

JAPAN INTERNATIONAL COOPERATION AGENCY(JICA)
DEPARTMENT OF WATER AFFAIRS AND FORESTRY
REPUBLIC OF SOUTH AFRICA

**THE STUDY
ON
THE EXPANSION OF CAPACITY OF
MAGALIES WATER
IN
THE REPUBLIC OF SOUTH AFRICA
(PHASE 2 AND 3)**

FINAL REPORT

**VOLUME 2 : FEASIBILITY STUDY FOR
NORTH MANKWE AREA**

JANUARY 1998

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**SANYU CONSULTANTS INC.
NIHON SUIDO CONSULTANTS CO.,LTD.**



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CURRENCY EQUIVALENTS

(As of September, 1997)

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VOLUME 1 : EXECUTIVE SUMMARY

VOLUME 2 : FEASIBILITY STUDY FOR NORTH MANKWE AREA

VOLUME 3 : FEASIBILITY STUDY FOR KLIPVOOR AREA

VOLUME 4 : FEASIBILITY STUDY FOR MORETELE2 AREA

VOLUME 5 : BOUNDARY ISSUES

VOLUME 6 : PILOT PROJECTS

VOLUME 7 : DATA BOOK



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PREFACE

In response to request from the Government of the Republic of South Africa, the Government of Japan decided to conduct the Study on the Expansion of the Capacity of Magalies Water in the Republic of South Africa and entrusted the study to the Japan International Cooperation Agency (JICA).

JICA sent to South Africa a study team headed by Mr. Satoshi Kadowaki, SANYU CONSULTANTS INC., and composed of staff members of SANYU CONSULTANTS INC. and NIHON SUIDO CONSULTANTS CO. LTD., two times between February 1997 and November 1997.

The team held discussions with the officials concerned of the Government of South Africa, and conducted field surveys at the study area. After the team returned to Japan, further studies were made and the present report was prepared.

I hope that this report will contribute to the promotion of the project and to the enhancement of friendly relation 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 Team.

January 1998



Kimio Fujita
President

Japan International Cooperation Agency

January 10, 1998

Mr. Kimio Fujita
President
Japan International Cooperation Agency
Tokyo, Japan

Letter of Transmittal

Dear Sir,

We are pleased to submit the final report of the Phases 2 and 3 Study on the Expansion of Capacity of Magalies Water in Republic of South Africa. This report incorporates the views and suggestions of the authorities concerned of the Government of Japan and your Agency. It is also included the comments made by the Department of Water Affairs and Forestry, Magalies Water and other stakeholders in the Republic of South Africa during the meetings organized by Project Execution Group (PEG) and Project Steering Committee (PSC) in both Rustenburg and Pretoria where the Draft Final Report was discussed.

According to the South Africa's new water supply and sanitation policy, the specific challenges are to consolidate appropriate water supply infrastructures and to transform and empower institutions in the sector to deliver service so that all communities in the country can have access to safe water and sanitation in the near future. JICA has prepared Master Plan Reports for the area following these policies and strategy guidelines in 1996.

The main objectives of the Phase2 and Phase3 were to focus on the realisation of recommendations made in the Master Plan until the target year of 2015. Accordingly Phase2 dealt with the Feasibility Studies for the selected priority projects and Phase 3 implemented the pilot projects which were selected in the Master Plan.

This report contains the findings, conclusions and recommendations as outcome of the Phases 2 and 3 in which Feasibility Studies for three regional water supply projects and implementation of four pilot projects were involved.

The report consists of seven volumes. They are Executive Summary (1), Feasibility Reports (3), Boundary Issues (1), Pilot Projects (1) and Data Book (1).

We wish to take this opportunity to express our sincere gratitude to your Agency, the Ministry of Foreign Affairs, and the Ministry of Welfare of the Government of Japan for their valuable advice and suggestions. We would also like to express our deep appreciation to the relevant officers of the Department of Water Affairs and Forestry, Magalies Water and other related agencies of the Government of the Republic of South Africa for their cooperation and the assistance extended to us during our study.

Very truly yours,


Satoshi KADOWAKI

Team Leader, Phases 2 and 3
Study on the Expansion of
Capacity of Magalies Water
in the Republic of South Africa

LOCATION MAP OF FEASIBILITY STUDY AREAS

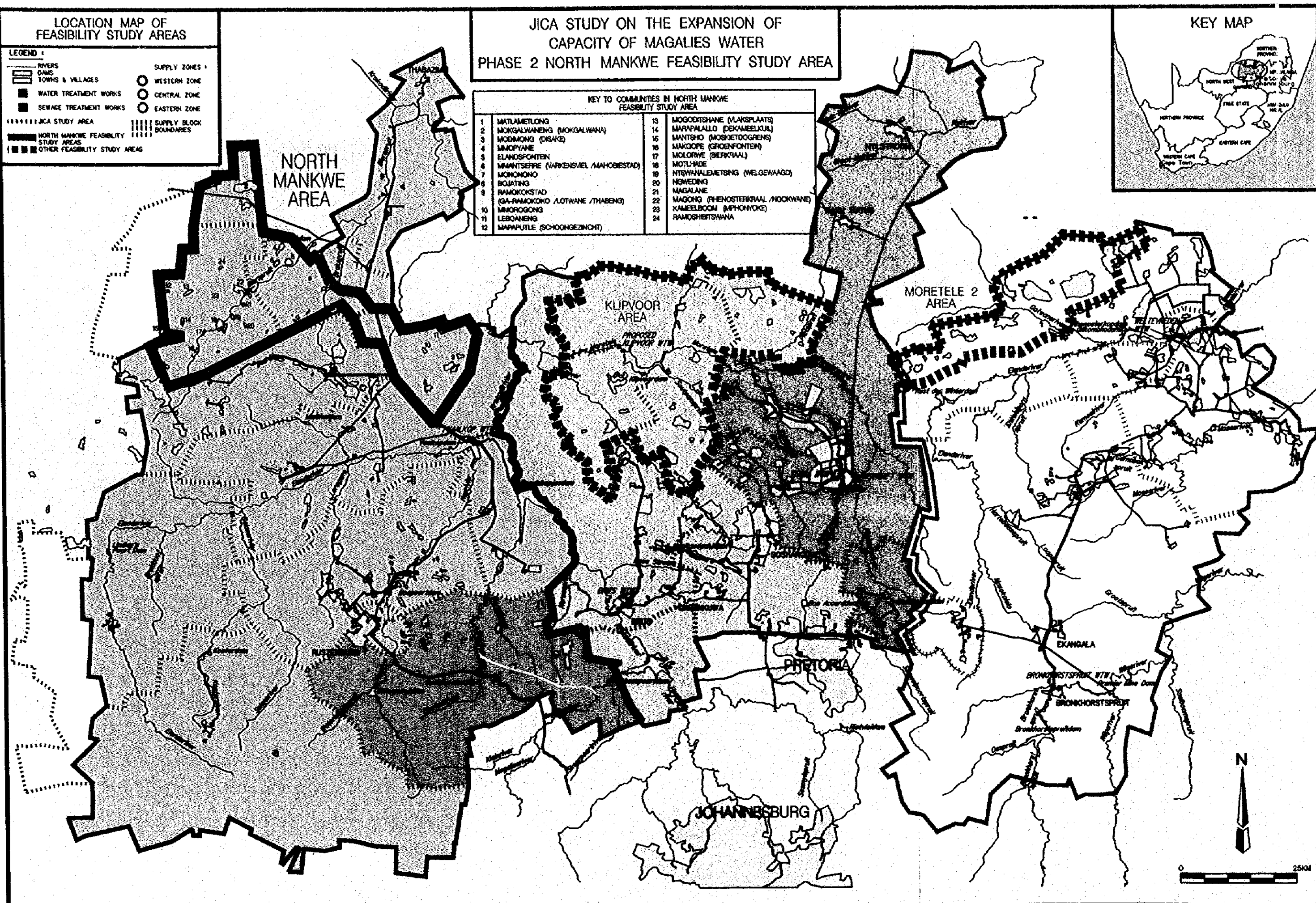
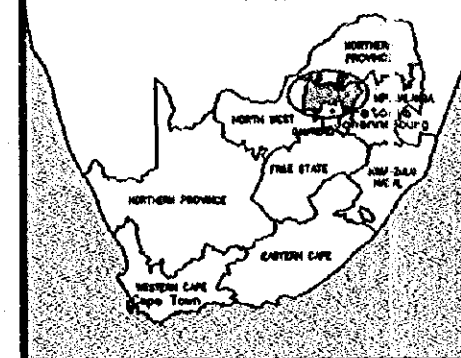
- LEGEND :**
- RIVERS
 - DAMS
 - TOWNS & VILLAGES
 - WATER TREATMENT WORKS
 - SEWAGE TREATMENT WORKS
 - JICA STUDY AREA
 - NORTH MANKWE FEASIBILITY STUDY AREAS
 - OTHER FEASIBILITY STUDY AREAS
- SUPPLY ZONES :**
- WESTERN ZONE
 - CENTRAL ZONE
 - EASTERN ZONE
 - ||||| SUPPLY BLOCK BOUNDARIES

JICA STUDY ON THE EXPANSION OF CAPACITY OF MAGALIES WATER PHASE 2 NORTH MANKWE FEASIBILITY STUDY AREA

KEY TO COMMUNITIES IN NORTH MANKWE FEASIBILITY STUDY AREA

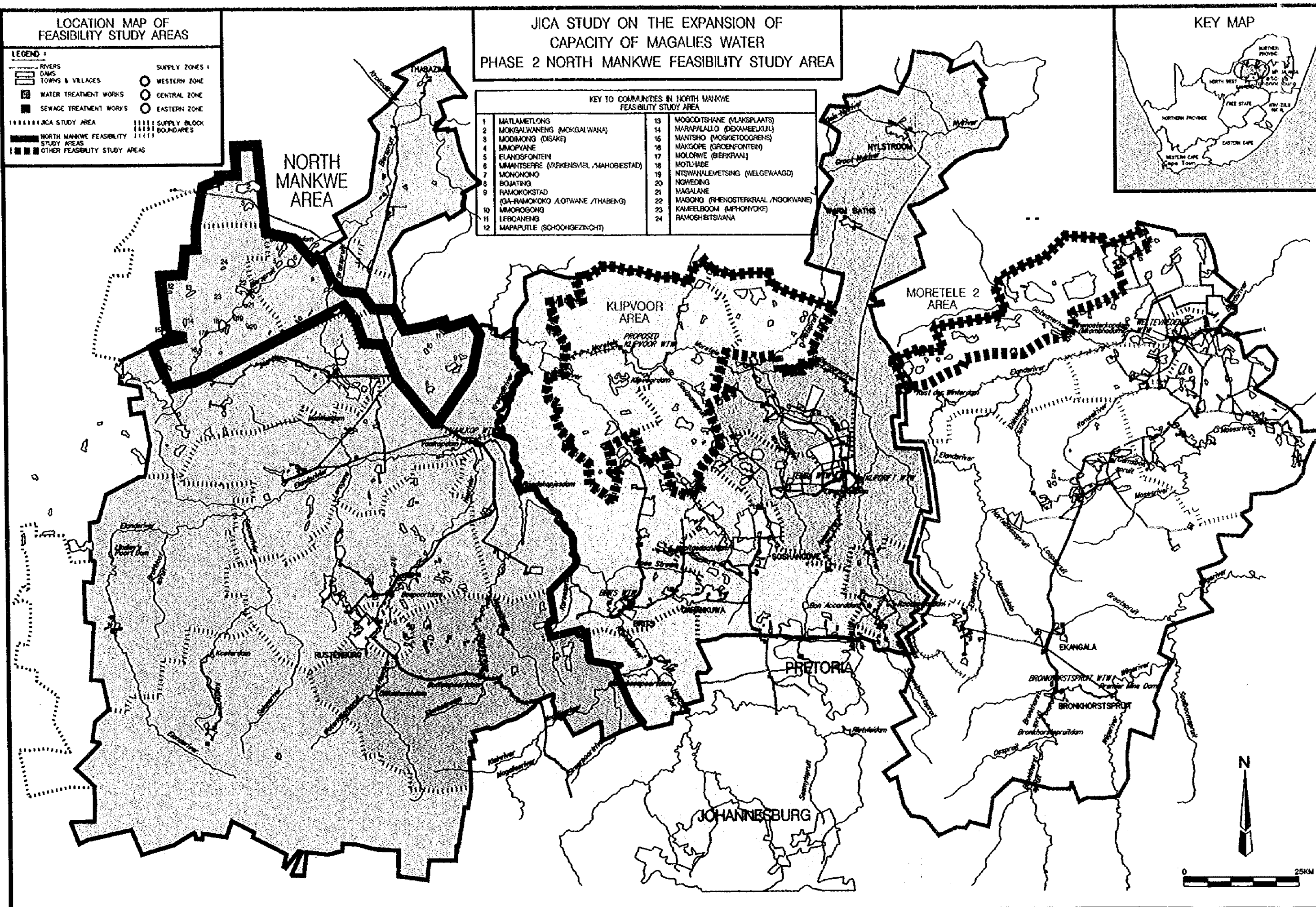
1	MATLAMETLONG	13	MOGORTSHANE (MAKSPLAATS)
2	MOKGALWANENG (MOKGALWANA)	14	MARAPALALLO (DEKAMEELKUL)
3	MODIMONG (DISAKE)	15	MANTSHO (MOSKETDOORENS)
4	MAOPYANE	16	MAKOPE (GROENFONTEIN)
5	ELANDSPONTEN	17	MOLORE (BIEKRAAL)
6	MINANTSEPE (NARKENSVEL / MAHOBIESTAD)	18	MOTUWAGE
7	MONOMONO	19	NTSWALEMEITSING (WELGEWAAGD)
8	BOUATING	20	NGWEDING
9	RAMOKOTSTAD	21	MAGALANE
10	(GA-RAMOKOKO / LOTWANE / THABENG)	22	MAGONG (PHENOSTERIKRAAL / MOOKWANE)
11	MAKOGONG	23	KAMEELBOOM (BPHONYOKE)
12	LEBOANENG	24	RAMOSHIETSWANA
	MAMPUTLE (SCHOONGEZICHT)		

KEY MAP



JICA STUDY ON THE EXPANSION OF
CAPACITY OF MAGALIES WATER
PHASE 2 NORTH MANKWE FEASIBILITY STUDY AREA

1	MATLAMETLONG	13	MOGODITSHANE (MAKSPLAATS)
2	MOKGALWANENG (MOKGALWANA)	14	MARAPALALO (DEKAMEELKUIJ)
3	MODIMONG (DISAKE)	15	MANTSHO (MOGKETOOGRENS)
4	MUNOPYANE	16	MAKGOPHE (GROENFONTEIN)
5	ELANDSFONTEIN	17	MOLORWE (BIERKRAAL)
6	MUNANTSEPE (VARKENSVEL / MAHOBIESTAD)	18	MOLUHADE
7	MONONONO	19	NTSWANALEMETSING (WELGEWAAGD)
8	BOUATING	20	NGWEDING
9	RAMOKOKSTAD	21	MAGALANE
10	(GA-RAMOKOKO) LOTWANE / THABENG	22	MAGONGI (RHENOSTERKRAAL / NGOKWANE)
11	MIMOROGONG	23	KAMEELBOOM (MPHORIKOE)
12	LEBOANENG	24	RAMOSHTSWANA
	MAPAPUTLE (SCHOOONGEZINCHT)		



EXECUTIVE SUMMARY

1. INTRODUCTION

The JICA Study has three phases; the first Phase, formulation of a master plan for the Magalies Water Expansion Area was completed in 1996 while Phase 2 (Feasibility Study) and Phase 3 (Pilot Project) will be completed by the end of 1997.

During Phase 1, three priority areas were identified and agreement was reached with all stakeholders that these should be the subject of subsequent feasibility studies. The North Mankwe project area is one of these three areas where many communities do not have access to a safe and adequate water supply to the RDP minimum standard.

The scope of work for the study included the preparation of a plan for a regional water supply system using surface water, an environmental impact assessment of the proposals, a plan for institutional development, proposals for implementation, a financial analysis of the proposed scheme and an overall evaluation and recommendations.

This report (North Mankwe: Volume 2) was compiled as part of Phase 2 (Feasibility Study) and contains the main text and annex. The JICA Study comprising Phases 2 and 3 has provided a total of seven volumes including this report comprising Executive Summary (Vol. 1), Klipvoor FS (Vol.3), Moretele 2 FS (Vol.4), Boundary Issues (Vol.5), and Pilot Projects (Vol.6) and Data Book (Vol.7).

2. PROJECT AREA

2.1 Water Source

Within the FS Area the existing major source of water for domestic use is groundwater. Where groundwater is inadequate in terms of quality, quantity or both, people buy water from water vendors, of which source is mostly untreated surface water and partly groundwater.

An extensive study of water resources conducted during the Phase 1 Master Plan concluded that for the reasons stated below groundwater, although it is a quick and economical way of providing water, will not be a sustainable solution in the long term, and that as far as domestic water use is concerned the demand should be met from a surface water supply scheme.

In this Feasibility Study which follows the Master Plan recommendation, the viability of a regional surface water supply plan was therefore studied in depth.

(1) Water Quality of Groundwater

The quality of groundwater is generally unsatisfactory in this FS Area and in many cases unfit for human consumption. Localised areas of high fluoride concentrations, nitrate concentrations and instances of faecal contamination are common. Currently chlorination of groundwater is not practised so the chance of an epidemic of waterborne disease is high.

Many of the existing boreholes are relatively shallow and so are quite susceptible to human contamination resulting from the prevailing poor sanitation environment.

At present, groundwater quality is not being monitored on a regular basis. In the absence of chlorination and with localised areas of high nitrate and fluoride concentrations (both hazardous to human health), the situation appears to be very unsafe.

(2) Yield and Potentiality of Groundwater

The yield is generally poor for groundwater in the FS Area. Accessibility (the probability of yielding more than 0.1 l/s) is greater than 40% while exploitability (the probability of a borehole yielding more than 2.0 l/s) is as low as 10 to 30%.

Because of the relatively high accessibility and low exploitability, many boreholes with a small yield have been constructed. If the situation continues and the number of boreholes increases further in the future, it will constitute an enormous workload for the institutions who must undertake the management and maintenance of the boreholes, including regular monitoring of water quality.

(3) Community Preference

On many occasions, FS communities expressed a feeling of disparity with communities located closer to urban areas. Virtually all the adjoining communities around the Pilanesburg already have, or will soon have, access to surface water from Vaalkop WTW.

Despite having little or no technical knowledge, people in the FS communities realise that a

surface water supply is more stable and is safer in terms of water quality than a borehole supply and this creates the sense of disparity.

(4) Availability of Surface Water

The Phase I water balance study indicated, and DWAF subsequently confirmed, that sufficient water is available for the Vaalkop - Roodekoppies - Hartbeespoort system to meet all primary demands in this region up to the year 2015. However, in the short to medium term (2002 to 2005), there is a projected shortfall in the amount of water available for irrigation until the increase in return flows overtakes the increasing demand.

2.2 Institutional Situation

2.2.1 First and Second Tiers

The key first and second tier stakeholders in the water sector within the Area are Magalies Water (MW) and the Department of Water Affairs and Forestry (DWAF). The North Mankwe FS Area is similar to the Klipvoor Area except that it is closer to the traditional areas of operation of MW. MW has retained the former Rustenburg Region of NWWA as a separate business unit based in Mogwase and operates a regional water supply scheme from Vaalkop Dam which supplies Thabazimbi, Sun City, Saulspoort and southwest to Rustenburg where the head office of MW is located. The Vaalkop scheme comprises the Western Business Unit of MW.

2.2.2 Third Tier

The third tier comprises a complex variety of statutory and non-statutory bodies, which are diverse in terms of size, complexity, funding and purpose. In many cases the organizations making up the third tier and their respective roles vary from community to community.

Mankwe District within which the North Mankwe FS Area lies, fall under the jurisdiction of Rustenburg District Council that lacks capacity but has developed some planning capacity through a system of zonal engineers and councilors.

2.3 Socio Economic Conditions

The North Mankwe Area comprises 24 communities and has an estimated 9,436 households or a population of 60,390 based on 6.4 persons per household.

The Area is rural and contains no significant industry. Many of the residents commute to jobs in urban centres while others rely on pensions or income remitted from urban areas. The main development axis runs north-south through the Area from Rustenberg to Thabazimbi.

The average monthly income is approximately R1,216 per household. On average residents pay water vendors R35.60 per month or if they obtain water from boreholes they pay R7.60 per month. The average willingness to pay for the RDP level of service was R8.30 per household per month however for yard connections, the figure per household was R29.60 per month.

Almost all of the households who answered the questionnaire survey expressed the view that water supply is a higher priority than sanitation. Women play a central role in the management (fetching and storing) of household water in three-quarters of households.

3. POPULATION, LEVEL OF SERVICE AND WATER DEMAND

3.1 Population

A comprehensive study on demographic and socio-economic conditions in the wider JICA Master Plan Area was conducted during 1996. The study envisaged that while growth will take place around Rustenburg with a growth axis extending up to Monakato - Mogwase - Northam - Thabazimbi, there will be no future growth in population in the 24 communities which comprise this FS Area, as the natural growth in the communities will be offset by migration of an approximately equal number of people to urban areas.

In February and March 1997, extensive surveys of these communities were conducted as part of this Feasibility Study, which included questionnaires regarding the present population and number of households. These surveys were based on interviews with leaders in each community supplemented where necessary by counting the number of houses. Comparison between information obtained from the surveys and 1/10,000 scale ortho-photos of the communities taken in 1989 reinforced the master plan assessment, in that virtually no increase

in the number of households in these communities was observed. For this reason, it is also assumed in this Feasibility Study that there will be no growth of population in the FS communities in the future.

The population and number of households estimated for each of the FS communities are presented in Table 3-1 of Chapter 3. The following table presents a summary of the estimate for the FS Area.

Number of Communities	24
Total Population	60,390
Number of Households	9,436
Average Number of Persons per Household	6.4

This Feasibility Study assumed that the proposed water supply plan will serve all the population enumerated in the table.

3.2 Level of Service

Generally communities express dissatisfaction with the RDP level of service and show a preference for supply through yard connections. In some areas, communities have rejected newly installed RDP schemes. Communities cite the following as the major reasons for their rejection of the RDP standpipe supply.

- A long cartage distance
- A uniform water charge per household being applied irrespective of the actual consumption rate of each household

Experience indicates that community acceptance of service level is the key to the success of any water supply project including achieving cost recovery. It is still questionable however whether or not communities can actually afford to pay for the level of service they expect. A decision regarding the appropriate service level can be made only after comparison of the following two parameters has been assessed.

- The level of water tariff which needs to be levied to recover the unsubsidized portion of both the capital cost and operation costs

- The level of affordability of communities

It has been a clear policy of the new South African Government that it will subsidize the full capital cost of providing the RDP level of service (25 lcd within 200 m), but that if communities want a higher level of service, they should pay any additional costs which are necessary to acquire such a service.

In the meantime, the following propositions have recently been adopted as Government policy for the planning and funding of RDP water supply schemes.

- Even for a water supply scheme based on the RDP level of service, certain components of the infrastructure, such as bulk supply and external reticulation pipelines, should from the outset be provided with a larger capacity which will facilitate the future upgrading of the service level. The capital cost for providing this extra capacity will also be fully subsidized by Government.
- The level of service to which this policy is applicable is for yard connections with a per-capita consumption rate of approximately 80 lcd on an annual average daily demand (AADD) basis.

Against the background mentioned above, this Feasibility Study developed the following two different levels of service with the intention of testing them against the affordability of the FS communities.

Service Level A : 100% of households in the community will be supplied through standpipes to the RDP level of service at an average per capita consumption rate of 30 lcd (AADD) including an allowance of approximately 15 % for leakage.

Service Level B : 90% of households in the community will be supplied through yard connections (85.6 lcd) and the remaining 10% through standpipes (30 lcd) in accordance with the RDP level of service, giving a weighted average per capita consumption rate of 80 lcd (AADD) including an allowance of approximately 15% for leakage.

Service Level A is presumed to be the case in which the communities can acquire the RDP minimum level of service but incur the least financial burden. In this case, communities will pay only for the O&M costs of the scheme once installed.

Service Level B is presumed to be the case in which the communities can acquire the level of service they want with the minimum financial burden on their part. Those households which remain on standpipes are those located around the periphery of the community. The extension of the reticulation to those households is not economically viable, as it will result in a significant increase in the per capita reticulation cost.

3.3 Water Demand

The survey conducted in February and March 1997 clearly indicated that the expectations of the FS communities is already higher than the RDP level of 25 lcd, and that the real questions are (1) whether water supply should, from the outset, be planned on the basis of the RDP standpipes or on the basis of yard connections; and (2) whether or not communities can actually afford to pay for the service which meets their expectations.

The average per capita water consumption rate of 25 lcd (85% of 30 lcd) assumed for standpipes is not likely to increase in the future, given the labour intensive nature of water cartage. Similarly it is unlikely that an average per capita consumption rate of 73 lcd (85% of 85.6 lcd) assumed for yard connection will increase significantly within the next decade or so. In terms of summer peak day demand, these consumption rates are 38 lcd (150% of 25 lcd) and 110 lcd (150% of 73 lcd) respectively assuming a peak day factor of 1.5.

For these reasons, future increases in the per capita water consumption rates were not considered in this Feasibility Study; instead water demand was estimated for each of the Service Levels A and B. The demands of each level are shown in Table 3-1 of Chapter 3. The table following presents a summary of the estimate for the FS Area..

Service Level and Water Demand	Service Level A	Service Level B
Total Annual Average Day Demand (kld)	1,812	4,834
Total Summer Peak Day Demand (kld)	2,718	7,251

In this Feasibility Study a regional surface water supply plan for each of these two service levels has been developed, costed and examined against the affordability of the FS communities.

4. INFRASTRUCTURE DESIGN

4.1 Study of Alternative Water Supply Plans

A study conducted during the Master Plan Study indicated that the only potentially viable source of surface water for FS communities is Vaalkop Dam which is operated as part of a system comprising Hartbeespoort Dam and Roodekopies Dam which receive large volumes of return flows from Pretoria and northern Johannesburg. For this reason a study of alternative water supply plans utilizing different water sources was not necessary for this FS Area.

This FS Area differs from the two other FS areas as there is extensive existing surface water supply infrastructure already in place in this region, most of which are operated by MW. This feasibility study has been concerned with extending the existing system into unserved or under served communities in the FS Area rather than providing a completely new system.

A detailed analysis was conducted to determine whether spare and unallocated capacity exists which could be utilised for the feasibility study. The results of this analysis were discussed with MW and refined accordingly. In essence, some components of the existing MW infrastructure was identified that can be utilized for this feasibility study.

Work is now in hand at MW to strengthen the current supply to the south of Vaalkop and to the west up to the Sun City and Saulspoort areas where water demands are approaching the limit of the existing infrastructure capacity. The work includes a 90 Mld extension of Vaalkop WTW, addition of a 25 Mld reservoir at La Patrie and construction of a new 350 mm bulk supply main from La Patrie to the Mabeskraal area. Discussion with MW confirmed that these planned expansions will be able to accommodate the estimated water demand for the FS communities.

With respect to the provision of retail supply infrastructure, many initiatives promoted by DWAF and MW are already underway for providing the RDP level of service (25 lcd within 200 m) in this FS Area. Most of these schemes are based on groundwater with standpipe reticulation.

Information regarding the status quo of these RDP initiatives for each community in the FS Area was collected from the respective zonal engineers. This feasibility study has been concerned with utilizing all the existing retail infrastructure and that for which there is fixed planning and which will soon be provided under RDP schemes. Such infrastructure, includes reservoirs and reticulation pipes but exclude boreholes, which it is proposed will be kept as an emergency source of supply or be used for stock-watering or for other non-domestic purposes.

The water supply plan for this FS Area was first developed on the basis of the Service Level B demand. The plan was then re-examined based on the Service Level A water demand, in which the water treatment works, pumping stations, reservoirs and reticulation system were planned or sized to meet the Service Level A water demand. This identified the cost required for the implementation of the same water supply scheme but on the basis of the RDP level of service, thus the difference in capital cost between the two different levels of service was calculated.

4.2 Proposed Water Supply Plan and Construction Cost

The water supply plan proposed for this FS Area is shown in Figure 4-1 of Chapter 4.

Table 4-1 of Chapter 4 shows a summary of the proposed infrastructure and the associated costs for Service Level B. The same data is presented for Service Level A in Table 4-2 of Chapter 4. Costs estimated for each service level are compared in Table 4-3 and summarised in the table following.

(Unit : R1,000)

Service Level	Construction Cost at 1997 Price
Service Level B	R68,426
Service Level A	R45,443
Difference (Service Level B - Service Level A)	R22,983

These costs are pure construction costs at 1997 prices to which various other costs and fees, such as P&G, contingencies, engineering fees, administration costs and VAT must be added to derive the actual project cost.

The cost for Service Level B includes a cost of approximately R 8.9 million for providing yard connections to 90% of households in all communities. This constitutes a large proportion (39%) of the difference between the two levels of service.

5. FINANCIAL ANALYSIS

5.1 Preliminary Analysis on Case A and Case B

On the basis of the facility planning, the following possible options were analysed and assessed

mainly from financial viewpoints: Case A: Implementation of the level A services (standpipe) only; and Case B: Implementation of the level B services (yard connections: 90% + standpipe: 10%) only

5.1.1 Affordability and Willingness to Pay (WTP)

According to the community survey, the average size of household in the North Mankwe F/S Area is 6.4 persons with an average monthly income of R1,216. 11% of households purchase water from private vendors paying R35.6/month, while the majority expend R7.6/month on borehole water. Irrespective of the amount of water consumed, their WTP is R29.6 and R8.3 per month for yard connections and the RDP level respectively. The WTP for the RDP level of service represents only 2.44% of household income, which is lower than the affordability figure of the World Bank (3% for water supply only).

5.1.2 Project Cost and Disbursement Schedule

The initial capital cost was derived from a cost model consisting of direct construction cost, provisional and general items (15%), engineering fees (10%), institutional development (2.5%), miscellaneous (2%), physical contingencies (15%), price contingency (10% compound rate) and VAT (14%). The estimated initial capital costs amount to R186.9 million and R285.8 million for Case A and Case B respectively. This can be broken down as follows.

(Unit : R1,000)

Capital Cost for Case A and B	Case A	Case B	Difference
1. Bulk Supply	90,888	102,388	11,500
2. Retail Supply			
- Reticulation	20,084	42,700	22,616
- Yard Connections	-	14,907	14,907
- Sub-total	20,084	57,607	37,523
Total Capital Cost	110,972	159,995	49,023

5.1.3 Operation and Maintenance Cost

To maintain the sustainability of the project, an operation and maintenance cost as well as an administrative cost must be duly estimated and disbursed both for the bulk and the retail supply systems. The cost items are raw water (R0.24/kl), electricity (R0.15/kl with real increase by

3% per annum), chemicals (R0.03/kl), salaries (R0.17/kl) and maintenance (R0.05/Kl) for the bulk supply, and bulk water purchases (variable), and maintenance and administration (variable) for the retail supply. The estimated operation and maintenance costs are as follows.

(Unit : R1,000)

Annual O&M for Case A and B	Case A	Case B
1. Bulk Supply	442.5	1,179.9
2. Retail Supply	243.0	513.0

5.1.4 Cash Flow Analysis and Tariff Setting

In order to find a realistic and sustainable water tariff, a simulation analysis has been conducted with several conditions and assumptions: (a) DWAF bears only the initial capital expenditure for the RDP minimum level of service (Case A); (b) average affordability is around 3% of income; (c) 100% tariff collection; and (d) 17% of long term loan interest. Water tariff which should cover operation and maintenance cost, reserve for replacement and Loan Repayment, was computed and compared with the affordability.

Set Tariff for Case A and B	Unit	Case A	Case B
1. Water Tariff			
- Bulk Water	R/Kl	0.90	1.30
- Retail Water	R/Kl	1.49	3.91
2. Monthly Tariff			
- Low Income Group	R/month	7.2	18.8
- Average Income Group	R/month	7.2	51.1
3. Monthly Income & Tariff Share/Tariff			
- Low Income Group	R/month	305(2.3%)	305(6.2%)
- Average Income Group	R/month	1,216(0.6%)	1,216(4.2%)

While Case A seems to be financially viable, community preference for this level of service is low resulting in a high risk of non-payment including illegal / unauthorised connections. On the contrary, the Case B level of service is well accepted by communities, however, a set tariff is far beyond their affordability.

5.2 Staged Development Approach

Based on the preliminary analysis on Case A and Case B as mentioned above, a staged development scenario (Case C) is recommended as a possible option that will realise the RDP

minimum level by year 2002 and allow subsequent upgrading to Service Level B. The Case C has two alternative options: Case C-1 and Case C-2 with and without a reserve fund arrangement during the service level A period. On the basis of a cash flow analysis, water tariff can be calculated as shown below:

Water Tariff for Case C-1, C-2	2002-2007	2008-2012	2013-2017	2018-2022	2023-2027
	R/HH	R/Kl	R/Kl	R/Kl	R/Kl
Case C-1	36.20	2.83	2.90	2.97	3.05
Case C-2	7.20	3.86	3.93	4.00	4.08

While the water tariff exceeds the affordability of low income group, especially during Stage 1 and aggregate water charge for the group in Case C-1 is a little bit higher than Case C-2, the financial burden for average income groups in Case C-1 is smaller than Case C-2. In addition, Case C-1 will be able to improve the credibility of service providers through the reserved fund arrangement during the service level A period. Thus, the Case C-1 is considered the most realistic option when proper measures will be taken for the low income group.

5.3 Proposed Option (Case C-1)

5.3.1 Project Cost and Allocation

The proposed option requires two sets of initial capital investment, firstly those cost to be invested for providing the infrastructure under the level A services and an institutional development; and secondly those for upgrading the infrastructure from the level A to the level B services and institutional development.

(Unit: R1,000)

Capital Cost for Case C	1st Stage (Level A)	2nd Stage (Upgrade)	Total	Executing Body
Bulk Supply	90,888	18,520	109,408	MW
Retail Supply	20,084	36,423	56,508	JV (MW + RDC)
Yard Connection	-	24,008	24,008	- ditto -
Total	110,972	78,951	189,923	
Remarks	1998 – 2002	2003 – 2007		

Note: At 1997 prices with price escalation of 10% p.a.

The necessary fund for the 1st stage amounting to R111 million must be shouldered by the 1st tier (DWAF Central Office), while those fund for the 2nd stage will be arranged both by the service provider and the beneficiaries. A part of the cost required for the 2nd stage should be collected from the beneficiaries as water tariff.

In order to maintain the project facilities on sustainable basis, an operation and maintenance cost (O & M cost) including administration cost will be required.

(Unit:R1,000)

Annual O&M Cost for Case C	Stage 1 (Level A)	Stage 2 (Level B)	Executing Body
Bulk Supply	446	1,230	MW
Retail Supply	243	513	JV (MW + RDC)
Total	689	1,743	
Remarks	2002 – 2007	2008 onward	

5.3.2 Water Tariff

During the 1st stage operation (Level A: 2002 – 2007), a flat rate of water tariff, R36.20 per month per household will be charged, of which 80 %, 14 % and 6 % are allocated to the reserve fund for upgrading, the bulk water tariff and the administration cost, respectively. After upgraded to the level B services, water tariff of R2.83-3.05 per Kl will be chargeable, which includes redemption of a part of the initial capital cost (upgrading cost) and O & M cost.

5.3.3 Issues on Water Tariff Setting

Since it is rather difficult to provide different service levels in a single community from technical viewpoint, the community, the service providers must pay due attention to the low income group, which includes: (a) cross-subsidisation within the community; (b) positive mobilisation of low income group for labour works during construction stage as well as O & M activities; (c) confirmation of responsibility of communities in terms of O & M of facilities and water charge collection; (d) preparation of specific accounting system for the reserve fund with proper periodic auditing and preparation of explanation document of the reserve fund; and (e) feedback of experience obtained from Pilot Project.

5.3.4 Funding Plan

(1) Viability of Stakeholders

The stakeholders who are responsible for providing community water supply are as follows.

First Tier	Second Tier	Third Tier
DWAF, North West	Magalies Water	Rustenburg DC

There is no question concerning the institutional and financial capacity of the first tier. MW as the second tier has a sound financial position. Although RDC has greater capacity, both in institutional and financial terms, than the other two district councils of EDC and HDC, the capacity is not sufficient for implementing the proposed project independently.

(2) Funding Source

DWAF is responsible for allocating fund for RDP projects, and has allocated its budget for RDP programmes 1, 2, 3 and 4. Under the RDP 4, total of R639 million has been allocated for new water projects during four years, in which KwaNdebel (Project No. 4101) receives the highest budget, R28.9 million. Taking into account the required initial cost for the Level A services, amounting to R111 million in North Mankwe, it is prerequisite for DWAF to secure external loan fund such as international financing agencies and/or bi-lateral source.

It is planned in the proposed and possible option "Case C-1" that the portion of the tariff over and above the O&M component be transferred to a reserve fund and invested with reasonable and safe return on investment over the five year period for operating at Service Level A. It is also hoped that the credibility of the Services Provider will be greatly improved after the five-year period.

The possibilities for obtaining funding in the form of soft loans or grants are low due to the current policy of DWAF of not obtaining loans, grants or guaranteeing loans on behalf of local authorities. This limits the funding sources to primarily DBSA, Commercial Banks (including special infrastructure and developments funds), and Merchant Banks (e.g. public finance departments) who would lend at commercial interest rates.

6. INSTITUTIONAL DEVELOPMENT

6.1 Current Institutional Environment

6.1.1 Rustenberg District Council

As indicated in the description of the project area, the Mankwe Feasibility Study Area comprises four discrete groups of communities lying within the Mankwe District of North West Province, and falls under the jurisdiction of Rustenburg DC.

RDC is a small organisation having 48 post in total with only a small number of posts directly related to the service delivery process. A Technical Planning and Service Delivery Department which is intended to provide for the need for RDC to become involved in facilitating service delivery has been created. It is significant to note that none of the posts in this department have yet been filled.

RDC has however created significant planning capacity by dividing the area of its jurisdiction into planning zones, allocating a councillor to each zone (Zonal Councillor) and appointing a Zonal Engineer (a firm of consulting engineers). Together with the councillor, these engineers are responsible for developing an integrated service delivery program.

An Area Planning Forum has been set up which includes the North Mankwe Feasibility Study Area.

6.1.2 Magalies Water

The North Mankwe FS Area is in relatively close proximity to the main centre of operations of MW. The Area falls in the Western Bulk Supply Region of MW and the closest facilities where staff resources are concentrated are the water treatment works at Vaalkop. The regional capacity of MW which is of relevance to the Feasibility Study Area consists of some 62 people in bulk supply and 116 in community services

MW has recently revised its organizational structure to cater for assistance / support for the process of community service i.e. retail as well as bulk water supply. The absorption into this function of staff in the area who were formerly employed by NWWA has changed the whole profile of the MW organization which is now a relatively large organisation with some 400 employees. As a result of the NWWA staff secondment some 60% of MW staff are now engaged in community water services.

The whole of the former Rustenberg Region of NWWA has been absorbed by MW and has its headquarters at Mogwase. A major function of this unit is the maintenance of a large number of boreholes, pumps and pipelines.

6.1.3 Local Authorities

The North Mankwe FS Area comprises 24 dispersed communities which are largely rural. No formal local authorities are yet in place i.e. existing structures are all transitional organisations and have little or no formal institutional capacity

RDC has provided some support for the planning and development process by allocating Zonal Councillors to specific communities / areas as discussed above.

6.1.4 DWAF

The regional office of DWAF is located in Mmabatho which is some distance from the North Mankwe Area. It should not therefore be expected that any significant support can be provided in the Feasibility Study Area. DWAF organisational development officers working in the region do however have a good knowledge of local communities and this can be tapped for planning and institutional development purposes.

6.2 Requirements of the Water Services Bill (1997)

The Water Services Bill was published for comment in May 1997 and will have a significant impact on the institutional structures in the water supply sector. For the purposes of this study its main provisions have been used as the basis for institutional planning.

The bill introduces the concept of a Water Services Authority which has responsibility ensure that the right of all people to access to water services is met and must take reasonable measures to realise this right and plan to achieve it. A Water Services Authority is essentially a municipality. In terms of the bill these institutions have a legal obligation to meet service requirements.

The main duties of Water Services Authorities include preparation of a Water Services Development Plan for their area of jurisdiction. Key aspects of this plan are identification of the Water Services Providers, proposed infrastructure, water sources, capital outlays and operating costs.

A Water Services Provider is also a concept introduced by the Bill. This entity carries out the function of actually providing the service as distinct from the legal obligation to do so which resides with the Water Services Authority. The obligation to provide the service cannot be delegated. The actual provision of the service can be delegated by means of a contractual relationship. The draft Bill clearly specifies the terms and conditions for contracting out the Services Provider function.

6.3 Institutional Framework Created by the Bill

Institutional options need to be built around the possibilities provided for in the proposed Water Services Bill. In summary there are four distinct institutional structures which could be involved in the service delivery process:

- (1) Water boards providing bulk water supply.
- (2) Water Services Authorities that must give effect to the right of all people to basic water and sanitation services.
- (3) Water Services Authorities acting as Water Services Providers and delivering services directly to consumers.
- (4) Water Services Providers that are third party institutions which the Authority contracts to deliver services on its behalf.

6.4 Most Feasible Solution

6.4.1 Bulk Supply

MW will be the bulk supplier as described.

6.4.2 Water Services Provider (Area)

An RDC-MW Joint Venture and Partnership which is in the process of discussion could become the Services Provider in the FS Area as a whole. This role will require the JV to provide water services directly to communities or to intermediaries which may be created.

The advantages of this JV functioning as Services Provider are that it can be put in place relatively quickly and therefore can address the need for urgency

6.4.3 Community Level Structures (Local Services Provider)

It has become clear from the findings of the pilot projects that the sustainable supply of water to communities cannot be achieved unless some institutional capacity is in place at community level. Thus while it has been strongly noted that there is no capacity at local level, the development of some capacity is essential to meeting service needs and must be an integral part of the proposed solution.

6.4.4 Intermediary Level Structures (Service Co-operatives)

There are twenty four communities in the FS Area with which the JV will need to interact in the process of service delivery. This presents a major challenge and given capacity limitations may lead to some communities being less well served than others. It is proposed that introducing an intermediary level structure may be important in co-ordinating service delivery. The form of such

intermediary structures may range from simple co-ordinating committees, through formal constituted co-operatives (partnerships), to registered companies. Furthermore the need for such intermediaries will vary from one supply block to another and the form may change over time.

6.5 Staged Institutional Development Plan

Given the lack of capacity described in general it must be recognised that the components of the proposed institutional solution described above are not in place. An institutional development plan to create the necessary structures, resource them and develop the people is therefore necessary.

Staged institutional development plan was proposed taking into account current institutions of water sector, water supply infrastructure development schedule and progress of capacity building. The followings are summaries of action plans.

6.5.1 Stage 1 Development : 1998 - 2002

- Step 1 : Preparatory Work

The main purpose of this step of the work is to get the policy decisions made necessary for project implementation to proceed, put in place the necessary institutional infrastructure and commence the process of engaging communities in planning. Particularly, authorisation of WSA and appointment of WSP are important components of the activities.

- Step 2 : Initiation of Construction of Water Supply Infrastructure

The key focus during this step is to achieve the institutional development including well establishment of BWSCs and LWCs and functioning necessary for the implementation of the basic level of service.

- Step 3 : Commissioning and Trial Operation of Initial Projects

This step is concerned with the operationalising the initial basic level of service infrastructure which has been constructed and developing the necessary operation and maintenance strategies and plans necessary to ensure sustainability.

6.5.2 Stage 2 Development : 2003 - 2007

- Step 1 : Preparatory Work and Implementation of Process for higher Level of Service

Local structures developed during stage 1 will need to be developed to play a full role in project implementation, commissioning and operation and maintenance, and including in the development of the process of planning and providing for upgrading of service level.

- Step 2 : Implementation of Higher Level of Service Projects

Major activities of this period are to start construction of infrastructures to be upgraded and strengthening BWSCs and LWCs as well as operation of reserve funds and disbursement of credit loans for construction contract.

- Step 3 : Commissioning and Trial Operation of Higher Service Level projects

Intermediary structures necessary will need transformation to cater for Third Stage needs by rationalisation of BWSCs and finally these institutions shall be reformed to Area Water Service Cooperatives(AWSC) which joints with JV and BWSCs .

6.5.3 Stage 3 Development : 2008 - 2012

Roles and responsibilities will change over time and realignment will necessarily need to take place. To illustrate this it is noted that in the Second Stage the JV structures fall away with the BWSCs amalgamating to fulfilling this role. In the long term as capacity is developed the local structures will take full responsibility for service provision themselves with no intermediary structures.

7. IMPLEMENTATION ARRANGEMENT

7.1 Overall Implementation Schedule

The proposed projects will be implemented in three stages starting at year 1998 and ending 2012, and major activities of each stages are summarised as follows;

- Stage 1 (1998 to 2002) : Preparatory works and construction of water supply infrastructures as service level A, and establishment of WSP institutions
- Stage 2 (2003 to 2007) : Commissioning and operation of the level A service, implementation of upgrading construction works, and strengthening of institution of BWSCs and LWCs

- Stage 3 (2008 to 2012) : Commissioning and full operation of service level B by the restructured AWSC.

7.2 Implementation Schedule for Service Level A

Overall implementation of stage 1 will require a 5 year period. The first two years will be spent for arranging the loan and finalising the detailed design and contract documents while the remaining three years will be the construction of service level A infrastructures and establishment of local institutions of the projects.

7.3 Implementation Schedule for Upgrading Project

The schedules of Stage 2 will continue immediately after completion of stage 1 project and confirmation of community consensus for upgrading project implementation. The work process and timeframes are similar to stage 1 as indicated in the main text.

8. ENVIRONMENTAL ASSESSMENT

8.1 Findings of the Study

No fatal flaws were identified during the environmental impact assessment that would prevent the scheme from going ahead. The environmental impact of the proposed development must be carefully managed both during and post construction and proper mitigation measures put in place to minimise potential negative impacts.

8.2 Important Environmental Impacts

The important environmental impacts for the Project were discussed and incorporated in the ROIP 2 Report. The following is a summary of the negative and positive impacts of the proposed development on the environment.

8.2.1 Negative impacts

The following is a list of negative impacts that could arise due to the construction of the pipelines and related surface works. This is a comprehensive list and many of these impacts are not considered to be severe.

- (1) The construction of the pipelines and the related infrastructure could:
- cause disturbance within the existing road reserves or erosion on the exposed slopes;
 - have a negative impact on the aesthetic value of an area and accelerate the invasion by exotic terrestrial plants;
 - noise and water pollution;
 - social disruption.

All these impacts are of a temporary nature during construction except for the invasion of exotic terrestrial plants.

- (2) The increased availability of drinking water in the North Mankwe Area may have an impact on the sanitation of the area. It is expected that the area could be negatively impacted by the increased availability of water. It is expected that the waste and excess water will be discarded randomly. This may also lead to an increase in the potential for pollution of surface water in the area. The impact would be greater if the Case B water supply option is pursued.
- (3) At present very little information is available on the occurrence of archaeological and historical sites and a Phase 1 survey is proposed before any construction is started.

In summary, the major negative impacts include the disturbance of an already highly disturbed area of low ecological value, coupled with a low conservation status and aesthetic value. Another negative impact may be on the areas where wastewater is discarded.

8.2.2 Positive Impacts

The major positive impacts are related to the availability of a reliable and safe water supply to an increased number of people in the North Mankwe Area. Construction activities could cause temporary economic upliftment in the immediate vicinity.

8.3 Recommendations

The issues to be determined in the detail design phase of the scheme are summarised as follows:

- (1) Social impacts
- The social and economic impacts associated with construction disturbance on farming activities along the pipeline routes.

- This investigation should include meetings with the local communities to determine the preferences of the communities to any options or alternative developments, especially in the siting of the regional and service reservoirs.
- The lack of adequate sanitation facilities needs to be investigated.

(2) Ecological impacts

- A Phase 1 archaeological survey of the proposed pipeline routes and especially the reservoir sites is recommended.
- General rehabilitation measures.
- Identify birds and their nesting sites where appropriate.
- Liaise with all the interested and affected parties.
- Compile an Environmental Management Plan for the construction phase and draw up appropriate rehabilitation guidelines to mitigate the disturbances and aesthetic impacts caused by the construction of the pipelines and associated infrastructure.
- Alert the contractor and labourers to the ecological and social impacts associated with the construction activities.
- Landscaping specification for the river and canal crossings as well as the permanent access roads.

9. PROJECT EVALUATION AND RISK ANALYSIS

9.1 Engineering Aspects

Due to the limitations of groundwater in the FS Area both in terms of quality and quantity, the proposed water supply system has been planned and designed on the basis of utilising surface water. In addition, the planning and design of facilities has paid due consideration to the possible future upgrading of the system while avoiding excessive cost over-runs as well as maximising the use of locally applicable technology and available resources.

In the Project Area, several RDP projects are being planned and implemented by MW and DWAF, and due cognisance, by way of necessary adjustment to cost estimates and coordination, has been taken of these schemes in the FS project formulation.

9.2 Institutional Aspects

Under the proposed Water Services Bill, MW shall be the Services Provider of bulk water, and RDC shall be the Services Authority for retail water supply. In view of the institutional capacity of RDC, a Services Provider for retail water supply should be considered during the project implementation stage based on the staged development plans incorporated in the chapter 6 of this report.

From a sustainability viewpoint, beneficiary communities should be involved in the project from the project design stage and throughout the project operation stage. In this connection, the lessons and experiences obtained from the pilot project implementation should be fully reflected.

9.3 Financial Aspects

The proposed option (staged development scenario: Case C) is shown to be financially viable having a positive net present value of R1.0 million at a discount rate of 8% (equivalent to the real rate of interest) and Financial Internal Rate of Return (FIRR) of 9.2%. However, the option is very sensitive to the tariff collection rate; if the rate decreases by only 10% and 30%, the FIRR becomes very marginal with respect to the real rate of interest and close to 0%, respectively. In addition, the option requires the deposit of beneficiaries contributions prior to the capital investment for upgrading the service level, therefore, mutual consent from the communities as well as the beneficiaries and proper management of the reserved fund will be important issues.

9.4 Economic Aspects

The planned options except Case A are evaluated from the national economic viewpoint of South Africa by applying both economic cost and benefit that are valued at real cost to the national economy. Similar to the financial aspects, both NPV and EIRR are measured. The economic benefit is measured as the saving of labour for water cartage, estimated at R3.6 per day per household. Case C has a negative NPV at 8% and EIRR of 5.5%. The reason is that Case C will include a 5-year period of RDP minimum service level during which no economic benefit is expected.

9.5 Social Aspects

Usually, a water supply project is examined from the supply side approach in its tariff setting which only focuses on average income groups within communities. In this project, tariff setting has been carefully carried out taking into consideration low income groups who have an average monthly income of R305, equivalent to about 25% of average income.

The provision of Service Level B (90% yard connections) would be one solution to overcome illegal and/or unauthorised connection, because the tariff would be imposed individually and be based on the amount of water consumed. In this connection, Case B will provide a much fairer supply system to communities than the RDP minimum level where a flat tariff structure is applied.

9.6 Environmental Aspects

The environmental impact assessment (ROIP2), indicated that there are no serious environmental impacts associated with implementation of the project.

10. CONCLUSIONS AND RECOMMENDATION

10.1 Conclusions

Since groundwater was found not to be a sustainable alternative source to meet the basic requirements of community water supply, the conclusion of the Study was to supply water to communities using a surface water system, which is rather costly but will be more reliable and sustainable, taking into consideration the socio-economic situation in the FS Area. The proposed infrastructure plan has been made on the basis of two levels of services; Level A covers 100% of beneficiaries with the RDP minimum level as Case A, and Level B covers 10% and 90% of beneficiaries with the RDP level, and with the higher service level of yard connections, respectively as Case B.

The project planning and design had taken into consideration the DWAF policy that allows spare capacity to be provided to meet future demand growth and upgrading of service level, especially for main pipelines and other basic facilities so as to avoid excessive cost when demand increases and upgrading becomes necessary. Currently, MW and DWAF are promoting RDP projects in the North Mankwe Area, and the necessary adjustment and coordination with such RDP projects has been taken into consideration in the project formulation.

From an integrated engineering, institutional, financial and socio-economic viewpoint, it would appear that neither simply implementing Case A nor Case B would be the best alternative considering the viability and sustainability of the project. To this end, it is proposed that a staged development approach, "Case C", be introduced that will start the project with Case A in the early years and then upgrade the system towards Case B. Under Case C the tariff during the first five-year period will not only cover the O&M cost but will also allow a reserve fund to be established for future upgrading of the service level. It is anticipated that the accumulation of the reserve fund will greatly improve the financial position of the Services Provider, by reducing the loan required from R25.7 million to R12.7 million at 1997 constant price.

10.2 Recommendations

In order to realise the proposed North Mankwe Water Supply Project on a sustainable basis, the project should be promoted with the following recommendations.

10.2.1 Technical Issues

Since the proposed bulk supply facilities under this project will be utilising the same facilities that will be constructed by MW under current fixed planning, it is necessary to adjust and coordinate the timing of implementation of both projects.

In implementing this proposed project, it is necessary to adjust and coordinate the project components to take into account other RDP funded projects both already implemented and under planning, which fall within the surrounding Area.

10.2.2 Institutional Issues

Full co-ordination, mutual understanding and communication among the role players over all three tiers shall be secured concerning their respective roles and responsibilities.

In terms of institutional reinforcement and/or strengthening:

- Full technical support of the second tier is essential
- Efficient utilisation of the private sector, especially consultants, for capacity building within beneficiary communities, for which the lessons and experiences obtained from the pilot project implementation shall be fully reflected.

10.2.3 Financial Issues

The first tier (DWAF) shall secure the initial capital cost of R76.8 million which covers Service Level A (RDP minimum level).

The second tier (MW) shall secure the initial capital cost for upgrading the system to Level B, amounting to R8.1 million.

The third tier or a proposed Services Provider for retail water shall secure R25.7 million for the capital cost of upgrading to Level B.

Beneficiary communities shall accept the set tariff which will include for a contribution to a reserve fund (total of R13.0 million including generated interest) for future upgrading even during the 5 year period at Service Level A.

All costs are expressed at 1997 constant prices.

10.2.4 Social Issues

As experienced in the pilot project implementation, positive participation of women in the planning and design of the project must be assured.

Within communities, due attention should be paid to low-income groups.

Beneficiary communities should be motivated to recognise that the water supply facilities are their property by contributing to payment for a reserve fund for upgrading the service level.

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ANNEX

- A: Engineering
- B: Environmental
- C: Financial and Economic

ABBREVIATIONS AND TERMINOLOGY

The following abbreviations are used in this report:

AADD	Annual Average Daily Demand
ANC	African National Congress
APF	Area Planning Forum
AWSC	Area Water Service Cooperative
BOTT	Build, Operate, Train, and Transfer
BWSC	Block Water Service Cooperative
CAPLEX	Capacity Expenditure
CEO	Chief Executive Officer
CIP	Capital Investment Plan
CRDC	Central Reconstructions Development Committee
CSS	Central Statistics Service
CWSS	Community Water Supply and Sanitation
DAF	Dissolved Air Flotation
DANDIA	Danish International Development Agency
DBSA	Development Bank of South Africa
DC	District Council
DCC	Direct Construction Cost
DCF	Discounted Cash Flow
DFA	Development Facilitation Act
DFID	Department for International Development (UK)(formerly British ODA)
DWAF	Department of Water Affairs and Forestry
EDC	Eastern District Council
EIRR	Economic Internal Rate of Return
ESA	Expanded Supply Area of Magalies Water Board as gazetted in April 1996
ESKOM	Electricity Supply Commission
EVN	EVN Consulting Engineers (Pty) Ltd
FIRR	Financial Internal Rate of Return
FS	Feasibility Study
FVDF	Five Villages Development Forum
GIS	Geological Information System
HW	Highveld Water Board
HWSA	Highveld Water and Sanitation Association
IFR	Instream Flow Requirements
IRR	Internal Rate of Return
IMT	Interim Management Team
ISD	Institutional and Social Development Department

JV	Joint Venture
JICA	Japan International Cooperation Agency (the official agency responsible for the implementation of the technical cooperation programmes of the government of Japan)
LDO	Labour Desk Officer
LPSC	Local Project Steering Committee
LRDC	Local Reconstruction and Development Committee (Local RDP Committee)
LWC	Local Water Committee
M&E	Monitoring and Evaluation
MANCO	Management Committee
MEC	Member of Executive Committee
MP	Management Plan
MW	Magalies Water Board
NGOs	Non-Governmental Organizations
NP	Northern Province
NPV	Net present Value
NWP	North West Province
NWWA	North West Water Supply Authority
O&M	Operation and Maintenance
ODA	Overseas Development Assistance
ODO	Organisation Development Officer
OECF	Overseas Economic Cooperation Fund of Japan
P&G	Provisional and General
PEF	Project Execution Forum
PEG	Project Execution Group
PLP	Presidential Lead Project
PMC	Project Management Committee
PSC	Project Steering Committee
PWV	Pretoria Witwatersrand Vereeniging triangle (geographical area)
RDC	Rustenburg District Council
RDP	Reconstruction and Development Program
RF	Representative Forum
ROIP	Relevant Environmental Impact Prognosis
RPM	Rustenburg Platinum Mine
RR	Regional Reservoir
RSA	Republic of South Africa
RSC	Regional Service Council (regional bodies established to facilitate and coordinate service provision across local boundaries - now replaced by Regional and District Councils)
RW	Rand Water
S/W	Scope of Works
SAMWU	South African Municipal Workers Union

SANCO	South African National Civic Organization
SPDD	Summer Peak Daily Demand
SR	Service Reservoir
STW	Sewage Treatment Work
SWET	Sanitation and Water Education Training Programme
TA	Tribal Authority
TBVC	Transkei; Bophuthatswana, Venda, Ciskei (former "independant" homelands)
TDS	Total Dissolved Salts
THM	Trihalomethanes
TLC	Transitional Local Council
TMC	Transitional Metropolitan Council
TOR	Terms of Reference
TRC	Transitional Rural Council
TT	Task Team
VAT	Value-added Tax
VIP	Ventilated Improved Pit Latrine
WATSAN	Water and Sanitation Management Committee
WP	White Paper
WRYM	Water Resources Yield Model
WSA	Water Service Authority
WSP	Water Service Provider
WTP	Willingness to Pay
WTW	Water Treatment Works

UNITS

ha	Hectare
kg/c/year	Kilograms per capita per year
kl	Kilolitre
kld	Kilolitres per day
km	Kilometre
l/c/yr	Litres per capita per year
lcd	Litres per capita per day
m³/c/yr	Cubic metres per capita per year
mcm	Million cubic metres
mcm/a	Million cubic metres per annum
mg/l	Milligrams per litres
Mld	Megalitre per day
R	Rand

CHAPTER 1

INTRODUCTION

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CHAPTER 1 INTRODUCTION

1.1 Background of the Study

1.1.1 Overall Framework of the Water Sector

(1) Historical Background

Historically the water sector in South Africa has been administered within the framework of The Water Act (Act 54 of 1956) which established centralised control over public water resources in South Africa and made some attempt to accommodate the expanding urban and industrial economy. The Act however still primarily served the interests of the agricultural sector. Homelands had their own water legislation that covered the areas under their jurisdiction.

(2) Transition

Since the transformation of South Africa with the election of a democratic government and the re-incorporation of the former homelands, a process of transition has commenced in the water sector. The first step in this process was the passing of the Water Laws Rationalisation and Amendment Act (Act 32 of 1994). While a major purpose of the act was to rationalise laws in force in the former homelands it also provided the Minister of Water Affairs and Forestry with the authority to provide water supply and sanitation services. This changed the emphasis in the public sector to the provision of basic services to the majority of the population who had not had these services in the past.

(3) Future Vision

The democratically elected government in South Africa has as its vision the total transformation of many aspects of society. The supply of basic services to those people who have been deprived of these services is central to this vision. To achieve this a number of strategies and programmes have been developed. Those relevant to the water sector are:

(a) The Reconstruction and Development Programme (RDP).

(b) White Paper on Water Supply and Sanitation Policy

(c) Water Law Review Programme

(d) The Water Services Act, 1997

Each of these four key initiatives is discussed in further detail in the paragraphs that follow.

1.1.2 Reconstruction and Development Programme (RDP)

(1) Background

Transformation is a key objective of the democratic Government of South Africa. While there are many aspects of this, the Reconstruction and Development Program (RDP) which is aimed at social and economic development is the central program. It is an integrated and comprehensive initiative, which is based on an extensive process of consultation and joint policy formulation.

A National Growth and Development Strategy has been formulated which sets out the objectives, priorities and strategies required to accelerate growth/development so as to reduce poverty and increase employment. This strategy provides a guiding framework for the RDP and facilitates making strategic choices and trade-offs during implementation of the RDP.

(2) Principles of the RDP

The RDP has as its foundation six principles, which apply to the overall programme and to RDP projects.

- (a) It must be an integrated and sustainable programme.
- (b) The programme must become a people-driven process.
- (c) The program and process must be closely bound to creating peace and Security for all.
- (d) As peace and security are established it will be possible to embark upon nation building.
- (e) Nation building is an integral part of reconstruction and development.

(f) The preceding five principles all depend upon thorough and ongoing democratisation.

(3) Programs of the RDP

To achieve its aims the RDP was designed around five sub programs: meeting basic needs, developing human resources, building the economy, democratising the state and society, and implementing the RDP itself i.e. projects in various sectors.

(4) Implementation Roles

All levels of government have a role to play in implementing the RDP: Central Government sets the broad objectives and programmes; provincial governments develop the strategies and programmes for their own provinces; and local authorities are the key institutions for delivering basic services, extending local control and managing local economic development. Obviously the role of local authorities is closely integrated with the activities of communities they serve.

(5) DWAF RDP BOTT Programme

In order to accelerate implementation of RDP water projects, DWAF has enlisted the support of the private sector in a build, operate, train and transfer programme, which is being managed at a provincial level.

1.1.3 White Paper on Water Supply and Sanitation

(1) Purpose

The White Paper was published in November 1994 as a policy document with the aim of clearly setting out the position and strategies to be followed by the Department of Water Affairs and Forestry (DWAF) and other institutions involved in water supply. It covers the historical background; explains the development approach which has guided policy formulation; puts forward basic policy principles; outlines the institutional framework for water supply and sanitation services; provides standards and guidelines for basic service delivery; sets out policy for financing of service delivery; outlines some immediate initiatives being taken and provides supplementary briefing information on important related topics.

(2) Principles

The White Paper outlines a number of principles to guide the formulation of policy and strategy in the supply of water and sanitation services. These are:

- (a) Development should be demand driven and community based.**
- (b) Basic services are a human right.**
- (c) The philosophy of "some for all" rather than "all for some".**
- (d) Equitable regional allocation of development resources.**
- (e) Water has an economic value.**
- (f) The user of the service must pay for it.**
- (g) Integrated development and environmental integrity.**

To give effect to (c) above a minimum standard has been set for water supply in the country, which is referred to as the RDP minimum. This states that all persons shall have access to 25 litres of clean and safe water per day within 200 m of their household. The Government will meet the capital cost of providing this RDP level of service but consumers must pay operation and maintenance costs.

(3) Institutional Development

The White Paper also provides some guidelines for institutional reform in the water sector. This is particularly important because of the government's emphasis on service delivery and obviously this requires institutional capacity. In terms of the White Paper there are phased goals:

- (a) In the short term:**

To maintain service delivery whilst rationalising DWAF and transforming and democratising the second tier (i.e. Water Boards)

(b) In the medium term:

To support institutional development at the third tier level (i.e. local level) and to provide financial and technical assistance for water supply and sanitation services. The restructured DWAF (especially at provincial level) and second tier institutions will work towards this goal together with the private and NGO sectors.

(c) In the long term:

To ensure that the provision of services to customers is the function of local government supported by provincial government. The second tier will provide bulk and wastewater disposal services, and DWAF will manage water resources and monitor and regulate policy implementation.

1.1.4 Sanitation Policy

The White Paper on Water Supply and Sanitation dealt at a high level with policy and strategy regarding sanitation. The need for more detailed inputs in this area has subsequently been addressed in the Draft White Paper entitled national Sanitation Policy issued in June 1996.

1.1.5 Water Law Review

(1) Background

As indicated there has only been a rationalisation of legislation since the democratically elected government came to power in 1994 (Water Laws Rationalisation and Amendment Act) (Act 32 of 1992). A major review of legislation to transform the water sector in accordance with the ideals of the RDP and White Paper is therefore necessary. To this end the Minister appointed a special Water Law Review Panel in June 1995 to develop a set of policy principles on which a new act could be based. The brief has been to make the new law simple, equitable, environmentally integrated and sustainable, economically viable and conducive to equitable economic growth, non-bureaucratic, and capable of simple and easy administration.

(2) Progress

The Panel has completed its work and reported (Fundamental Principles and Objectives of a New Water Law in South Africa). Nine fundamental categories were developed. These were:

- (a) Hydrological cycle.**
- (b) Aquatic ecosystem.**
- (c) Legal status of water.**
- (d) Demand apportionment and usage.**
- (e) Water quality management.**
- (f) Value of water.**
- (g) Existing rights to the use of water.**
- (h) Management, administration and enforcement.**
- (i) Water supply and sanitation services.**

There are a number of areas identified which are not included in the above and need further investigation. It is noted that one of these is institutional and administrative structures.

The law review process was taken forward by a Steering Committee and a major step in this process was a Water Law Review Conference. A final set of principles were embodied in the draft Water Services Act, 1997.

1.1.6 Water Services Act

(1) Background

The draft Water Services Act, 1997 was published in the Government Gazette dated 23 May 1997 and interested parties were requested to submit comments within 30 days. A

large number of comments were received from many of the stakeholders which are currently being reviewed in order to finalise the bill to put it before parliament.

(2) Provisions

The provisions of the Act include the following:

- (a) to provide for the right of access to basic water supply and basic sanitation
- (b) to provide for the setting of national standards and norms and standards for tariffs
- (c) to provide for water services development plans
- (d) to provide a regulatory framework for water services institutions and intermediaries
- (e) to provide for the establishment and de-establishment of water boards and water services committees and their powers and duties
- (f) to provide for the monitoring of water services and intervention by the Minister or by the relevant Province
- (g) to provide for financial assistance to water services institutions
- (h) to equip the Minister with certain powers
- (i) to provide for the gathering of information in a national information system and the distribution of that information
- (j) to repeal certain laws

(3) Role of Local Government

National water policy has consistently emphasised the responsibility of local government in the provision of water services. The Water Services Bill has made it very clear that local government (as the service authority) is accountable for the provision of local water services. Local government may delegate the role of Services Provider to other bodies, but the authority function cannot be transferred.

Against this background, it is clear that capable and effective local government is critical to the implementation of national water policy. This imperative is reflected in

the attention given to local government support strategies by DWAF (at national and regional levels), by other government departments, and by agencies such as Water Boards.

1.1.7 Quantitative Overview of the Water Supply Scenario

The preceding paragraphs describe the overall framework of change in which the JICA study is taking place. To more fully illustrate the necessity for change the following statistics illustrate the historical imbalances and lack of service provision, which the changes seek to address. Historically, the population of the RSA was classified in terms of population groups, namely, blacks, whites, coloureds and Asians. The classification is no longer enshrined in law, but it has relevance when considering demographic and socio-economic characteristics. Some baseline statistics for water supply and sanitation are summarised in the tables below:

Table 1-1 Population of South Africa According to Population Group

Population (1 000's)	Black	White	Coloured	Asian	Total
1995	31,676	5,215	3,602	1,051	41,544
	(76.2%)	(12.6%)	(8.7%)	(2.5%)	(100%)

Source: October Household Survey, 1995, Central Statistical Service

Table 1-2 Percentage Covered by Water Reticulation System According to Population Groups

Delivery Method	Black	White	Coloured	Asian
House Connection	17.5	99.7	78.9	99.2
Yard Connection	25.8	0.2	16.5	0.8
Public Standpipe	23.8	0.1	3.0	-
No Service	32.9	-	1.6	-
Total	100%	100%	100%	100%

Source: South Africa Labour and Development Research Unit, UCT, 1994

Table 1-3 Percentage of Population with Flush Toilet According to Population Group

Population Group	Black	White	Coloured	Asian
Diffusion of Flush Toilet (%)	34.2	99.8	88.0	99.6

Source: South Africa Labour and Development Research Unit, UCT, 1994

As clearly expressed the above, the black population group (who comprise about 70 percent of the total population) have access to characteristically low level of services in the water supply and sanitation sector. In view of RSA's policy to upgrade the quality of life of all South Africans, it is appropriate that high priority should be given to those people who are facing inferior service quality in the water supply and sanitation sector.

1.1.8 JICA Study Arrangements

(1) JICA's Preliminary Survey and Scope of Work

In response to the request of the Government of the Republic of South Africa, the Japanese Preparatory Study Team sent by JICA visited South Africa from 18 July to 11 August, 1995. The objectives of the Team were: to conduct a preliminary survey of the proposed study area and to discuss and finalise the Scope of Work for the proposed study among key stakeholders concerned, including DWAF, the Department of Finance, the Department of Foreign Affairs, MW, NWWA and the Embassy of Japan.

Through a series of discussions, the implementing arrangement termed A Scope of Work for the Study on Expansion of Capacity of the Magalies Water in the Republic of South Africa was agreed upon between DWAF and JICA on 4 August 1995. The Scope of Work and the Minutes of Meeting on S/W are compiled in the Data Book.

(2) Overall Framework of the Study

The Study has three phases; the first was completed in 1996 while Phases 2 and 3 will be completed by the end of 1997. The Phases are as follows:

(a) Phase 1: Formulation of a Master Plan.

Phase 1 comprised a situational analysis (an investigation to understand the circumstances prevailing in the Study Area including policy, socio-economic conditions, institutional arrangements, water resources, water demand, physical infrastructure, water tariffs and cost recovery systems); the formulation of a Master Plan up to the year 2015 and priority projects to the year 2002 (which incorporated a process leading to the formulation of policy and strategy recommendations; an investigation of technical solutions to water supply challenges identified throughout the Study Area; an institutional development plan; and an initial capital investment plan); and recommendations on study methods and terms of reference for Phases 2 and 3.

(b) Phase 2: Feasibility study on priority projects.

During Phase 1, many projects were identified by the master plan study in order to meet the requirements of the policy. The identified projects cover a range of infrastructure from modernised supply systems to the minimum level of the RDP.

There are priority projects in two-time frames. Firstly, the project target to the year 2002 involved areas where communities have no water supply, or where supply is below RDP requirements. In this context, the objective is to provide safe and hygienic drinking water to RDP service levels. Secondly, areas where incremental water demands will be high within the selected target years will be given high priority to implement expansion or improvement projects. Three priority areas under the first categories were identified and agreement was reached with all key stakeholders that these should be the subject of subsequent feasibility studies. The three feasibility study areas identified were North Mankwe, Klipvoor and Moretele 2. This report is the culmination of Phase 2 and is concerned with the second of these areas, Klipvoor. The scope of work for each area under Phase 2 included the preparation of a plan for a regional water supply system using surface water, an environmental impact assessment of the proposals, a plan for institutional development, proposals for implementation, a financial analysis of the proposed scheme and an overall evaluation and recommendations concerning implementation.

(c) Phase 3: Implementation of selected water supply and sanitation pilot initiatives.

Phase 3, which comprises four pilot projects, was carried out in parallel with Phase 2 and is reported on in Volume 6. The pilot projects were primarily institutional and intended to explore, in a practical context, institutional and technical options for water supply in previously unserved or under served communities. This was achieved by establishing or reinforcing sustainable management structures and systems (including cost recovery where appropriate) to support the long-term use of the infrastructure developed.

The pilot projects were carried out in four communities. Three of these, namely Kameelboom in North Mankwe, Ga Rasai in the Klipvoor Area and Segokgo in Moretele 2 contained an infrastructural element and were located in each of the Feasibility Study areas, while the fourth in Bapong was purely institutional in nature.

The technical component comprised design, preparation of tender documents, tendering and contract award, construction and commissioning of water supply infrastructure in each of the three communities. At Kameelboom an RDP level reticulated groundwater system was constructed, at Ga Rasai a prepayment system was installed to operate with the infrastructure already provided under an RDP scheme and in Segokgo an RDP level system was provided by extending the existing surface water supply network.

(3) Milestones

Work on Phases 2 and 3 has been carried out by a single Study Team working almost exclusively in South Africa with only the production of the Final Report being undertaken in Japan. Figure 1-1 shows the detailed work schedule from February to December 1997. The study was undertaken in two stages with a break in April corresponding to the change in the Japanese fiscal year. With regard to the Feasibility Study, data was collected and planning criteria were established and confirmed with key stakeholders during Stage 1. During the subsequent Stage 2 the water supply plan was developed and costed and financial, institutional and overall project evaluation took place.

The various reports produced by the Study Team during Phases 2 and 3 formed key milestones for the Study. These reports and their respective dates are as follows:

Inception Report	February 1997
Progress Report	March 1997
Interim Report	July 1997
Draft Final Report	October 1997
Final Report	December 1997

The first three reports have already been issued and served several important functions:

- (1) they have provided regular opportunities for stakeholders to provide valuable input to the Study,
- (2) they have enabled a wider audience than those able to actively participate in the management structures of the Study to be kept informed of progress,
- (3) being accepted formally by the stakeholders they have provided the Study Team with a mandate to move forward to the subsequent stages of the Study, and

- (4) they have recorded the methodology and findings of the Study for future use as a resource by stakeholders both within the Study Area and beyond in other parts of the country.

1.2 Composition of the Final Report

The Final Report for Phases 2 and 3 comprises a total of seven volumes. These are as follows:

- Volume 1: Executive Summary
- Volume 2: Feasibility Study for North Mankwe
- Volume 3: Feasibility Study for Klipvoor
- Volume 4: Feasibility Study for Moretele 2
- Volume 5: Study on Boundary Issues
- Volume 6: Pilot Projects
- Volume 7: Data Book

The Executive Summary contained in Volume 1 summarised the conclusions of the Study. The other volumes are self-contained so as to facilitate access by those concerned with only individual parts of the overall study. Back-up information, which may be of interest to the specialist reader, is provided as an Annex to each report.

This Report forms Volume 2 of the Final Report and is concerned with the Feasibility Study for the North Mankwe Area. The Report comprises a main report and an annex.

1.3 Project Management Structure

1.3.1 Study Management

The project management structure for the JICA Study is shown in Figure 1-2. The four levels are as follows:

(1) Project Steering Committee

The PSC remained in place from Phase 1 and is a high level body which discusses and resolves matters of policy and major issues relating to implementation. It has the following responsibilities:

- (a) To discuss and resolve matters of policy relating to the agreement between the governments of Japan and South Africa.
- (b) To discuss and resolve matters of study design, management and implementation that have major implications for the governments of Japan and South Africa, and for JICA, DWAF and MW; and
- (c) To monitor overall project progress, especially with reference to the delivery and quality of major products.

(2) Project Execution Group

This replaced the former Project Working Groups (and aspects of the Project Management Committee). Membership consists of representatives of MW, the District Councils covering the three FS Areas, DWAF Provincial Officials and the JICA Study Team. This group is responsible for the efficient implementation of the Study by providing guidance and co-ordination between the Phases 2 and 3.

(3) Local Project Steering Committees

These were created at community level where pilot projects are being implemented to facilitate joint control of pilot projects and to oversee handover of the completed projects.

(4) Project Execution Forum

The forum is a reference group for the Study. It was created to formalise the interaction with the more than forty stakeholders that participated in Phase 1 and provides a vehicle for considering the many capacity building recommendations which emerged from Phase 1.

The above structure was approved by the key stakeholders at the Project Steering Committee Meeting held on 18 February 1997.

1.3.2 Study Implementation

JICA entrusted implementation of the Study, based on the Scope of Works, to a consortium of Japanese consultants comprising Sanyu Consultants Inc. (SCI) as the managing company and Nihon Suido Consultants Co., Ltd. (NSC). This consortium was selected through open tendering.

SCI and NSC together established the Study Team, which for Phases 2 and 3 has mobilised the experience gained during Phase 1. The team of 12 members is composed of 7 members from the Phase 1 Study Team and a further 3 people who participated in sub-contract work during Phase 1. The team includes six Japanese, one British and five South African Nationals.

During Stage 1, the Study Team sub-contracted some minor components of the Study to South African consultants. Their work included providing support for the environmental impact assessments and for gathering cost data for engineering aspects of the Feasibility Studies.

1.4 Acknowledgements

The numerous organisations and individuals that contributed to the work of the Study Team during Phase 1 have continued to provide excellent support to the Study. Whilst taking responsibility for this report, the Study Team wishes to acknowledge the help and support of the following:

1.4.1 Japanese Government

Embassy of Japan in South Africa
JICA Head Office
JICA local office in Pretoria
JICA Advisory Committee

The continued financial support of the Government of Japan has made the Study possible and the guidance and support provided by the Advisory Committee has played a crucial role in the strategic direction that the project has taken. The Study Team hopes that this first experience of this type of technical aid support in South Africa will provide a good precedent and contribute to further collaboration on future projects.

1.4.2 Department of Water Affairs and Forestry

DWAF Head Office
DWAF - Mpumalanga
DWAF - North West Province

Due to the more applied nature of the work, Phases 2 and 3 of the Study have required closer links with the Provincial staff of DWAF. In particular the Directors of DWAF in the two Provinces within whose jurisdiction the feasibility studies fall have participated actively in the Study despite the very pressing nature of their many other commitments. Senior staff from the Provinces have also provided valuable strategic and operational support. The senior managers and directors of DWAF in Pretoria have continued to provide excellent support through chairing and participating in meetings, providing insight and direction and not least by making available office space and other facilities to the Study Team.

1.4.3 Local Government

North West Province

Mpumalanga

Northern Province

Gauteng

Rustenburg DC

Eastern DC

Highveld DC

Mbibane TLC

It is clear from the Water Services Act that local government is responsible for service delivery and the responsibilities of Services Provider cannot be abrogated. Representatives of local government have played a crucial role in the project as it has been necessary to ensure that the institutional recommendations of the Study in each area are appropriate to the capacity and direction of the relevant local government institutions.

The organisations listed above have enthusiastically supported the Study by attending and actively participating in meetings. The senior members of staff at the district councils have met with the Study Team and provided guidance in interpretation of policy and new and ongoing service delivery initiatives.

In particular, Rustenburg DC must be thanked for providing office space and logistical support to the Team during their stay in Rustenburg. The system of zonal councillors and engineers has also provided something of a model and is rightly viewed with interest.

1.4.4 Water Boards

Magalies Water

Rand Water

Magalies Water in particular have provided invaluable ongoing help and support to the Study by participating in and chairing meetings but also by providing many hours of advice through reviewing reports and providing feedback to the Study Team. Of course Magalies Water is at the hub of the Study and the dialogue between the Study Team and Magalies Water has confirmed that the initiative is of value. The team hopes that the Study has provided a firm foundation for Magalies Water to lead the way as a representative of the new generation of second tier water supply institutions envisaged in the White Paper of 1994.

1.4.5 Pilot Project Communities

Kameelboom, Ramoshibitswana and Mphonyoke Communities

Ga Rasai Community

Segokgo, Moletsi, Semohlase and Loding Communities

Bapong Community

The members and leadership of the communities which have been the subject of the pilot projects have played an important role by giving of their time and hospitality most generously and affording the Study Team the privilege of working with them. The Team has certainly learnt much from working together with the communities and hope that this feeling is mutual. With regards to the Feasibility Studies, the Study Team is especially grateful to the pilot project communities for their co-operation with the questionnaire surveys and for providing feedback to inform Phase 2.

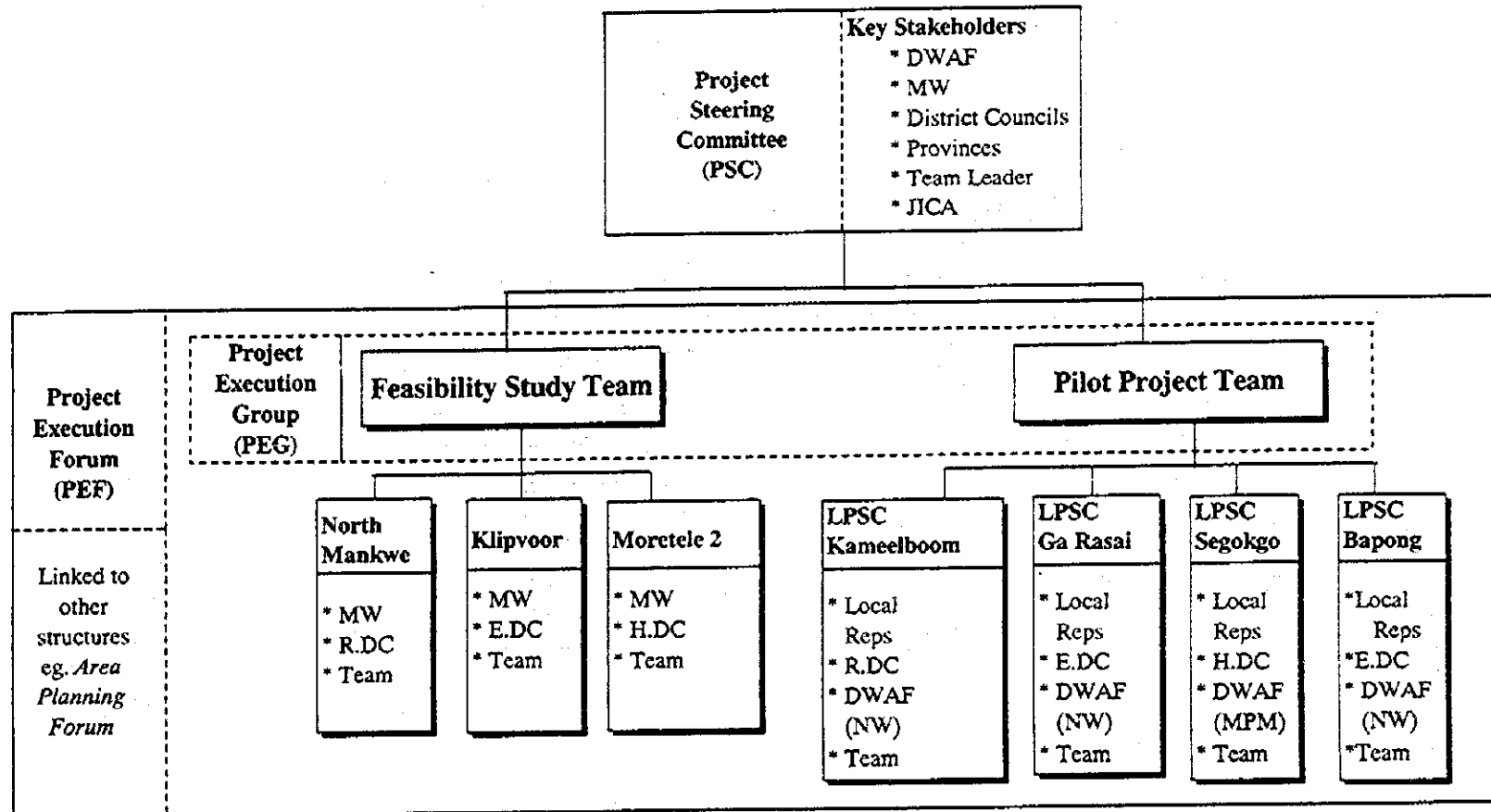
1.4.6 Other Stakeholders

There are more stakeholders in the Study than can be listed in this short acknowledgement. The Study Team interacted with many of these, and was pleased with the level of involvement and commitment. Since the Study area is large, many of the stakeholders demonstrated their interest by travelling long distances to meetings. A hallmark of the Study has been the high level of stakeholder involvement and the loyalty and commitment of participating stakeholders. The Team extends thanks to all who have played a role in the execution of the Study.

Figure 1-1 Master Work Schedule for Phases 2 and 3 of Magalies Water Study

Work Description	FY 1996		FY 1997									
	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
1. First Stage Field Works												
1.1 Presentation of Inception Report												
1.2 Setup Management Structure												
1.3 Inception Workshop												
1.4 Conduction of Survey												
1.5 Pilot Project Design												
1.6 Submission of Progress Report												
2. Second Stage Field Works												
<i>A. Feasibility Study</i>												
2.1 Basic Plan Formulation												
2.2 Preparation of Interim Report												
2.3 Preliminary Design												
2.4 Financial / Investment Plan												
2.5 Project Evaluation												
2.6 Preparation of Draft Final Report												
<i>B. Pilot Project Implementation</i>												
2.7 Tendering of Infrastructure												
2.8 Construction Works												
2.9 Institutional Development												
2.10 Evaluation of Pilot Project												
3. First Home Works												
3.1 Submission of Final Report												

Figure 1-2 Management Structure for Phases 2 and 3



Note: RDC: Rustenburg DC, EDC: Eastern DC, HDC: Highveld DC