BASIC DESIGN STUDY REPORT ON THE PROJECT FOR RURAL WATER SUPPLY AND PROVISION OF SANITATION IN EASTERN CAPE IN THE REPUBLIC OF SOUTH AFRICA FINAL REPORT MARCH 2002

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FINAL REPORT

MARCH 2002

JAPAN INTERNATIONAL COOPERATION AGENCY

JAPAN TECHNO CO., LTD.

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ON
THE PROJECT FOR
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PREFACE

In response to a request from the Government of the Republic of South Africa, the Government of Japan decided to conduct a basic design study on the Project for Rural Water Supply and Provision of Sanitation in Eastern Cape and entrusted the study to the Japan International Cooperation Agency (JICA).

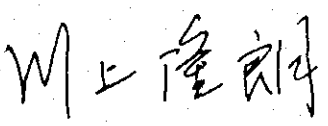
JICA sent to South Africa a study team from 7 April 2001 to 28 May 2001 for the First Field Survey and 1 August 2001 to 30 October 2001 for the Second Field Survey.

The team held discussions with the officials concerned of the Government of the Republic of South Africa, and conducted a field study at the study area. After the team returned to Japan, further studies were made. Then, a mission was sent to South Africa in order to discuss a draft basic design, from 28 January 2002 to 14 February 2002, and as this result, the present report was finalized.

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

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

March 2002



Takao Kawakami
President
Japan International Cooperation Agency

March 2002

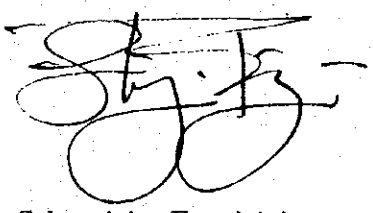
LETTER OF TRANSMITTAL

We are pleased to submit to you the basic design study report on the Project for Rural Water Supply and Provision of Sanitation in Eastern Cape in the Republic of South Africa.

This study was conducted by Japan Techno Co., Ltd, under a contract to JICA, during the period from April 2001 to March 2002. In conducting the study, we have examined the feasibility and rationale of the project with due consideration to the present situation of South Africa and formulated the most appropriate basic design for the project under Japan's grant aid scheme.

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

Very truly yours,



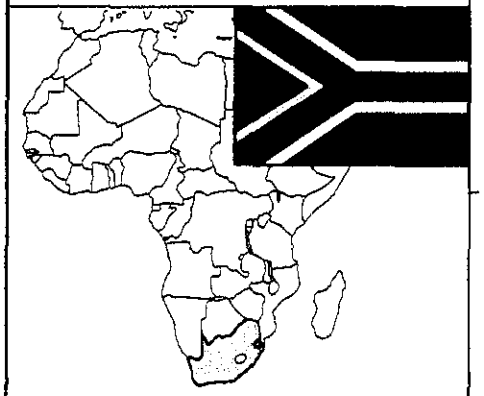
Shoji Fujii
Project Manager
Basic Design Study Team
The Project for Rural Water Supply and Provision of Sanitation in Eastern Cape
The Republic of South Africa
Japan Techno Co., Ltd.

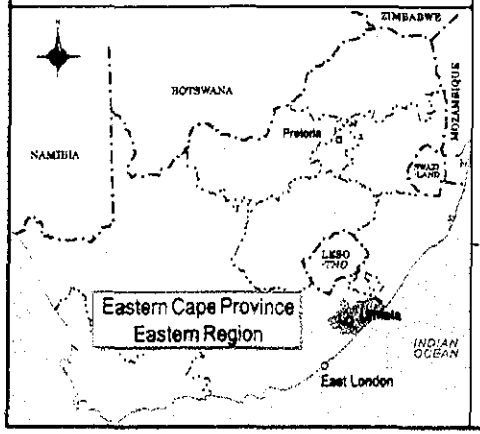
The Republic of South Africa

The Project for Water Supply and Provision of Sanitation in Eastern Cape

Basic Design Study

Map of Project Area





LESOTHO

KWAZULUNATAL Province

UKWAHLAMBA District Municipality

CHRIS HANI District Municipality

AMATOLE District Municipality

O.R. TAMBO District Municipality

INDIAN OCEAN

TABANKULU ④

QUMBU ③

TSOLO

LIBODE ①

UMTATA ②

NGQELENI

MQANDULI

Local Municipality
① *NYANDENI*
② *KING SABATA DALINDYEBO(KSD)*
③ *MHLONTLO*
④ *NTABANKULU*

□ *Pre-Transitional Local Council (=Pre-Magisterial District Capital)*

THE PROJECT FOR RURAL WATER SUPPLY AND PROVISION OF SANITATION IN EASTERN CAPE
IN THE REPUBLIC OF SOUTH AFRICA

LIST OF FIGURES AND TABLES

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LIST OF ABBREVIATIONS

A/P	Authorization to Pay
B/A	Banking Arrangement
CBO	Community-based Organization
DM	District Municipality
DPLG	Department of Provincial and Local Government
DWAF	Department of Water Affairs and Forestry
E/N	Exchange of Notes
EU	European Union
HH	Households
ISD	Institutional and Social Development
ISWIP	Implementation of Sustainable Water Services Institutions Programme
JICA	Japan International Cooperation Agency
LM	Local Municipality
MAAP	Multi-Annual Action Plan
NGO	Non-governmental Organization
OJT	On-the-job Training
O&M	Operation and Maintenance
PDI	Planning Development and Implementation
PRA	Participatory Rapid Appraisal
PSC	Project Steering Committee
PWL	Pumping Water Level
RDP	Reconstruction and Development Programme
RRA	Rapid Rural Appraisal
RSA	Republic of South Africa
SABS	South African Bureau of Standards
SSA	Support Services Agent
SWL	Static Water Level
VIP	Ventilated Improved Pit (latrine)
VWC	Village Water Committee
VWSC	Village Water and Sanitation Committee
WHO	World Health Organization
WSA	Water Services Authority
WSP	Water Services Provider
ZAR	South African Rands

SUMMARY

SUMMARY

For the Republic of South Africa, a new government was reorganized in 1994 and soon after, the Reconstruction and Development Programme (RDP) was formulated to institute a reform in the government and eliminate racial segregation issues. Having the highest development priority by the government, the aim of the RDP for the water and sanitation sector is to supply 25 lit/cap/day of clean and stable water accessible within 200 m from the residence, and to construct VIP latrines for all households in the rural areas. The Department of Water Affairs and Forestry (DWAF) was given the responsibility to carry out this strategy, and the White Papers on Water Supply and Sanitation Policy published in 1994 announced that the RDP objective will be met within seven years. The White Papers also emphasized that operation and maintenance of infrastructures are the obligated responsibility of the beneficiaries.

In Eastern Cape Province, the coverage rate for water supply is only 39% and for sanitation, 26% (DWAF survey results, 1998). On the other hand, the coverage rate for water supply in the project target areas averages about 8% which implies that this is the most highly affected area.

In this predicament, a request was made by the government of the Republic of South Africa to the government of Japan for Grant Aid Assistance. The 30 requested villages are located in six former magisterial districts of Eastern Cape Province. The request consists of the construction of sustainable water supply and sanitation facilities with adequate capacity building for proper operation and maintenance and opportunities for sanitation and hygiene awareness promotion. The requested facilities are: boreholes, water supply facilities with either handpump or piped system, and VIP latrines.

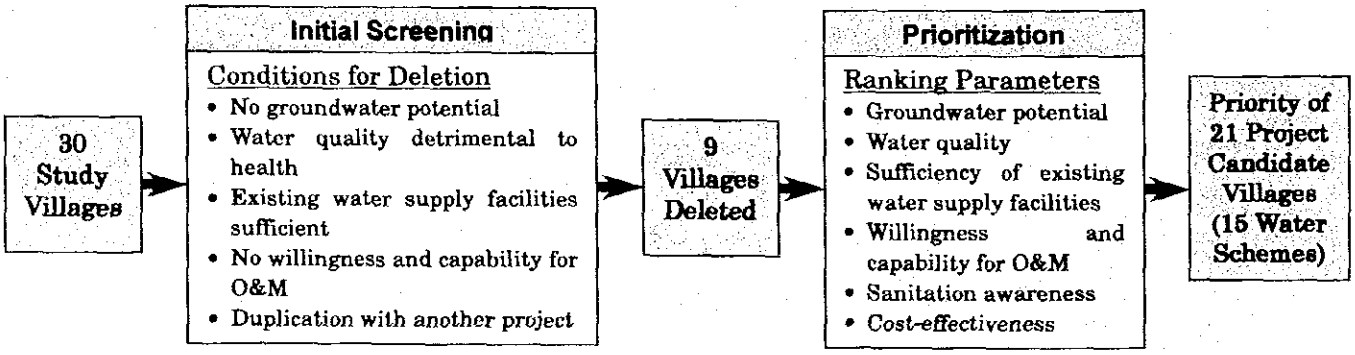
Upon accepting the above request, the Japanese government decided to conduct a basic design study and the responsibility for executing this study was given to Japan International Cooperation Agency (JICA). The first field survey was held from 7 April to 28 May 2001 in South Africa. The second field survey was held from 1 August to 25 August 2001 for the water source survey, and from 1 October to 30 October 2001 for the other surveys. Then the explanation of the draft final report was conducted from 28 January to 14 February 2002, and the contents of the basic design report was agreed by the South African side.

The executing agency for this project is the Department of Water Affairs and Forestry (DWAF). DWAF has capability for management, operation and maintenance of water and sanitation facilities through many years of experience. However, according to the Water Services Act of 1997 and other acts, the responsibility for management and supervision of operation and maintenance will be the local authorities. Therefore in this project, the completed facilities will be transferred to the relevant local authority which is Oliver R. Tambo District Municipality. However, since this recently formed District Municipality is lacking in staff, experience and budget, DWAF and other organizations are in the process of assisting them in institutional strengthening and capacity building.

Water Supply Schemes

From the results of the field surveys, the 30 study villages were put through a screening process taking into account such factors as insufficient flow rates, poor water quality, adequacy of existing water supply facilities, and duplication with other projects. This procedure resulted in 21 villages remaining as candidates for project implementation.

The requested water schemes included Level 1 (handpump facilities) and Level 2 (piped water schemes with communal tapstands), but the screening process eliminated the Level 1 candidate villages which left only Level 2 villages. Also, due to lack of appropriate water sources for some villages, and since some sources have sufficient flow rates to cover more than one village and villages are located in close proximity of each other, some of the villages were grouped together to form multi-village water schemes. Furthermore, the 21 target villages were prioritized by water scheme groups. The process of screening and prioritization is depicted below.



Screening and Prioritization Process for Water Supply

The priority ranking as obtained by the above procedure is shown below. The plan for water supply facilities in accordance with the RDP standards is shown in the next page.

Priority of Water Scheme Groups

District Municipality	Local Municipality	Magisterial District	Water Scheme Group		Priority Ranking
Oliver R. Tambo	Nyandeni	Ngqeleni	1	1. Kumaxhaka	1
			2	2. Qanqu	15
			3	3. Didi	4
			4	4. Ezinkozweni	10
	King Sabata Dalindyebo (KSD)	Umtata	5	5. Sikobeni	7
			6	6. Centuli	8
			7	7. Dlova	4
			8	8. Upper Xongora	4
			9	9. Gubevu	1
		Mqanduli	10	10. Luxolweni 13. Tafeni	13
			11	11. Cezu 12. Mavundleni	3
	Mhlontlo	Qumbu	12	14. Lower Roza 16. Ncalukeni 17. Ndasane	8
			13	15. Ndwane 18. Mvumelwano	14
	Ntabankulu	Tabankulu	14	19. Dambeni 20. Bhakuba	11
			15	21. Kwazulu	12

Sanitation Facilities

The South African side emphasized that due consideration should be paid on the investment in the field of sanitation in order to alleviate waterborne diseases such as cholera. In this respect, construction of toilets in primary schools was considered, but maintenance of school toilets should be the responsibility of the Department of Education. Therefore, DWAF has asked the Department of Education for their permission to construct the toilets and their agreement on maintenance of the toilets. However, due to the fact that a letter to confirm these matters was not received within the agreed period, the toilets had to be deleted from the project.

Water Supply Facilities Planning

Local Municipality	Village Name	Population		Households		Bore-holes	Control Rooms	Reser-voirs	Tap-stands
		Present	Design	Present	Design				
Nyandeni	Kumaxhaka	1,262	1,615	175	224	1	1	1	7
	Qanqu	1,827	2,339	231	296	2	2	1	9
	Didi	1,234	1,580	153	195	1	1	1	7
	Ezinkozweni	1,770	2,266	203	260	1	1	1	9
KSD	Sikobeni	1,784	2,284	223	285	1	1	1	10
	Centuli	2,184	2,796	267	342	1	1	1	14
	Dlova	2,356	3,016	299	383	1	1	3	15
	Upper Xongora	730	934	83	106	1	1	1	6
	Gubevu	995	1,274	143	183	1	1	1	6
	Luxolweni	1,033	1,322	130	166	1	1	1	17
	Tafeni	1,696	2,171	229	293				
	Cezu	711	910	84	108	1	1	2	14
	Mavundleni	634	812	91	116				
Mhlontlo	Lower Roza	1,885	2,413	267	342	1	1	3	24
	Ncalukeni	1,935	2,477	264	338				
	Ndasane	819	1,048	116	148				
	Ndwane	3,675	4,704	528	676	2	2	1	24
	Mvumelwano	1,407	1,801	227	291				
Ntabankulu	Dambeni	4,250	5,440	587	751	1	3	3	45
	Bhakuba	4,831	6,184	587	751				
	Kwazulu	1,609	2,060	219	280	1	1	1	9
Total		38,627	49,446	5,106	6,534	17	19	22	216

The project will be implemented in two phases by locality as follows:

Phase I: Nyandeni and KSD Local Muncipalities

Phase II: Mhlontlo and Ntabankulu Local Muncipalities

The Japanese government will provide the following assistance in the form of grant aid.

- Construction of water supply schemes
- Shared support to institutional and social development (ISD) activities

The South African is responsible for carrying out the following obligations.

- Proper maintenance of constructed facilities

- Shared funding for ISD interventions.
- Other undertakings as stipulated by the guidelines for Japanese grant assistance (see Section 2-3).

As a result of the implementation of the project, the following benefits can be expected.

- The number of beneficiaries in the project target villages will increase from the present total population of 38,627 persons to 49,446 persons in the target year.
- The unit water consumption rate of the project target villagers will increase from the present 9 lit/cap/day to 25 lit/cap/day in the target year.
- The coverage of water supply in the project target areas (4 LMs) will expand from the present 8% to 12% in the target year.
- At the project target villages, the constructed facilities can contribute to prevention of water-borne diseases such as cholera.

This project has effects as explained above and will contribute to improvement of the basic human needs of the population. Therefore, implementation of this project through the Japanese grant assistance will have great significance. However, if strengthening and capacity building of WSA, CBO and WSP are properly carried out, this project can be effectively implemented and the water supply system will become sustainable.

CONTENTS

CHAPTER 1
BACKGROUND OF THE PROJECT

CHAPTER 1 BACKGROUND OF THE PROJECT

In 1994, a new government was reorganized and soon after, the Reconstruction and Development Programme (RDP) was formulated to institute a reform in the government and eliminate racial segregation issues. The RDP was placed as the highest development priority by the government of the Republic of South Africa. The aim of the RDP for the water and sanitation sector is to supply 25 lit/cap/day of clean and stable water accessible within 200 m from the residence, and to construct ventilated improved pit (VIP) latrines to all households in the rural areas. The Department of Water Affairs and Forestry (DWAF) was given the responsibility to carry out this strategy. As a result, the White Papers on Water Supply and Sanitation Policy published in 1994 announced that the RDP objective will be met within seven years. The White Papers also emphasized that operation and maintenance of infrastructures are the obligated responsibility of the beneficiaries.

In Eastern Cape Province, the coverage rate for water supply is only 39% and for sanitation, 26% (DWAF survey results, 1998). On the other hand, the coverage rate for water supply in the project targeted 4 Local Municipalities (5 Magisterial Districts) averages about 8% which implies that this is the most highly affected area.

For this purpose, a request was made by the government of the Republic of South Africa to the government of Japan for Grant Aid Assistance. The 30 requested villages are located in six former magisterial districts of Eastern Cape Province. The request consists of the construction of sustainable water supply and sanitation facilities with adequate capacity building for proper operation and maintenance and opportunities for sanitation and hygiene awareness promotion. The requested facilities are: boreholes, water supply facilities with either handpump or piped system, and VIP latrines.

CHAPTER 2
CONTENTS OF THE PROJECT

CHAPTER 2 CONTENTS OF THE PROJECT

2-1 Basic Concepts of the Project

2-1-1 Objectives

In accordance with the RDP, the national objective for the rural water and sanitation sector is to provide sustainable water supply facilities which can supply a sufficient amount of good quality water to all citizens by the horizon year, and toilet facilities which can contribute to improvement of the sanitary environment.

- By the horizon year, all nationals will be assured of 25 lit/cap/day of clean water conforming to the national drinking water standards within 200 m of their homes.
- By the horizon year, all nationals will have access to VIP toilets.

The objective of the project is the improvement in conditions of water supply and sanitation in the least developed target areas of Eastern Cape. This can be realized through the provision of sustainable water schemes to supply domestic water in sufficient quantity and of good quality, as well as toilet facilities to upgrade the sanitation conditions of the village environment. Furthermore, formation of *an appropriate operation and maintenance system is essential for sustainability*, which require developing the capacities of village committees as well as the communities to foster a strong sense of ownership.

- At the project target villages, all villagers will be provided with 25 lit/cap/day of safe and stable water within 200 m of their residences.
- At the primary schools in the project target villages having maintenance capabilities, VIP toilets will be considered to contribute to sanitation education of the pupils.

As a result of the implementation of the project, the following benefits can be expected.

- The number of beneficiaries in the project target villages will increase from the present total population of 38,627 persons to 49,446 persons in the target year.

- The unit water consumption rate of the project target villagers will increase from the present 9 lit/cap/day to 25 lit/cap/day in the target year.
- The coverage of water supply in the project target areas will expand from the present 8% to 12% in the target year.
- Water sources in conformity to the national drinking water standards will be developed in the project target villages.
- At the project target villages which receive full ISD intervention, village committees will be organized for active operation and maintenance of the constructed facilities with opportunities for sanitation education and hygiene promotion.
- At the project target villages, the constructed facilities can contribute to prevention of water-borne diseases such as cholera.

2-1-2 Project Description

In the predicament as mentioned previously, the less privileged population is suffering most from deficits in water and sanitation. The study target area is presently receiving the lowest coverage in water supply and sanitation. This implies that this area requires improvements in water and sanitation the most.

For this purpose, a request was made by the government of the Republic of South Africa to the government of Japan for Grant Aid Assistance. The request consists of the construction of sustainable water supply and sanitation facilities with adequate capacity building for proper operation and maintenance and opportunities for sanitation and hygiene awareness promotion. The requested facilities are: boreholes, water supply facilities with either handpump or piped system, and VIP latrines.

The requested 30 villages located in six magisterial districts of Eastern Cape Province are listed below showing the District Councils as originally requested. However, after the request was made, reorganization of the local government had taken place, which required modifications in jurisdiction and demarcation. These modifications will be reflected in tables listing the sites later in the report.

Table 2-1 List of Requested Villages

Province	District Council	Magisterial District	Village Name	
Eastern Cape	Kei	Ngqeleni	1.	Kumaxhaka
			2.	Qanqu
			3.	Ngcilitshana
			4.	Didi
			5.	Kuleka
		Umtata	6.	Sikobeni
			7.	Centuli
			8.	Dlova
			9.	Upper Xongora
			10.	Lower Centuli
			11.	Sigubudu
		Mqanduli	12.	Luxolweni
			13.	Cezu
			14.	Mavundleni
			15.	Macosa
			16.	Tafeni
			17.	Ngwangweni
		Engcobo	18.	Sixhotyeni
			19.	Luxeni
			20.	Sigangeni
			21.	Manzana
		Qumbu	22.	Lower Roza
			23.	Ndwane
			24.	Ncalukeni
			25.	Ndasane
	Wild Coast	Tabankulu	26.	Kubhonxa
			27.	Dambeni
			28.	Bhakuba
			29.	Mpisini
			30.	Kwazulu

During the first field survey, it was learned that two of the requested villages, namely Kubhonxa and Mpisini of Tabankulu District, were already being implemented through other funding. Therefore, both sides agreed to replace these villages with alternate villages which are located in close proximity to the study villages and have similar village scales. As a result, Mvumelwano of Qumbu District and Kwazulu D of Tabankulu District replaced the first two villages. Also as revealed during the first field survey, District Municipalities were demarcated from the previous District Councils after the request was made. Further, Local Municipalities were demarcated based on previous Magisterial Districts. The village names were clarified, corrected and confirmed by DWAF during the second field survey.

Water Supply Schemes

Using the results of the first field survey, the 30 study villages were put through a screening process which considered inadequate flow rates, poor water quality and sufficiency of existing water supply facilities, and consequently, 8 villages had to be excluded. The remaining 22 villages were agreed as the target villages for the project. However, one of the 22 villages was later found to be duplicated by another project, and so this village was also deleted. This gave 21 villages for project target which are listed below along with changes in village names and evolution of demarcations. The locations of the target villages are shown on the map in the next page

Table 2-2 List of Project Target Villages

District Council	District Municipality	Magisterial District	Local Municipality	Village Name		
				Request	1st Field Survey	Project
Kei	Oliver R. Tambo	Ngqeleni	Nyandeni	1. Kumaxhaka	1. Kumaxhaka	1. Kumaxhaka
				2. Qanqu	2. Qanqu	2. Qanqu
				3. Ngcilitshana	3. Ngcilitshana	3. Didi
				4. Didi	4. Didi	4. Ezinkozweni
		Umtata	KSD (King Sabata Dalindyebo)	5. Sikobeni	5. Sikobeni	5. Sikobeni
				6. Centuli	6. Centuli	6. Centuli
				7. Dlova	7. Dlova	7. Dlova
				8. Upper Xongora	8. Upper Xongora	8. Upper Xongora
		Mqanduli		9. Sigubudu	9. Sigubudu	9. Gubevu
				10. Luxolweni	10. Luxolweni	10. Luxolweni
				11. Cezu	11. Cezu	11. Cezu
				12. Mavundleni	12. Mavundleni	12. Mavundleni
				13. Tafeni	13. Tafeni	13. Tafeni
		Qumbu	Mhlontlo	14. Lower Roza	14. Lower Roza	14. Lower Roza
				15. Ndwane	15. Ndwane	15. Ndwane
				16. Ncalukeni	16. Ncalukeni	16. Ncalukeni
				17. Ndasane	17. Ndasane	17. Ndasane
				18. —	18. Mvumelwano	18. Mvumelwano
Wild Coast		Tabankulu	Ntabankulu	19. Dambeni	19. Dambeni	19. Dambeni
				20. Bhakuba	20. Bhakuba	20. Bhakuba
				21. Kwazulu	21. Kwazulu B	21. Kwazulu

N.B.: The shaded village names indicate those which were changed to a local name or replaced by another village.

The requested water schemes included Level 1 (handpump facilities) and Level 2 (piped water schemes with communal tapstands), but the screening process eliminated the Level 1 candidate villages which left only Level 2 villages. Also, due to lack of appropriate water sources for some villages, and since some sources have sufficient flow rates to cover more than one village and villages are located in close proximity of each other, some of the villages were grouped together to form multi-village water schemes. Furthermore, the 21 target villages were prioritized by water scheme groups.

No.	Mag. District	Village Name
Nyandeni Local Municipality		
1.	Ngqeleni	Kumaxhaka
2.		Qanqu
3.		Didi
4.		Ezinkozweni
KSD Local Municipality		
5.	Umtata	Sikobeni
6.		Centuli
7.		Diova
8.		Upper Xongora
9.		Gubevu
10.	Mqanduli	Luxolweni
11.		Cezu
12.		Mavundleni
13.		Tafeni
Mhlontlo Local Municipality		
14.	Qumbu	Lower Roza
15.		Ndwane
16.		Ncalukeni
17.		Ndasane
18.		Mvumelwano
Ntabankulu Local Municipality		
19.	Tabankulu	Dambeni
20.		Bhakuha
21.		Kwazulu B

LEGEND

- Projected Village
- Magisterial District Capital
- Eastern Cape Provicial Boundary
- District Municipal Boundary
- Magisterial District Boundary
- Main Road
- Other Road

Local Municipal Boundary being omitted.

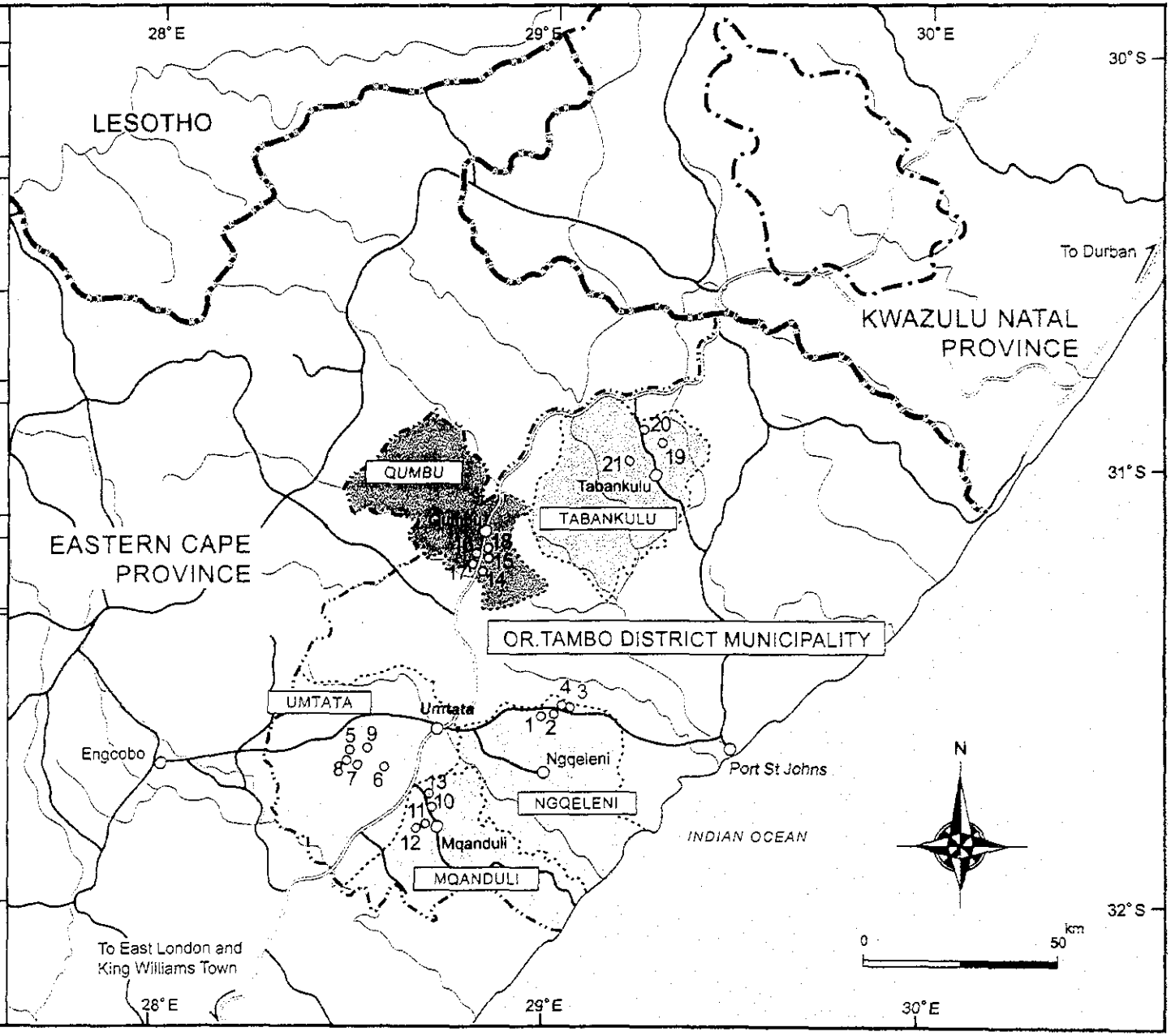


FIGURE 2-1.
LOCATION MAP OF
PROJECT TARGET VILLAGES

The process of screening and prioritization is depicted in the following flow diagram.

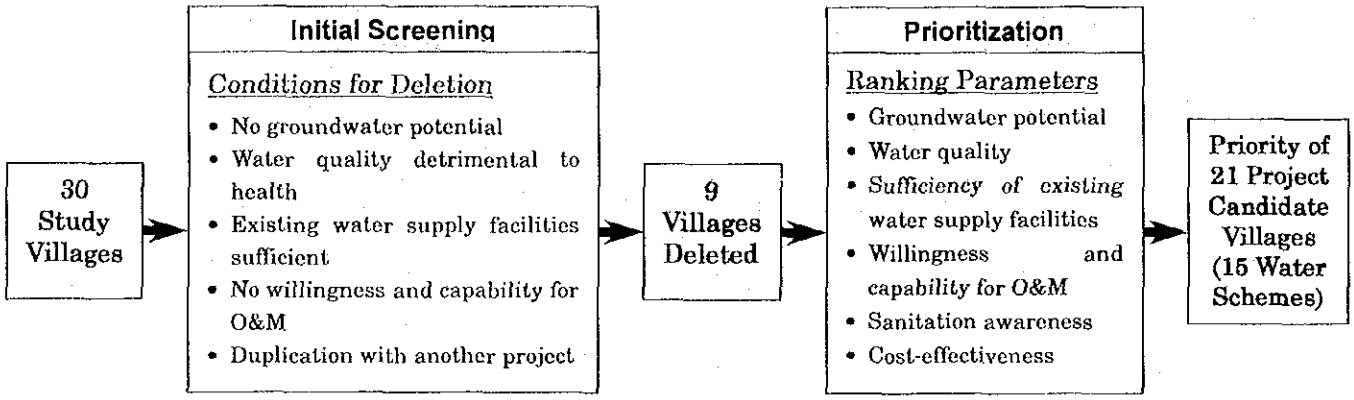


Figure 2-2 Screening and Prioritization Process for Water Supply

The priority ranking as obtained by the above procedure is shown below. Note that some rankings are duplicated due to prevalence of equal conditions, and the subsequent rank numbers are shifted accordingly.

Table 2-3 Priority of Water Scheme Groups

Local Municipality	Water Scheme Group		Priority Ranking
Nyandeni	1	1. Kumaxhaka	1
	2	2. Qanqu	15
	3	3. Didi	4
	4	4. Ezinkozweni	10
KSD (King Sabata Dalindyebo)	5	5. Sikobeni	7
	6	6. Centuli	8
	7	7. Dlova	4
	8	8. Upper Xongora	4
	9	9. Gubevu	1
	10	10. Luxolweni 13. Tafeni	13
	11	11. Cezu 12. Mavundleni	3
Mhlontlo	12	14. Lower Roza 16. Ncalukeni 17. Ndasane	8
	13	15. Ndwane 18. Mvumelwano	14
Ntabankulu	14	19. Dambeni 20. Bhakuba	11
	15	21. Kwazulu	12

Sanitation Facilities

The South African side emphasized that due consideration should be paid on the investment in the field of sanitation in order to alleviate waterborne diseases such as cholera. In this respect and also considering the fact that private toilets cannot be implemented according to Japanese guidelines for grant assistance, both sides agreed that toilets will be constructed in primary schools (JPS, SPS, JSS) of the 21 project target villages depending on the condition of the existing toilets. The selection procedure for construction of toilets involved initial elimination of villages without primary schools. Then, the primary schools are screened in terms of existence of toilets, condition of existing toilets and extent of sufficiency in the number of existing toilets. Finally, willingness for operation and maintenance of toilets and awareness on sanitation were evaluated to decide on the village for implementation. The selection process is illustrated in the following flow diagram.

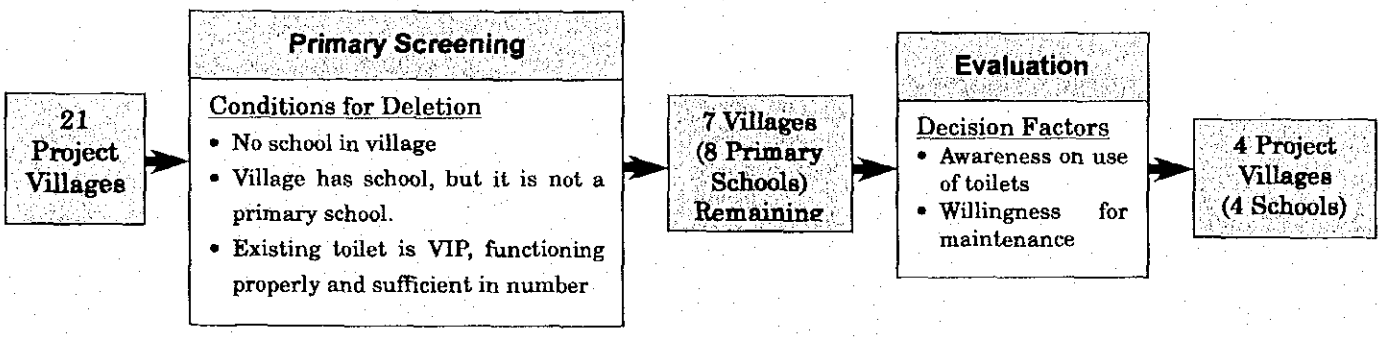


Figure 2-3 Selection Process for Sanitation Facilities

As a result of the above selection procedure, the selected villages are listed below.

Table 2-4 Selected Villages for Provision of Sanitation

Local Municipality	Selected Village Name	No. of Schools Selected for Toilet Construction
KSD	1. Centuli	1
	2. Gubevu	1
Mhlontlo	3. Mvumelwano	1
Ntabankulu	4. Kwazulu	1

However, since the maintenance of the toilets in the premise of the school is the responsibility of the Department of Education, DWAF has contacted the Department of Education to request their approval for construction and agreement on maintenance. Unfortunately, the Department of Education could not submit a letter concerning their final confirmation within the agreed time period. Therefore, the provision of sanitation had to be eliminated from the project.

2-2 Basic Design of the Requested Japanese Assistance

2-2-1 Design Policy

2-2-1-1 Basic Policy

This project will target 21 villages in 4 Local Municipalities of the O. R. Tambo District Municipality in Eastern Cape. The project aims to construct water supply and sanitation facilities to improve the living and sanitation environment of the villagers. The basic concepts to be applied to this project are the following.

- Prioritization process will be based on water scheme groups, and not necessarily by villages.
- Provision of sanitation will focus on construction of public toilets.

2-2-1-2 Policy towards Natural Conditions

Hydrogeological maps of Eastern Cape reveal that the study area is classified as a difficult area for groundwater development with a high occurrence of dry boreholes. The success rate for drilling in this area is generally predicted to be about 66%. During the field survey for this project, 20 test drillings were conducted of which 15 of them were successful. Also, the water quality of some sources revealed concentrations of manganese, fluoride and arsenic above the drinking water standards. Therefore, when selecting the water sources for this project, both quality and quantity will be sufficiently considered to provide adequate supply of safe drinking water.

2-2-1-3 Policy towards Socio-Economic Conditions

The project will make full consideration of socio-economic conditions influenced by historical background and regional characteristics of the study area. The facilities design will consider features to prevent vandalism and theft such as constructing fences around the facilities and installing locks. Further, the village water and sanitation committees will be educated and intervened on awareness to deter such incidents. Also, in line with the promotion for upgrading the social level of women in South Africa, participation by women in awareness and education activities is encouraged including gender conscious decision making.

2-2-1-4 Policy towards Construction Situation

Excluding Umtata and its surroundings which is the nucleus of the study target area, demand for construction works is very low, in which the main undertakings are public works and small scale construction of commercial establishments and residences. Construction materials such as concrete blocks, bricks and roof tiles are manufactured locally. Most of the construction contractors based in the target area have experience only in small scale works, and larger works are handled by large to medium sized contractors having their headquarters in urban centers such as East London.

Although procurement of equipment and materials is out of scope of this project, equipment and materials for construction will be given priority to those procured locally in consideration of ease of handling and maintenance during construction and minimization of costs. The main materials needed for construction in this project such as cement, block and lumber are available in Eastern Cape. In consideration of operation and maintenance, the selection of equipment such as pumps will consider spare parts available in South Africa as much as possible. Also, taps and gate valves which are frequently used as well as large volume materials such as pipes will consider local procurement.

2-2-1-5 Policy on Use of Local Contractors

Many of the local contractors have high capability and experience in water and sanitation works. Therefore, the use of local contractors as subcontractors would be effective in consideration of their knowledge on local construction matters and regional social environment. However, the prime contractor must be a Japanese firm under the Japanese grant assistance guidelines, and the prime contractor will decide on the use of local contractors.

2-2-1-6 Policy towards Capacity of Executing Agency on Operation and Maintenance

The executing agency for this project is DWAF and they have sufficient experience for proper operation and maintenance of water and sanitation facilities. However, according to the Water Services Act of 1997 and other related acts, completed facilities will be transferred to local authorities, where O. R. Tambo District Municipality is the responsible body for this project. Nevertheless, this District Municipality was established just recently and they are lacking in staff, experience and budget allocation. In this predicament, O. R. Tambo District Municipality is presently receiving support on institutional strengthening and capacity building from DWAF and other organizations to prepare this DM to function as a Water Services Authority (WSA). The agreement that DWAF will enter into with this DM, which stipulates that the DM will accept full responsibility, financial and otherwise, for the sustained operation and maintenance of the project, is a requisite for implementation of this project.

2-2-1-7 Policy on Grade of Facilities

The project water supply facilities as public infrastructure will be designed to be durable, easy to operate and maintain, and matched to the daily life style of the target villages. Facilities design and specifications of equipment and materials will be in conformity with SABS and DWAF/RDP standards.

2-2-1-8 Policy on Project Schedule

Basic design for this project is carried out for 15 water supply schemes in 21 villages. If all 15 schemes are to be implemented at one time, completion within the stipulated period for implementation of Japanese grant projects would be difficult resulting from problems in supervision due to the expanded scale of the facilities, scattering of the villages and limitations in annual working days; as well as limitations in the number of appropriate local subcontractors and construction machineries which can be handled in parallel. This gives reason to implement the project in 2 phases.

2-2-2 Basic Plan

2-2-2-1 Water Supply

The "RDF Guidelines for Rural Water Supply Facilities" is the standard used for water supply construction works in South Africa. Therefore, the present project will adopt the following design criteria in accordance with the RDF guidelines to base the planning of the water supply schemes:

- Design Horizon: 10 Years
- Population Growth Rate: 2.5 %/yr
- Design Water Usage: 25 lit/cap/day
- Standpipe Flow Rate: min. 10 lit/min per tap
- Standpipe Spacing: Each household within a 200 m radius with modifications as necessary

1) Intake Facilities

Water Source

The water sources for this project will be boreholes. The test boreholes drilled during the field survey of this study will be developed as production wells to be used as the water sources. Those having high yields can supply multiple villages, while at villages whose boreholes have yields insufficient to meet the demands of the target villages, new boreholes are needed as listed below. These new boreholes will be test drilled during the detailed design survey. If these new test boreholes can meet the required demands, then these will be developed as the project water sources during the implementation stage. However, if their yields are not sufficient to meet the requirements, then the water schemes to be covered by these insufficient boreholes will be deleted from the project.

Table 2-5 New Borehole Drilling Requirements

Water Scheme Group	Required Number	Proposed Location
Qanqu	1	On the lineament about 1.5 km south of the test borehole for the neighboring village of Kumaxhaka
Luxolweni, Tafeni	1	In the valley about 1 km away from the center of the 2 target villages
Ndwane, Mvumelwano	1	In the fracture zone along the valley about 700 m northeast of the test borehole for this group

Intake Facility

As intake facilities, submersible motor pumps will be installed in the project boreholes. The power will come from commercial power lines. The intake pump will transmit water up to a reservoir. The pump operation hours will be from 8 to 10 hours as calculated from the design supply rate and borehole yield. For ease of maintenance, the borehole will be independent of the control room, and for security, a pump pit will be constructed to house the borehole as well as appurtenant valves.

Three-phase power line extensions up to the water source will be the responsibility of the South African side only if an existing grid is available within one kilometer from the project pump station. Other power line extensions will be supported by the Japanese side.

Control Room

A control room will be constructed near the water source. The control room will house the control panel, valves and chlorinator. For security, fencing material will be installed surrounding the control room.

2) Transmission/Distribution Facilities

Pipeline

Since rocks are found along the pipeline route and high pressures are formed due to long distances and high head losses, the transmission mains will be steel pipes in principle. For the distribution lines, pipes to be laid above the ground will be steel pipes, while those to be laid underground will be either PVC or HDPE, in accordance with RDP standards. Maximum pressure allowance will be specified as above 6 Mpa, and where necessary, high pressure pipes will be used as well as break pressure tanks. Pipe diameters will be calculated using the Hazen-William's formula from maximum hourly demand. Pipe flow rates will be based on RDP standards of maximum 3.0 m/sec for transmission lines and 0.3 to 1.5 m/sec for distribution lines. If a service area is located along the transmission main between the water source and reservoir, water will be pumped directly to tapstands in some areas. Meters will be installed along the transmission main and distribution line from the reservoir to monitor the yield and consumption rates.

Water Storage Facility

Reservoirs and elevated tanks will be cylindrical of reinforced concrete. The tank volume is determined in accordance with RDP standards of 24 hours of the design supply rate.

Booster Pump and Tank

Topographically, if the total head rating of the submersible pump does not allow the water to be pumped up to the reservoir, a booster tank and booster station will be designed. To minimize detention time, the booster tank will be designed as 2 to 4 hours of the design supply rate. Next to the booster tank, a booster station housing a horizontal centrifugal pump will be constructed to pump up water to the reservoir. The power for the booster pump will be from a commercial line.

Stream and Road Crossing

Where pipelines must cross streams and roads, appropriate protection will be designed to prevent damages. Special attention must be paid to crossing national roads where asphalt must be cut for laying the pipeline and repaired after completing the work.

3) Supply Facilities

Communal Tapstand

The design number and spacing of communal tapstands will be determined as per the RDP standard of 1 tapstand within a 200 m radius, or if the standard of 10 lit/min flow from a tap is considered, this means that 1 tapstand can supply about 250 persons. The final locations of the tapstands will be decided during the detailed design survey through the participation of the village committee. The communal tapstand will have 1 tap and installed with a valve and flowmeter. If the maximum static pressure at the tap is above 0.75 Mpa, then a break pressure valve will be used.

The plan for water supply facilities according to the above mentioned conditions and adopted standards is shown in the table below. The concepts for water supply facilities are depicted in the figure shown in the following page.

Table 2-6 Water Supply Facilities Planning

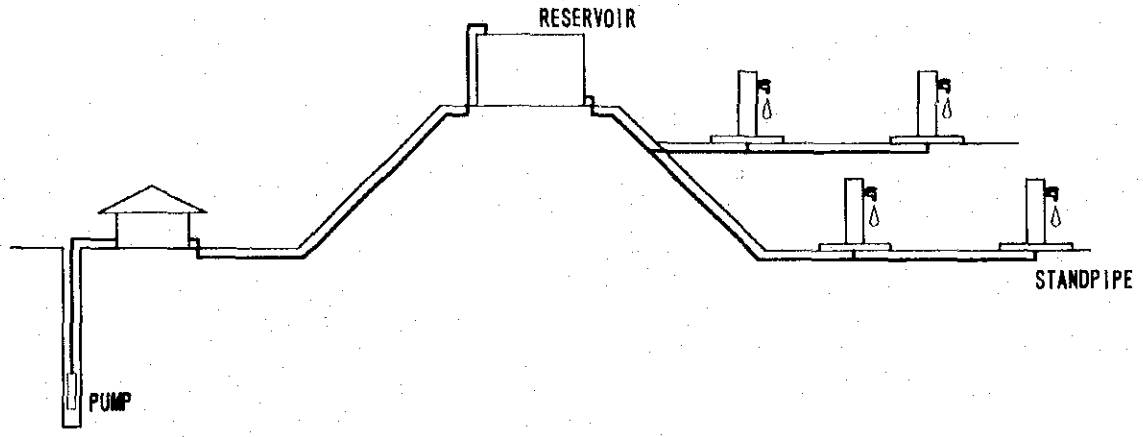
District	Village Name	Population		Households		Bore-holes	Control Rooms	Reser-voirs	Tap-stands
		Present	Design	Present	Design				
Ngqeleni	Kumaxhaka	1,262	1,615	175	224	1	1	1	7
	Qanqu	1,827	2,339	231	296	2	2	1	9
	Didi	1,234	1,580	153	195	1	1	1	7
	Ezinkozweni	1,770	2,266	203	260	1	1	1	9
Umtata	Sikobeni	1,784	2,284	223	285	1	1	1	10
	Centuli	2,184	2,796	267	342	1	1	1	14
	Dlova	2,356	3,016	299	383	1	1	3	15
	Upper Xongora	730	934	83	106	1	1	1	6
	Gubevu	995	1,274	143	183	1	1	1	6
Mqanduli	Luxolweni	1,033	1,322	130	166	1	1	1	17
	Tafeni	1,696	2,171	229	293				
	Cezu	711	910	84	108	1	1	2	14
	Mavundleni	634	812	91	116				
Qumbu	Lower Roza	1,885	2,413	267	342	1	1	3	24
	Ncalukeni	1,935	2,477	264	338				
	Ndasane	819	1,048	116	148				
	Ndwane	3,675	4,704	528	676	2	2	1	24
	Mvumelwano	1,407	1,801	227	291				
Tabankulu	Dambeni	4,250	5,440	587	751	1	3	3	45
	Bhakuba	4,831	6,184	587	751				
	Kwazulu	1,609	2,060	219	280	1	1	1	9
Total		38,627	49,446	5,106	6,534	17	19	22	216

2-2-2-2 Provision of Sanitation

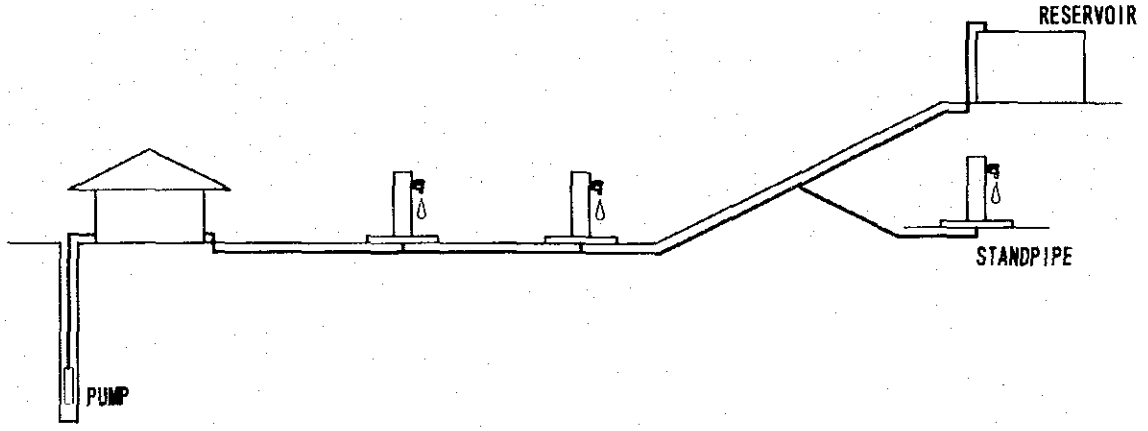
The Department of Education has responsibility for maintenance of toilets constructed in the premise of a school, and permission and agreement from the Department is necessary to proceed with the project. However, since a letter to convey this confirmation could not be received by the agreed deadline, the provision of sanitation facilities had to be excluded from the project. The plan and design of the toilets considered for this project are shown in the Appendix.

FIGURE2-4. WATER SUPPLY PATTERN

1) LEVEL-Ⅱ/ GRAVITY FED SYSTEM



2) LEVEL-Ⅱ/ FLOATING ON SYSTEM



3) LEVEL-Ⅱ/ BOOSTER + GRAVITY DISTRIBUTION