ANNEX B

ENVIRONMENTAL

FEASIBILITY STUDY FOR KLIPVOOR
ANNEX B FENVIRONMENTAL

B.1 TOR and Scope of ROIP

B.2 Report of ROIP 2

B.1 TOR and Scope of ROIP

1. Terms of Reference

This study constitutes an assessment of the potential environmental impacts which can be expected from options considered as part of the Master Plan to expand the capacity of Magalies Water. Inevitably, development leads to modifications in the environment and negative environmental impacts, which often result from inappropriate management of development activities because of a lack of appreciation of the potential problems. All components of the environment that might be involved were identified so that appropriate ameliorative actions can be integrated with the project as a whole to obtain the best possible results.

It is important to note that the environmental study at this stage of the project preparation is at a feasibility level to prepare a prognosis of relevant issues. Accent has been placed on the impacts of the proposed pipelines and other related surface structures as these were seen as the element causing greatest concern.

Relevant data from preliminary investigation reports were extracted to provide baseline information. Additional, more detailed information was obtained to update the existing information as was presented in the ROIP 1 Report.

The construction of pipelines, reservoirs and treatment works could have an impact on the socio-economic aspects, i.e land use, settlement, infrastructure and population, and the ecological aspects, i.e. the vegetation, fauna, habitat, changes in flow regime and changes in water quality. The study was undertaken on an incremental basis with the relevant environmental impact prognosis phase (ROIP2) as the second feasibility phase.

The ROIP 2 will identify the anticipated environmental impacts and state the feasibility of the proposed options from an environmental, both ecological and socio-economical, viewpoint. The socio-economical impacts are presented in another module. The need for further more detailed studies will be identified from the data available at this point. The extent of further work needed on the ecological and socio-economical aspects will be defined in the ROIP 2 report.

2. Scope of the ROIP 2

The ROIP 2 constitutes an assessment of the potential environmental impacts which can be expected from options for extending the water supply network in the Klipvoor Project Area.

The scope of this assessment is to investigate the environmental impacts associated with the proposed water treatment works, pipelines, reservoirs, elevated tanks and pump stations to increase the existing capacity of Magalies Water. This scheme is the preferred option which has been proposed to augment the water supply in the Project Area. Accent has been placed on the impacts of the proposed pipelines and the other surface structures as this is seen as the component likely to cause the greatest impact over the largest area.

Three technical alternatives were evaluated during the Master Plan stage for the Klipvoor Project Area. As part of this Feasibility Study, those alternatives were re-examined using the Case B water demand. Service Level B (Case B) 90 % of households will be supplied through yard connections (85.6 lcd) and the remaining 10 % through stand pipes (30 lcd) in accordance with the RDP level of service, giving a weighted average per capita consumption rate of 80 litre per capita per day including an allowance of approximately 15 % for leakage.

The aspects that will be addressed in this report are:

the effect of abstraction from dams and the rivers downstream of the dams.

the impact of the construction of pipelines, pump stations, reservoirs and elevated tanks.

The main activities to be expected during the construction of the proposed developments are the following:

- Pre-construction phase: Surveying, clearing of vegetation and construction of access routes.
- Construction phase: Typical activities will be clearing of vegetation, stripping and stockpiling topsoil, excavations, disposal of excess material, transport of pipes, drilling, blasting additions or alterations to existing infrastructure and the importation of foreign workers, including their accommodation and recreational facilities.

- Post-construction and operational phase: Rehabilitation of disturbed areas, implementation and maintenance of the water treatment works, the pipelines, regional and service reservoirs, elevated tanks and pump stations. Also included will be the impacts on sanitation due to the increased water consumption.

B.2 Report of ROIP

1. Executive Summary

1.1 General Project Description

The Klipvoor Feasibility Project Area (Figure 1) comprises the northern parts of the Odi 1 and Moretele 1 Magisterial Districts of North West Province. The Area is essentially rural in nature. Average annual rainfall is approximately 500 mm and summer rainfall predominates falling mainly between October and March. The Area drains to the Moretele River or its tributaries and most of the area lies in the catchments upstream of Klipvoor Dam. Annual average evaporation is over 2,200 mm and is higher in summer than in winter. Annual monthly temperatures vary from 12 to 25° C. Prevailing winds are light to moderate in a north-easterly direction, occasionally south-easterly in winter, and typical wind speeds are 2.5 to 3.5 m/s. The Borokalalo National Park is located within the Area and the environmental sensitivity of the proposed water supply infrastructural development within the Reserve requires particularly careful consideration.

The project components are the following and describes the most feasible option from the three alternative options investigated:

As a general principle, water from a treatment works will be pumped to a regional reservoir from where it will be distributed through bulk supply pipelines to service reservoirs which will be constructed in each community.

Under the recommended water supply plan, two separate high lift pumping systems are proposed from Klipvoor Water Treatment Works. The smaller system, rated at 20.97 l/s based on summer peak day demand for the Case B level of service (80 lcd), will supply the Klipvoor West Supply Block from a regional reservoir on top of the Mogosane Hills which form the southern abutment of Klipvoor Dam. From the regional reservoir, the system will supply communities to the south as far as Kgomo Kgomo under gravity including a branch to Fafung and Ga Rasai. A booster pumping station is required at Kgomo Kgomo to supply Ga Tsogwe, the most southerly community in this system.

The other system, rated at 138.59 l/s based on summer peak day demand for the Case B level of service, will supply the remaining areas comprising the Klipvoor East and Moretele North Supply Blocks. A regional reservoir to serve this system will be located approximately 7.6 km north-east of the treatment works at the high point in the system. From here the pipeline will run eastwards with branches to the north to Lebotlwane North and Mokobjane and south to Lebotlwane South and Tlholwe before reaching a major bifurcation.

The southern fork will cross the Moretele River after which a branch will supply Sutelong and Ga Hadebi. South of Sutelong a booster pumping station is required. From Makgabetlwane a branch supplies Dikgophaneng while another branch supplies Botshabelo and the neighbouring communities. A further booster pumping station is required south of Makgabetlwane to supply the southern extremity of this system through Shakung as far as Dipompong.

The northern fork will supply Bollantlokwe after which a booster pumping station is necessary to supply Slagboom where a further regional reservoir would also be located. Due to the higher elevation of the communities in the Moretele North Supply Block it is necessary to provide a further booster pumping station downstream of the regional reservoir. From here the main pipeline heads east through Transactie, Ngobi, Swartboom and on to Makekeng with branches off southwards to Selepe, Dipetlrloana and Makgapha and Rhenostervlei en route.

This ROIP 2 gives an overview of expected impacts and recommends further environmental investigations to be done during the detail design phase.

1.2 General Environmental Description

The dominant vegetation type in the Klipvoor Project Area is mixed bushveld.

The proposed pipelines within existing road or pipeline reserves are not seen as areas of major impact as the areas are seen as having low aesthetic values and a highly disturbed natural environment. construction activities could cause further disturbance of the area, which could result in the infestation of invasives which could be transported to the area in a number of ways.

The conservation status of the rivers is likely to be poor in most instances, as all the rivers are regulated by dams and weirs. The impact on the rivers as a result of the proposed project is seen as negligible although it will depend on future management of the dams and future return flows from the catchments.

The Borakalalo National Park is of a high aesthetic value and an important tourist destination for the area. Special consideration need to be given to the proposed development of the Water Treatment Works, Regional Reservoir and access roads within the Park boundaries.

1.3 Important Environmental Impacts

(1) Negative impacts:

The list of disadvantages 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.

a. The construction of the pipelines and its related infrastructure could:

- cause disturbance within the existing road reserves;
- have a negative impact on the aesthetic value of an area;
- cause erosion on the exposed slopes;
- cause/accelerate the invasion by exotic terrestrial plants;
- cause disturbance of a section of the river channels where pipelines crosses the channels;
- cause increased sediment loads within the rivers.
- noise pollution;
- water pollution;
- the introduction and encroachment of alien plants;
- inconveniences to affected local farmers and other local residents;
- social disruption;
- inconveniences to affected road users.

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

b. Three technical alternatives were evaluated during the Master Plan stage. As part of this Feasibility Study, those alternatives were re-examined using the Case B water demand. At Service Level B (Case B) 90 % of households will be supplied through yard connections (85.6 lcd) and the remaining 10 % through stand pipes (30 lcd) in accordance with the RDP level of service, giving a weighted average per capita consumption rate of 80 litre per capita per day including an allowance of approximately 15 % for leakage.

c. 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 impact includes 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 water levels of the dam and on the ecology of the river downstream of the dam. The other major negative impact relates to the tourism potential of Borakalalo National Park downstream of Klipvoor Dam in the proposed Water Treatment Works area.

No fatal flaw has been found that renders the proposed project non-viable from an environmental impact point of view but certain aspects must be addressed in more detail in later phases of the project.

(2) Positive impacts:

a. A reliable water supply to an increased number of people in the Project Area.

b. The construction activities could cause temporary economic upliftment in the immediate vicinity.

1.4 Conclusion

The construction of pipelines and related infrastructure will not cause substantial disturbance. The environmental consequences associated with these impacts are not considered to be significant if managed during and after construction as stipulated in the environmental management plan.

The impacts of abstraction from Klipvoor Dam and downstream of the dam are not considered to be significant, but with a large degree of uncertainty.

1.5 Recommendation

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 disturbances on the 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 sanitation facilities need to be investigated.

(2) Ecological impacts

A Phase 1 archaeological survey of the proposed pipeline routes and especially the reservoir sites are 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 pipeline 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.

2. Terminology

Abbreviations used in the ROIP 2 are the following (for the purpose of simplicity some abbreviations are used in the English version of the ROIP): Afrikaans

AV	AVERAGE
DCD	DATA CONFIDENCE DEGREE
EC	ELECTRICAL CONDUCTIVITY
ENDAN	ENDANGERED
IEM	INTEGRATED ENVIRONMENTAL MANAGEMENT
IMP	IMPORTANCE
INDETERM	INDETERMINATE
ISD	IMPACT SEVERITY DEGREE
MAP	MEAN ANNUAL PRECIPITATION
MAR	MEAN ANNUAL RUNOFF
MAX	MAXIMUM
MIN	MINIMUM
MCD	MITIGATION IMPACT CONFIDENCE DEGREE
MDC	MITIGATED DATA CONFIDENCE
MID	MITIGATED IMPACT DEGREE
ROIP	Relevante Omgewingsinvloed prognose - RELEVANT ENVIRONMENTAL IMPACT PROGNOSIS
SCD	SEVERITY CONFIDENCE DEGREE
SRCE	SOURCE OF INFORMATION
TDS	TOTAL DISSOLVED SALTS
VULNER	VULNERABLE

3. Main Report of ROIP

Chapter 1. Introduction

The Department of Water Affairs and Forestry (DWAF) follows a procedure of Integrated Environmental Management (IEM) for all proposed developments. This IEM procedure consists of certain successive levels of impact studies of which the Relevant Environmental Impact Prognosis 2 (ROIP - the Afrikaans acronym), which relates to a feasibility phase, is the second.

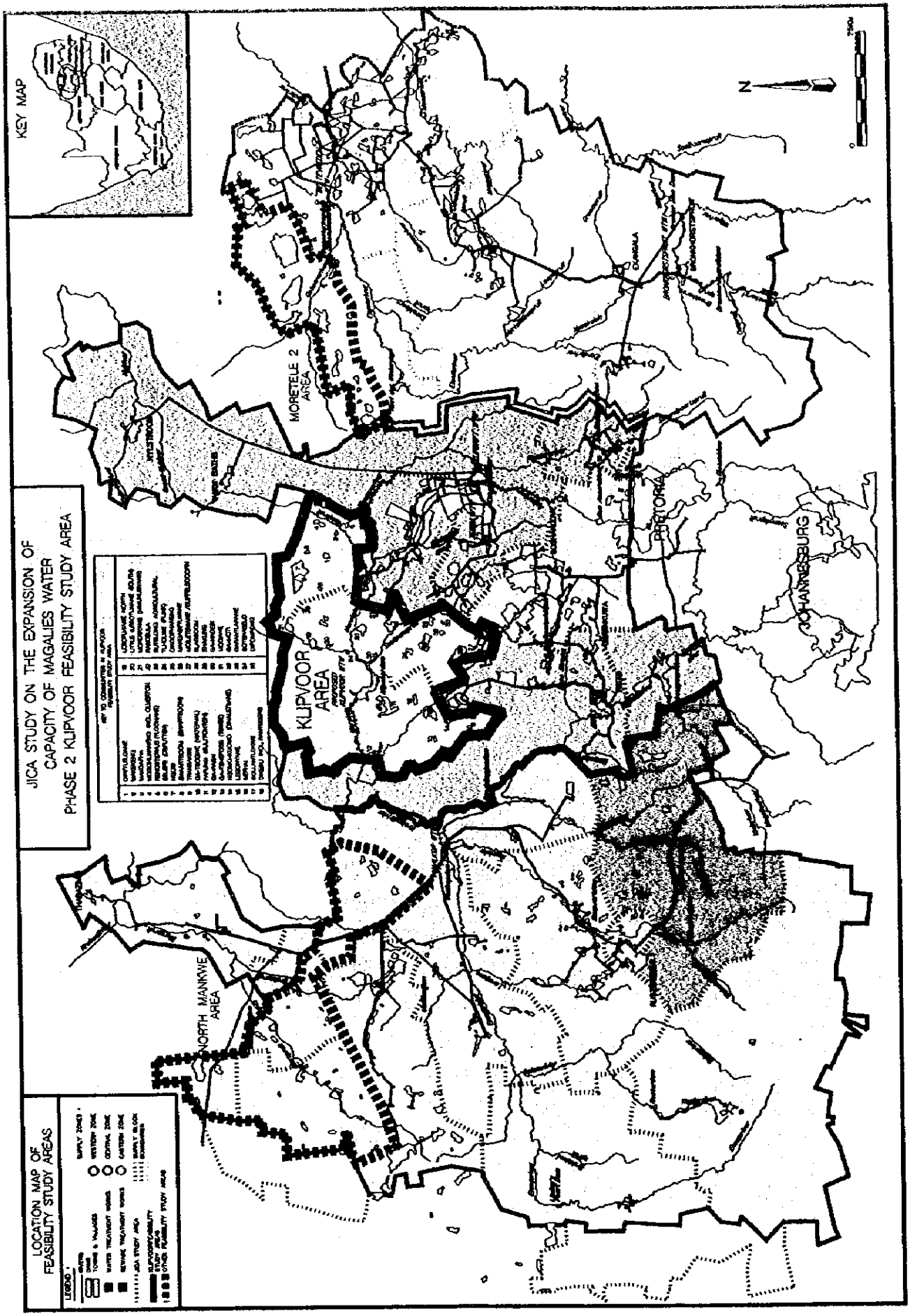
The numerical values used in the ROIP are as follows:

SOURCE (Column 3):	The source of the information given in column 3 is given a letter which correlates with the source, as listed in the references.		
DCD (Column 4) :	Data Confidence Degree is rated on a scale from 0 to 4 from no data available with unreliable conclusions to data sufficient and adequately verified.		
ISD (Column 5) :	Impact Severity Degree relates to the severity of the proposed scheme on the aspect that is being evaluated and is rated on a scale from 0 to 4 with 0 being no impact and 4 being an impact of the most important significance.		
SCD (Column 6) :	Severity Confidence Degree of the identified impact is rated so that the reliability increases with an increase in numeric value, on a scale from 0 to 4. Source of the mitigation measure relates to the listed reference.		
MDC (Column 8):	Mitigation Data Confidence is rated on a scale from 0 to 4, with totally reliable information receiving a rating of 4 and totally unreliable information receiving a rating of 0. This refers specifically to an evaluation of the suggested mitigation measure.		
MID (Column 9) :	Mitigated Impact Degree or impact (as determined in column 5) after mitigation is rated on a scale from 0 to 4, with a severe impact after mitigation receiving a rating of 4 and no impact after mitigation receiving a rating of 0.		
MCD (Column 10) :	Mitigation Impact Confidence Degree of the proposed mitigation increases with an increase in numeric value, on a scale from 0 to 4.		
ADVANTAGES:	1	:	Unimportant advantage
	2	:	Medium important
	3	:	High important
FURTHER WORK:1	1	:	Necessity of work needs to be determined (low or high importance)
	2	:	Medium priority work - to be undertaken after an option is deemed acceptable
	3	:	High priority - to be undertaken immediately - before determining the preferred option / acceptability of any option

Chapter 2. Locality of the Area

The attached map (Figure-1) illustrates the location of Project Area..

Figure 1 : Location Map



NO	COMPONENT	DATA DESCRIPTION	SRCE
3.1	NAME OF SCHEME	Study on the Expansion of the Capacity of Magalies Water	1
3.2	PURPOSE OF THE PROJECT	To confirm the feasibility of planning for the three selected priority areas (North Mankwe, Klipvoor and Moretele 2) Klipvoor will be discussed in this ROIP 2 document	1 1 - -
3.3	STARTING DATE	1997	1
3.4	COMPLETION DATE	1997	2
3.5	WHITE PAPER NO	Not applicable Interim Report, July 1997	
3.6	PLANNING REPORT	Not applicable	
3.7	COSTS (R X 10^6)		
3.8	LOCALITY		
	Province	GAUTE / MPUM / NP / **NWP**	
	Districts	Moretele 2, Brits, Moretele 1, Odi 1, Mankwe, Bafokeng, Rustenburg, Koster, Swartruggens, KwaNdebele, Cullinan, Bronkhorstspruit, Wonderboom, Waterberg (part), Thabazimbi (part) and Warmbath (part)	
	Game-, Nature Reserve, Wilderness Area, National Heritage site	Rust de Winter Dam, Klipvoor Dam, Pilanesberg, Roodeplaat Dam and Hartbeespoort Dam	

PROJECT DETAIL

Alternatives

Three technical alternatives were evaluated during the Master Plan stage. As part of this Feasibility Study, those alternatives were re-examined using the Case B water demand. At Service Level B (Case B) 90 % of households will be supplied through yard connections (85.6 lcd) and the remaining 10 % through stand pipes (30 lcd) in accordance with the RDP level of service, giving a weighted average per capita consumption rate of 80 litre per capita per day including an allowance of approximately 15 % for leakage. Figures 2, 3, 4 and 5 illustrate these alternative water supply plans.

Under Alternative-1, the entire Klipvoor Area which comprises of Klipvoor West Supply Block, Klipvoor East Supply Block and Moretele North Supply Block is assumed to be supplied from the new Klipvoor WTW at Klipvoor Dam. This alternative therefore does not require any supplementary supply from sources other than Klipvoor Dam.

In Alternative-2, Moretele North Supply Block is assumed to be supplied from Klipdrift WTW either through the existing Klipdrift-Nylstroom pipeline or through a new pipeline from Klipdrift WTW, while both Klipvoor West Supply Block and Klipvoor East Supply Block are assumed to be supplied from the new Klipvoor WTW.

Under Alternative-3, both Klipvoor East Supply Block and Moretele North Supply Block are supplied from Klipdrift WTW either through the existing Klipdrift-Nylstroom pipeline or through a new pipeline from Klipdrift WTW, while Klipvoor West Supply Block is assumed to be supplied from the new Klipvoor WTW.

Description of Recommended Water Supply Plan

The description of the recommended water supply plan was forwarded to the Department of Environmental Affairs and Tourism. The Memorandum is attached in Appendix A and gives a more detailed description than the following paragraphs. Under the recommended water supply plan for Alternative 1, two separate high lift pumping systems are proposed from Klipvoor Water Treatment Works. The smaller system, rated at 20.97 l/s based on summer peak day demand for the Case B level of service (80 lcd), will supply the Klipvoor West Supply Block from a regional reservoir on top of the Mogosane Hills which form the southern abutment of Klipvoor Dam. From the regional reservoir, the system will supply communities to the south as far as Kgomo Kgomo under gravity including a branch to

Fafung and Ga Rasai. A booster pumping station is required at Kgomo Kgomo to supply Ga Tsogwe, the most southerly community in this system.

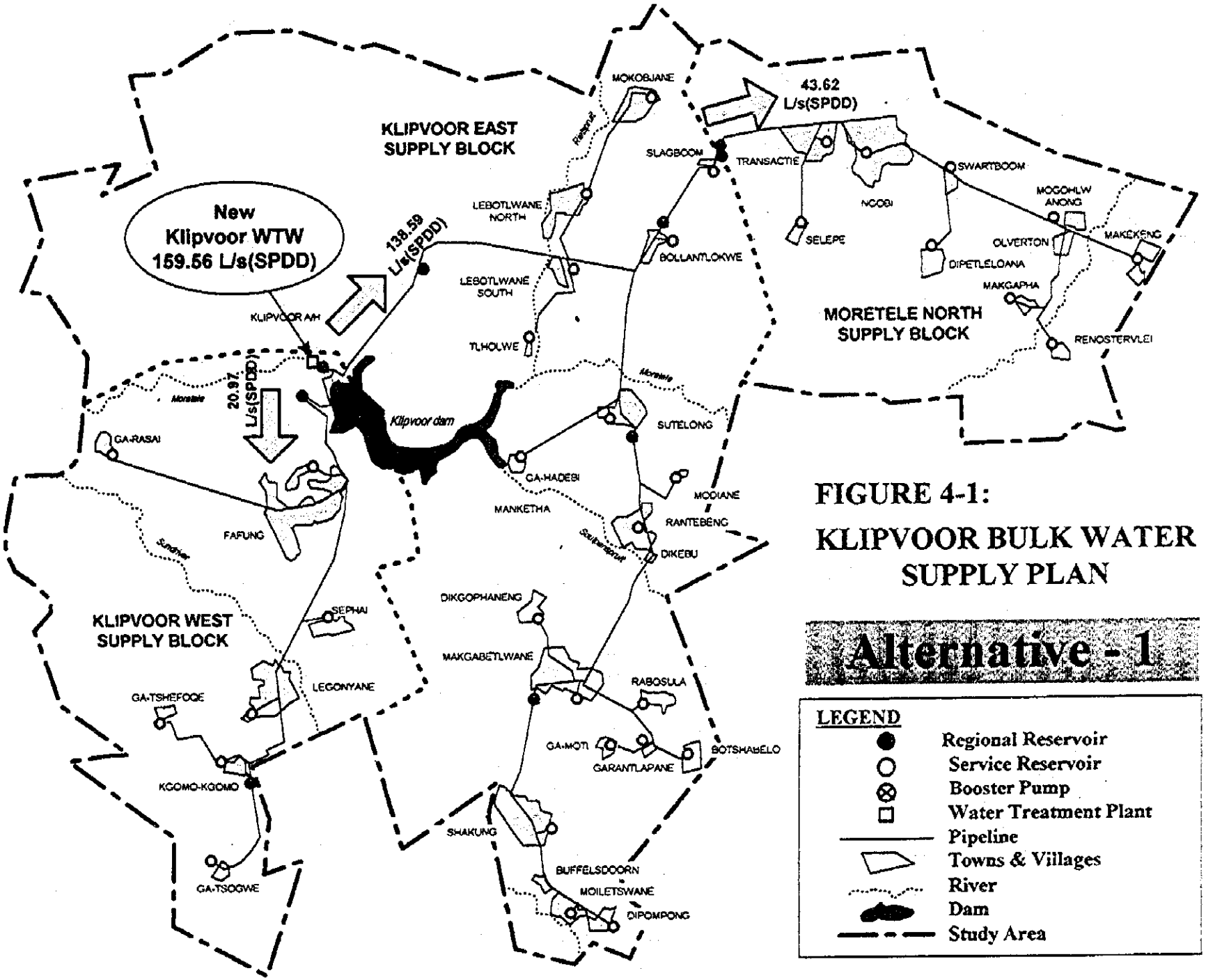


FIGURE 4-1:
KLIPVOOR BULK WATER SUPPLY PLAN

Alternative - 1

LEGEND

- Regional Reservoir
- Service Reservoir
- Booster Pump
- Water Treatment Plant
- Pipeline
- Towns & Villages
- River
- Dam
- Study Area

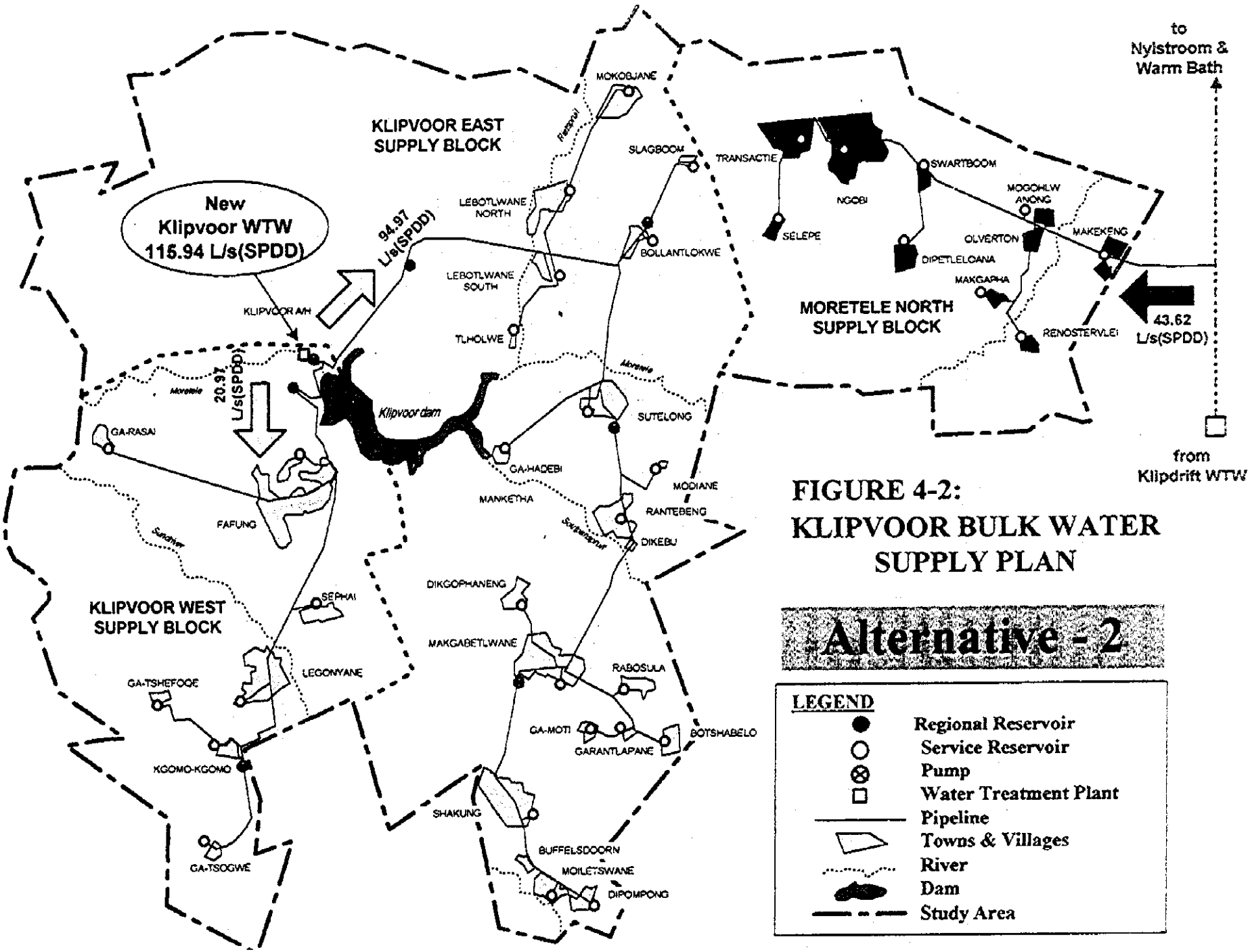


FIGURE 4-2: KLIPVOOR BULK WATER SUPPLY PLAN

Alternative - 2

LEGEND

- Regional Reservoir
- Service Reservoir
- Pump
- Water Treatment Plant
- Pipeline
- Towns & Villages
- River
- Dam
- Study Area

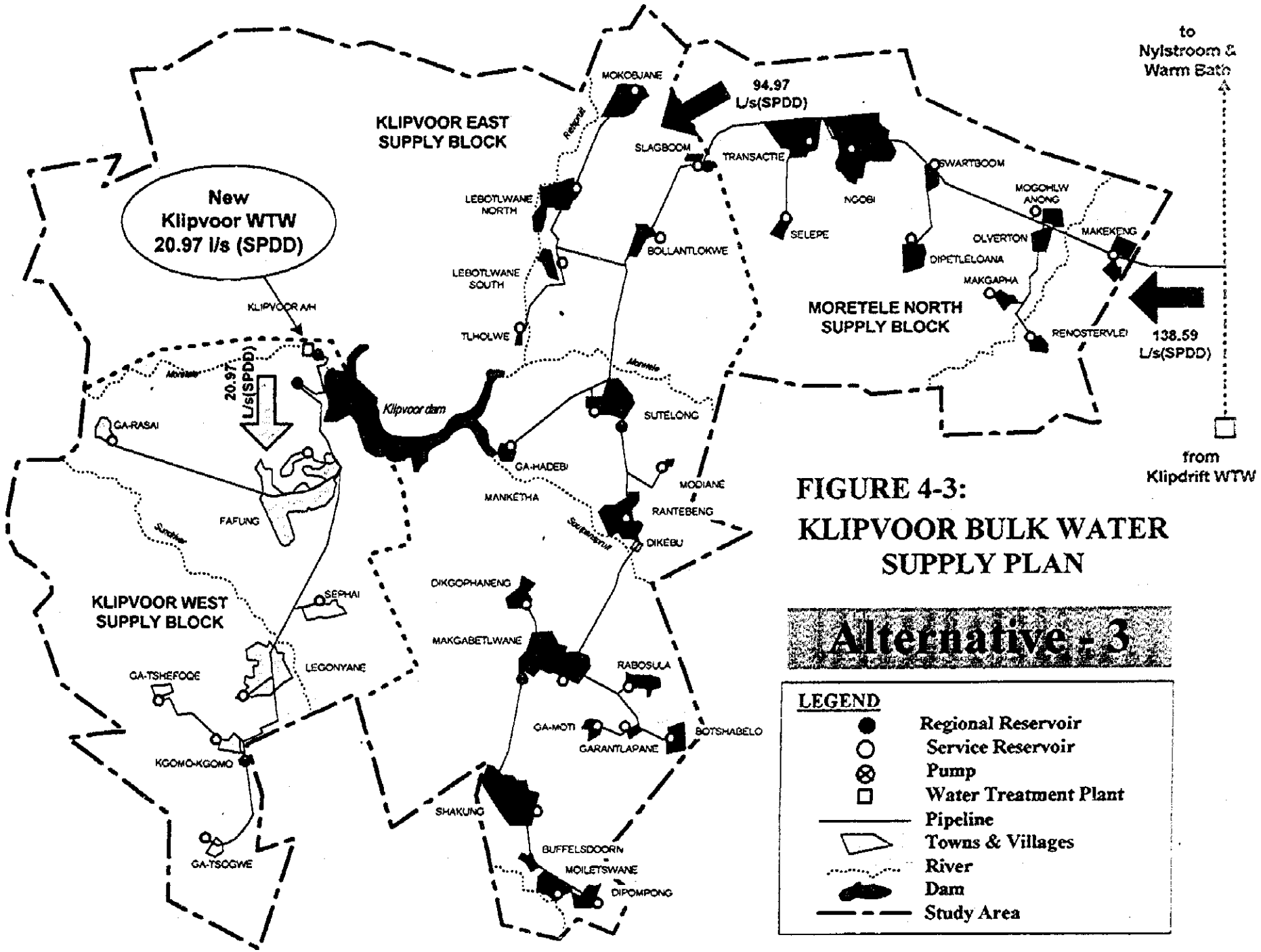


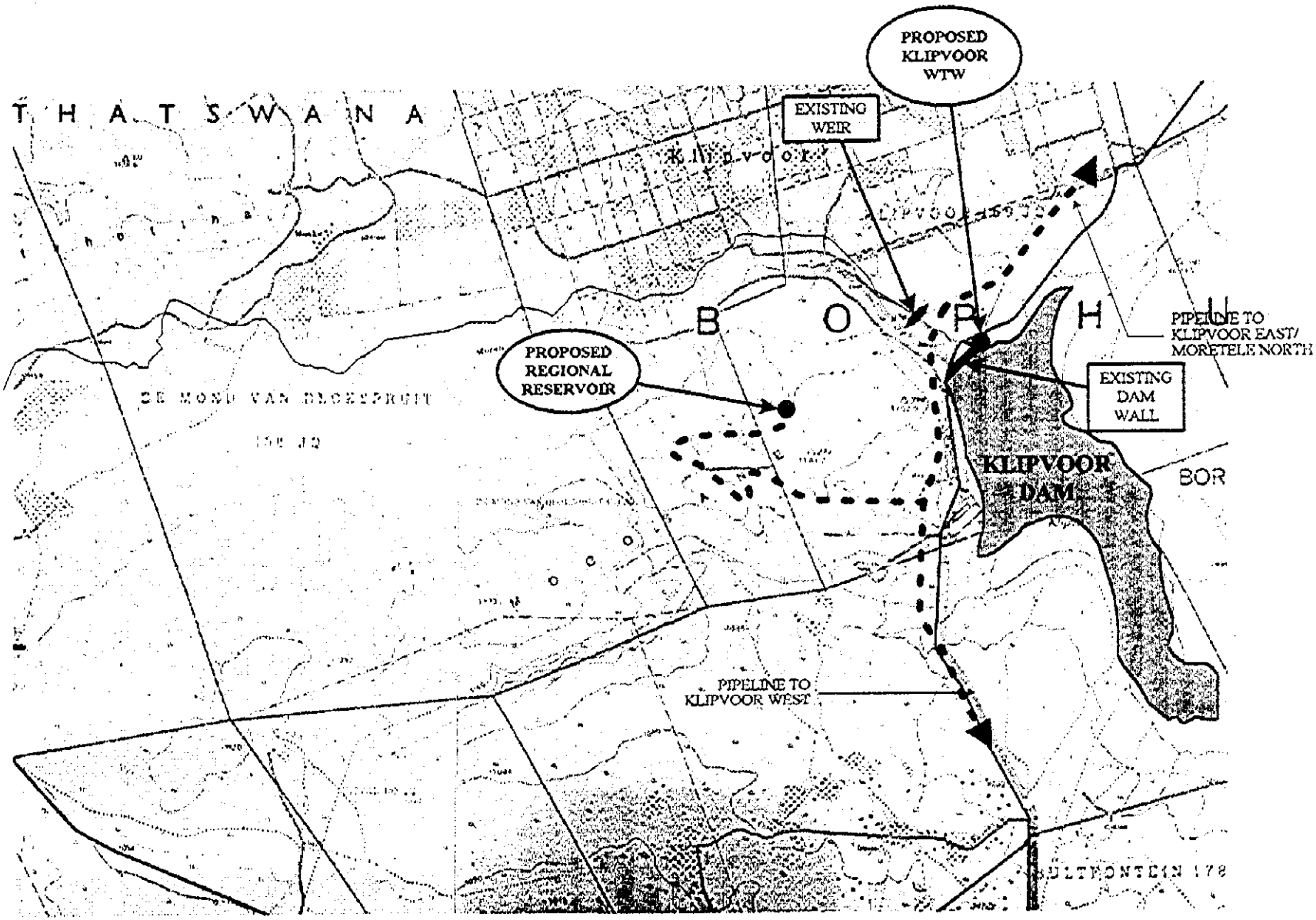
FIGURE 4-3: KLIPVOOR BULK WATER SUPPLY PLAN

Alternative 3

LEGEND

- Regional Reservoir
- Service Reservoir
- Pump
- Water Treatment Plant
- Pipeline
- Towns & Villages
- River
- Dam
- Study Area

FIGURE 5 : PROPOSED INFRASTRUCTURE AROUND KLIPVOOR DAM



The other system, rated at 138.59 l/s based on summer peak day demand for the Case B level of service, will supply the remaining areas comprising the Klipvoor East and Moretele North Supply Blocks. A regional reservoir to serve this system will be located approximately 7.6 km north-east of the treatment works at the high point in the system. From here the pipeline will run eastwards with branches to the north to Lebotlwane North and Mokobjane and south to Lebotlwane South and Tlholwe before reaching a major bifurcation.

The southern fork will cross the Moretele River after which a branch will supply Sutelong and Ga Hadebi. South of Sutelong a booster pumping station is required. From Makgabetlwane a branch supplies Dikgophaneng while another branch supplies Botshabelo and the neighbouring communities. A further booster pumping station is required south of Makgabetlwane to supply the southern extremity of this system through Shakung as far as Dipompong.

The northern fork will supply Bollantlokwe after which a booster pumping station is necessary to supply Slagboom where a further regional reservoir would also be located. Due to the higher elevation of the communities in the Moretele North Supply Block it is necessary to provide a further booster pumping station downstream of the regional reservoir. From here the main pipeline heads east through Transactie, Ngobi, Swartboom and on to Makekeng with branches off southwards to Selepe, Dipetlhloana and Makgapha and Rhenostervlei en route.

Infrastructure Planning

For each of the above three alternatives, a water supply infrastructure plan was prepared. As a general principle, water from a treatment works will be pumped to a regional reservoir from where it will be distributed through bulk supply pipelines to service reservoirs which will be constructed in each community.

Buil Infrastructure

Communities were identifies on 1/10,000 orthophotos and location for a service reservoir was selected either at a high place within or immediately adjeacent to each community. These service reservoirs were planned to receive water either from a treatment works or from a regional reservoir through bulk supply pipelines and to feed the reticulation system in the community by gravity. Given the relatively small capacity required, most were planned to be pressed cellular steel elevated tanks.

Bulk supply pipelines which connect water treatment works to service reservoirs were then routed. The routes elected followed existing roadways to minimize the necessity for land acquisition and adverse impacts of pipeline construction on the environment.

Using all this data as inputs, a series of hydraulic analyses were conducted on the basis of the Case B water demand in order to ensure that the dynamic water pressure will always remain higher than the ground elevations along the proposed bulk supply pipeline routes, and that each community will be able to receive its summer peak day demand. This exercise determined the size of bulk supply pipelines as well as the head where pumping is found to be necessary.

Retail Infrastructure

The copacity of service reservoir was determined, taking into account the water demand of the community and whether the reservoir is fed by pumping or by gravity.

Reticulation pipelines were sized to ensure that the residual dynamic pressure is adequate throughout the reticulation system to maintain a supply through yard connections under the designed instantaneous peak flow condition.

REMARKS

This ROIP 2 gives an overview of expected impacts and recommends further environmental investigations to be done during the detail design phase.

Chapter 4. ENVIRONMENTAL DESCRIPTION

NO	COMPONENT	DATA DESCRIPTION	SRCE
4.1	State of habitat disturbance	See remarks	1, 3, 4
4.2	Ground cover	See remarks	5
4.3	Game-, Nature Reserve, Wilderness Area, National Heritage Site	Klipvoor Dam	5
4.4	Aesthetic value	See remarks	1, 3
4.5	Land use	See remarks	1, 2

REMARKS

4.1
- The proposed development is within a rural development area where the roads and housing facilities have already disturbed the area from its original state.
- The route of the proposed pipelines are where possible along existing pipeline routes and road reserves. These areas are already disturbed.
- The pump stations, reservoirs, elevated tanks are also along the pipeline routes and one could assume at least some form of habitat disturbance.
- The area of the proposed water treatment works, downstream of Klipvoor Dam, is already disturbed by the dam wall and weir.

4.2
- The Klipvoor Project Area is predominantly a mixed bushveld veld type.

4.3
- Many parts have low aesthetic value due to the rural development taking place.

4.4
- The major land use in the area is agriculture, rural development, recreation and natural veld.

Chapter 5. Description of the Impacts of the Proposed Development

5.1 Physical Environment

5.1.1 Climate

NO	COMPONENT	DATA DESCRIPTION								DATA	
										SRCE	DCD
a.	**WIND** Prevailing wind directions										
	summer:	N	NE	E	SE	S	SW	W	NE	-	-
	winter:	N	NE	E	SE	S	SW	W	NW	-	-
b.	**RAINFALL (mm per year)**	MAP = 500 mm				SUMMER		WINTER		6	2

MEASURING STATION : LOCALITY

The following representative weather stations were used in the study: Marble Hall, Warmbad, Pilanesberg and Pretoria.

a. Wind: Prevailing winds are light to moderate, prevailing in a north-easterly direction, and occasionally south-east in winter. Typical wind speeds are 2,5 to 3,5 m/s.

b. Temperature: The averages minimum temperature for the eastern area is 12,7°C and the average maximum temperature is 25,4°C. The averages minimum temperature for the central area is 11,8°C and the average maximum temperature is 23,5°C.

c. Rainfall: The mean average annual rainfall is approximately 500 mm/a. Annual average evaporation is over 2 200 mm and is higher in summer than in winter.

5.1.2 Geology

NO	COMPONENT	DATA DESCRIPTION	DATA	
			SRCE	DCD
	GEOLOGY	See remarks	7	2

REMARKS

- See the report on the geology for detailed information [7]. The geology will however not be impacted upon by the proposed development.

5.1.3 Topography

NO	COMPONENT	DATA		IMPACT		MITIGATION			
		SRCE	DCD	ISD	SCD	SRCE	MDC	MID	MCD
	TOPOGRAPHY	5	2	0	3	Not applicable			

DATA

- The majority of the pipeline routes follow the road and existing pipeline routes and are within an existing road or pipeline reserves.

IMPACT

- The pipelines will be buried and therefore there will be no impact on the topography.

5.1.4 Soils

NO	COMPONENT	DATA		IMPACT		MITIGATION			
		SRCE	DCD	ISD	SCD	SRCE	MDC	MID	MCD
	SOIL SERIES/TYPE	7	2	Not applicable					

DATA

- **Soil series/type** :The soil types occurring within the Study Area are diverse and complex. This is due to the variety and the complex distribution of rock types in the study area and the fact that the geological substratum generally enjoys a close relationship to soil and land type. See the report on the soils for detailed information[7]. The project will not have an impact on the soils but the soils may have an impact on the project and need to be examined before detailed design takes place.

IMPACT

- Construction activities on slopes could trigger and accelerate soil erosion.

MITIGATION MEASURE

- Careful planning of construction activities accompanied by landscape rehabilitation measures in the immediate vicinity of the pipelines could minimise the problems associated with erosion.
- The topsoil which is removed during construction should be replaced after construction. The seeds in the topsoil will accelerate the rehabilitation process.

IMPACT AFTER MITIGATION

- Success of the landscape rehabilitation measures on the pipeline routes are likely to be relatively high, especially if the topsoil removed during construction is replaced with that same topsoil. The impact after mitigation is likely to be relatively low.

SOILS		SRCE	IMP
FURTHER WORK	• Landscape rehabilitation measures should be determined • Problem soil areas need to be investigated	3	2
ADVANTAGES	Not applicable	3	-

5.1.5 River Characteristics

NO	COMPONENT	DATA		IMPACT		MITIGATION			
		SRCE	DCD	ISD	SCD	SRCE	MDC	MID	MCD
a1	**FLOW REGIME - See data**	1, 8	2	3	2	3	2	2	2

DATA

- Klipvoor Dam is situated on the Moretele River a tributary of the Pienaars River.

IMPACT

- Klipvoor Dam will probably not have much less water as most of the water extracted from the dam will be from the incremental increase of return flows from the catchment to the system. If there is less water in the dam, overflow from the dam will be less frequent.

MITIGATION MEASURE

- If a situation should develop where overflow is less frequent appropriate water releases for the downstream environment may be a solution. This could however impact on the availability of water for the other downstream users.

IMPACT AFTER MITIGATION

- The impact after mitigation will be decreased, but the confidence level is low.

NO	COMPONENT	DATA		IMPACT		MITIGATION			
		SRCE	DCD	ISD	SCD	SRCE	MDC	MID	MCD
a2	**FLOW REGIME - Pipeline**	3	2	1	3	3	1	0	3

DATA

- The pipelines will have an impact on the river flows during construction as it crosses the rivers. The pipelines will be buried and will only cause a temporary obstruction of flow which is negligible.

IMPACT

- The flow in the rivers will be temporarily disrupted during construction at the site where the pipeline crosses the river. The whole river bed will not be closed off, but only half of it at any given time during construction.

MITIGATION MEASURE

- Work in the river bed should be done during low flow periods such as during the winter months. Only half of the river bed should be closed off at any given time and all obstructions cleared after construction.
- Areas of construction disturbance should be clearly defined, so as to minimise the impact on the flow regime.

IMPACT AFTER MITIGATION

- The impact after mitigation will be insignificant as after construction the flow regime should not be modified.

NO	COMPONENT	DATA		IMPACT		MITIGATION			
		SRCE	DCD	ISD	SCD	SRCE	MDC	MID	MCD
b	SEDIMENT LOAD	9	3	2	3	3	3	0	3

DATA

- The vegetation and stone/rock cover at the site where the pipelines crosses the rivers will be removed exposing the bottom alluvium of the river bed thus potentially increasing the sediment load of the river in that particular area.

IMPACT

- Construction activities within a section of the river will disturb riverine habitats and lead to increased sediment loads entering the river. This is a short term impact.

MITIGATION MEASURE

- Work in the river bed should be done during low flow periods such as during the winter months. Only half of the river bed should be closed of at any given time.
- Disturbance within the river channel should be minimised and appropriately rehabilitated

IMPACT AFTER MITIGATION

- The impact after mitigation will be insignificant.

RIVER CHARACTERISTICS		SRCE	IMP
FURTHER WORK	Landscaping specifications required for erosion protection, specifically at the river and canal crossings	9	2
ADVANTAGES	Not applicable	3	-

5.1.6 Water Quality

Klipvoor Dam

SRCE	DCD	PARAMETERS					
10	3	TEMP	pH	EC	TDS	PO_4 as P	$NO_3 + NO_2$ as N
UNIT		°C		$mS.m^{-1}$	mg/l	mg/l	mg/l
Minimum		-	8.1	47.6	376	0.113	<0.04
Median		-	8.7	61.1	466	0.316	0.04
Mean		-	8.7	61.7	456	0.331	0.08
90%		-	9.0	70.4	492	0.452	0.14
Maximum		-	9.1	79.6	558	1.033	0.38
ISD			1	1	1	1	1
SCD			3	3	3	3	3
MID			0	0	0	0	0
MCD			2	2	2	2	2

REMARKS

- Water quality records of the Department of Water Affairs and Forestry were used for information of the present water quality monitoring systems in the Project Area. The water quality is presented in another module of the Study.
- The project will have limited impact on the water quality but the water quality may have an impact on the project. If the water quality deteriorates, the purification costs will increase. The water quality changes that will take place will depend on the present and future land use activities.
- The water is generally of a good quality for domestic use although not always within the ideal water quality guideline ranges as specified in the guidelines for domestic use[11]. No comments can be made on the bacteriological and other biological qualities of the water as not data are available.
- Eutrophication, the process whereby water systems become enriched with plant nutrients such as ammonia, nitrates and phosphates with the consequent appearance of nuisance growths of aquatic plants and algae, has been identified as one of South

Africa's water quality problems. This implies that algae will be present in the water bodies, and it may reach nuisance proportions. Klipvoor Dam is eutrophied and additional treatment will be required to remove taste and odour from the water. The blue-green algae, *Microcystis aeruginosa*, which can produce toxins, are present in the water certain times of the year. Special care should be taken not to have these toxins present in the treated water[12, 13, 14].

- The effluent from the Water Treatment Works will be discharged into the Moretele River after sedimentation in ponds. The quality of the river water will not be negatively influenced because of the low sediment content of the return water and the small quantity of effluent (3 to 4 % of the abstracted water.)
- The increase of the availability of drinking water in the Study Area may have an impact on the sanitation of the area. As no sanitation facilities exist it is expected that the area could be negatively impacted by the increase of water. It is expected that the waste and excess water will be discarded randomly. The areas surrounding the houses and stand pipes may become wet depending on the drainage potential of the soils in the area. This may also lead to an increase in the potential for polluting the surface water in the area. Depending on the soils and the groundwater potential of the area it may also impact the groundwater quality of the area. The lack of sanitation facilities can also have a health implication for the communities.

WATER QUALITY		SRCE	IMP
FURTHER WORK	Water quality monitoring programme should be established	3	2
ADVANTAGES	Not applicable	3	-

5.2 Aesthetics

NO	COMPONENT	DATA		IMPACT		MITIGATION			
		SRCE	DCD	ISD	SCD	SRCE	MDC	MID	MCD
a	HIGH	3, 15, 16	2	2	3	3	3	1	1

NO	COMPONENT	DATA		IMPACT		MITIGATION			
		SRCE	DCD	ISD	SCD	SRCE	MDC	MID	MCD
b1	LOW : Dams	3	2	0	1	Not applicable			

DATA

- The aesthetics of the Project Area varies from high in the Borakalalo National Park to low in the rural settlements.

IMPACT

- The riparian vegetation will possibly be impacted by additional abstraction from dams if there are less frequent spills from the dam walls.
- The Borakalalo National Park can be impacted upon if a Water Treatment Works (WTW) and a regional reservoir is constructed within its boundaries, especially in the aesthetic appeal for tourism. The acccess road to the regional reservoir will probably impact the most on the aesthetic appeal of the Mogoshane hill as it will leave a permanent scar and can accelerate the potential for erosion on the slopes.
- Noise will emanate from the Water Treatment Works.
- Light at the Water Treatment works during the night may be a nuisance to animals in the Park as well as to visitors in the National Park.

MITIGATION MEASURE

- No mitigation measures will be possible from the project point of view, except perhaps improving the operating rules of the dams.
- The Water Treatment Works and the regional reservoir can be sited to be as invisible as possible to the tourists in the Reserve.
- Noise and light emanating from the Water Treatment Works should be minimised.

IMPACT AFTER MITIGATION

- The impact after mitigation is seen as small but the confidence degree is low.

NO	COMPONENT	DATA		IMPACT		MITIGATION			
		SRCE	DCD	ISD	SCD	SRCE	MDC	MID	MCD
b2	**LOW: Pipeline routes**	3, 15	3	2	3	3	3	0	2

DATA

- Some of the pipeline routes are in areas that have been developed and these areas are of a relatively low aesthetic value. The status of some of the proposed areas for reservoirs are not always low and special care should be taken in the final siting of the reservoirs.

IMPACT

- The construction of the pipeline in the road reserve will cause some disturbance and scar the roadside on a temporary basis rather than a permanent basis as the pipeline will be buried. Erosion could be accelerated during construction.
- The manholes with section, air and scour valves will be visible.
- The construction of the reservoirs, elevated tanks and pump stations will cause some disturbance and will have to be sited carefully because they will be a permanent feature on the landscape.
- The disposal of domestic and construction wastes will have a negative impact on the surrounding area.

MITIGATION MEASURE

- Appropriate rehabilitation procedures should be detailed to reduce the disturbance and erosion potential of the pipelines. The placing of the reservoirs, elevated tanks and pump stations should be done in such a manner as to make them as inconspicuous as possible.
- The location of waste dumps and spoil heaps, as well as the development of an appropriate protocol for the disposal of wastes, requires careful attention.

IMPACT AFTER MITIGATION

- It is likely that the disturbances associated with the construction of the pipelines can be almost totally mitigated except for the section, air and scour valves at manholes and the other surface structures.

AESTHETICS		SRCE	IMP
FURTHER WORK	• The siting of the reservoirs have to be done in consultation with the local people and the National Parks Board. • Suitable rehabilitation measures to be identified and enforced. • Remedial works for the rehabilitation of disturbed areas should be planned as an integral part of the project.	9	2
ADVANTAGES	Not applicable	3	-

5.3 Natural Environment

5.3.1 Flora

NO	COMPONENT	DATA		IMPACT		MITIGATION			
		SRCE	DCD	ISD	SCD	SRCE	MDC	MID	MCD
a	VEGETATION	2, 5, 17	3	1	3	3	2	1	3

DATA

- The dominant veld type in the Klipvoor Project Area is mixed bushveld.

IMPACT

- The impact on the flora will be small as the proposed pipelines are along roads and other pipeline reserves where possible and this has already been disturbed from its original state.

- The impact on the flora will be more significant for the proposed water treatment works, reservoirs, elevated tanks and pump stations but these impacts will be localised within the construction area.

MITIGATION MEASURE

- Construction activities and disturbance should be limited to a minimum area of disturbance.
- After the pipelines have been laid the areas must be revegetated with grass, especially where there are slopes.
- Fill material or topsoil for rehabilitation purposes should be taken from areas which have an appropriate seed bank to help with the revegetation process.

IMPACT AFTER MITIGATION

- Slight to no impact as the area is already disturbed and after mitigation the area should practically be the same as before pipeline construction. The same cannot be said for the other structures but the impact is not seen as severe.

NO	COMPONENT	DATA		IMPACT		MITIGATION			
		SRCE	DCD	ISD	SCD	SRCE	MDC	MID	MCD
b	AQUATIC FLORA	3	2	0	3	Not applicable			

DATA

- Aquatic flora will be present to a lesser or greater extent in all the dams.

IMPACT

- Aquatic flora should not be affected by the proposed developments.

NO	COMPONENT	DATA		IMPACT		MITIGATION			
		SRCE	DCD	ISD	SCD	SRCE	MDC	MID	MCD
c	INVASIVE AQUATIC PLANTS	3, 16	3	0	3	Not applicable			

DATA

- *Azolla* is present in Klipvoor Dam. These plants and other smaller unicellular algae cause problems at the purification works and abstraction points.

IMPACT

- The proposed development option can be impacted upon by the invasive aquatic plants in the dam. Precautions will have to be taken at the inlet of the water to the purification works.

MITIGATION MEASURE

- No mitigation measures will be possible, except for proper catchment management.

NO	COMPONENT	DATA		IMPACT		MITIGATION			
		SRCE	DCD	ISD	SCD	SRCE	MDC	MID	MCD
d	**INVASIVE TERREST. PLANTS**	3, 5	1	2	2	3	2	0	2

DATA

- The presence of alien plant species has a number of serious ecological implications for both indigenous vegetation and the production potential of the land. The banks of rivers are the habitats which are most affected by the presence of alien plant species. The most significant of these alien plant species are; *Syringa,* the grey poplar (*Populus canescens*) and the giant reed (*Arundo donax*). In places where the *Syringa* is present, it becomes the dominant canopy tree and is a serious threat to indigenous riverine vegetation and the associated fauna. The grey poplar occurs in dense thickets, which suppress indigenous vegetation, as well as blocking and narrowing river courses. The giant reed, invades water courses and tends to go largely unnoticed at the expense of the indigenous riparian vegetation.
- Few invasive terrestrial plants have been identified along the pipeline route.
- In roadside and veld habitats the following are potential invaders: Sweet prickly pear *(Opentia ficus-indica)*, syringa *(Melia azedarach)*, as well as lantana *(Lantana camara)*, queen of the night *(Cereus peruvianus)*, Jacaranda *(Jacaranda mimosifolia)* and sisal *(Aqave sisalana)*.

IMPACT

- Construction activities could cause disturbance of the area, which could result in the infestation of invasives which could be transported to the area in a number of ways.

MITIGATION MEASURE

- Limited, well demarcated pipeline corridors and construction sites should be identified. Disturbed areas should be appropriately vegetated before aliens can become established and an ongoing programme should be implemented if aliens are identified.
- Fill material or topsoil for rehabilitation purposes should be taken from areas which have an appropriate seed bank and are free of aliens.

IMPACT AFTER MITIGATION

- The appropriate mitigation measures should minimise the impact of disturbance by construction.
- Seeds of invasive weeds that could be brought in with fill material could remain dormant in the soil for long periods. An ongoing weeding programme of the contaminated areas should be implemented to prevent aliens becoming established.

FLORA		SRCE	IMP
FURTHER WORK	• Follow an approved eradication programme for floral invasives. • Suitable landscaping specifications to be enforced.	9	2
ADVANTAGES	Not applicable	3	-

5.3.2 Fauna

NO	COMPONENT	DATA		IMPACT		MITIGATION			
		SRCE	DCD	ISD	SCD	SRCE	MDC	MID	MCD
a	**MAMMALS**	5	2	1	3	3	2	0	2

DATA

- A game census was conducted in 1997 in the Borakalalo National Park and the results are presented in Appendix D. As the surrounding areas are rural not many mammals are expected to roam the areas.

IMPACT

- No severe impact on mammals is expected as the rural area is already developed.
- A temporary impact could be poaching and disturbance associated with construction activities, although it is doubtful whether it will be serious as the rural areas are already heavily utilised.
- The impact on the mammals in the National Park will mostly be temporary during construction. However, noise and light from the proposed WTW could influence the

animals by scaring them off in the vicinity of the works.

MITIGATION MEASURE

- Construction workers should be educated as regards environmental issues.
- Noise from the WTW should be minimised. Pumps and motors will be installed in the building of the WTW.
- Light from the WTW during the night will be minimised except in case of an emergency.

IMPACT AFTER MITIGATION

- The impact after mitigation will probably be slight in the rural area as the impact before mitigation is also seen as slight.
- The impact of the WTW on the National Park will have a permanent impact on the mammals although it is not seen as a major impact.

NO	COMPONENT	DATA		IMPACT		MITIGATION			
		SRCE	DCD	ISD	SCD	SRCE	MDC	MID	MCD
b	**BIRDS**	5	2	1	2	3	3	0	2

DATA

- There are many birds in the Project Area.

IMPACT

- The impact is relatively low as other similar habitats exist for birds in the area. A temporary impact is envisaged for birds having nesting sites within the construction area.

MITIGATION MEASURE

- No practical mitigation measures exist to minimise noise pollution and human activities associated with construction activities.
- Limit disturbance of area as far as possible.

IMPACT AFTER MITIGATION

- Once construction is completed and the road reserve rehabilitated the loss of habitat should be alleviated.

NO	COMPONENT	DATA		IMPACT		MITIGATION			
		SRCE	DCD	ISD	SCD	SRCE	MDC	MID	MCD
c	**REPTILES & AMPHIBIANS**	5	2	1	3	3	2	0	2

DATA

- Little is known about the species distribution in the rural areas.

IMPACT

- A temporary impact could be poaching of tortoises and snakes and disturbance associated with construction activities, although it is doubtful whether it will be serious as the rural area is reasonably developed.
- The impact on these animals in the Borakalalo National Park is also seen as temporarily during construction.

MITIGATION MEASURE

- Construction workers should be educated as regards environmental issues.

IMPACT AFTER MITIGATION

- The impact after mitigation will probably be slight to none as the impact before mitigation is also seen as slight.

NO	COMPONENT	DATA		IMPACT		MITIGATION			
		SRCE	DCD	ISD	SCD	SRCE	MDC	MID	MCD
d	**FISH**	5, 18	2	1	1	Not applicable			

DATA

- A fish survey was conducted at Klipvoor Dam in 1983. The fish species commonly found were Mozambique tilapia (*Oreochromis mossambicus*), butterfish (*Butropius depressirostris*), common carp (*Cyprinus carpio*), barbel (*Claria gariepinus*) and largescale yellow fish (*Barbus marequensis*)[18].

IMPACT

- The abstraction of water from the dam will probably not influence fish in the dam and downstream in the river even if species of conservation importance do occur.
- The construction of the pipelines, reservoirs, elevated tanks and pump stations will have

no impact on fish.

NO	COMPONENT	DATA		IMPACT		MITIGATION			
		SRCE	DCD	ISD	SCD	SRCE	MDC	MID	MCD
e	**TERRESTRIAL INVERT**	3	1	1	2	Not applicable			

DATA

- No data have been collected for terrestrial invertebrates but the project will not impact on invertebrates and this is not seen as an important component.

IMPACT

- It is envisaged that even if terrestrial invertebrates of conservation importance do occur, the impacts associated with the pipeline construction are unlikely to be significant.

NO	COMPONENT	DATA		IMPACT		MITIGATION			
		SRCE	DCD	ISD	SCD	SRCE	MDC	MID	MCD
f	**AQUATIC INVERT COMMUNITY**	3	2	1	2	Not applicable			

DATA

- No surveys have been undertaken for this study for aquatic invertebrates within the different rivers.

IMPACT

- It is envisaged that even if aquatic invertebrates of importance do occur within the river, the impacts associated with the abstraction of water from dams are unlikely to be significant.
- There will be no impact on aquatic invertebrates due to the construction activities.

NO	COMPONENT	DATA		IMPACT		MITIGATION			
		SRCE	DCD	ISD	SCD	SRCE	MDC	MID	MCD
g	EXOTIC TERRESTRIAL	3	2	1	2	3	2	0	2

DATA

- No data are available, but the project will have a negligible impact on exotic terrestrial animals.

IMPACT

- During the duration of pipeline construction, there may be a danger to goats and cattle while the trenches are open. This is not seen as a major impact as not many stray animals are expected.

MITIGATION MEASURE

- Large areas of open trenches should not be left unattended or unfenced.
- The area around open trenches should be fenced off if practical and/or filled up as soon as possible.

IMPACT AFTER MITIGATION

- The impact after mitigation will be low as the impact before mitigation is not deemed significant.

NO	COMPONENT	DATA		IMPACT		MITIGATION			
		SRCE	DCD	ISD	SCD	SRCE	MDC	MID	MCD
h	EXOTIC AQUATIC	3	2	0	2	Not applicable			

DATA

- Little information is available on exotic aquatic organisms. The project will however not have an impact on the exotic aquatic organisms.

IMPACT

- The abstraction of water from dams is unlikely to have an impact on exotic aquatic species.
- The construction activities are unlikely to have an impact on exotic aquatics.

FAUNA		SRCE	IMP
FURTHER WORK	Not applicable	3	2
ADVANTAGES	Not applicable	3	-

5.3.3 Habitat

NO	COMPONENT	DATA		IMPACT		MITIGATION			
		SRCE	DCD	ISD	SCD	SRCE	MDC	MID	MCD
a	CURRENT DISTURBANCE :BADLY DISTURBED	3	3	1	3	3	3	1	2

DATA

- Some of the proposed pipeline routes are within a badly disturbed area, i.e. in an existing road or pipeline reserve.

IMPACT

- The pipelines will represent a temporary disturbance of the road or pipeline reserves which should revegetate and hardly leave any scar.

MITIGATION MEASURE

- Appropriate rehabilitation procedures should be followed.

IMPACT AFTER MITIGATION

- Hardly any impact will be noticeable after rehabilitation except for manholes along the pipeline route.

NO	COMPONENT	DATA		IMPACT		MITIGATION			
		SRCE	DCD	ISD	SCD	SRCE	MDC	MID	MCD
b	CURRENT DISTURBANCE : DISTURBED	3	3	2	2	3	2	1	2

DATA

- All the rivers within the study area are regulated by dams and weirs and as such are disturbed systems.

IMPACT

- Dams will probably not have much less water as most of the water extracted from the dams will be from the incremental increase of return flows from the catchment to the system. If there is less water in the dam overflow from the dam will be less frequent. The proposed project would probably not disturb the rivers downstream of the dams any further.

MITIGATION MEASURE

- If a situation should develop where overflow is less frequent, appropriate water releases for the downstream environment may be a solution.

IMPACT AFTER MITIGATION

- The impact after mitigation will be decreased, but the confidence level is low.

NO	COMPONENT	DATA		IMPACT		MITIGATION			
		SRCE	DCD	ISD	SCD	SRCE	MDC	MID	MCD
d	**CONSERVATION STATUS OF RIVER**	4	2	1	2	Not applicable			

DATA

- Changes are apparent, such as locally severe pollution, dominant alien species, major water regulations etc. in most of the Project Area. More specific data are not available at present and very little can be said about the conservation status of the specific rivers.

IMPACT

- The impact of the pipelines and other surface structures on the rivers and streams will be negligible as the construction activities and structures will not constitute a permanent disturbance to the river or stream.
- The dam will probably not have much less water, as most of the water extracted from the dam will be from the incremental increase of return flows from the catchment to the system.

MITIGATION MEASURE

- If a situation should develop where overflow is less frequent appropriate water releases for the downstream environment may be a solution. This could however impact on the availability of water for the other downstream users.

IMPACT AFTER MITIGATION

- The impact after mitigation will be decreased, but the confidence level is low.

HABITAT		SRCE	IMP
FURTHER WORK	Define a suitable operating rule for dams taking into account the recreation and tourism activities as well as the downstream ecological requirements.	9	2
ADVANTAGES	The river stretches downstream of dams may improve ecologically if the instream flow requirements are met.	3	3

5.4 Socio-Economic/Political

5.4.1 Recreation

NO	COMPONENT	DATA		IMPACT		MITIGATION			
		SRCE	DCD	ISD	SCD	SRCE	MDC	MID	MCD
	RECREATION	8	2	1	2	3	3	0	2

DATA

- Klipvoor Dam, is used for recreation and is part of the Borakalalo National Park.

IMPACT

- If water levels in the dam should drop, it may affect recreation. Most dams have varying water levels and the impact should not be more severe than the situation at present.
- The pipelines and other surface structures will have no impact on recreation.

- The location of the WTW and the one regional reservoir with its associated access road can have an impact on the aesthetic appeal of the river downstream of the dam.

MITIGATION MEASURE

- Operating rules for Klipvoor Dam should be such that the recreation potential around the dam and downstream thereof will not be negatively influenced by the drawdown of the dam.

IMPACT AFTER MITIGATION

- The impact after mitigation measures should not be more than it is at the present drawdown rate. The confidence level is not high.

RECREATION		SRCE	IMP
FURTHER WORK	Define a suitable operating rule for the dams taking into account the recreation and tourism activities as well as the downstream ecological requirements.	9	2
ADVANTAGES	Improved management potential for dams.	9	2

5.4.2 Land Use

(Grazing, Agronomy, Mining, Industrial, Tourism, Rural, Forestry, Conservation/Wilderness etc)

NO	COMPONENT	DATA		IMPACT		MITIGATION			
		SRCE	DCD	ISD	SCD	SRCE	MDC	MID	MCD
a	**TYPE : AGRICULTURE**	1,3	1	2	2	3	2	1	2

DATA

- Parts of the pipelines may cross small areas of agricultural land.

IMPACT

- Some agricultural land will be lost if pipelines pass through it. Non-permanent crops

can still be cultivated within the pipeline servitudes.

MITIGATION MEASURE

- The pipelines should be aligned so that they cross as small as possible areas of cultivated land. The area should be appropriately rehabilitated after construction.
- Appropriate compensation should be made to the land owners for the loss of crop and/or lands. This compensation should probably take the form of financial compensation.

IMPACT AFTER MITIGATION

- The impact after mitigation is small, as cultivation can continue as long as it is not permanent crops.

NO	COMPONENT	DATA		IMPACT		MITIGATION			
		SRCE	DCD	ISD	SCD	SRCE	MDC	MID	MCD
b	**TYPE : RURAL**	1, 2, 3	2	1	2	Not applicable			

DATA

- Parts of the pipelines and the reservoirs, elevated tanks and pump stations will be situated close to existing rural development.

IMPACT

- The construction sites will have to be acquired and some land loss will occur.
- During construction there will be an impact on the local residents of the rural areas. These impacts will be of a temporary nature and include noise and dust pollution and the safety of the local residents.
- A danger of physical injury exists for people and animals during construction, especially where housing is close to the construction activities.

MITIGATION MEASURE

- Appropriate compensation should be made to the land owners for the loss of land. This compensation should probably take the form of financial compensation.
- The construction activities should be such as to minimize disturbances to the local communities.

- Proper supervision on the construction site, especially during excavations, is essential in safeguarding people and animals as the trenches may sometimes be as deep as 2,5 m.
- If any blasting is needed, careful planning is essential, and even more so where work is done close to housing or grazing areas.

IMPACT AFTER MITIGATION

- The impacts should be small after mitigation but the confidence degree is low.

NO	COMPONENT	DATA		IMPACT		MITIGATION			
		SRCE	DCD	ISD	SCD	SRCE	MDC	MID	MCD
c	**TYPE : MINING AND INDUSTRIAL**	1, 3	2	0	2	Not applicable			

DATA

- There are limited industrial activities within the Project Area.

IMPACT

- The proposed extension of Magalies Water will not influence the industrial activities in the Project Area negatively. The proposed development will enhance the potential for industrial activities by creating a more assured water supply.

NO	COMPONENT	DATA		IMPACT		MITIGATION			
		SRCE	DCD	ISD	SCD	SRCE	MDC	MID	MCD
d	**TYPE : TOURISM**	1, 3	1	2	2	3	2	1	1

DATA

- A WTW is proposed downstream of Klipvoor Dam in Borakalalo National Park.
- An access road will be required to reach the Regional Reservoir site on the mountain in the Borakalalo National Park.
- There are a number of land dispute issues in the Borakalalo National Park.

- The Bultfontein II Community, just outside the entrance gate of Barakalalo, owns 744 ha in the Park. They are claiming R2,4 million compensation from the Government and an agreement should now be liiked at for the future tenure of the land. They have already threatened to break down the Park should they not be paid compensation soon.
- The Jonathan Community claims that they have been underpaid for their land years ago and would now want their land back.
- The Klipvoorstad Community claims that the Parks Board have fenced off the water for watering their cattle.
- Excessive poaching and cutting of perimeter fences is presently going on in the Park, making future development difficult.

IMPACT

- The WTW site will have an aesthetic impact on the tourism potential downstream of the dam as it is close to proposed hiking trails.
- During construction there will be an impact on the local residents of the National Park as well as the animal life. These impacts will be of a temporary nature and include noise and dust pollution and the safety of the local residents.
- A danger of physical injury exists for people and animals during construction, especially where housing is close to the construction activities.
- The access road to the Regional Reservoir will leave a permanent scar on the mountain side.

MITIGATION MEASURE

- The construction activities should be such as to minimize disturbances to the local communities and the residents in the National Park.
- Proper supervision on the construction site, especially during excavations, is essential in safeguarding people and animals as the trenches may sometimes be as deep as 2,5 m.
- If any blasting is needed, careful planning is essential, and even more so where work is done close to housing or grazing areas.
- The access road must be carefully chosen and constructed as environmentally friendly as possible.
- The positioning of the WTW shoud be such that it does not influence the tourism potential downstream of the dam.

IMPACT AFTER MITIGATION

- The impacts should be small after mitigation but the confidence degree is low.

LAND USE		SRCE	IMP
FURTHER WORK	• Choose the sites of the WTW and the access road to the Regional Reservoir with input from the National Parks Board. • Identify appropriate measures for minimizing impacts on the local communities outside and within the National Park.	3	2
ADVANTAGES	Not applicable	3	-

5.4.3 Cultural/Historical

(Archaeology, national monuments, historical areas, areas of special significance, etc)

NO	COMPONENT	DATA		IMPACT		MITIGATION			
		SRCE	DCD	ISD	SCD	SRCE	MDC	MID	MCD
a	**TYPE : ALL**	2, 4, App H	3	2	1	App H	2	1	1

DATA

- Archaeological research consisting of surveys and extensive excavations of Stone Age and Iron Age sites as well as of the recording of rock art sites has been conducted in the Magaliesberg Valley and in the Central Bankeveld during the past three decades. This region, which ecologically speaking, is situated between the Highveld in the south and the Bushveld in the north, has a rich archaeological heritage comprised of remains dating from both the prehistoric and the colonial periods of South Africa. These archaeological and historical remains include:
- Stone Age sites which may be associated with the San people and which date back

thousands of years;

- In order to comply with legislation knowledge is required of the presence and of the significance of any archaeological or historical remains which may occur in these development areas and if such remains could be affected, damaged or destroyed by the proposed development activities. More information regarding the legislation and previous work done in the area are presented in Appendix H. Iron Age sites occupied by Bantu Groups during the past two millennia; and
- Remains dating from the previous century when the first Colonists settled in various places to the north and the west of the Magaliesberg.
- The Project Area is part of the spheres of influence of Iron Age and historical Batswana and Ndebele clans who occupied these areas for the last half a millenniam.
- In order to comply with legislation knowledge is required of the presence and of the significance of any archaeological or historical remains which may occur in these development areas and if such remains could be affected, damaged or destroyed by the proposed development activities. More information regarding the legislation and previous work done in the area are presented in Appendix H.

IMPACT

- From this study on the basis of the available data it cannot be stated whether or not the proposed development will have a negative impact on any cultural resources.

MITIGATION MEASURE

- Mitigation may be necessary and measures will be determined by archaeological and historical experts.

IMPACT AFTER MITIGATION

- If mitigation measures are satisfactory the impact after mitigation is low. The confidence level is not high.

CULTURAL/HISTORICAL		SRCE	IMP
FURTHER WORK	Before any construction activities can commence a Phase 1 archaeological survey of the proposed development areas should be commissioned in order to establish the nature, the extent and the significance of any archaeological or historical remains in these areas.	AppH	2
ADVANTAGES	Not applicable	3	-

5.4.4 Infranstructure

(Roads, Railways, Power lines, Telephone lines, pipelines, dams, canals, etc)

NO	COMPONENT	DATA		IMPACT		MITIGATION			
		SRCE	DCD	ISD	SCD	SRCE	MDC	MID	MCD
a	**TYPE : ROADS**	3	2	2	2	3	2	1	2

DATA

- Some entrance roads may be temporarily closed as the trenches are dug and the pipeline installed.
- Where the proposed pipelines are within a road reserve there may be temporary disruptions to the road users.

IMPACT

- Access to secondary roads may be temporarily disrupted.
- Traffic will probably be inconvenienced during some stages in the construction of the pipelines if the road is blocked for whatever reason. This is a temporary impact.
- The construction activities may also result in the premature degradation of the existing road surface due to the increase in heavy vehicle traffic.
- Fences may be temporarily broken during construction and local residents should be aware of this in good time, in order to remove any live stock and children in those particular areas.

- It was assumed that the proposed pipelines will cross roads in certain instances. Temporary traffic deviations will be necessary and will cause traffic hazards. The road surface will have to be retarred as soon as possible after the pipes have been laid.

MITIGATION MEASURE

- Warning of the day on which the entrance roads will be blocked should be given to affected parties. Work should be expedited. Any broken fences should be replaced as soon as possible.
- No mitigation is possible for inconveniences caused to other road users.
- Degradation of the existing road should be avoided where possible, and mended where necessary.

IMPACT AFTER MITIGATION

- Inconveniences should be minimised.
- The road should be in an acceptable condition after construction.

NO	COMPONENT	DATA		IMPACT		MITIGATION			
		SRCE	DCD	ISD	SCD	SRCE	MDC	MID	MCD
b	**TYPE : POWER& TELEPHONE LINES**	3	2	2	2	3	2	0	2

DATA

- Power, telephone and railway lines are within the proposed area of development and need to be considered during the final placing of the proposed developments.

IMPACT

- Disturbance of any existing infrastructure will have a temporary disruptive impact.

MITIGATION MEASURE

- Work at the construction sites should be expedited.

IMPACT AFTER MITIGATION

- The appropriate mitigation measures should minimise the impact of disturbance during and after construction.

INFRASTRUCTURE		SRCE	IMP
FURTHER WORK	• Determine the exact route of the pipelines and location of other surface structures in relation to existing infrastructure	3	2
	• Specify suitable measures to inform the users of secondary roads timeously of the possibility of blocked access roads and broken fences.	3	3
ADVANTAGES	Not applicable	3	-

5.4.5 Population

NO	COMPONENT	DATA		IMPACT		MITIGATION			
		SRCE	DCD	ISD	SCD	SRCE	MDC	MID	MCD
	POPULATION	2	2	2	1	3	1	1	2

DATA

- A comprehensive study on demographic and socio-economic conditions in the Master Plan Study Area was conducted during Phase 1 of the JICA Study. With regard to the three feasibility Project Areas, the Study concluded that there will be no future growth in population. It is foreseen that the natural growth of population in the areas will be offset by migration of an approximately equal number of people to urban areas.

IMPACT

- The construction activities will cause some disturbance and inconvenience to the people.
- Construction activities will cause a temporary influx of people which could lead to an artificial economic boom for the area. The influx of people could also lead to poaching and littering. These impacts could also include increased pressure on local resources for food and for accommodation and on community life. This impact is temporary and may not present a large impact.

- There will be some employment opportunities for local people.
- Apart from the visual impacts of construction work, there will also be a considerable level of noise, dust, vibrations and increased traffic. This could have an adverse effect on the inhabitants of the area close to the construction activities, as well as on the aesthetics of the area. These effects are temporary.

MITIGATION MEASURE

- The pipeline routes should be aligned so as to minimise disturbances to the local population.
- Appropriate information and educational aspects regarding environmental issues should be conveyed to the workforce.
- Negotiations between the local population and the construction team should be appropriately and timeously organised.

IMPACT AFTER MITIGATION

- The social structure of the surrounding population is unlikely to be severely disrupted.

POPULATION		SRCE	IMP
FURTHER WORK	• The specific people along the pipeline routes and other surface structures that will be impacted have been identified and should be included in the further planning of the project. • The anticipated impact with reference to a temporary economic boost to the local people should be addressed.	2	2
ADVANTAGES	• The people in the Project Area will have a more assured supply of water. • Local people could get work during construction.	3 3	3 2

5.4.6 Interested and Affected Parties

NO	COMPONENT	DATA		IMPACT		MITIGATION			
		SRCE	DCD	ISD	SCD	SRCE	MDC	MID	MCD
	INTERESTED AND AFFECTED PARTIES	2	1	2	1	3	1	1	1

DATA

- An area planning forum has been established. The forum consists of of the following representatives:
  Eastern District Council, Rustenberg District Council, Magalies Water, Department of Water Affairs and Forestry, Rand Water, South African National Civic Organisation (SANCO), Transitional Local Council (TLC) and the Transitional Metropolitan Council (TRC). More information is presented in the Interim Report of July 1997. **IMPACT**
- Negative impacts of the project on the interested and affected parties are uncertain, however by not involving the necessary people the project could be detrimentally influenced. The affected parties, being supplied with water, will be positively influenced.

MITIGATION MEASURE

- Identify and involve the interested and affected parties.

IMPACT AFTER MITIGATION

- The impact after mitigation should be negligible.

INTERESTED AND AFFECTED PARTIES		SRCE	IMP
FURTHER WORK	The interested and affected parties must be involved in the project in a public participation programme.	3	2
ADVANTAGES	More assured water supply to the Project Area.	3	-

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Borakalalo National Park.
16. National Parks Board, 1997. Ecologist for Borakalalo National Park; Mr R Schaller.
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APPENDIX B

DEPARTEMENT VAN WATERWESE EN BOSBOU
DEPARTMENT OF WATER AFFAIRS AND FORESTRY
REPUBLIEK VAN SUID-AFRIKA / REPUBLIC OF SOUTH AFRICA

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Privaatsak
Private Bag XB13
Pretoria
0001

Navrae:
Enquiries C J Munro
338 8218

Verwysing
Reference:

Director
Department of Environment Affairs
Kockspark
P O Box 5396
2523

FOR ATTENTION : MR DEON SWART

RE : MAGALIES WATER STUDY : KLIPVOOR AREA FEASIBILITY STUDY : BORAKALALO NATURE RESERVE

Attached please find background information prepared by the JICA study team, regarding the proposed scheme.

Should you wish to have a meeting to discuss the proposed scheme in more detail with the consultants, JICA and the Department of Water Affairs, please contact Ms G Munro in this regard.

pp.

DIRECTOR GENERAL : DEPARTMENT OF WATER AFFAIRS AND FORESTRY
DATE: 97-01-02

MEMORANDUM

JICA STUDY TEAM on MAGALIES WATER STUDY
c/o DEPARTMENT OF WATER AFFAIRS AND FORESTRY

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PO BOX 11599, QUEENSWOOD, 0121, SOUTH AFRICA
TEL : (012) 3388 647 FAX: (012) 323 1679 E-MAIL: JICASA@ICON.CO.ZA

To: DWAF - Ms G Munro **Date:** 18 August 1997

From: Mr S Kadowaki

Subject: **Klipvoor Area Feasibility Study - Works in Borakalalo Nature Reserve**

COMMENTS:

Further to our meeting on Friday, we have revised the attached description of the proposed facilities within the nature reserve and combined the various material copied to you previously. I trust that this will be suitable for you to attach to a letter to the Parks Board but should you require any revisions to be made, please contact me on Extension 8647.

I will return to Japan on 4 September so please liaise with Linda Rousseau on 012 982 492 concerning other matters related to this subject.

Regards

Satoshi Kadowaki
Study Team Leader
JICA Study Team

Copies: L Rousseau (fax 012 982 492)

Study on the Expansion of Capacity of Magalies Water
Phase 3 : Feasibility Study

Proposed Water Supply Facilities in Borakalalo Nature Reserve

1. Introduction

In order to supply the rural and peri-urban communities in the area around Klipvoor Dam, the JICA Study is investigating the feasibility of constructing a water treatment works and associated facilities, including river intake, pumping station and pipelines. As part of the environmental impact assessment for the Study, the Department of Environmental Conservation in North West Province has been contacted about the proposed development and an initial meeting has been held with managers from the park to discuss the viability. Although the proposals are still in the planning stage, the agreement in principle of the Nature Conservation Board is requested to enable the proposals to be developed further and firmed up.

2. Context

The aim of the JICA Study on the Expansion of Capacity of Magalies Water Board is to carry out the necessary planning to provide the residents in the Study Area with a safe and reliable water supply. The Study is funded by the Government of Japan as part of its overseas aid programme and is being carried out by specialist financial and institutional specialists and water supply planners from both South Africa and Japan with the support of local consultants.

During 1996, a Master Plan Study was conducted which covered a large area including parts of four Provinces. This Study identified three priority areas of greatest need, all within the former Bophuthatswana, where the level of water supply provision falls below the RDP level of service. In many rural parts of the Study Area, communities rely on groundwater which, in many cases, is unsatisfactory in terms of available yield or quality. A study of groundwater accessibility and exploitability indicated that opportunities for developing further groundwater supplies are quite limited. As a result it is proposed that where feasible, communities should be served from water treatment works supplied from surface water sources (rivers or dams).

The Klipvoor Feasibility Study Area shown in Figure 1 is located in the northern parts of Odi 1 and Moretele 1 districts. The communities are currently totally dependent on groundwater sources which are subject to pollution from poor sanitation and natural sources and which in many cases are of low yield. For the purposes of the Study, it is proposed that those living in such communities should be served to at least the RDP level of service (25 litres per person per day). To achieve this it is proposed to construct a water purification works, to treat water abstracted from the Moretele River downstream of Klipvoor Dam, regional reservoirs and pipelines as shown in Figure 2. The intake and some of the pipelines would be located within the Borakalalo Nature Reserve but would be restricted to existing corridors of development. In addition it would be most cost effective to locate the water treatment works and a regional service reservoir within the park. However, two alternatives to this initial proposal whereby the treatment works and possibly also the regional reservoir are relocated outside of the park boundary are also being considered. The pipelines to each community are shown in Figure 1.

3. Details of Proposed Developments

It should be emphasised that the proposals are still in the planning or feasibility stage and more detailed study will require that some details are changed. The viability of the entire scheme is currently being appraised to estimate the cost per capita for the proposals and to determine the relative priority compared to other schemes which are competing for funding.

3.1 River Intake

It is proposed that the intake be located on the southern bank of the river immediately upstream of a gauging weir which is owned and operated by the Department of Water Affairs and Forestry (DWAF) approximately 800m west of Klipvoor Dam. This site would minimise disruption of the riverine environment by avoiding the need to construct a further weir in the river and keeping development along the river bank in a single location. The approximate location is shown on Figure 2. The intake would be a concrete structure which would house electric pumps. A power supply is available at this side of the dam wall which, if the capacity is sufficient, would need to be extended to the intake. The raw water pipeline from the intake to the treatment works would run back along the road towards the dam before crossing the Moretele River close to the existing bridge. From there it would run northwards at the side of the road and, in the case of Option 2 or Option 3, out of the north gate to the treatment works.

3.2 Water Treatment Works

The most significant development is the water treatment works. The best technical option (Option 1) would be to locate the works above the flood level but close to the river. Alternative locations (Options 2 and 3) are outside the park to the north as shown in Figure 2 either immediately outside the north gate of the park or further to the north at the high point. The works will comprise a series of concrete tanks, sludge drying beds and buildings.

Two different sizes of treatment works (6 Ml/d and 15 Ml/d) are being considered which correspond to different levels of service. A preliminary layout is shown in Figure 3 with the treatment units for the smallest capacity shown as solid lines while the additional units required for the larger capacity are shown as dashed. The smaller option would treat sufficient water to meet the water demand associated with the RDP level of service, (a daily demand of 25 litres per capita), while the larger capacity is equivalent to 90% of houses having yard connections while 10% remain on standpipes, (a demand of 80 litres per capita per day). Both service levels will be costed and, based on willingness to pay and affordability, a recommendation will be made as to which option should be pursued.

The larger size works would occupy a total area approximately 300m x 100m. Treated water will be pumped to one or two regional reservoir. Under Options 1 and 3 there would be two separate reservoirs; one for Klipvoor East / Moretele North and one for Klipvoor West (on the Mogosane Hills which lie within the Park). Treated water from the works would be transferred via pipelines to the north and south. Under Option 2 the reservoirs would be combined and located close to the treatment works at the local high point. The pipeline to Klipvoor West (to the south), will run back through the park along the main north-south road to the main gate and onwards to communities of Fafung and southwards towards Jericho. The pipeline to Klipvoor East would not be affected by the options.

A by-product of the water treatment process is a so-called "sludge" which is water containing the dirt abstracted from the raw water and a chemical coagulant, (typically aluminium sulphate or ferric chloride), that is added during the treatment process. In South Africa, standard practise is to discharge the sludge into lagoons to allow settling of the solids to take place. The supernatant is then decanted and returned to a watercourse. It must be emphasised that this sludge typically contains around 98% water and has no smell. The sludge lagoons usually have a large volume. Water enters at one side and the supernatant water is usually decanted at the opposite corner. Depending on which option is pursued, two possible routes for discharging this supernatant exist. It could either be returned to the Moretele River downstream of the weir (passing through Klipvoorstaat en route), or to the dam via the creek just east of the north abutment as indicated in Figure 2.

The most preferable route should be determined during the detailed design through consultation with key stakeholders, (the Parks Board and the community in Klipvoorstaat).

3.3 Regional Reservoir

The purpose of a regional reservoir is to store treated water to enable peak water demands to be met and to enable a reliable pressure to be maintained. To achieve this the reservoir should be located on high ground and upstream of any off-takes to individual communities. Under Options 1 and 3 it is proposed to site the regional reservoir for Klipvoor West on the Mogosane Hills. Under Option 2 this facility would also be constructed close to the new treatment works at the high point on the north side of the Park.

3.4 Pipelines

All pipelines will be buried except at river crossings where the pipelines will be attached to pipe bridges. The maximum size of the pipelines will be 400 mm diameter and, where practical, they will be laid along the side of existing roads. Treated water will gravitate or be pumped from the works via pipelines, (as shown in Figure 1 and described above), to the communities. Storage reservoirs would be constructed at each community.

4. Expected Biophysical Impacts

The DWAF procedures for Integrated Environmental Management (IEM) have been adopted for the Study. The IEM procedure consists of successive levels of impact studies of which the Relevant Environmental Impact Prognosis (ROIP1 - the Afrikaans acronym) was the first step. This was completed during 1996 as part of the Master Plan Study and comprised a scoping and screening process. A ROIP 2 which involves site investigations and inputs from specialists is currently under way.

The river intake, some of the proposed pipelines and possibly the treatment works and a regional reservoir (with associated access road) will be located in the Borakalalo Nature Reserve. The main impacts will be associated with the construction of the intake pumping station and will be most significant during construction.

During construction the main biophysical impacts will be:

- noise and vibration
- dust
- visual and aesthetic impact
- construction traffic
- possible disturbance of archaeological and historic sites
- erosion of exposed slopes
- invasion by exotic terrestrial plants

During operation the main biophysical impacts will be:

- visual
- occasional traffic for access
- impact on river regime due to returned water and reduced availability for other uses
- noise of operation

As stated previously, where possible development would be restricted to existing corridors i.e. pipelines would follow roads, the treatment works would be located close to the dam (under Option 1) and the intake would be located at the existing gauging station.

To enable the raw water pumps at the intake to operate continuously, it would be necessary to maintain flow down the river. The noise of the flow over the weir would drown out any noise from the intake pumping station.

Work within the Park could be scheduled to take place within the winter months so as to limit disruption during the peak tourist season.

If the scheme proves to be feasible, an Environmental Management Plan will be prepared for the construction phase and rehabilitation guidelines will be drawn up to mitigate the resulting disturbance and aesthetic impacts. Landscaping and provisions in the construction contract will be used to reduce the environmental impact of the works.

5. Social Impacts

The management of the Study has been arranged to involve the beneficiaries through their elected representatives and other community groups (such as tribal organisations). In addition, needs and attitude surveys have been conducted to assess needs and priorities and pilot projects are in progress to confirm effective methods of project implementation.

The social impacts are expected to be positive and will comprise:

- reduced illness and disease
- reduced workload for those currently fetching water (mostly women and children)
- improved long term viability of rural communities
- employment prospects both during construction and operational phases
- improved awareness of health and hygiene issues

The communities that will benefit from the scheme are shown in Figure 1 and may be summarised as follows:

Key Facts	Total
Number of Communities	35
Estimated Number of Households	16,885
Estimated Population	114,818
Total Water Demand in 2007 (Annual Average Daily Demand)	9,190 kl/d

6. Technical Evaluation of Options

From a technical perspective Option 1 is preferable as the length of pipelines is minimised as is the amount of pumping that is necessary. These factors will be reflected in the financial appraisal of the options.

It is preferable to locate the works close to the water source to enable the intake and river to be monitored regularly by the treatment works operators. Option 1 is also preferable in this respect.

7. Financial Evaluation of Options

An initial appraisal of the relative costs of the options for locating the treatment works, construction and energy costs was made for Options 1 and 2 and the result of the analysis is shown below. The costs are only for those parts of the scheme which are affected by the options; common aspects have not been considered.

Costs	Option 1	Option 2
Construction Cost (R)	9,111,427	10,140,065
Annual Energy Cost (R)	197,538	237,050

It can be seen that both the construction and the annual energy costs are more expensive for Option 2. The difference in construction cost is approximately one million Rand while the difference in annual energy cost is around R40,000.

8. Conclusions

Three options for the treatment works site have been considered. From purely technical and financial considerations Option 1 is preferred due to the lower construction and pumping costs.

Whichever option is adopted for the treatment works, it is proposed to locate the raw water intake and pipelines within the park. The proposed infrastructure would be restricted to existing corridors of development where possible.

The conclusion of the ROIP1 Study was that the impacts will be mostly restricted to the treatment works site.

The preliminary conclusion of the ROIP2 Study is that the adverse (biophysical) environmental impacts are relatively minor and are greatly outweighed by the beneficial (social) impacts.

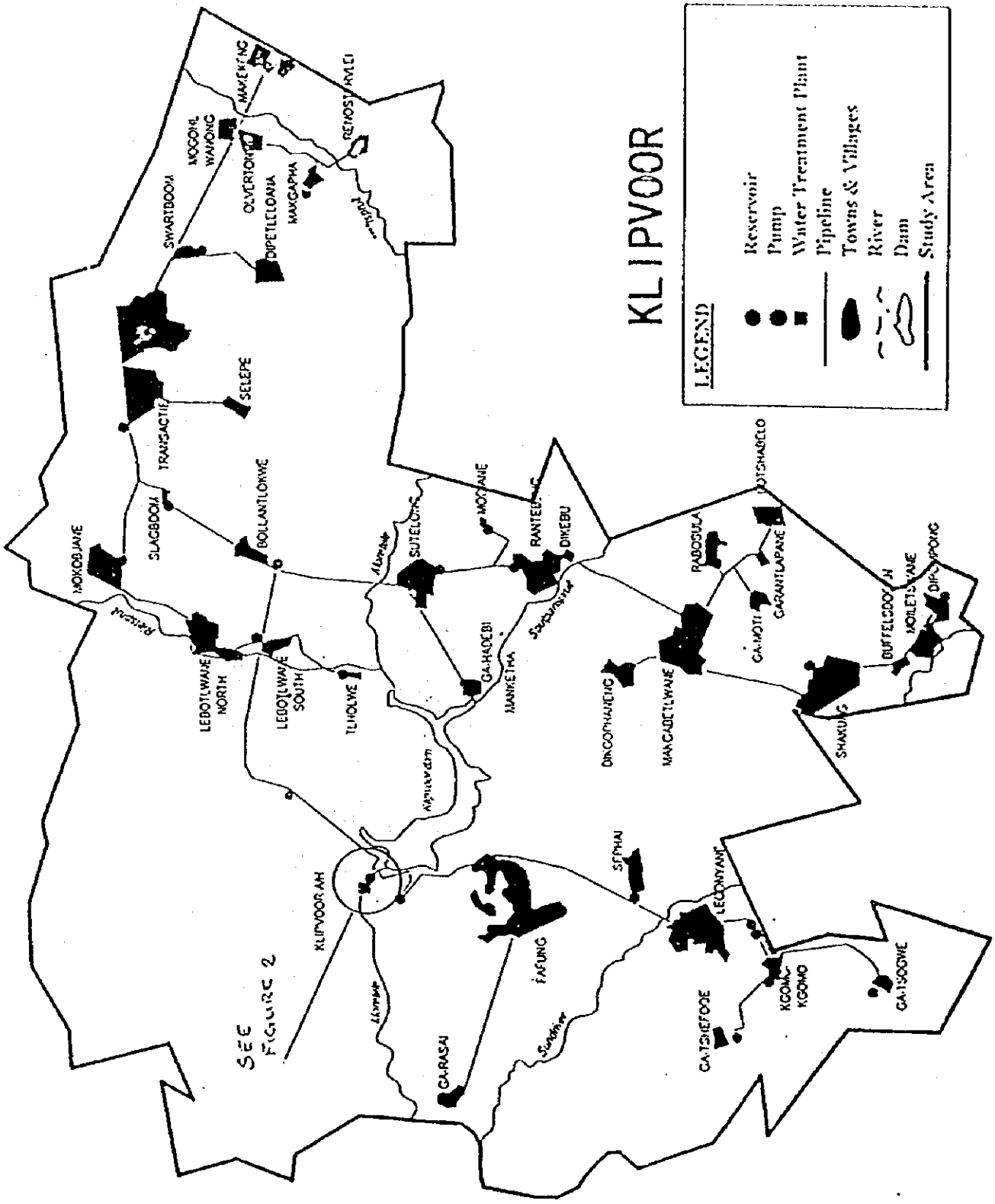

Figure 1 : Klipvoor Feasiblity Study Area

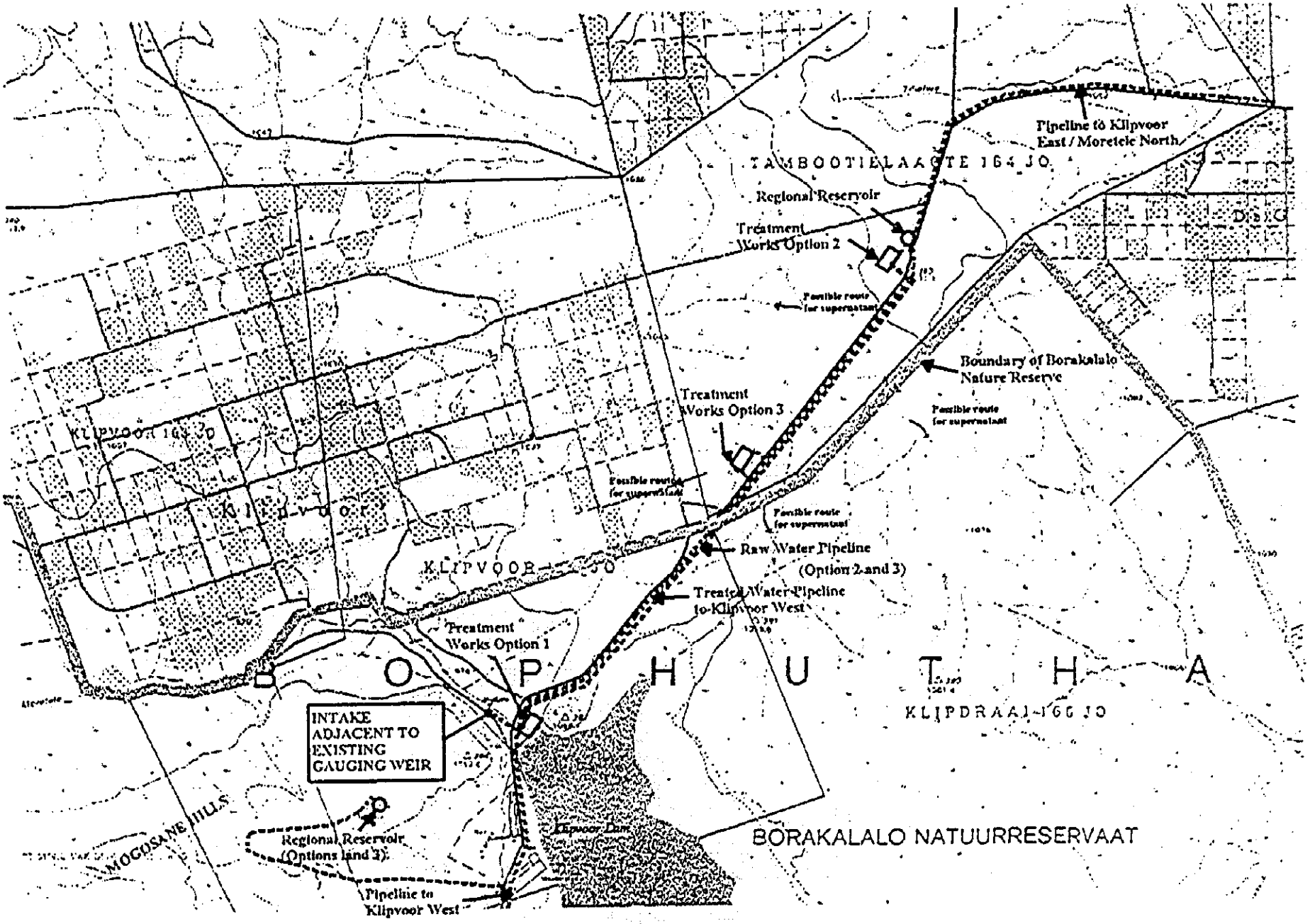

Figure 2 : Proposed Infrastructure at Klipvoor Dam

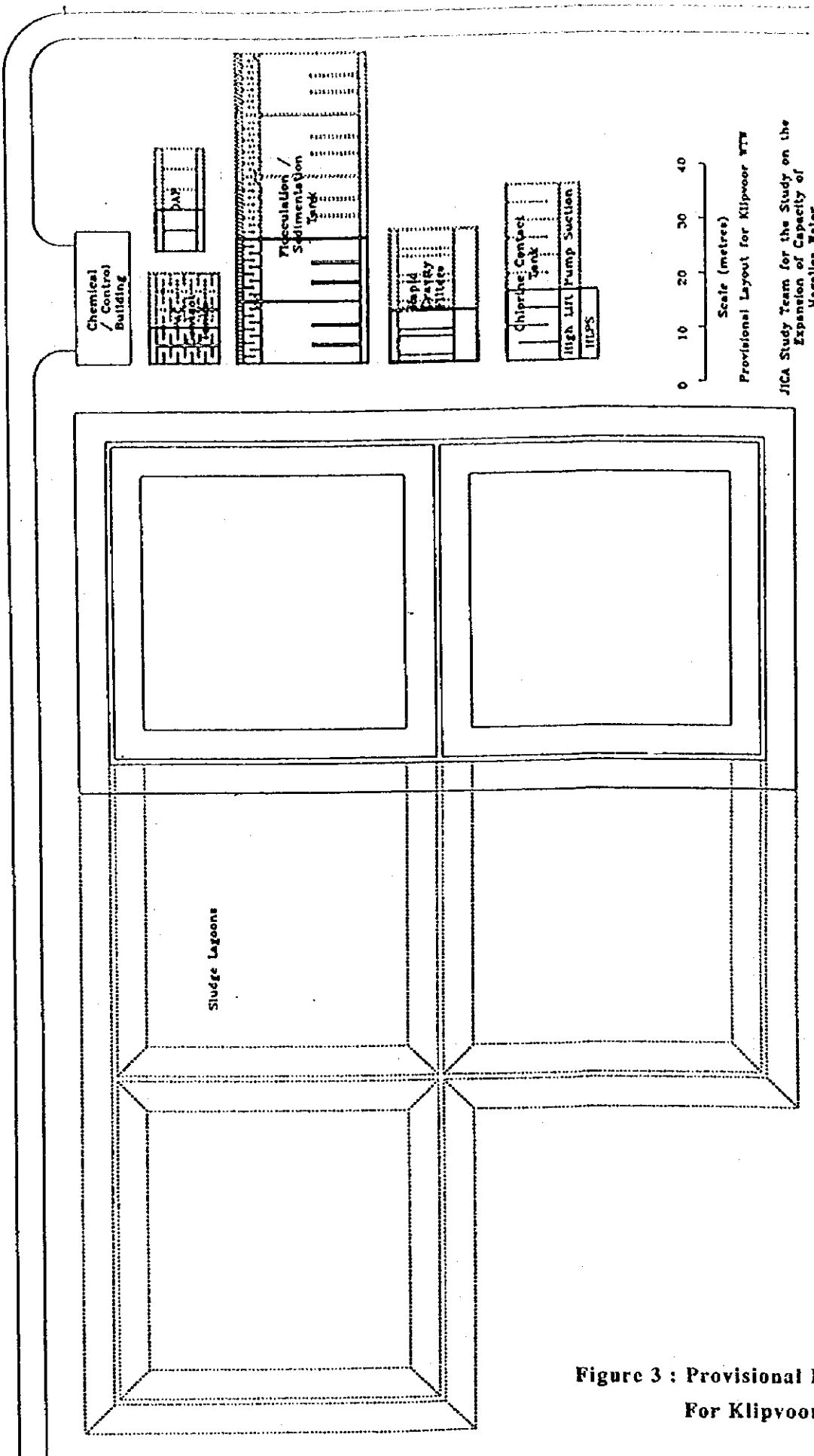

Figure 3 : Provisional Layout For Klipvoor WTW

APPENDIX C

Potchefstroomse Universiteit
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Mr Deon Swart
DEAT
Potchefstroom

10 October 1997

Dear Mr Swart

MAGALIES WATER STUDY - KLIPVOOR AREA FEASIBILITY STUDY : BORAKALALO NATIONAL PARK

I inspected the proposed development (attached) on October 9, 1997. Herewith my comments:

1. Although undesirable, it is unavoidable that the development will continue. There are communities around the national park which have no access to potable water, as prescribed in the new Water Act.
2. The proposed site for the water purification works are still under discussion. Three sites are considered at the moment, two of which are situated within the national park. Since a water purification plant is a quiet operation, economics dictate that the plant be constructed inside the park, close to the road, about 500m downstream of the Klipvoor dam. The only noise emanating from such a plant are pumps, which should be insulated as to not cause any impact on visitors to the park. The visual impact could be minimized by moving the site to a position about 100m from the road, thereby effectively screening it from any view by vegetation. The access road should also be curved so that the plant cannot be seen from the tourist road.
3. My main concern, however, is the construction of a water reservoir on top of the Mogoshane hills. There are three possible impacts, viz.:
    - the visual impact of the construction itself - this could be minimized by siting the reservoir as far as possible in the center of the plateau on top of the hills, so that it could only be seen from some distance away. A survey of ortho-photos indicated that there are indeed flat areas on top of the hills where the visual impact of such a construction on the national park will be minimal.
    - The pipes to and from the reservoir - the current thinking is that the pipes will be buried. This action should be meticulously planned and monitored, since any destabilization of the steep slopes will lead to severe erosion and degradation. Experience has shown that once started, such slope-degradation is almost impossible to manage or to mitigate.

- The access road to the reservoir - **this road is the most serious impact of the proposal**. It should preferably approach the mountain from the west, again to minimize any visual scars to the hillsides. Also in this instance, the construction of such a road should be planned and executed in such a way as to not initiate erosion. Strict control measures should be formulated and applied.

Regards

Yours sincerely

Dr. I.J. van der Walt
Pr. Sci. Nat ; Senior Lecturer
GGFIJVDW c:\word\aprojek\staatsverslae\boarskiffo.doc

APPENDIX D

metsiqaa.001

MOTIVATION FOR PHASE I ARCHAEOLOGICAL SURVEY IN MAGALIES WATER'S INTENDED DEVELOPMENT AREAS

Archaeological research consisting of surveys and extensive excavations of Stone Age and Iron Age sites as well as of the recording of rock art sites has been conducted in the Magaliesberg valley and in the Central Bankeveld during the past three decades. This region, which, ecologically speaking, is situated between the Highveld in the south and the Bushveld in the north, has a rich archaeological heritage comprised of remains dating from both the prehistoric and the colonial periods of South Africa. These archaeological and historical remains include:

* Stone Age sites which may be associated with the San people and which date back thousands of years;

* Iron Age sites occupied by Bantu groups during the past two millennia; and

* Remains dating from the previous century when the first colonists settled in various places to the north and the west of the Magaliesberg.

Magalies Water intends to construct, to upgrade and to establish services in parts of the Bankeveld (Mankwe, Klipvoorsiening and Moretele II). These areas are part of the spheres of influence of Iron Age and historical Batswana and Ndebele clans who occupied these areas for the last half a millennium.

In order to comply with legislation Magalies Water requires knowledge of the presence and of the significance of any archaeological or historical remains which may occur in these development areas and if such remains could be affected by Magalies's proposed development. This knowledge is essential to allow pro-active measures to be taken with regard to any significant archaeological or historical remains which may occur in this area and which may be affected, damaged or destroyed by the proposed development activities. Consequently, Magalies Water must commision a Phase I archaeological survey of the proposed development areas in order to establish the nature, the extent and the signifance of any archaeological or historical remains in these areas. This will determine whether such remains will be affected by Magalies Water's proposed development activities, and if so, what appropriate actions should be taken to soften the impact of development activities on such remains.

ARCHAEOLOGICAL REMAINS AND LEGISLATION

All archaeological and historical sites which may occur in the proposed development area and which are older than fifty years are protected by legislation. A synopsis of the relevant legislation is provided below. It must serve as a guideline which must be considered before any development project is undertaken.

The National Monuments Act (Act No. 28 of 1969)

In South Africa, all palaeontological, archaeological and historical sites older than 50 years are protected by the National Monuments Act (Act No. 28 of 1969, as amended). According to this Act, it is an offence to destroy, damage, excavate, alter, or to remove from its original site, or to export from the Republic any part of such a site or such material without a permit.

If convicted of an offence in terms of the Act, a person could be liable for a fine of up to R10 000 or two years imprisonment, or both. Permits for excavations, the removal of, damage to or the export of archaeological/historical relics are issued by the National Monuments Council. Permits for the destruction of such remains can only be obtained in consultation with professional archaeologists.

The new Heritage Bill

The National Monuments Act is currently being reviewed and will be replaced in 1998 by the "Heritage Bill." The new law will require all developers (including engineers, farmers [agricultirists] and mines who previously have been excluded from the bill) to undertake archaeological impact studies whenever any type of development activities are undertaken. Phase I archaeological impact studies will consequently become a common procedure for all development activities, even if such development may be exempted in terms of the Environment Conservation Act.

The new law will ensure community participation in the protection of national heritage resources and will involve all three levels of government in the management of the country's national heritage. The South African Heritage Agency (SAHA) will establish and maintain a national policy, strategy plans and standards for heritage resources management and will monitor the system as a whole. Heritage authorities will assist and co-operate with individuals and organisations concerned with the study, the conservation and the promotion and utilization of national heritage reources. A newly established National Heritage Resources Fund will provide financial assistance for heritage projects.

The Environment Conservation Act (Act No. 73 of 1989)

In addition, the Environment Conservation Act (Act No. 73 of 1989) makes provision for the drawing up of reports concerning the impact on the environment of activities identified and prohibited in terms of Sections 21 and 22 respectively. These reports must evaluate the impact development may have on the natural and man-made environment, and this includes archaeological sites.

Local and regional authorities (Town Councils, Regional Governments and Regional Services Councils) also have regulations requiring evaluation of the possible effects that rezoning and

development schemes may have on the environment, including the cultural environment. These regulations must be studied to ensure that they are implemented correctly.

THE NATURE AND EXTENT OF ARCHAEOLOGICAL/HISTORICAL REMAINS IN MAGALIES WATER'S PROPOSED DEVELOPMENT AREA

During the last two decades archaeological and historical remains in the Central Bankeveld of Gauteng and the North-West have increasingly received attention from archaeologists. The writer's involvement with archaeclogical research in the Bankeveld consists of:

* A long-term archaeological research project undertaken between Onderstepoort and Rustenburg entitled: "'n *Argeologiese Rekonstruksie van die Invloedsfere, die Geskiedenis en die Leefwyse van die Ystertydperk Sotho-Tswana van Brits-Rustenburg (Mabyanamatshwaana) en die Pilanesbergdistrikte van die Noordwes-Provinsie van Suid-Afrika*". This project is sponsored by Kelgran and Marlin Granite Mines and contributions have also been received from Eskom and Highveld Steel.

* Archaeological assessment studies for developers in the Bankeveld (see Bibliography). These assessment studies and the research project supplement each other and enable the writer to explain, conserve and promote, in various ways and with the help of local communities, the archaeology and history of this region.

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B.3 Minutes of Meeting

STUDY ON THE EXPANSION OF CAPACITY OF MAGALIES WATER ENVIRONMENTAL STUDY

MINUTES OF THE SECOND ECOLOGICAL TASK GROUP MEETING

MONDAY 20 OCTOBER 1997

AT 07:30 IN ROOM 344 RESIDENSIE BUILDING

185 SCHOEMAN STREET, PRETORIA

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1. WELCOME AND OPENING

The Chairman, Mr C Mannall, welcomed all the participants to the meeting.

2. ATTENDANCE AND APOLOGIES

Attendance

S Kadowaki	JICA Study Team, Team Leader
B Sawara	JICA Study Team
C Mannall	JICA Study Team
G V Munro	Department of Water Affairs and Forestry: Environmental Studies
S C Vogel	Department of Water Affairs and Forestry: Project Planning
J J de Vries	North West Parks Board
J de Vries	North West Parks Board
L Rossouw	MetsiQual cc

Apologies

S Davis	Department of Environment Affairs & Tourism: Mpumalanga
K R Legge	Department of Water Affairs and Forestry: Environmental Studies
D Swart	Department of Environment Affairs & Tourism: North West
R Strydom	Magalies Water

3. ACCEPTANCE OF MINUTES

The Minutes of the First Ecological Task Group Meeting were accepted.

4. ACCEPTANCE OF AGENDA

The Agenda was accepted. One additional issue was raised, that of the concerns of North West Park Board regarding development in Borakalalo National Park.

5. FEEDBACK ON STUDY ACTIVITIES

5.1 Technical component

Initially in Phase 1 of the JICA study a large area was investigated at a Master Plan level for water supply up to 2015. The villages in the Study Area were mostly unserved and relied on poor quality groundwater for potable water. Three areas were identified as priority areas to supply surface water to. They were North Mankwe, Moretele 2 and the Klipvoor Water Supply Areas. These priority areas were investigated in Phase 2, the feasibility phase, of the project. A pilot project was conducted in each of the priority areas during the current study.

Three alternative supply options were investigated for both Moretele 2 and Klipvoor Water Supply Areas. The options were briefly discussed. The most viable option for Klipvoor Water Supply Area is from a new Water Treatment Plant downstream of Klipvoor Dam. The best option for supplying water to the Moretele 2 Water Supply Area was from the Weltevreden Water Treatment Works at Mkombo Dam. Only one option was viable to supply water to the North Mankwe Water Supply Area, that of supplying water to the area from Vaalkop Water Treatment Works at Vaalkop Dam.

5.2 Environmental component

A ROIP 2 feasibility study was completed for Klipvoor FS Area. This project area was found to include an environmentally sensitive area, Borakalalo National Park, and more detailed studies were required to determine the expected impacts.

The Environmental Impact Assessment as described in the ROIP 1 Report was sufficient for the expected impacts in the Moretele 2 and North Mankwe FSAreas and no further work was done after the site investigations. More detailed project descriptions of these two areas were presented in short reports summarising the expected impacts from the proposed development.

Comments from North West Parks Board

- The Parks Board do not object to the construction of an intake pump station at the

existing weir downstream of Klipvoor Dam. However, they do object to any further development within the Park Boundaries. They appreciate the need to supply drinking water to the communities in the area, but propose that the water treatment works and regional reservoir be constructed outside the Park boundaries. Negotiations are ongoing.

Mr Vogel explained that Klipvoor Dam is a water resource that has been reserved for future use depending on economic development. It is expected that further abstractions will be made from Klipvoor Dam in future. A pump station in the Park in the short term will probably serve its purpose. It is expected that further water resource development will take place probably requiring infrastructure within the Park in future.

- There are land claims for areas of the Borakalalo National Park. This may have implications for the future development of the National Park as well as the proposed water project. The three communities involved are Bultfontein 2, Klipvoorstad and Jonathan. This issue is being investigated.

  It was pointed out that possibly the proposed water supply scheme could alleviate some of the problems with the communities by ensuring a more assured drinking water supply.

- Concern was expressed as to the draw down level of the dam during drought conditions. During droughts some of the exposed areas around the dam become muddy and can trap animals. There was an agreement between the Department of Water Affairs and Forestry and the former Bophuthatswana Government not to release water for irrigation if there is 10% water in the dam. The operating rule of the dam will have to be evaluated for the future water resource management of the system to ensure sufficient water is released for most of the time for primary use.

- Concern was also expressed regarding the danger posed by fences around the proposed infrastructure to the animals in the Park especially during game counting drives.

6. REVIEW OF ENVIRONMENTAL REPORTS

The three Project Area reports were distributed to the ETG Members for comment.

Comment was received from Mpumalanga Department of Environment Affairs & Tourism.

Their main comment was that an acceptable Environmental Management Plan for the Construction and Operational Phases should be produced, before any construction commences.

Ms Munro, DWAF: Environmental Studies, raised the following issues:

- It was stated that the impact of the abstraction for drinking water on the river downstream of the dam would be minimal. The motivation for this statement was absent.

  Motivation:
  The mean annual runoff in the catchment is 80,7 million m^3. The full supply volume of Klipvoor Dam is 43,8 million m^3. The irrigation demand from the dam is 62 million m^3per annum. The total drinking water demand can range from 1,3 to 3,4 million m^3per annum depending on the level of service supplied. This drinking water supply will be abstracted downstream of the dam and the percentage is relatively small compared to the irrigation demand.

- A commitment was required that the expected negative impacts should be mitigated and during both the detailed design stage and construction due cognisance of the need to minimise adverse impacts is required.

7. FURTHER ACTIONS

- A Project Steering Committee need to be formalised before the necessary funding becomes available. Once funding is available it is foreseen that the projects will progress rapidly.

  A meeting between all the stakeholders in the Borakalalo National Park will be organised by Ms Munroe as soon as possible. Stake holders involved include North West Parks Board, North West Province Department of Environment Affairs and Tourism, Department of Water Affairs and Forestry: Environmental Studies and Project Planning. These stakeholders will also be part of the Project Steering Committee. Issues to be addressed at this proposed meeting should include the land claims on the Park as well as future development in the Park. The issue of land claims should involve legal expertise.

- It was recommended by Mr Vogel that the environmental impact assessment reports be accepted as a basis to move forward.

- The following recommendations were made in the reports and need to be addressed before and during the detailed design phases of the project:

    1. This investigation should include meetings with 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.
    2. The lack of sanitation facilities and the impact of increased water usage needs to be investigated.
    3. Investigate the land claims issues at Borakalao National Park.
    4. Liaise with all the interested and affected parties.
    5. A Phase 1 archaeological survey of the proposed pipeline routes and especially the reservoir sites is recommended.
    6. Compile an Environmental Management Plan for the construction phase and draw up appropriate rehabilitation guidelines to mitigate the disturbances and aesthetic impacts caused by construction of the pipelines and associated infrastructure.
    7. Alert the contractor and labourers to the ecological and social impacts associated with construction activities.

8. CLOSURE

The meeting was closed at 9:00 and the Chairman thanked everyone for their attendance.