3	3.0	3	3
8	Kanzauwu	Kitui	1,500	4	1	2	22.5	35.0	9.3	49.3	3.2	8.1	12.6	19.1	21.9	0	3	3.0	3	3
9	Kamulanbani	Kitui	2,000	0	0	0	30.0			5.0	7.3	18.1	28.0	43.9	50.6	24	0		0	0
10	Kaluva secondary school	Kitui	2,500	4	1	2	36.2	35.0	9.3	49.3	3.2	8.1	12.6	19.1	21.9	0	3	3.0	3	3
11	Kyangulu	Kitui	2,000	4	0	3	30.0	25.0	6.1	36.1	4.6	11.3	17.7	27.5	31.5	26	3	5.0	3	3
12	Mutanda	Kitui	2,500	4	0	3	37.5	25.0	6.1	36.1	4.6	11.3	17.7	27.5	31.5	0	3	5.0	3	3
13	Ilako Mututa secondary school	Kitui	600	4	0	3	9.0	25.0	6.1	36.1	4.6	11.3	17.7	27.5	31.5	16	3	5.0	3	1
14	Mithikwani	Kitui	630	4	0	3	9.5	25.0	6.1	36.1	4.6	11.3	17.7	27.5	31.5	16	3	5.0	3	1
15	Kakeani secondary school	Kitui	2,000	4	0	3	30.0	25.0	6.1	36.1	4.6	11.3	17.7	27.5	31.5	26	3	5.0	3	3
16	Kasakini	Kitui	3,000	4	1	2	45.0	25.0	6.1	36.1	4.6	11.3	17.7	27.5	31.5	0	3	5.0	3	3
17	Kalinditi	Kitui	2,000	4	1	2	30.0	25.0	6.1	36.1	4.6	11.3	17.7	27.5	31.5	26	2	5.0	2	2
18	Kasue secondary school	Kitui	910	4	1	2	24.3	35.0	4.5	44.5	3.4	8.6	13.4	20.6	23.6	0	3	1.0	3	3
19	Uae primary school	Kitui	1,800	0	0	0	0.0			5.0	7.3	18.1	28.0	43.9	50.6	0	0		0	0
20	St. Mary's Miambani	Kitui	2,000	4	0	3	38.0	15.0	8.6	28.6	5.5	13.5	21.2	32.9	37.7	0	3	3.5	3	3
21	Kawala	Kitui	1,400	4	0	3	21.0	15.0	8.6	28.6	5.5	13.5	21.2	32.9	37.7	20	3	3.5	3	3
22	Kithumulani	Kitui	700	4	0	3	10.5	15.0	8.6	28.6	5.5	13.5	21.2	32.9	37.7	16	3	3.5	3	1
23	Makutano	Kitui	1,800	0	0	0	0.0			5.0	7.3	18.1	28.0	43.9	50.6	0	0		0	0
24	Kabati	Kitui	735	4	0	3	11.0	15.0	8.6	28.6	5.5	13.5	21.2	32.9	37.7	16	3	3.5	3	1
25	Ithangathi	Kitui	350	0	0	0	0.0	15.0	8.6	28.6	5.5	13.5	21.2	32.9	37.7	0	0	3.5	0	0
26	Ngungi	Kitui	525	0	0	0	0.0			5.0	7.3	18.1	28.0	43.9	50.6	0	0		0	0
27	Katikoni	Kitui	2,500	4	0	3	37.5	15.0	8.6	28.6	5.5	13.5	21.2	32.9	37.7	26	3	3.5	3	3
28	Makongo	Kitui	700	4	0	3	10.5	15.0	8.6	28.6	5.5	13.5	21.2	32.9	37.7	16	3	3.5	3	1
29	Kiseuni	Kitui	910	0	0	0	0.0			5.0	7.3	18.1	28.0	43.9	50.6	0	0		0	0
30	Kanyongonyo	Kitui	3,000	4	1	2	45.0	35.0	4.5	44.5	3.4	8.6	13.4	20.6	23.6	0	3	1.0	3	3
31	Nthongoni	Kitui	540	4	0	3	8.1	35.0	9.3	49.3	3.2	8.1	12.6	19.1	21.9	20	3	3.0	3	1
32	Kalulini	Kitui	2,000	4	0	3	30.0	35.0	9.3	49.3	3.2	8.1	12.6	19.1	21.9	0	3	3.0	3	3
33	Muselele	Kitui	1,500	4	0	3	22.5	35.0	9.3	49.3	3.2	8.1	12.6	19.1	21.9	0	3	3.0	3	3
34	Ikulumbutani	Kitui	480	1	0	1	7.2	35.0	9.3	49.3	3.2	8.1	12.6	19.1	21.9	16	1	3.0	1	1
35	Kateiko	Kitui	900	4	0	3	13.5	35.0	9.3	49.3	3.2	8.1	12.6	19.1	21.9	24	3	3.0	3	1
36	Tiva secondary school	Kitui	2,500	4	0	3	37.5	35.0	9.3	49.3	3.2	8.1	12.6	19.1	21.9	0	3	3.0	3	3
37	Ngava	Kitui	210	1	0	1	3.2	25.0	6.1	36.1	4.6	11.3	17.7	27.5	31.5	12	1	5.0	1	1
38	Katitika	Kitui	700	4	0	3	10.5	35.0	6.1	46.1	3.4	8.6	13.4	20.6	23.6	20	3	5.0	3	1
39	Kunikila	Kitui	3,200	4	0	3	48.0	35.0	6.1	46.1	3.4	8.6	13.4	20.6	23.6	0	3	5.0	3	3
40	Kalindilo	Kitui	2,000	4	0	3	30.0	35.0	6.1	46.1	3.4	8.6	13.4	20.6	23.6	0	3	5.0	3	3
41	Kyaani secondary school	Kitui	3,000	4	0	3	43.4	35.0	6.1	46.1	3.4	8.6	13.4	20.6	23.6	0	3	5.0	3	3
42	Kakumuti	Kitui	700	4	0	3	10.5	35.0	6.1	46.1	3.4	8.6	13.4	20.6	23.6	20	3	5.0	3	1
43	Kwa Motonga	Kitui	1,200	0	0	0	18.0			5.0	7.3	18.1	28.0	43.9	50.6	16	0		0	0
44	Mutini sec. school	Kitui	2,400	4	1	2	36.0	25.0	6.1	36.1	4.6	11.3	17.7	27.5	31.5	0	3	5.0	3	3
45	Kwa Nyingi Pri.	Kitui	1,700	4	0	3	25.5	25.0	6.1	36.1	4.6	11.3	17.7	27.5	31.5	24	3	5.0	3	3
46	Endau Sec School	Kitui	1,500	4	1	2	27.0	30.0	4.5	39.5	3.7	9.1	14.3	22.1	25.3	0	3	1.0	3	3
47	Ikutha market	Kitui	4,500	4	1	2	74.7	30.0	4.5	39.5	3.7	9.1	14.3	22.1	25.3	0	3	1.0	3	3
48	Kituti secondary school	Kitui	1,600	4	1	2	24.6	30.0	4.5	39.5	3.7	9.1	14.3	22.1	25.3	26	2	1.0	2	2
49	Kamutei	Kitui	1,500	4	0	3	22.5	30.0	4.5	39.5	3.7	9.1	14.3	22.1	25.3	26	3	1.0	3	3
50	Mwala	Kitui	480	1	0	1	7.2	30.0	4.5	39.5	3.7	9.1	14.3	22.1	25.3	16	1	1.0	1	1
51	Kyatune	Kitui	600	4	0	3	9.0	30.0	4.5	39.5	3.7	9.1	14.3	22.1	25.3	16	3	1.0	3	1
52	Yuku	Kitui	600	4	1	2	9.0	15.0	8.6	28.6	5.5	13.5	21.2	32.9	37.7	16	2	3.5	2	1
53	Ngaaka	Kitui	2,400	4	1	2	36.0	15.0	8.6	28.6	5.5	13.5	21.2	32.9	37.7	26	2	3.5	2	2

Result of Pump Type Selection
(2/4)

Serial No.	Village/Community Name	District	Beneficiary People	Screening 1	Possibility to Put Windmill regard with Topographical Condition	Screening 2	Comparison between Water Demand and Possible Volume to Pump up										Screening 3	Yield(m3/h)	Screening 4(Successful Borehole)	Screening 5(Capacity to Pay for Water)
							Demand(m3/day)	S.W.L (G.L., -m)	Draw Down (GL, -m)	Pump Head (GL, -m)	Possible Volume to Pump up with Windmill (m3/day)									
											Rotor Diameter : 12 ft	: 16 ft	: 20 ft	: 24 ft	: 26 ft	Type				
54	Yenzuva	Mwingi	2,000	4	0	3	30.0	25.0	6.1	36.1	5.9	14.5	23.0	35.5	40.7	24	3	5.0	3	3
55	Winzeei	Mwingi	1,400	4	0	3	23.5	25.0	6.1	36.1	5.9	14.5	23.0	35.5	40.7	24	3	5.0	3	3
56	Katuyu	Mwingi	800	4	0	3	12.0	25.0	6.1	36.1	5.9	14.5	23.0	35.5	40.7	16	3	5.0	3	1
57	Kakululo	Mwingi	500	4	1	2	7.5	25.0	6.1	36.1	5.9	14.5	23.0	35.5	40.7	16	2	5.0	2	1
58	Makengekani	Mwingi	900	4	0	3	13.5	15.0	8.6	28.6	7.0	17.4	27.5	42.4	48.7	16	3	3.5	3	1
59	Itumbi	Mwingi	1,500	4	0	3	17.5	25.0	6.1	36.1	5.9	14.5	23.0	35.5	40.7	20	3	5.0	3	3
60	Kyusyani	Mwingi	1,800	4	0	3	27.0	25.0	6.1	36.1	5.9	14.5	23.0	35.5	40.7	24	3	5.0	3	3
61	Kavaini	Mwingi	1,200	4	0	3	18.0	25.0	6.1	36.1	5.9	14.5	23.0	35.5	40.7	20	3	5.0	3	3
62	Nzauni	Mwingi	2,000	4	0	3	22.5	25.0	6.1	36.1	5.9	14.5	23.0	35.5	40.7	20	3	5.0	3	3
63	Migwani market	Mwingi	1,500	0	1	0	17.5	25.0	6.1	36.1	5.9	14.5	23.0	35.5	40.7	20	0	5.0	0	0
64	Kasanga	Mwingi	850	4	0	3	12.8	25.0	6.1	36.1	5.9	14.5	23.0	35.5	40.7	16	3	5.0	3	1
65	Mavui	Mwingi	600	4	0	3	9.0	25.0	6.1	36.1	5.9	14.5	23.0	35.5	40.7	16	3	5.0	3	1
66	Ndaluni	Mwingi	1,500	4	0	3	22.0	25.0	6.1	36.1	5.9	14.5	23.0	35.5	40.7	20	3	5.0	3	3
67	Katoteni	Mwingi	2,300	4	0	3	41.8	25.0	6.1	36.1	5.9	14.5	23.0	35.5	40.7	0	3	5.0	3	3
68	Itiko	Mwingi	600	4	0	3	9.0	15.0	8.6	28.6	7.0	17.4	27.5	42.4	48.7	16	3	3.5	3	1
69	Yumbu	Mwingi	1,300	4	0	3	19.5	15.0	8.6	28.6	7.0	17.4	27.5	42.4	48.7	20	3	3.5	3	3
70	Ngungi	Mwingi	2,000	0	0	0	30.0	15.0	8.6	28.6	7.0	17.4	27.5	42.4	48.7	24	0	3.5	0	0
71	Kathonzweni	Mwingi	800	0	0	0	12.0	15.0	8.6	28.6	7.0	17.4	27.5	42.4	48.7	16	0	3.5	0	0
72	Kyamwenze secondary school	Mwingi	1,500	0	0	0	24.4	15.0	8.6	28.6	7.0	17.4	27.5	42.4	48.7	20	0	3.5	0	0
73	Kalitini	Mwingi	600	0	0	0	0.0	15.0	8.6	28.6	7.0	17.4	27.5	42.4	48.7	0	0	3.5	0	0
74	Miambani	Mwingi	2,000	4	0	3	30.0	15.0	8.6	28.6	7.0	17.4	27.5	42.4	48.7	24	3	3.5	3	3
75	Mutula	Mwingi	400	1	1	1	6.0	15.0	8.6	28.6	7.0	17.4	27.5	42.4	48.7	12	1	3.5	1	1
76	Yatwa	Mwingi	240	1	0	1	3.6	15.0	8.6	28.6	7.0	17.4	27.5	42.4	48.7	12	1	3.5	1	1
77	Nyaani	Mwingi	600	4	1	2	9.0	15.0	8.6	28.6	7.0	17.4	27.5	42.4	48.7	16	2	3.5	2	1
78	Muangeni	Mwingi	350	1	1	1	5.3	15.0	8.6	28.6	7.0	17.4	27.5	42.4	48.7	12	1	3.5	1	1
79	Engamba	Mwingi	270	1	0	1	4.1	15.0	8.6	28.6	7.0	17.4	27.5	42.4	48.7	12	1	3.5	1	1
80	Ndunguni	Mwingi	300	1	1	1	4.5	15.0	8.6	28.6	7.0	17.4	27.5	42.4	48.7	12	1	3.5	1	1
81	Kathanze	Mwingi	100	0	1	0	1.5	15.0	8.6	28.6	7.0	17.4	27.5	42.4	48.7	12	0	3.5	0	0
82	Tyaa Kamuthale	Mwingi	800	4	0	3	17.0	15.0	8.6	28.6	7.0	17.4	27.5	42.4	48.7	16	3	3.5	3	3
83	Ndatha	Mwingi	500	4	0	3	5.4	15.0	8.6	28.6	7.0	17.4	27.5	42.4	48.7	12	3	3.5	3	1
84	Gaukanga	Mwingi	500	4	1	2	9.0	15.0	8.6	28.6	7.0	17.4	27.5	42.4	48.7	16	2	3.5	2	1
85	Ndathani	Mwingi	1,800	4	0	3	27.0	15.0	8.6	28.6	7.0	17.4	27.5	42.4	48.7	20	3	3.5	3	3
86	Mbavani	Mwingi	1,120	0	0	0	0.0	15.0	8.6	28.6	7.0	17.4	27.5	42.4	48.7	0	0	3.5	0	0
87	Miramba Ikanba	Mwingi	1,000	4	0	3	15.0	15.0	8.6	28.6	7.0	17.4	27.5	42.4	48.7	16	3	3.5	3	3
88	Muruu	Mwingi	375	1	0	1	5.6	15.0	8.6	28.6	7.0	17.4	27.5	42.4	48.7	12	1	3.5	1	1
89	Kamusiliu	Mwingi	1,000	4	0	3	24.0	15.0	8.6	28.6	7.0	17.4	27.5	42.4	48.7	20	3	3.5	3	3
90	Kakongo	Mwingi	600	0	0	0	9.0	15.0	8.6	28.6	7.0	17.4	27.5	42.4	48.7	16	0	3.5	0	0
91	Kamula	Mwingi	500	4	1	2	7.5	15.0	8.6	28.6	7.0	17.4	27.5	42.4	48.7	16	2	3.5	2	1
92	Twimiwa	Mwingi	600	4	1	2	9.0	15.0	8.6	28.6	7.0	17.4	27.5	42.4	48.7	16	2	3.5	2	1
93	Maseki	Mwingi	800	4	0	3	12.0	15.0	8.6	28.6	7.0	17.4	27.5	42.4	48.7	16	3	3.5	3	3
94	Kandwia	Mwingi	400	1	0	1	6.0	15.0	8.6	28.6	7.0	17.4	27.5	42.4	48.7	12	1	3.5	1	1
95	Kyanika	Mwingi	500	4	0	3	7.5	15.0	8.6	28.6	7.0	17.4	27.5	42.4	48.7	16	3	3.5	3	1

Result of Pump Type Selection
(3/4)

Serial No.	Village/Community Name	District	Beneficiary People	Screening 1	Possibility to Put Windmill regard with Topographical Condition	Screening 2	Comparison between Water Demand and Possible Volume to Pump up										Screening 3	Yield(m3/h)	Screening 4(Successful Borehole)	Screening 5(Capacity to Pay for Water)
							Demand(m3/day)	S.W.L (G.L., -m)	Draw Down (GL, -m)	Pump Head (GL, -m)	Possible Volume to Pump up with Windmill (m3/day)									
											Rotor Diameter : 12 ft	: 16 ft	: 20 ft	: 24 ft	: 26 ft	Type				
96	Muambani	Makueni	2,100	4	0	3	15.0	20.0	1.5	26.5	3.6	8.7	14.0	21.7	25.0	24	3	5.0	3	3
97	West Ngosini	Makueni	350	0	0	0	0.0	20.0		25.0	3.6	8.7	14.0	21.7	25.0	0	0		0	0
98	Kithundi	Makueni	1,000	4	0	3	15.0	20.0	9.3	34.3	2.6	6.2	10.1	15.5	17.8	24	3	3.0	3	3
99	Utui wa wote	Makueni	300	0	1	0	4.5	20.0	6.1	31.1	3.1	7.4	12.1	18.5	21.2	16	0	5.0	0	0
100	Kyaume	Makueni	300	1	0	1	4.5	20.0	5.7	30.7	3.1	7.4	12.1	18.5	21.2	16	1	1.5	1	1
101	Nthangu pri.	Makueni	250	1	0	1	3.8	20.0	8.6	33.6	2.6	6.2	10.1	15.5	17.8	16	1	4.0	1	1
102	Kithundi	Makueni	1,000	4	1	2	15.0	20.0	5.7	30.7	3.1	7.4	12.1	18.5	21.2	24	2	1.5	2	2
103	Kazokeani	Makueni	1,000	0	0	0	15.0			5.0	4.1	9.9	15.9	24.9	28.7	20	0		0	0
104	Kisau girls school	Makueni	1,040	0	0	0	0.0			5.0	4.1	9.9	15.9	24.9	28.7	0	0		0	0
105	Kiteta girls school	Makueni	800	0	0	0	0.0			5.0	4.1	9.9	15.9	24.9	28.7	0	0		0	0
106	Ngaa primary school	Makueni	1,350	0	0	0	20.3			5.0	4.1	9.9	15.9	24.9	28.7	24	0		0	0
107	Kyang'ondu primary school	Makueni	300	1	0	1	4.5	20.0	1.5	26.5	3.6	8.7	14.0	21.7	25.0	16	1	0.3	1	1
108	Kisau health center	Makueni	660	4	0	3	9.9	20.0	1.5	26.5	3.6	8.7	14.0	21.7	25.0	20	3	0.3	1	1
109	Sakai	Makueni	800	0	0	0	6.0			5.0	4.1	9.9	15.9	24.9	28.7	16	0		0	0
110	Kanzili	Makueni	800	4	1	2	12.0	40.0	8.6	53.6	1.4	4.2	6.6	10.0	11.6	0	3	4.0	3	3
111	Kilili secondary school	Makueni	700	4	1	2	8.5	40.0	8.6	53.6	1.4	4.2	6.6	10.0	11.6	24	2	4.0	2	2
112	Mulenyu	Makueni	1,300	4	1	2	19.5	40.0	6.7	51.7	1.8	4.5	7.2	10.8	12.4	0	3	2.0	3	3
113	Mboani	Makueni	600	4	0	3	9.0	40.0	8.6	53.6	1.4	4.2	6.6	10.0	11.6	24	3	4.0	3	1
114	Wemyatu	Makueni	4,500	4	0	3	67.5	40.0	5.7	50.7	1.8	4.5	7.2	10.8	12.4	0	3	1.5	3	3
115	Tutini secondary school	Makueni	1,600	0	0	0	24.0			5.0	4.1	9.9	15.9	24.9	28.7	24	0		0	0
116	Ndwaani secondary school	Makueni	600	0	0	0	0.0			5.0	4.1	9.9	15.9	24.9	28.7	0	0		0	0
117	Kavuthu health center	Makueni	1,050	4	0	3	15.8	40.0	8.3	53.3	1.4	4.2	6.6	10.0	11.6	0	3	2.2	3	3
118	Kiumoni market	Makueni	360	1	0	1	5.4	40.0	4.5	49.5	1.8	4.5	7.2	10.8	12.4	20	1	1.0	1	1
119	Mbuthani sec. sch	Makueni	1,600	0	0	0	24.0			5.0	4.1	9.9	15.9	24.9	28.7	24	0		0	0
120	Kalima pri.	Makueni	800	0	0	0	12.0			5.0	4.1	9.9	15.9	24.9	28.7	20	0		0	0
121	Ititu secondary school	Makueni	1,360	4	0	3	20.4	20.0	8.6	33.6	2.6	6.2	10.1	15.5	17.8	0	3	3.5	3	3
122	Musingini	Makueni	665	0	0	0	0.0			5.0	4.1	9.9	15.9	24.9	28.7	0	0		0	0
123	Ngunini	Makueni	500	4	0	3	7.5	20.0	3.5	28.5	3.1	7.4	12.1	18.5	21.2	20	3	3.5	3	1
124	Kyamutuku	Makueni	1,260	4	0	3	18.9	20.0	5.7	30.7	3.1	7.4	12.1	18.5	21.2	26	3	1.5	3	3
125	Uiini	Makueni	300	0	0	0	0.0			5.0	4.1	9.9	15.9	24.9	28.7	0	0		0	0
126	Kitaingo secondary school	Makueni	1,000	4	0	3	15.0	40.0	8.3	53.3	1.4	4.2	6.6	10.0	11.6	0	3	2.5	3	3
127	Kwekolya	Makueni	1,500	4	0	3	22.5	40.0	8.3	53.3	1.4	4.2	6.6	10.0	11.6	0	3	2.5	3	3
128	Enzae	Makueni	850	4	0	3	12.8	40.0	4.5	49.5	1.8	4.5	7.2	10.8	12.4	0	3	1.0	3	3
129	Kasikeu market	Makueni	3,600	4	0	3	60.5	40.0	4.5	49.5	1.8	4.5	7.2	10.8	12.4	0	3	1.0	3	3
130	Kwale health center	Makueni	800	4	1	2	12.0	40.0	6.7	51.7	1.8	4.5	7.2	10.8	12.4	26	2	2.0	2	2
131	Kiou village	Makueni	600	4	0	3	9.0	40.0	4.5	49.5	1.8	4.5	7.2	10.8	12.4	24	3	1.0	3	3
132	Iimbani	Makueni	1,050	0	0	0	0.0			5.0	4.1	9.9	15.9	24.9	28.7	0	0		0	0
133	Mangala	Makueni	2,100	4	0	3	31.5	40.0	6.7	51.7	1.8	4.5	7.2	10.8	12.4	0	3	2.0	3	3
134	Nguuni	Makueni	1,800	4	0	3	27.0	40.0	4.5	49.5	1.8	4.5	7.2	10.8	12.4	0	3	1.0	3	3
135	Kwa Munyali	Makueni	270	0	0	0	0.0			5.0	4.1	9.9	15.9	24.9	28.7	0	0		0	0
136	Iviani	Makueni	1,300	4	0	3	19.5	40.0	6.7	51.7	1.8	4.5	7.2	10.8	12.4	0	3	2.0	3	3
137	Muangeni	Makueni	300	1	0	1	4.5	40.0	6.1	51.1	1.8	4.5	7.2	10.8	12.4	20	1	5.0	1	1
138	Kikumini	Makueni	480	0	0	0	0.0			5.0	4.1	9.9	15.9	24.9	28.7	0	0		0	0
139	Kwa kaloki	Makueni	280	0	0	0	0.0			5.0	4.1	9.9	15.9	24.9	28.7	0	0		0	0
140	Mbukani	Makueni	270	1	0	1	4.1	40.0	9.3	54.3	1.4	4.2	6.6	10.0	11.6	16	1	3.0	1	1
141	Yindundu	Makueni	456	0	0	0	0.0			5.0	4.1	9.9	15.9	24.9	28.7	0	0		0	0
142	Utu	Makueni	275	1	0	1	4.1	40.0	9.3	54.3	1.4	4.2	6.6	10.0	11.6	16	1	3.0	1	1
143	Nzoila	Makueni	455	0	0	0	0.0			5.0	4.1	9.9	15.9	24.9	28.7	0	0		0	0
144	Nthunguni self help group	Makueni	560	0	0	0	0.0			5.0	4.1	9.9	15.9	24.9	28.7	0	0		0	0
145	Katulie self help group	Makueni	280	1	0	1	4.2	30.0	8.3	43.3	1.9	4.7	7.7	11.7	13.4	16	1	2.5	1	1
146	Kitengei	Makueni	1,400	4	0	3	21.0	30.0	8.3	43.3	1.9	4.7	7.7	11.7	13.4	0	3	2.5	3	3

Result of Pump Type Selection
(4/4)

Serial No.	Village/Community Name	District	Beneficiary People	Screening 1	Possibility to Put Windmill regard with Topographical Condition	Screening 2	Comparison between Water Demand and Possible Volume to Pump up										Screening 3	Yield(m3/h)	Screening 4(Successful Borehole)	Screening 5(Capacity to Pay for Water)
							Demand(m3/day)	S.W.L (G.L., -m)	Draw Down (GL, -m)	Pump Head (GL, -m)	Possible Volume to Pump up with Windmill (m3/day)									
											Rotor Diameter : 12 ft	: 16 ft	: 20 ft	: 24 ft	: 26 ft	Type				
147	Kithyoko sec.	Machakos	765	0	0	0	0.0	25.0	1.5	31.5	3.5	8.5	13.8	21.2	24.3	0	0	0.3	0	0
148	Kagonde primary school	Machakos	1,000	4	1	2	12.0	23.0	6.1	34.1	3.0	7.1	11.5	17.7	20.3	24	2	5.0	2	2
149	Kwa wanzilu	Machakos	2,250	4	0	3	33.8	35.0	8.3	48.3	2.0	5.1	8.2	12.3	14.2	0	3	2.2	3	3
150	Ekalakala	Machakos	2,000	4	0	3	35.0	20.0	9.3	34.3	3.0	7.1	11.5	17.7	20.3	0	3	3.0	3	3
151	Kamunyu primary school	Machakos	1,500	4	0	3	22.5	35.0	9.3	49.3	2.0	5.1	8.2	12.3	14.2	0	3	3.0	3	3
152	City cotton village	Machakos	800	4	0	3	12.0	25.0	8.3	38.3	2.4	5.8	9.3	14.3	16.3	24	3	2.5	3	3
153	Kivandini	Machakos	2,400	4	0	3	36.0	24.0	8.6	37.6	2.4	5.8	9.3	14.3	16.3	0	3	4.0	3	3
154	Kyasioni secondary school	Machakos	1,000	4	1	2	18.8	30.0	8.3	43.3	2.2	5.4	8.7	13.3	15.2	0	3	2.5	3	3
155	Ukaa kani	Machakos	800	0	0	0	0.0			5.0	4.7	11.4	18.1	28.4	32.7	0	0		0	0
156	Nguumo primary school	Machakos	700	4	0	3	10.5	24.0	8.6	37.6	2.4	5.8	9.3	14.3	16.3	24	3	4.0	3	3
157	Kilango Nditonya	Machakos	1,000	0	0	0	15.0			5.0	4.7	11.4	18.1	28.4	32.7	20	0		0	0
158	Movoloni secondary school	Machakos	2,000	4	0	3	30.0	20.0	8.6	33.6	3.0	7.1	11.5	17.7	20.3	0	3	4.0	3	3
159	Kakongo village	Machakos	900	0	0	0	13.5			5.0	4.7	11.4	18.1	28.4	32.7	20	0		0	0
160	Ikombe	Machakos	700	4	0	3	10.5	25.0	8.3	38.3	2.4	5.8	9.3	14.3	16.3	24	3	2.5	3	3
161	Mweleki	Machakos	800	4	0	3	12.0			5.0	4.7	11.4	18.1	28.4	32.7	20	3		1	1
162	Kikeneani	Machakos	1,800	4	0	3	23.0	25.0	6.7	36.7	3.0	7.1	11.5	17.7	20.3	0	3	2.0	3	3
163	Matinga	Machakos	872	4	0	3	13.1	25.0	8.3	38.3	2.4	5.8	9.3	14.3	16.3	24	3	2.5	3	3
164	Utithini primary school	Machakos	800	4	0	3	12.0	20.0	2.4	27.4	4.1	10.0	15.9	24.8	28.5	20	3	0.5	1	1
165	Ndalani	Machakos	2,400	4	0	3	36.0	20.0	4.5	29.5	3.5	8.5	13.8	21.2	24.3	0	3	1.0	3	3
166	Kwale public	Machakos	600	4	1	2	9.0	12.0	6.7	23.7	4.1	10.0	15.9	24.8	28.5	16	2	2.0	2	2
167	Mukukuni wp	Machakos	1,200	4	0	3	18.0	12.0	8.3	25.3	4.1	10.0	15.9	24.8	28.5	24	3	2.5	3	3
168	Lower Kitanga	Machakos	1,500	0	0	0	22.5	12.0	8.3	25.3	4.1	10.0	15.9	24.8	28.5	24	0	2.5	0	0
169	Koma rock	Machakos	1,800	4	0	3	27.0	12.0	6.1	23.1	4.1	10.0	15.9	24.8	28.5	26	3	5.0	3	3
170	Mwala girls secondary school	Machakos	640	4	0	3	9.6	35.0	8.6	48.6	2.0	5.1	8.2	12.3	14.2	24	3	4.0	3	3
171	Makutano A.I.C.	Machakos	540	4	0	3	8.1	35.0	8.3	48.3	2.0	5.1	8.2	12.3	14.2	20	3	2.2	3	1
172	Mbele wp	Machakos	1,380	4	0	3	20.7	35.0	6.7	46.7	2.2	5.4	8.7	13.3	15.2	0	3	2.0	3	3
173	Iembeni s.h.g.	Machakos	1,800	4	0	3	27.0			5.0	4.7	11.4	18.1	28.4	32.7	24	3		1	1
174	Maweli wp	Machakos	2,000	0	0	0	30.0			5.0	4.7	11.4	18.1	28.4	32.7	26	0		0	0
175	Mango secondary school	Machakos	595	4	0	3	8.9	30.0	4.5	39.5	2.4	5.8	9.3	14.3	16.3	20	3	1.0	3	1
176	Masii girls school	Machakos	540	4	0	3	8.1	30.0	4.5	39.5	2.4	5.8	9.3	14.3	16.3	20	3	1.0	3	1
177	Kwendana self help group	Machakos	1,000	4	0	3	15.0	35.0	6.7	46.7	2.2	5.4	8.7	13.3	15.2	26	3	2.0	3	3
178	Kyawango self help group	Machakos	1,800	4	1	2	27.0	35.0	9.3	49.3	2.0	5.1	8.2	12.3	14.2	0	3	3.0	3	3
179	Utethanyo wa kwelita	Machakos	1,000	0	0	0	15.0	12.0	8.3	25.3	4.1	10.0	15.9	24.8	28.5	20	0	2.2	0	0
180	Meka self help group	Machakos	4,100	4	0	3	61.5	35.0	8.6	48.6	2.0	5.1	8.2	12.3	14.2	0	3	4.0	3	3
181	Katulani	Machakos	600	4	0	3	9.0	20.0	8.3	33.3	3.0	7.1	11.5	17.7	20.3	20	3	2.2	3	1
182	Ikaalasa	Machakos	2,000	4	0	3	30.0	20.0	6.7	31.7	3.5	8.5	13.8	21.2	24.3	0	3	2.0	3	3
183	Miu secondary school	Machakos	1,500	4	0	3	30.0	20.0	9.3	34.3	3.0	7.1	11.5	17.7	20.3	0	3	3.0	3	3
184	Munyuni	Machakos	600	4	0	3	9.0	35.0	4.5	44.5	2.2	5.4	8.7	13.3	15.2	24	3	0.8	1	1
185	Makulumi	Machakos	800	4	1	2	9.0	35.0	8.3	48.3	2.0	5.1	8.2	12.3	14.2	24	2	2.2	2	2
186	Lema girls secondary school	Machakos	304	1	0	1	4.6	35.0	4.5	44.5	2.2	5.4	8.7	13.3	15.2	16	1	1.0	1	1
187	Kilembwa	Machakos	700	4	0	3	13.5	35.0	8.3	48.3	2.0	5.1	8.2	12.3	14.2	26	3	2.2	3	3
188	Kyususioti	Machakos	800	4	0	3	12.0	20.0	8.3	33.3	3.0	7.1	11.5	17.7	20.3	24	3	2.2	3	3
189	Ndithini secondary school	Machakos	1,500	4	0	3	22.5	20.0	4.5	29.5	3.5	8.5	13.8	21.2	24.3	26	3	1.0	3	3
190	Munyiiki	Machakos	2,500	4	0	3	37.5	20.0	8.3	33.3	3.0	7.1	11.5	17.7	20.3	0	3	2.2	3	3
191	Manaja secondary school	Machakos	1,260	4	0	3	18.9	20.0	9.3	34.3	3.0	7.1	11.5	17.7	20.3	26	3	3.0	3	3
192	Nzii primary school	Machakos	500	0	0	0	6.2			5.0	4.7	11.4	18.1	28.4	32.7	16	0		0	0
193	Muthesya	Machakos	1,500	0	0	0	22.5			5.0	4.7	11.4	18.1	28.4	32.7	24	0		0	0
194	Tana ranch primary school	Machakos	700	0	0	0	0.0			5.0	4.7	11.4	18.1	28.4	32.7	0	0		0	0
195	Thayu wa ndela	Machakos	600	4	0	3	9.0	20.0	9.3	34.3	3.0	7.1	11.5	17.7	20.3	20	3	3.0	3	1
196	Milaani	Machakos	700	4	1	2	12.8	20.0	9.3	34.3	3.0	7.1	11.5	17.7	20.3	24	2	3.0	2	2
197	Manaja center	Machakos	1,200	4	0	3	18.0	20.0	9.3	34.3	3.0	7.1	11.5	17.7	20.3	26	3	3.0	3	3
198	Kyawalia dispensary	Machakos	2,000	4	0	3	30.0	20.0	1.5	26.5	4.1	10.0	15.9	24.8	28.5	0	3	0.3	1	1
199	Iyuni	Machakos	1,000	4	1	2	15.0	20.0	2.4	27.4	4.1	10.0	15.9	24.8	28.5	20	2	0.5	1	1
200	Kyamutheke	Machakos	2,250	4	0	3	33.8	35.0	5.7	45.7	2.2	5.4	8.7	13.3	15.2	0	3	1.5	3	3

5.4
Criteria for Successful Borehole and Success Rate of Borehole

Criteria to Decide on Successful Borehole and Success and Failure Rates of Boreholes

1. Criteria for Successful Boreholes

1.1 Minimum Requirement of Water Yield

The minimum requirements of pumps were described in the main text and are listed below:

- Hand Pump : greater than or equal to 0.3 m^3/hr
- Windmill Pump : greater than or equal to 0.6 m^3/hr
- Submersible Pump : greater than or equal to 1.0 m^3/hr

1.2 Water Quality

The proposed water quality criteria are given in the following Table.

Classification	Chemical Parameters	WHO	Kenyan Standard		Proposal
			Desirable	Permissible	
Health Item （Guideline）	Arsenic	0.01	0.05	0.05	0.05
	Fluoride	1.5	1.5	3.0	3.0
Chemical Component	Total Dissolved Solids (Conductivity)	1000 (1600)	1000 (1600)	1500 (2400)	2000 (3200)
	Iron	0.3	0.3	1.0	1.0
	Manganese	0.1	0.1	0.5	0.5
Chemical Component : This is provided as “the level that somebody complains about the item” by WHO. It is distinguished from Guideline Standards. Unit : mg/L (Conductivity: micro S/cm)					

【Health Item】

High level fluoride concentrations in water are a problem with groundwater development in Kenya. In recent years, bone charcoal has been applied to reducing the concentration; however, the following problems have arisen:

✧ Frequent replacement of bone charcoal is required to achieve effective reduction of fluoride concentration.

✧ High level of fluoride in water is not easily detected by smell or taste, and therefore, if the effectiveness of bone charcoal is valid, there is a high possibility that water users will continue to drink water with rich fluoride.

To avoid these problems, effective and continuous education of water users is required. This is, however, difficult to realize under the Project. Therefore, if fluoride rich water is found to exceed the permissible level, the borehole is backfilled to ensure it is not used for water supply.

【Chemical Component】

The following chemical components are assumed to exceed the permissible level in the study area:

- Iron and Manganese

These components are easily removed by simple equipment. Also, if equipment is not operated well, the taste of water deteriorates and therefore reasonable operation and maintenance is expected. These components do not cause problem to human health and it is proposed that for sites with iron and manganese above the permissible level, they be treated with equipment or facilities.

- Total Dissolved Solid（TDS）

Contamination of TDS is set at 2,000mg/l, taking into account the present domestic water use condition and standards in the Design Manual of water supply facilities in Kenya, as described in the main text.

2. Success Rate

2.1 Database

The available database has been updated using new data obtained in field surveys by the study team. These updated data are summarized in Figures 1 to 3, which show the locations of boreholes registered in the database, those with water quality data, and locations of new data taken by the study team.

2.2 Identification of Specific Areas of High Contamination of Fluoride and TDS

【High Level of Fluoride】

Figure 4 show that groundwater in the western area of Machakos district and the central part of Makueni district has high level of fluoride. This fluoride rich water occurs in certain geologic formation such as volcanic, and therefore, borehole data in these areas were excluded from the study.

There are several areas with high level of fluoride, however their associated geological features were unclear due to a lack of data. As a result, the concentration data of the associated boreholes were used for the study.

It is noted that the community with code No.168 in Attachment-5-3 was excluded from those with a high possibility of containing high fluoride concentrations.

【High TDS Levels】

Taking into account the distribution of TDS concentration, and excluding the central part of Makueni district, Figure 5 shows that high levels of TDS in groundwater are not generally related to regional geology. However, an area around latitude 0°48', where groundwater contains high levels of TDS, does not include the target communities. Data in this area were excluded as, firstly, the success rate was considered low if these data were used in the study and, secondly, no target communities were located in this area.

In general, vertical electrical sounding surveys were made to assist in identifying groundwater potential. No analysis of specific resistance values and concentrations of salty water were discussed in this survey. Therefore, the database includes borehole data with high concentrations of salt.

Through the analysis of concentrations of salt and electric conductivity, when EC exceeds 5000

micro S/cm (corresponding to a TDS of 3100 mg/l), the vertical electrical sounding survey was able to identify high TDS concentrations in groundwater.

Test Well Site	EC Specific Resistance (Ωm)	EC (micro S /cm)
Mwingi	70-110	3,400
Machakos	22-48	4,100
Makueni	200-300	(Particle Water)

Electrical sounding survey results with a specific resistance value less than 50 were associated with seven target communities (serial nos. 25, 70, 71, 72, 73, 86 and 90) where the ECs of groundwater exceeded 5000 micro S/cm.

From these analyses, where borehole data indicated ECs exceeding 5000 micro S/cm the associated target communities nearby were excluded.

2.3 Number of Data for Analysis

The number of applied data is outlined below:

Existing Borehole Data Nos.

Item	Machakos	Kitui	Mwingi	Makueni	Total
Existing Borehole Data	484	124	74	281	963
Data with Coordinates	339	79	59	265	742
Data except High F/TDS	85	79	38	189	391
Data with Yield	65	63	26	143	297
Data with Yield (Q= over 0.3m^3/h)	62	57	21	115	255

Existing Borehole Water Quality Data Nos.

Item	Machakos	Kitui	Mwingi	Makueni	Total
Water Quality Analysis	127	56	27	69	279
Data with Coordinates	99	41	24	64	228
Data except High F/TDS	32	40	20	45	137
Data with Yield (Q= over 0.3m^3/h)	22	27	9	27	85
F Data with above Nos.	21	27	8	23	79
TDS Data with above Nos.	22	27	9	25	83

2.4 Success Rate for Water Yield

The minimum requirement of water yield for hand pumps, windmill pumps and submersible pumps were estimated as follows:

A. Success Rate With Regard to Yield						
District		Machakos	Kitui	Mwingi	Makueni	4 Districts
Yield Q (m^3/h)	0.3	95.4% (62/65)	90.5% (57/63)	82.4% (21/26- 22/26)	81.7% (116/143-117/143)	86.2% (256/297)
	0.6	92.3% (60/65)	83.3% (52/63)	75.8% (19/26)	77.6% (111/143)	81.5% (242/297)
	1.0	86.3% (56/65-57/65)	80.4% (50/63-51/63)	67.6% (17/26,-18/26)	73.6% (105/143-106/143)	76.9% (228/297- 229/297)
Data Nos.		65	63	26	143	297
		Number with （ ） : Nos. of data used to calculate success rate				

2.5 Success Rate for Water Quality

Success rate for water quality based on F and TDS was estimated using data for boreholes with a water yield of more than 0.3 m^3/hr, as follows:

B-1. Success Rate With Regard to Fluoride Consistency						
District		Machakos	Kitui	Mwingi	Makueni	4 Districts
F (mg/l)	Less than 3.0	100.0% (21/21)	94.4% (25/27-26/27)	100.0% (8/8)	100.0% (23/23)	97.6% (77/79-78/79)
Data Nos.		21	27	8	23	79
		Number with （ ） : Nos. of data used to calculate successful rate				

B-2. Success Rate With Regard to TDS（except data with high TDS, exceeding 3100 mg/l）						
District		Machakos	Kitui	Mwingi	Makueni	4 Districts
TDS (mg/l)	Less than 1500 （EC2400）	94.7% (19/21- 20/21)	81.5% (22/27)	60.0% (4/7-5/7)	76.5% (17/23-18/23)	79.5% (62/78)
	Less than 2000 (EC3200)	100.0% (21/21)	90.7% (24/27-25/27)	91.2% (6/7-7/7)	89.9% (20/23-21/23)	91.9% (71/78-72/78)
Data Nos.		21	27	7	23	78
Data No. except high TDS (exceeding 3100 mg/l)		1	0	2	2	5
Total Data Nos.		22	27	9	25	83
		Number with （ ） : Nos. of data used to calculate successful rate				

Based on the above result, the following combined success rate was established for F and TDS:

B-3. Success Rate With Regard to Water Quality（F,TDS） （B-1 x B-2）								
Case	F (mg/l)	Condition	TDS (mg/l)	Machakos	Kitui	Mwingi	Makueni	4 Districts
1	Less than 3.0	and	Less than 1500 （EC2400）	94.7%	77.0%	60.0%	76.5%	77.6%
2	Less than 3.0	and	Less than 2000 (EC3200)	100.0%	85.7%	91.2%	89.9%	89.7%

2.6 Comprehensive Success Rate

Comprehensive success rate from the viewpoints of both water yield and quality was derived for each district as follows:

C-1. Success Rate With Regard to Yield and Water Quality (Machakos) (A x B-3)					
Q (m^3/h)		0.3	0.6	1.0	Remarks
F, TDS (mg/l)	Case 1	90.4%	85.7%	81.8%	Kenyan Standard
	Case 2	95.4%	92.3%	86.3%	Provisional Standard

C-2. Success Rate With Regard to Yield and Water Quality (Kitui) (A x B-3)					
Q (m^3/h)		0.3	0.6	2.0	Remarks
F, TDS (mg/l)	Case 1	69.6%	64.1%	61.9%	Kenyan Standard
	Case 2	77.5%	71.4%	68.9%	Provisional Standard

C-3. Success Rate With Regard to Yield and Water Quality (Mwingi) (A x B-3)					
Q (m^3/h)		0.3	0.6	1.0	Remarks
F, TDS (mg/l)	Case 1	49.5%	45.5%	40.6%	Kenyan Standard
	Case 2	75.1%	69.1%	61.6%	Provisional Standard

C-4. Success Rate With Regard to Yield and Water Quality (Makueni) (A x B-3)					
Q (m^3/h)		0.3	0.6	1.0	Remarks
F, TDS (mg/l)	Case 1	62.5%	59.4%	56.3%	Kenyan Standard
	Case 2	73.4%	69.8%	56.1%	Provisional Standard

3. Required Rates for Number of Sand Filters for Removal of Fe and Mn

Using borehole data with the water yields exceeding 0.3 m^3/hr, the rates of required number of sand filters were estimated for each district as follows:

Excess Rate of Iron and Manganese Standard								
Yield (m^3/h)	Fe (mg/L)	Condition	Mn (mg/L)	Machakos	Kitui	Mwingi	Makueni	Average
0.3	over 1.0	Or	over 0.5	22.7%	9.1%	38.5%	38.1%	25.6%

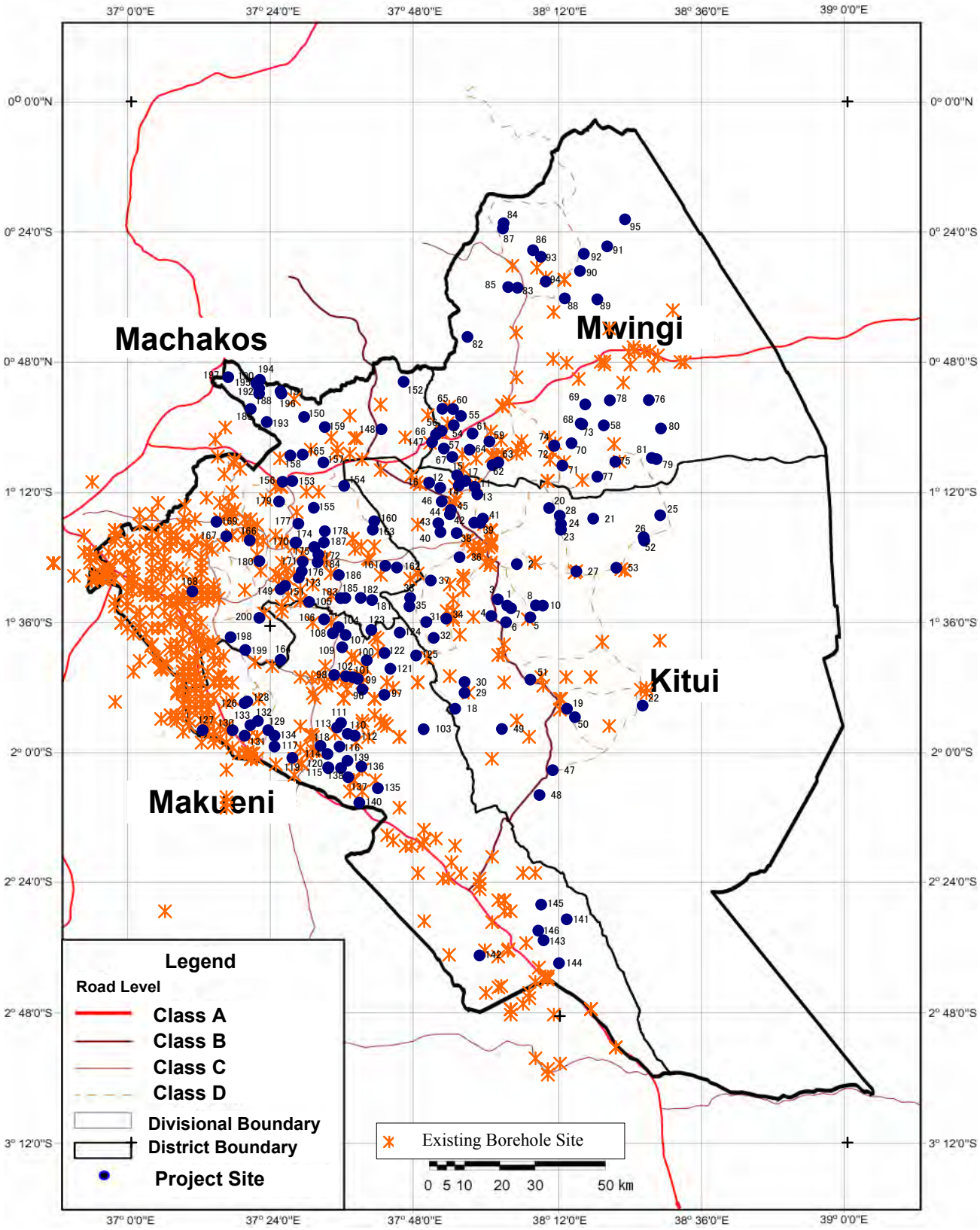


Figure 1 Point of Existing Borehole

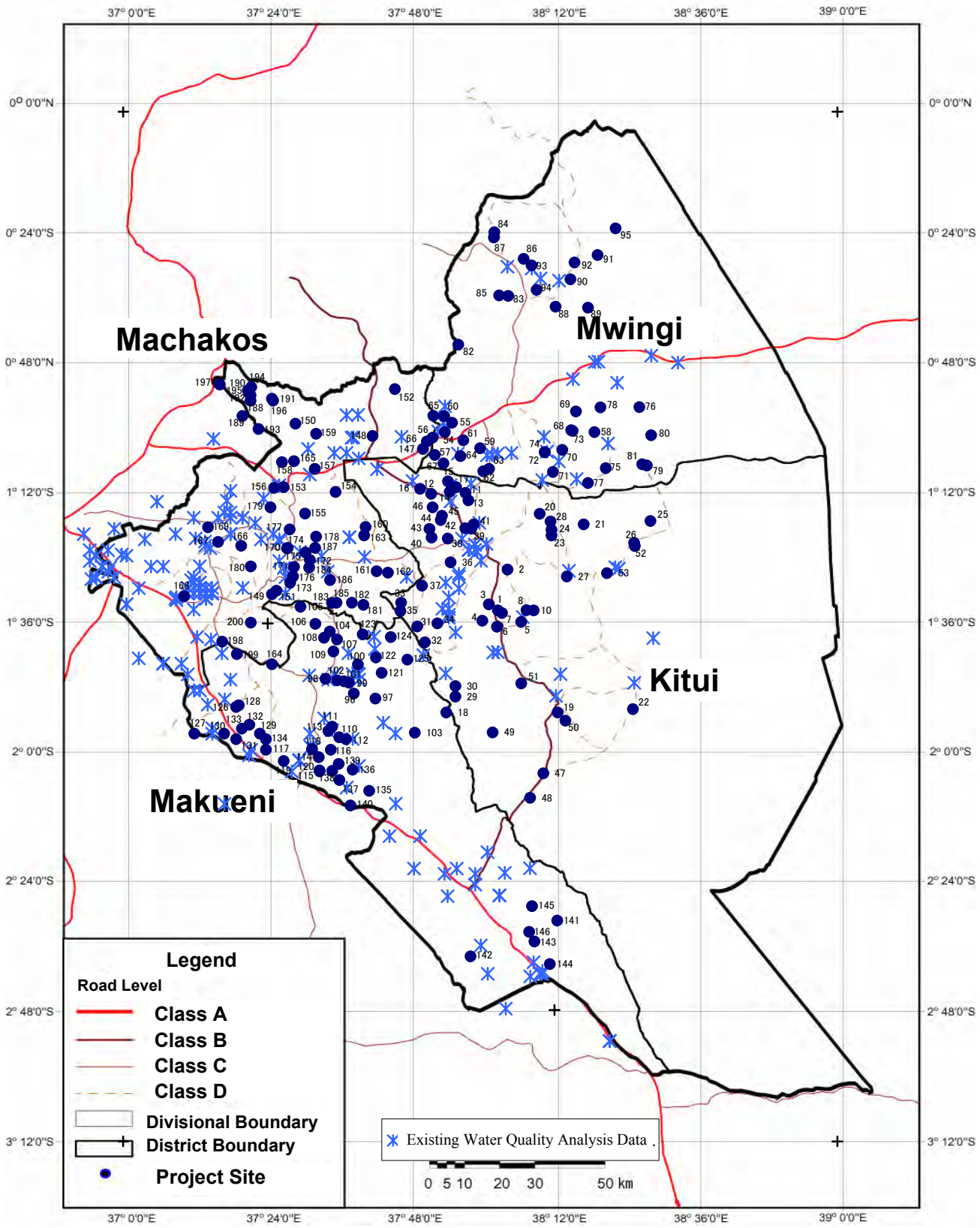


Figure 2 Point of Existing Water Quality Analysis Data

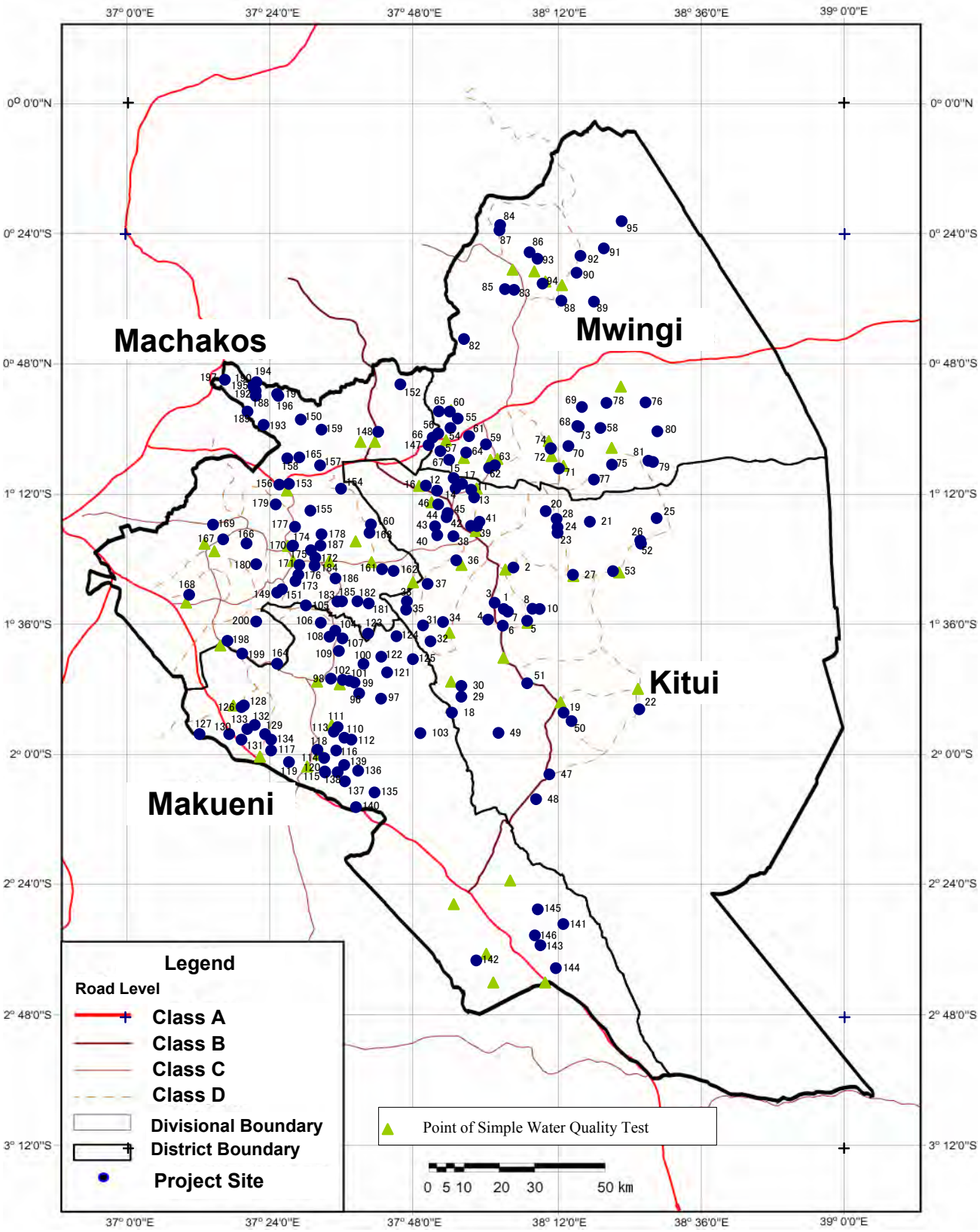


Figure 3 Point of Simple Water Quality Test

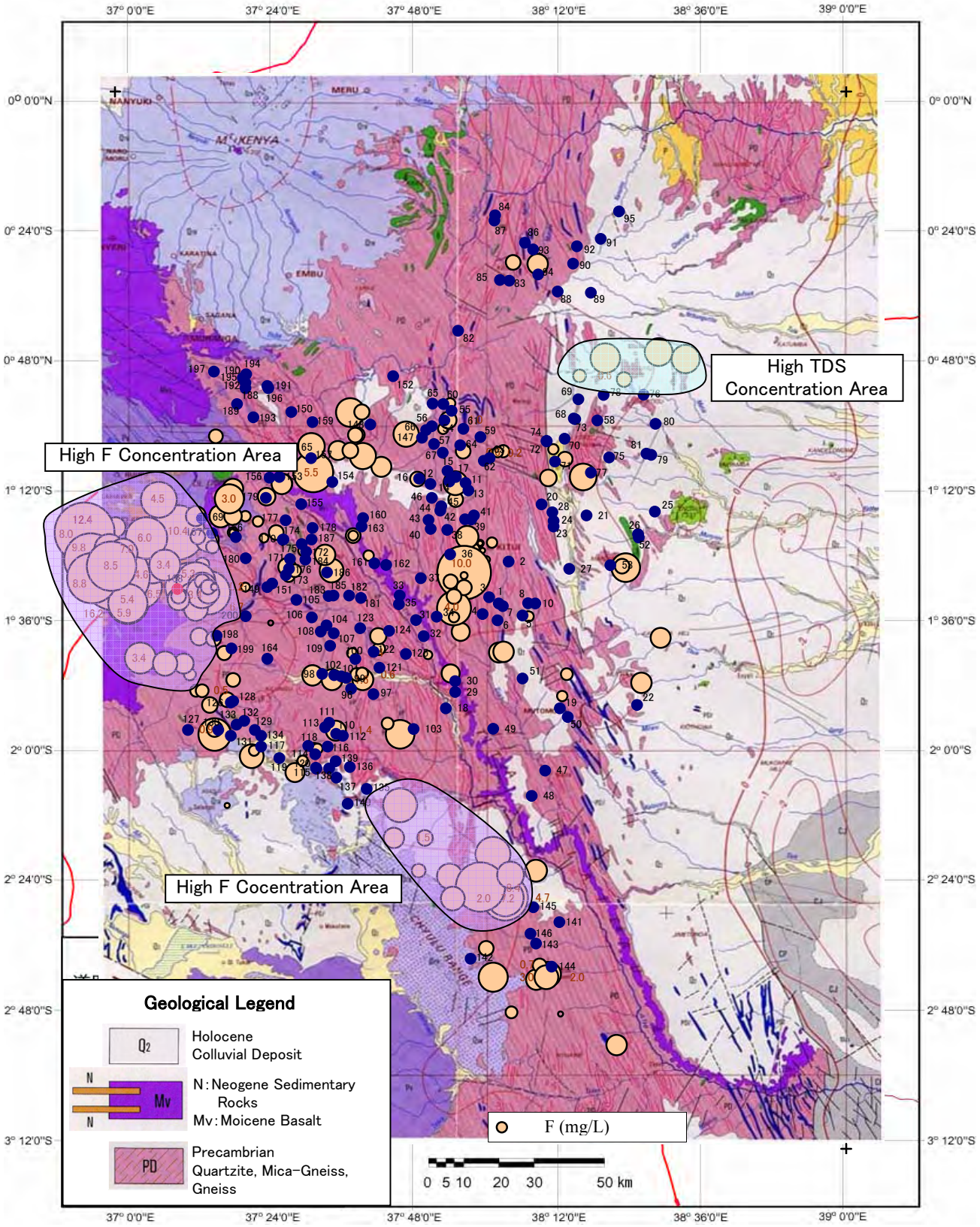


Figure 4 Distribution Map of Fluoride (F) Concentration (All Data)

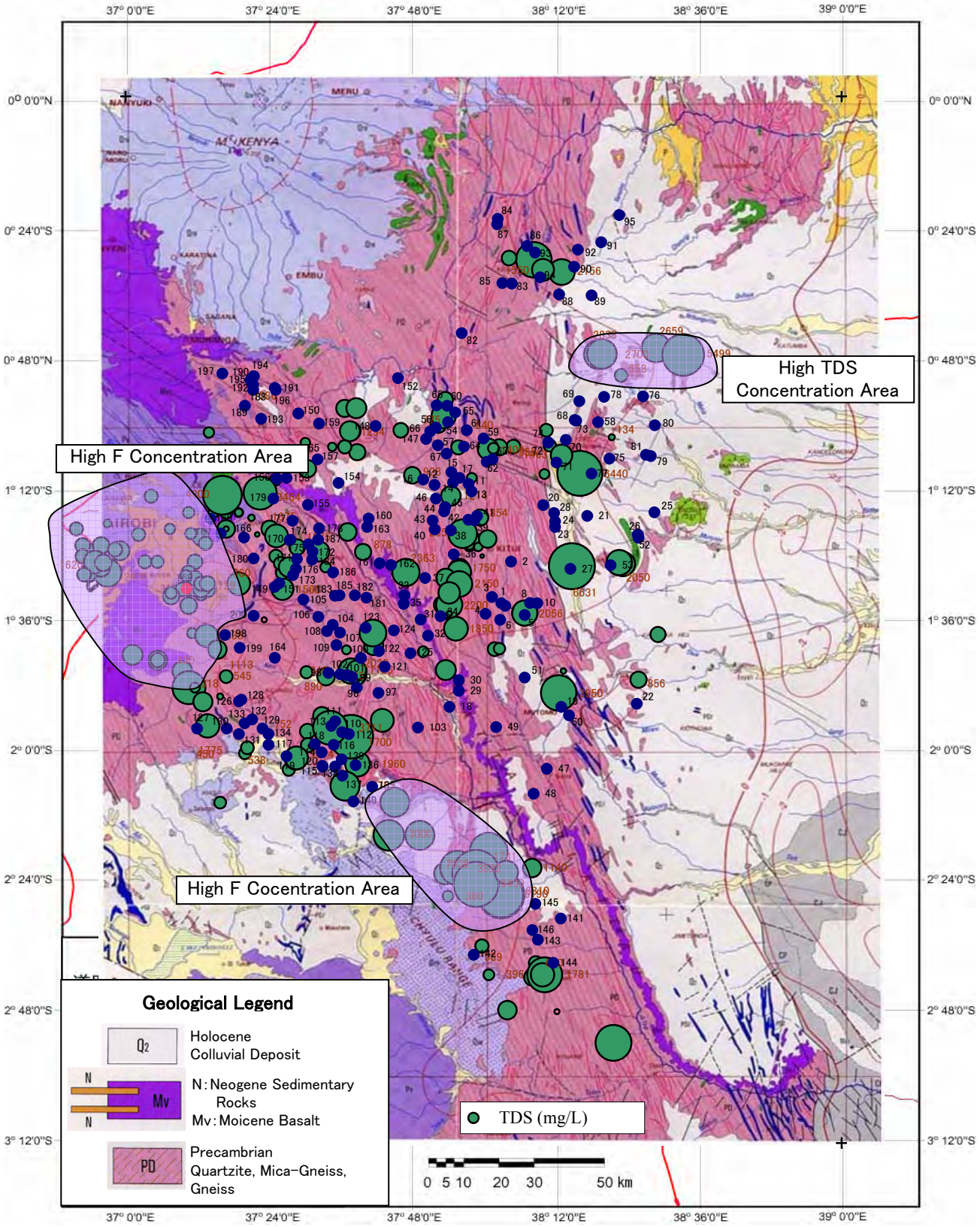


Figure 5 Distribution Map of TDS Concentration (All Data)

Table1 Table of Yield and Successful Rate Calculation

District	BH No	X grid	Y grid	Pumping rate (m3/h)		%	Target Yield	Successful Rate	Calculation Formula
Machakos	C2427	338.7	9845.2	0.06	65	100.0%			
Machakos	C1972	355.4	9848.9	0.12	64	98.5%			
Machakos	C2041	357.2	9896.8	0.18	63	96.9%			
Machakos	C3957	316.4	9834.1	0.30	62	95.4%	0.3	95.4%	
Machakos	C4162	331.2	9898.6	0.30	61	93.8%			
Machakos	C2019	335.0	9867.3	0.60	60	92.3%			
Machakos	C3124	310.6	9889.1	0.60	59	90.8%			t=(87.7-86.2)/(0.84-1.02)
Machakos	C1507	364.6	9885.8	0.72	58	89.2%			Successful Rate (1.0m3/h) =87.7− (0.84−1) x t
Machakos	C2407	331.3	9848.9	0.84	57	87.7%			
Machakos	C3679	303.5	9782.5	1.02	56	86.2%	1.0	86.3%	
Machakos	C6038	312.7	9858.1	1.20	55	84.6%			
Machakos	C2024	338.7	9867.3	1.44	54	83.1%			
Machakos	TW-1	322.8	9864.7	1.80	53	81.5%			
Machakos	C11923	336.3	9881.6	2.00	52	80.0%	2.0	80.0%	
Machakos	C11942	333.8	9846.4	2.00	51	78.5%			
Machakos	C4295	371.2	9811.2	2.10	50	76.9%			
Machakos	C4978	335.0	9778.9	2.40	49	75.4%			
Machakos	C1973	344.2	9882.1	2.82	48	73.8%			
Machakos	C11856	315.8	9852.8	3.00	47	72.3%			
Machakos	C11943	340.2	9844.1	3.00	46	70.8%			
Machakos	C4452	325.7	9852.6	3.00	45	69.2%			
Machakos	C5255	312.7	9859.9	3.00	44	67.7%			
Machakos	U1	310.0	9849.3	3.00	43	66.2%			
Machakos	C3454	329.4	9832.3	3.30	42	64.6%			
Machakos	C6890	319.0	9854.8	3.30	41	63.1%			
Machakos	C2731	333.2	9788.1	3.66	40	61.5%			
Machakos	C1864	318.3	9854.4	3.78	39	60.0%			
Machakos	C1508	357.2	9874.7	3.90	38	58.5%			
Machakos	C2357	342.4	9885.8	3.90	37	56.9%			
Machakos	C12060	348.8	9851.5	4.00	36	55.4%			
Machakos	C1949	318.3	9858.1	4.08	35	53.8%			
Machakos	C3967	329.4	9837.8	4.08	34	52.3%			
Machakos	C3997	310.9	9762.3	4.26	33	50.8%			
Machakos	C2815	313.1	9877.2	4.50	32	49.2%			
Machakos	C1493	327.5	9869.2	4.56	31	47.7%			
Machakos	C1571	347.9	9893.1	4.56	30	46.2%			
Machakos	C2406	327.5	9850.7	4.56	29	44.6%			
Machakos	U3	351.4	9849.0	5.00	28	43.1%			
Machakos	C6301	353.6	9784.4	5.28	27	41.5%			
Machakos	C3776	316.4	9858.1	5.46	26	40.0%			
Machakos	C473	368.4	9802.9	6.54	25	38.5%			
Machakos	C2474	333.1	9830.5	6.78	24	36.9%			
Machakos	C4541	322.0	9850.7	7.08	23	35.4%			
Machakos	C11619	326.4	9869.8	7.50	22	33.8%			
Machakos	C1430	348.8	9851.5	7.50	21	32.3%			
Machakos	C3151	409.2	9690.5	8.10	20	30.8%			
Machakos	C3453	336.8	9836.0	8.16	19	29.2%			
Machakos	C4039	327.6	9843.4	8.16	18	27.7%			
Machakos	C10875	320.2	9846.0	8.40	17	26.2%			
Machakos	C3842	320.1	9850.7	8.58	16	24.6%			
Machakos	C1989	315.1	9875.1	9.00	15	23.1%			
Machakos	C2132	310.3	9873.3	9.00	14	21.5%			
Machakos	C4000	312.7	9867.3	9.06	13	20.0%			
Machakos	C4483	312.7	9852.6	9.84	12	18.5%			
Machakos	C2943	313.4	9878.1	10.50	11	16.9%			
Machakos	C436	310.8	9859.9	10.50	10	15.4%			
Machakos	C1595	351.6	9878.4	10.92	9	13.8%			
Machakos	C5256	312.7	9852.6	11.22	8	12.3%			
Machakos	C11696	357.3	9839.3	13.00	7	10.8%			
Machakos	C1133	325.7	9869.2	14.40	6	9.2%			
Machakos	C11434	317.4	9854.4	14.40	5	7.7%			
Machakos	C401	316.4	9858.1	17.04	4	6.2%			
Machakos	C2333	333.1	9834.2	18.18	3	4.6%			
Machakos	C11092	326.7	9836.0	20.00	2	3.1%			
Machakos	C11936	332.1	9860.5	21.60	1	1.5%			

Table1 Table of Yield and Successful Rate Calculation

District	BH No	X grid	Y grid	Pumping rate (m3/h)		%	Target Yield	Successful Rate	Calculation Formula
KITUI	C1522	401.8	9784.5	0.00	63	100.0%			
KITUI	C3913	407.3	9871.0	0.00	62	98.4%			
KITUI	C3328	386.9	9848.9	0.06	61	96.8%			
KITUI	C1521	394.3	9802.9	0.18	60	95.2%			
KITUI	C4059	385.0	9847.1	0.24	59	93.7%			
KITUI	C3326	386.9	9848.9	0.24	58	92.1%			
KITUI	C3760	344.2	9880.2	0.30	57	90.5%	0.3	0.9	
KITUI	C425	390.6	9850.8	0.36	56	88.9%			
KITUI	C1622	386.9	9848.9	0.42	55	87.3%			
KITUI	C4028	386.9	9848.9	0.42	54	85.7%			
KITUI	C9470	390.2	9854.5	0.50	53	84.1%			
KITUI	C13604	377.0	9827.0	0.70	52	82.5%			t=(81.0-79.4)/(0.96-1.08) Successful Rate (1m3/h) =81.0- (0.96-1) x t
KITUI	C3884	392.5	9812.1	0.96	51	81.0%			
KITUI	C496	425.9	9788.1	1.08	50	79.4%	1.0	0.8	
KITUI	C13605	381.0	9819.0	1.20	49	77.8%			
KITUI	C11043	390.1	9842.5	1.44	48	76.2%			
KITUI	C538	437.0	9799.2	1.44	47	74.6%			
KITUI	C1300	390.6	9777.1	1.50	46	73.0%			
KITUI	C13236	379.0	9825.0	1.50	45	71.4%			
KITUI	C3766	347.9	9880.2	1.50	44	69.8%			
KITUI	C1543	385.1	9825.0	2.00	43	68.3%	2.0	0.7	
KITUI	U12	415.9	9840.6	2.00	42	66.7%			
KITUI	C2260	405.5	9804.7	2.04	41	65.1%			
KITUI	C10418	369.0	9870.0	2.50	40	63.5%			
KITUI	C13601	382.0	9839.0	2.60	39	61.9%			
KITUI	C2179	388.8	9843.4	2.70	38	60.3%			
KITUI	C3883	394.3	9815.8	2.70	37	58.7%			
KITUI	C13602	382.0	9838.0	3.30	36	57.1%			
KITUI	C3907	407.3	9871.0	3.48	35	55.6%			
KITUI	C5243	412.9	9804.7	3.72	34	54.0%			
KITUI	C11137	389.7	9848.5	4.00	33	52.4%			
KITUI	C7730	390.3	9843.4	4.38	32	50.8%			
KITUI	C10392	382.0	9875.0	4.50	31	49.2%			
KITUI	C3795	386.9	9847.1	4.56	30	47.6%			
KITUI	C10929	390.4	9849.2	4.80	29	46.0%			
KITUI	C95	379.5	9863.7	4.92	28	44.4%			
KITUI	C464	411.0	9797.4	4.98	27	42.9%			
KITUI	U13	430.5	9840.7	5.00	26	41.3%			
KITUI	C4299	386.9	9848.9	5.22	25	39.7%			
KITUI	C13609	379.0	9831.0	5.30	24	38.1%			
KITUI	C11319	379.9	9864.8	5.50	23	36.5%			
KITUI	C7313	420.3	9804.7	5.82	22	34.9%			
KITUI	C3198	398.0	9790.0	5.88	21	33.3%			
KITUI	C11492	390.5	9854.2	6.00	20	31.7%			
KITUI	C4355	387.6	9846.5	6.00	19	30.2%			
KITUI	C2191	366.5	9872.9	6.24	18	28.6%			
KITUI	C9654	377.8	9863.1	7.00	17	27.0%			
KITUI	C13608	382.0	9834.0	7.20	16	25.4%			
KITUI	C135	379.5	9869.2	8.10	15	23.8%			
KITUI	C452	411.0	9793.7	8.40	14	22.2%			
KITUI	C11821	383.0	9851.0	9.00	13	20.6%			
KITUI	C12062	383.4	9850.9	9.00	12	19.0%			
KITUI	C438	368.4	9839.7	9.54	11	17.5%			
KITUI	U14	383.6	9799.4	10.00	10	15.9%			
KITUI	C1738	385.0	9848.9	11.34	9	14.3%			
KITUI	C13607	379.0	9824.0	11.50	8	12.7%			
KITUI	C3242	437.0	9801.0	12.66	7	11.1%			
KITUI	C10198	388.2	9856.4	13.80	6	9.5%			
KITUI	C11818	378.0	9805.0	16.00	5	7.9%			
KITUI	C13603	378.0	9836.0	18.40	4	6.3%			
KITUI	C4136	385.0	9847.1	20.52	3	4.8%			
KITUI	C13606	379.0	9827.0	20.80	2	3.2%			
KITUI	C5902	403.6	9843.4	37.14	1	1.6%			

Table1 Table of Yield and Successful Rate Calculation

District	BH No	X grid	Y grid	Pumping rate (m3/h)		%	Target Yield	Successful Rate	Calculation Formula
MWINGI	C5673	406.0	9801.8	0.00	26	100.0%			
MWINGI	U17	399.5	9884.5	0.00	25	96.2%			
MWINGI	U19	409.6	9883.8	0.00	24	92.3%			t=(84.6-80.8)/(0.22-0.36)
MWINGI	C9471	395.8	9897.8	0.16	23	88.5%			Successful Rate (0.3m3/h) =84.6- (0.22-0.3)xt
MWINGI	C4363	400.6	9881.5	0.22	22	84.6%			
MWINGI	C573	398.0	9906.0	0.36	21	80.8%	0.3	0.8	
MWINGI	C9652	429.0	9877.5	0.50	20	76.9%			t=(69.2-65.4)/(0.9-1.14)
MWINGI	C104	393.6	9896.6	0.84	19	73.1%			Successful Rate (1．0m3/h)=69.2-(0.9-1.0)xt
MWINGI	C128	372.0	9883.9	0.90	18	69.2%			
MWINGI	C11172	412.4	9939.1	1.14	17	65.4%	1.0	0.7	
MWINGI	C13260	390.3	9887.7	1.20	16	61.5%			
MWINGI	U16	385.9	9878.6	2.00	15	57.7%	2.0	0.6	
MWINGI	C8756	393.8	9896.2	2.18	14	53.8%			
MWINGI	C9472	404.1	9943.2	2.94	13	50.0%			
MWINGI	C8755	393.9	9896.4	3.30	12	46.2%			
MWINGI	C4930	390.8	9879.8	3.64	11	42.3%			
MWINGI	C9653	390.5	9879.5	4.20	10	38.5%			
MWINGI	C11851	417.8	9871.3	6.00	9	34.6%			
MWINGI	C4223	398.0	9880.3	8.20	8	30.8%			
MWINGI	C2196	375.7	9887.6	9.00	7	26.9%			
MWINGI	C4887	393.8	9880.0	10.90	6	23.1%			
MWINGI	TW-3	377.3	9890.5	12.57	5	19.2%			
MWINGI	C13258	371.4	9893.2	14.60	4	15.4%			
MWINGI	C4888	393.8	9879.8	15.90	3	11.5%			
MWINGI	C4988	393.4	9884.8	18.20	2	7.7%			
MWINGI	U18	398.4	9882.3	25.00	1	3.8%			

Table1 Table of Yield and Successful Rate Calculation

District	BH No	X grid	Y grid	Pumping rate (m3/h)		%	Target Yield	Successful Rate	Calculation Formula
MAKUENI	C12056	355.5	9818.1	0.00	143	100.0%			
MAKUENI	C1667	312.8	9802.8	0.00	142	99.3%			
MAKUENI	C1668	310.9	9802.8	0.00	141	98.6%			
MAKUENI	C1802	297.9	9786.2	0.00	140	97.9%			
MAKUENI	C1835	346.1	9797.3	0.00	139	97.2%			
MAKUENI	C1849	355.4	9797.3	0.00	138	96.5%			
MAKUENI	C2498	351.7	9766.0	0.00	137	95.8%			
MAKUENI	C3323	420.3	9692.4	0.00	136	95.1%			
MAKUENI	C398	355.4	9791.8	0.00	135	94.4%			
MAKUENI	C5095	352.5	9807.7	0.00	134	93.7%			
MAKUENI	C6009	317.3	9779.3	0.00	133	93.0%			
MAKUENI	C610	296.1	9791.7	0.00	132	92.3%			
MAKUENI	C687	303.5	9793.6	0.00	131	91.6%			
MAKUENI	C82	318.3	9777.0	0.00	130	90.9%			
MAKUENI	P127	355.7	9769.8	0.00	129	90.2%			
MAKUENI	P143	349.3	9769.8	0.00	128	89.5%			
MAKUENI	C3135	407.4	9672.1	0.02	127	88.8%			
MAKUENI	C2182	316.5	9778.9	0.03	126	88.1%			
MAKUENI	C2777	401.8	9697.9	0.06	125	87.4%			
MAKUENI	C2779	396.3	9692.3	0.06	124	86.7%			
MAKUENI	C1132	309.1	9788.1	0.14	123	86.0%			
MAKUENI	C3128	299.8	9789.9	0.16	122	85.3%			
MAKUENI	TW-2	343.6	9785.6	0.18	121	84.6%			
MAKUENI	C1485	307.2	9786.2	0.19	120	83.9%			
MAKUENI	C55	318.3	9778.9	0.20	119	83.2%			t=(81.8-81.1)/(0.28-0.38) Successful Rate (0.3m3/h)=81.8-(0.28-0.3)xt
MAKUENI	C1004	394.4	9729.2	0.23	118	82.5%			
MAKUENI	C315	318.3	9777.0	0.28	117	81.8%			
MAKUENI	C1053	310.9	9782.5	0.38	116	81.1%	0.3	0.8	
MAKUENI	C6	307.2	9797.3	0.40	115	80.4%			
MAKUENI	C2829	336.8	9823.1	0.54	114	79.7%			
MAKUENI	C9750	291.4	9790.5	0.55	113	79.0%			
MAKUENI	C3315	301.6	9793.6	0.58	112	78.3%			
MAKUENI	C688	305.3	9793.6	0.60	111	77.6%			
MAKUENI	C13263	310.1	9811.9	0.66	110	76.9%			
MAKUENI	C1856	361.0	9801.0	0.73	109	76.2%			
MAKUENI	C4009	349.8	9804.7	0.75	108	75.5%			t=(74.1-73.4)/(0.90-1.03) Successful Rate (1.0m3/h) =74.1- (0.90-1.0)xt
MAKUENI	C12238	319.5	9809.7	0.80	107	74.8%			
MAKUENI	C1804	312.8	9797.3	0.90	106	74.1%			
MAKUENI	C2747	305.3	9797.3	1.03	105	73.4%	1.0	0.7	
MAKUENI	C1518	333.1	9830.5	1.18	104	72.7%			
MAKUENI	C11153	444.5	9634.8	1.20	103	72.0%			
MAKUENI	C13126	347.1	9800.5	1.20	102	71.3%			
MAKUENI	C11353	400.9	9714.7	1.26	101	70.6%			
MAKUENI	C3121	407.4	9703.4	1.27	100	69.9%			
MAKUENI	C13265	333.5	9775.3	1.32	99	69.2%			
MAKUENI	C1005	394.4	9729.2	1.35	98	68.5%			
MAKUENI	C3336	427.8	9679.5	1.38	97	67.8%			
MAKUENI	C6036	331.3	9771.5	1.50	96	67.1%			
MAKUENI	C2426	342.4	9823.1	1.53	95	66.4%			
MAKUENI	C1181	401.8	9696.0	1.60	94	65.7%			
MAKUENI	C33	394.4	9725.5	1.62	93	65.0%			
MAKUENI	C3145	411.1	9673.9	1.68	92	64.3%			
MAKUENI	C5759	346.6	9803.4	1.68	91	63.6%			
MAKUENI	C10036	404.7	9706.4	1.80	90	62.9%			t=(62.2-61.5)/(1.80-2.04) Successful Rate (2.0m3/h) =62.2-(1.80-2.0)xt
MAKUENI	C2452	303.5	9795.4	1.80	89	62.2%			
MAKUENI	C1455	396.3	9692.3	2.04	88	61.5%	2.0	0.6	
MAKUENI	C1557	331.3	9777.0	2.04	87	60.8%			
MAKUENI	C34	396.2	9725.5	2.21	86	60.1%			
MAKUENI	C2203	316.5	9778.9	2.27	85	59.4%			
MAKUENI	C5054	403.6	9738.4	2.52	84	58.7%			
MAKUENI	C3132	303.5	9789.9	2.60	83	58.0%			
MAKUENI	C1376	305.3	9793.6	2.70	82	57.3%			
MAKUENI	C2454	336.9	9799.1	2.70	81	56.6%			
MAKUENI	C5055	399.9	9738.4	2.70	80	55.9%			
MAKUENI	P98	299.0	9798.0	2.73	79	55.2%			
MAKUENI	C3356	420.3	9692.4	2.88	78	54.5%			
MAKUENI	C4878	337.4	9797.7	2.88	77	53.8%			
MAKUENI	C18	307.2	9784.4	3.00	76	53.1%			
MAKUENI	C488	342.4	9802.8	3.06	75	52.4%			
MAKUENI	C305	297.9	9795.4	3.14	74	51.7%			
MAKUENI	C2855	331.3	9839.7	3.60	73	51.0%			
MAKUENI	C1580	340.6	9808.4	3.70	72	50.3%			
MAKUENI	C19	307.2	9782.5	3.80	71	49.7%			
MAKUENI	C13262	356.3	9817.5	3.90	70	49.0%			

Table1 Table of Yield and Successful Rate Calculation

District	BH No	X grid	Y grid	Pumping rate (m3/h)		%	Target Yield	Successful Rate	Calculation Formula
MAKUENI	C474	368.4	9802.9	3.98	69	48.3%			
MAKUENI	C12054	322.3	9826.2	4.00	68	47.6%			
MAKUENI	C2284	342.4	9832.3	4.09	67	46.9%			
MAKUENI	C3977	359.1	9788.1	4.27	66	46.2%			
MAKUENI	C2004	297.9	9791.7	4.50	65	45.5%			
MAKUENI	C4016	349.8	9804.7	4.50	64	44.8%			
MAKUENI	C4275	336.9	9784.4	4.50	63	44.1%			
MAKUENI	C73	292.5	9725.5	4.50	62	43.4%			
MAKUENI	C51	325.8	9775.2	4.60	61	42.7%			
MAKUENI	C2778	396.3	9692.3	4.68	60	42.0%			
MAKUENI	P57	309.2	9784.2	4.68	59	41.3%			
MAKUENI	C414	357.3	9790.0	4.80	58	40.6%			
MAKUENI	C454	359.1	9802.9	4.87	57	39.9%			
MAKUENI	C12057	346.1	9797.3	5.00	56	39.2%			
MAKUENI	C12058	362.8	9784.5	5.00	55	38.5%			
MAKUENI	C328	351.7	9773.4	5.00	54	37.8%			
MAKUENI	U9	327.0	9878.7	5.00	53	37.1%			
MAKUENI	C3092	403.7	9675.8	5.40	52	36.4%			
MAKUENI	C545	348.0	9766.0	5.53	51	35.7%			
MAKUENI	C500	362.8	9784.4	5.83	50	35.0%			
MAKUENI	C3338	310.9	9773.3	5.90	49	34.3%			
MAKUENI	C3116	407.4	9670.2	5.94	48	33.6%			
MAKUENI	C11154	334.6	9593.7	6.00	47	32.9%			
MAKUENI	C8745	351.1	9805.1	6.20	46	32.2%			
MAKUENI	C10334	407.3	9702.4	6.30	45	31.5%			
MAKUENI	C446	344.3	9804.7	6.40	44	30.8%			
MAKUENI	C2451	338.7	9804.7	6.50	43	30.1%			
MAKUENI	C2520	333.2	9780.7	6.50	42	29.4%			
MAKUENI	C445	297.9	9795.4	6.50	41	28.7%			
MAKUENI	C1131	310.9	9786.2	6.80	40	28.0%			
MAKUENI	C1311	305.3	9789.9	6.80	39	27.3%			
MAKUENI	C12055	341.0	9801.8	7.00	38	26.6%			
MAKUENI	C1578	351.7	9802.9	7.00	37	25.9%			
MAKUENI	C3347	390.7	9721.8	7.00	36	25.2%			
MAKUENI	C437	344.3	9804.7	7.20	35	24.5%			
MAKUENI	C2232	320.2	9777.0	7.26	34	23.8%			
MAKUENI	C17	305.3	9786.2	7.60	33	23.1%			
MAKUENI	C10405	393.4	9700.2	7.76	32	22.4%			
MAKUENI	U8	311.2	9788.0	8.00	31	21.7%			
MAKUENI	C2370	318.3	9777.0	8.17	30	21.0%			
MAKUENI	C2267	327.6	9828.6	8.18	29	20.3%			
MAKUENI	C52	299.8	9795.4	8.70	28	19.6%			
MAKUENI	C1054	314.6	9778.9	9.08	27	18.9%			
MAKUENI	C359	318.3	9777.0	9.10	26	18.2%			
MAKUENI	C427	296.1	9789.9	9.10	25	17.5%			
MAKUENI	C60	305.3	9786.2	9.10	24	16.8%			
MAKUENI	C612	294.2	9791.7	9.10	23	16.1%			
MAKUENI	C2975	310.9	9764.1	9.12	22	15.4%			
MAKUENI	C2860	305.3	9789.9	10.00	21	14.7%			
MAKUENI	C603	299.8	9788.1	10.50	20	14.0%			
MAKUENI	C11615	395.6	9712.6	11.00	19	13.3%			
MAKUENI	C2695	310.9	9760.4	11.40	18	12.6%			
MAKUENI	C469	294.2	9791.7	12.72	17	11.9%			
MAKUENI	C3510	296.1	9791.7	13.00	16	11.2%			
MAKUENI	C2944	396.3	9690.5	13.10	15	10.5%			
MAKUENI	C3322	403.7	9701.6	13.18	14	9.8%			
MAKUENI	U6	349.1	9769.8	15.00	13	9.1%			
MAKUENI	P28	295.4	9790.6	15.75	12	8.4%			
MAKUENI	C461	351.7	9804.7	16.36	11	7.7%			
MAKUENI	C5110	356.5	9813.3	18.00	10	7.0%			
MAKUENI	C1579	294.2	9791.7	18.20	9	6.3%			
MAKUENI	C2123	312.8	9780.7	18.20	8	5.6%			
MAKUENI	C2896	307.2	9789.9	18.20	7	4.9%			
MAKUENI	C10667	317.7	9784.5	18.80	6	4.2%			
MAKUENI	C9004	406.7	9703.5	26.00	5	3.5%			
MAKUENI	U10	340.3	9802.7	30.00	4	2.8%			
MAKUENI	C1885	346.1	9797.3	39.30	3	2.1%			
MAKUENI	C2150	299.8	9793.6	40.00	2	1.4%			
MAKUENI	C1886	351.7	9789.9	49.00	1	0.7%			

A. Successful Rate regard with Yield

District		Machakos	Kitui	Mwingi	Makueni	Total
Yield Q (m^3/h)	0.3	95.4%	0.9	82.4%	81.7%	86.2%
	1.0	86.3%	0.8	67.6%	73.6%	76.9%
	2.0	80.0%	0.7	57.7%	61.7%	66.7%
Data Nos.		65	63.0	26	143	297

Table 2 Successful Rater Calculation regard with TDS

District	BH No	TDS	Nos.	%	Target TDS	Successful Rate	Calculation Formula
Machakos	C4541	79	1	4.8%			
Machakos	C5256	90	2	9.5%			
Machakos	C2406	183	3	14.3%			
Machakos	C3776	220	4	19.0%			
Machakos	C401	282	5	23.8%			
Machakos	C4000	290	6	28.6%			
Machakos	C5255	300	7	33.3%			
Machakos	C1493	380	8	38.1%			
Machakos	C4295	390	9	42.9%			
Machakos	C436	414	10	47.6%			
Machakos	C6038	498	11	52.4%			
Machakos	C3967	540	12	57.1%			
Machakos	C4039	575	13	61.9%			
Machakos	C1507	715	14	66.7%			
Machakos	C11942	800	15	71.4%			
Machakos	C1595	879	16	76.2%			
Machakos	C4452	888	17	81.0%			t=(90.5-95.2)/(990-1560)
Machakos	C1571	960	18	85.7%			Successful Rate (1500) =90.5 + (1500-990)xt
Machakos	C4483	990	19	90.5%			
Machakos	C3454	1560	20	95.2%	1500	94.7%	
Machakos	C3957	1660	21	100.0%			
Kitui	C2179	55	1	3.7%			
Kitui	C13607	110	2	7.4%			
Kitui	C5243	120	3	11.1%			
Kitui	C4299	240	4	14.8%			
Kitui	C3760	246	5	18.5%			
Kitui	C3795	252	6	22.2%			
Kitui	C4355	252	7	25.9%			
Kitui	C3907	320	8	29.6%			
Kitui	C4136	351	9	33.3%			
Kitui	C4028	550	10	37.0%			
Kitui	C3766	564	11	40.7%			
Kitui	C3884	620	12	44.4%			
Kitui	C10198	854	13	48.1%			
Kitui	C13604	950	14	51.9%			
Kitui	C10929	990	15	55.6%			
Kitui	C13236	1000	16	59.3%			t=(88.9-92.6)/(1850-2150)
Kitui	C13603	1200	17	63.0%			Successful Rate (2000) =88.9+(2000-1850)xt
Kitui	C95	1214	18	66.7%			
Kitui	U13	1285	19	70.4%			t=(96.3-100)/(2200-2650)
Kitui	C11818	1300	20	74.1%			Successful Rate (2500) =96.3+(2500-2200) x t
Kitui	C13601	1450	21	77.8%			
Kitui	C13609	1500	22	81.5%	1500	81.5%	
Kitui	C13602	1750	23	85.2%			
Kitui	C13605	1850	24	88.9%			
Kitui	C13608	2150	25	92.6%	2000	90.7%	
Kitui	C13606	2200	26	96.3%			
Kitui	C11821	2650	27	100.0%	2500	98.8%	

Table 2 Successful Rater Calculation regard with TDS

District	BH No	TDS	Nos.	%	Target TDS	Successful Rate	Calculation Formula
Mwingi	C4223	636	1	14.3%			
Mwingi	C2196	826	2	28.6%			
Mwingi	C4887	840	3	42.9%			t=(57.1-71.4)/(1400-1897) Successful Rate (1500)＝57.1+(1500-1400)xt
Mwingi	C9653	1400	4	57.1%			
Mwingi	C13258	1897	5	71.4%	1500	60.0%	
Mwingi	TW-3	1904	6	85.7%			
Mwingi	C11172	2156	7	100.0%	2000	91.2%	
Makueni	C1376	231	1	4.3%			
Makueni	C2695	470	2	8.7%			t=(85.7-100)/(1904-2156) Successful Rate (2000)＝85.7+(2000-1904)xt
Makueni	C6036	504	3	13.0%			
Makueni	C10036	630	4	17.4%			
Makueni	C4009	740	5	21.7%			
Makueni	C4275	752	6	26.1%			
Makueni	C3121	840	7	30.4%			
Makueni	C1578	890	8	34.8%			
Makueni	C3322	926	9	39.1%			t=(73.9-78.3)/(1250-1674) Successful Rate (1500)=73.9+(1500-1250) x t
Makueni	C488	985	10	43.5%			
Makueni	C13263	1113	11	47.8%			
Makueni	C461	1125	12	52.2%			t=(87.0-91.3)/(1960-2020) Successful Rate (2000) ＝87.0 + (2000-1960) x t
Makueni	C2944	1140	13	56.5%			
Makueni	C5054	1140	14	60.9%			
Makueni	C5110	1200	15	65.2%			t=(95.7-100)/(2275-2757) Successful Rate (2500) ＝95.7 + (2500-2275)xt
Makueni	C8745	1200	16	69.6%			
Makueni	C2855	1250	17	73.9%			
Makueni	C13265	1674	18	78.3%	1500	76.5%	
Makueni	C3977	1700	19	82.6%			
Makueni	C328	1960	20	87.0%			
Makueni	C4016	2020	21	91.3%	2000	89.9%	
Makueni	C13262	2275	22	95.7%			
Makueni	C545	2757	23	100.0%	2500	97.7%	

Machakos	Kitui	Mwingi	Makueni	Total
94.7%	81.5%	60.0%	76.5%	79.5%
100.0%	90.7%	91.2%	89.9%	91.9%
100.0%	98.8%	-	97.7%	98.2%
21	27	7	23	78