DWAF Report No. P WMA 17/E10/00/0805

DEPARTMENT OF
WATER AFFAIRS
AND FORESTRY

Feasibility Study for the Raising of Clanwilliam Dam

Environmental Scoping

Draft
July 2007

NINHAM SHAND
CONSULTING SERVICES

ASCH

JAKOET &
ASSOCIATES

DEPARTMENT OF WATER AFFAIRS AND FORESTRY
DIRECTORATE OPTIONS ANALYSIS

FEASIBILITY STUDY FOR THE RAISING OF THE CLANWILLIAM DAM

ENVIRONMENTAL SCOPING

Draft

July 2007

Prepared by:

A West and K Shippey
Ninham Shand Consulting Services
81 Church Street
Cape Town
8001
South Africa

Tel: 021-481 2459
Fax: 021-422 5588
e-mail: Karen.shippey@shands.co.za

Prepared for:

Director: Options Analysis
Department of Water Affairs and Forestry
Private Bag X313
Pretoria
South Africa

Tel: 012 – 336 8321
Fax: 012 – 338 8295
e-mail: icb@dwaf.gov.za

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Department of Water Affairs and Forestry
Directorate Options Analysis

FEASIBILITY STUDY FOR THE RAISING OF THE CLANWILLIAM DAM

APPROVAL

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STUDY TEAM **:** **Approved for the Clanwilliam Dam Raising Association by:**

…….. ……..
E VAN DER BERG *M J SHAND*
Study Leader *Study Director*

DEPARTMENT OF WATER AFFAIRS AND FORESTRY
Directorate Options Analysis
Approved for Department of Water Affairs and Forestry by:

…….. …….
A D BROWN *L S MABUDA*
Study Manager *Director: OA*

EXECUTIVE SUMMARY

The Executive Summary has not been written yet.

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GLOSSARY AND ABBREVIATIONS

Assurance of Supply	the reliability at which a specified quantity of water can be provided, usually expressed as a percentage or as a risk. For example, "98% reliability" means that, over a long period of time, the specified quantity of water can be supplied 98% of the time, and a lesser quantity for the remaining 2% of the time.
Capital Cost	the capitalised capital costs required during the lifespan of the infrastructure.
Capital-to-yield ratio	the capital cost divided by the capitalised 1:50 year long term yield of the scheme.
Dam	the wall (across a valley in the case of the Clanwilliam Dam) that retains water, but also used in a colloquial sense to denote the lake or impoundment upstream of the wall.
Ecological Water Requirements	the quantity and quality of water required to achieve the desired level of ecological functionality in a river system. Based on this, Basic Human Needs and stakeholder input, the Minister of Water Affairs and Forestry may declare the Reserve or a preliminary Reserve may be set by the Department.
Endemic	occurring within a specific locality; not introduced.
Environment	the external circumstances, conditions and objects that affect the existence and development of an individual, organism or group; these circumstances include biophysical, social, economic, historical, cultural and political aspects.
Environmental Impact Assessment (EIA)	a study of the environmental consequences of a proposed course of action.
Environmental impact	an environmental change caused by some human act.
Full Supply Level	This usually is the level of the overspill or spillway. The level denotes the height to which the water can rise before it flows freely over the spillway and out of the dam.
Geohydrology	the study of groundwater.
Gross Domestic Product	total value of all final goods and services produced within the economy of country for a given period of time.
Gross Geographic Product	total value of final good and services produced within the economy in a specified geographic area for a given period of time.
Hydrology	the study and prediction of rainfall and run-off.
Public Participation Process	a process of involving the public in order to identify needs, address concerns, choose options, plan and monitor in terms of a proposed project, programme or development.
Red Data Book (South African)	an inventory of rare, endangered, threatened or vulnerable species of South African plants and animals.
Reserve Determination Process	the process for establishing the ecological water requirements of a river system.

Scoping	a procedure for determining the extent of and approach to an EIA, used to focus the EIA to ensure that only the significant issues and reasonable alternatives are examined.
Scoping Report	a report describing the issues identified.
Spillway	That part of the dam wall through or over which flood water is designed to flow
Water Management Area	an area established as a management unit in the national water resource strategy within which a catchment management agency will conduct the protection, use, development, conservation, management and control of water resources.
DEA&DP	Western Cape Provincial Department of Environmental Affairs and Development Planning (formerly Department of Environmental and Cultural Affairs and Sport)
DEAT	National Department of Environmental Affairs and Tourism
DME	Department of Minerals and Energy
DWAF	Department of Water Affairs and Forestry
ECA	Environment Conservation Act
EIA	Environmental Impact Assessment
EIR	Environmental Impact Report
EMP	Environmental Management Programme
ESA	Early stone age
EWR	Ecological Water Requirements
FSL	Full Supply Level
GDP	Gross domestic product
GGP	Gross geographic product
ha	Hectares
HIA	Heritage Impact Assessment
HWC	Heritage Western Cape
I&APs	Interested and Affected Parties
LSA	Late stone age
mamsl	Meters above mean sea level
MAP	Mean annual precipitation
MAR	Mean annual rainfall
m^3/a	Cubic metres per annum

mm/a	Millimetres per annum
MPRDA	Mineral and Petroleum Resources Development Act
NEMA	National Environmental Management Act
MSA	Middle stone age
PGWC	Provincial Government of the Western Cape
RPF	Resource-poor farmers
SAHRA	South African Heritage Resources Agency
ToR	Terms of Reference
WMA	Water management area
WODRIS	The Western Cape Olifants/Doring River Irrigation Study

1 INTRODUCTION

1.1 Background

The Clanwilliam Dam, located on the Olifants River in the Western Cape, was originally built in 1935, and was raised in the 1960s by adding 13 crest gates and through the use of pre-stressed cables.

In order to comply with current dam safety standards applicable during extreme events, the Department of Water Affairs and Forestry (DWAF) envisages that remedial measures will be required at the dam in the near future. This presents an opportunity to raise the full supply level (FSL), if the marginal cost of raising, over and above the cost of strengthening the dam wall, is such that the raising is economically viable, socially desirable and environmentally acceptable. Refer to **Figure 1** for a map of the dam area.

The Reconnaissance Study (DWAF, 2003), which formed part of the Olifants/Doring River Basin Study Phase II, concluded that raising the Clanwilliam Dam could cost-effectively result in the provision of increased water yield and recommended that it be investigated further at a feasibility level of study. In January 2004, the Clanwilliam Dam Raising Association, comprising Ninham Shand, Asch Consulting Engineers and Jakoet & Associates was appointed by DWAF to undertake a Feasibility Study for the possible raising of the Clanwilliam Dam (hereinafter referred to as the Feasibility Study).

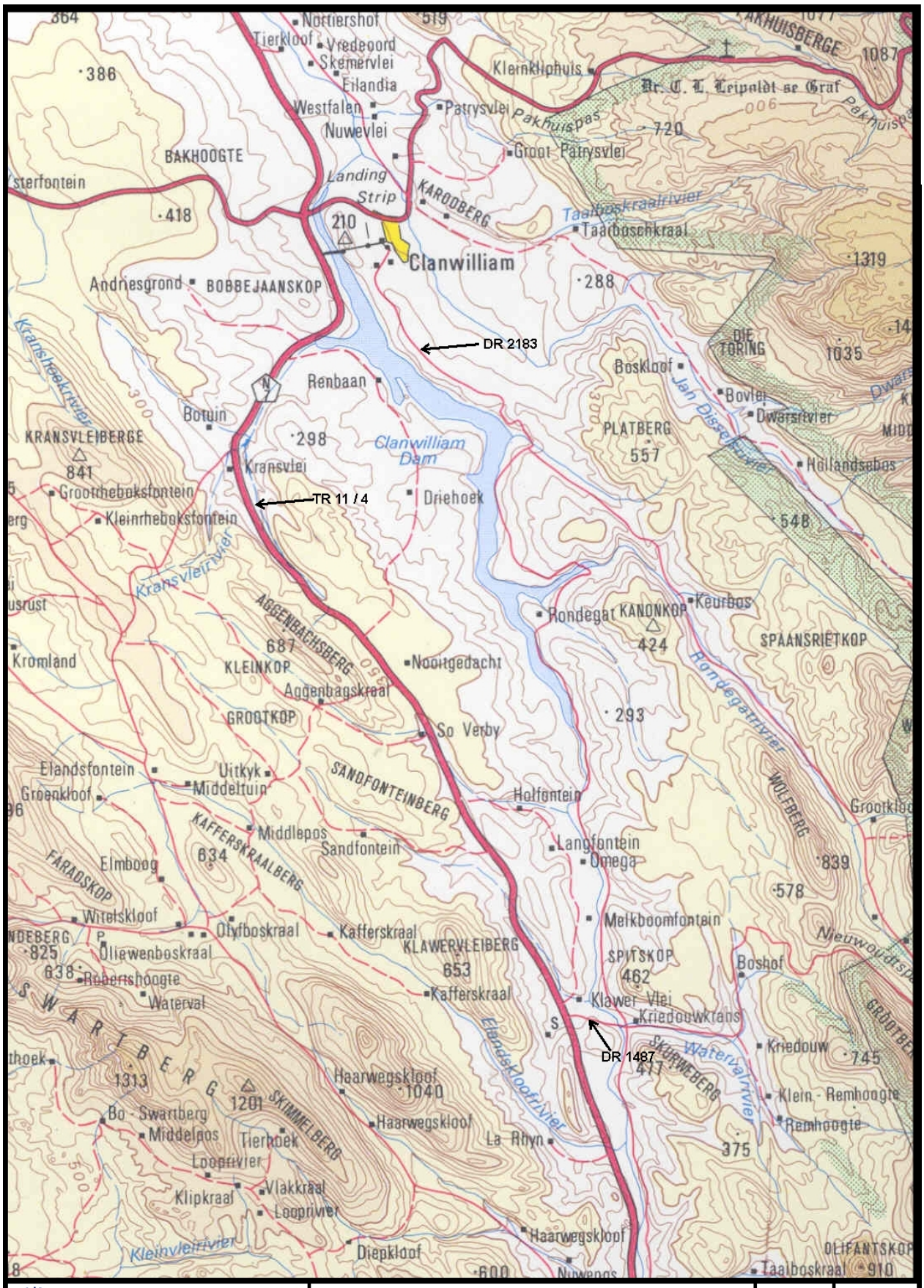
Should the dam be raised, various sections of the N7 National Road would be inundated or flooded (dependent on the level to which the dam is raised), and would therefore require realignment. Other roads in the vicinity may also be affected by the inundation. The DWAF, in consultation with the Provincial Government of the Western Cape, Department of Transport and Public Works, Roads Infrastructure Branch (hereinafter referred to as PGWC: Transport and Public Works), has agreed to undertake the investigation and design work associated with the potential road realignment.

1.2 Legal requirements

1.2.1 The Environment Conservation Act

On 5 September 1997 regulations in terms of Sections 21, 22 and 26 of the Environment Conservation Act (No. 73 of 1989) were promulgated. According to the regulations[1], an Environmental Impact Assessment (EIA) process is a legal requirement for certain scheduled activities which "could have a substantial detrimental effect on the environment". The listed activities in this project which trigger the requirement for an EIA are as follows:

[1] Regulation 1182 as amended by Notice R1355 (17 October 1997), Notice R448 (27 March 1998), Notice R670 (10 May 2002) and Notice R782 (7 June 2002)



NINHAM SHAND CONSULTING SERVICES	RAISING OF CLANWILLIAM DAM	SCALE	FIG 1
	Locality Plan	NTS	

"…The construction, erection and upgrading of

- 1k) *dams, levees and weirs affecting the flow of a river"*,
- 1d) *"roads, railways, airfields and associated structures",*
- 1c) *"with regard to any substance which is dangerous or hazardous and is controlled by national legislation.." "…storage, handling, treatment or processing facilities for any such substance[2]."* and
- *"2c)…The change of land use from agricultural or zoned undetermined use or an equivalent zoning to any other land use…"*

Accordingly, the proposed activities require approval from the competent environmental authority, *viz.* the Department of Environmental Affairs and Tourism (DEAT) via the EIA process. Regulation 1183 of the Environment Conservation Act requires that DEAT be consulted at the outset of the project in order to discuss the project and obtain agreement as to the scope of the work which should be carried out in order to adequately address the potential environmental implications. However, since this project is based in the Western Cape, the Western Cape Provincial Department of Environmental Affairs and Development Planning (DEA&DP) has applied to DEAT for delegation to act as the competent authority. DEA&DP has subsequently been delegated authority to act as the competent authority for this application (refer to **Annexure C**). Accordingly, the EIA process will follow the process prescribed by DEA&DP. DEA&DP's involvement in this investigation is outlined in detail in **Section 1.6** of this report.

The EIA process is described below and diagrammatically in **Figure 2**. In the Western Cape the EIA process entails the following key phases:

Phase 1: The initial application phase consists of the completion and submission of an Application Form and Screening Checklist. On reviewing this document DEA&DP may:

- Refuse the activity;
- Authorise the proposed activity with specific conditions;
- Ask the proponent to notify the public and forward all comment to the Department; or
- Indicate that there is insufficient information with which to make an informed decision and request that the applicant proceed to the Scoping Report phase.

Phase 2: The Scoping Report phase entails the identification of appropriate alternatives, the identification of potential environmental impacts and appropriate opportunity for public input. On submission of the Final Scoping Report DEA&DP may:

- Refuse the activity;
- Authorise the proposed activity with specific conditions; or
- Indicate that there is insufficient information with which to make an informed decision and request that the proponent proceed to the EIR phase.

[2] The storage and utilisation of hazardous substances would be limited to the construction period, a maximum of three years duration.

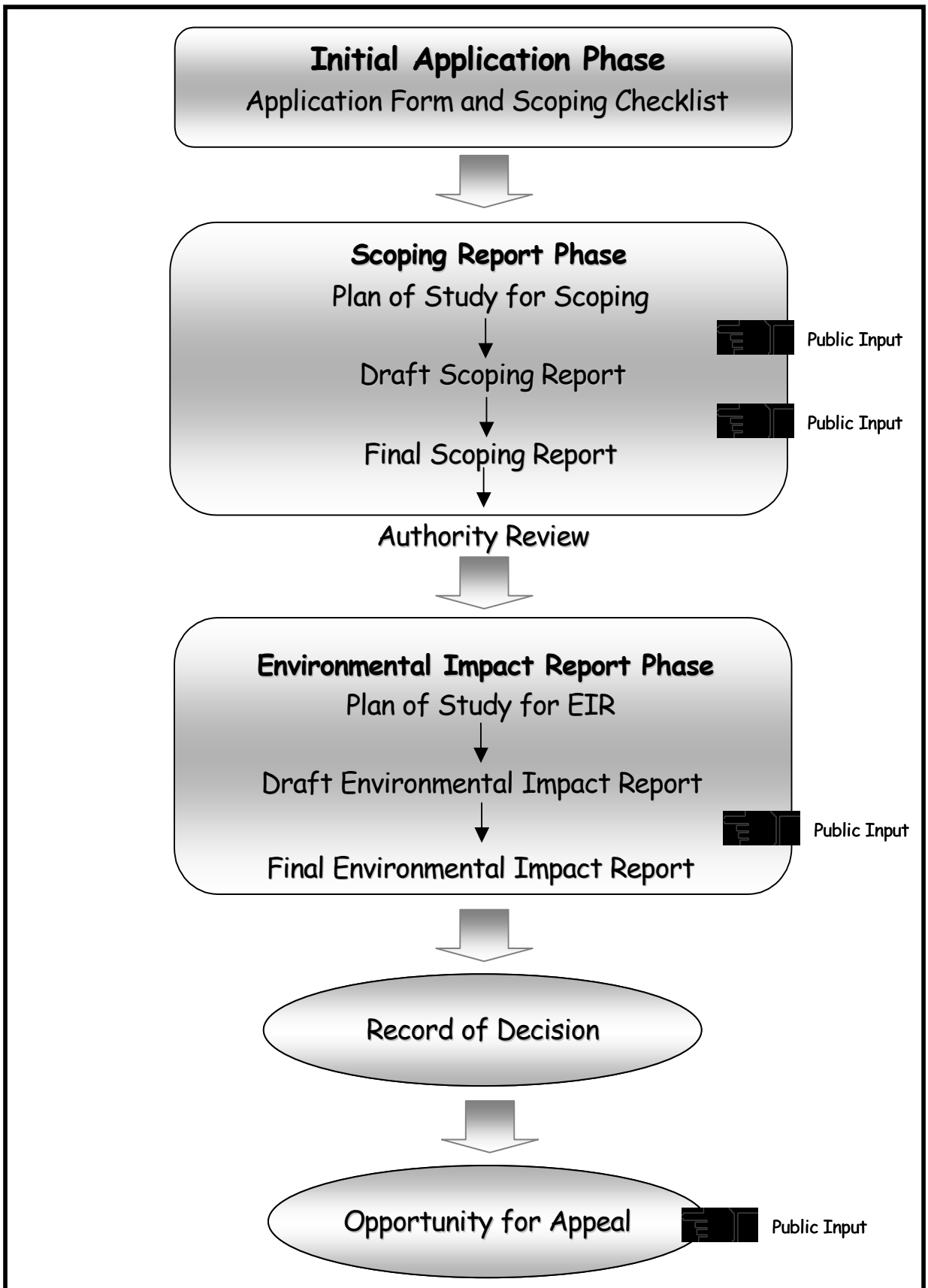


Figure 2: Environmental Impact Assessment process

Phase 3: The Environmental Impact Report (EIR) phase entails the investigation of specific aspects (as directed by DEA&DP) in more detail and the compilation of an EIR. On review of the report DEA&DP may:

- Refuse the activity; or
- Authorise the proposed activity with specific conditions.

Where a Record of Decision is issued by DEA&DP, there is a 30 day period during which appeal can be made to the Minister of Environmental Affairs and Development Planning.

1.2.2 National Environmental Management Act

The National Environmental Management Act (No. 107 of 1998) establishes the principles for decision-making on matters affecting the environment. Although this EIA process has been undertaken in terms of the requirements of the Environment Conservation Act (No. 73 of 1989), the ECA and its Regulations are in the process of being repealed and new EIA Regulations in terms of the National Environmental Management Act are likely to be promulgated in late 2005 and enacted during 2006. **Section 2** sets out the National Environmental Management Principles which apply to the actions of organs of state that may significantly affect the environment.

Furthermore, Section 28(1) states that "every person who causes or may cause significant pollution or degradation of the environment must take reasonable measures to prevent such pollution or degradation from occurring, continuing or recurring". If such pollution cannot be prevented then appropriate measures must be taken to minimise or rectify such pollution.

The Department of Water Affairs and Forestry therefore has the responsibility to ensure that the proposed activity as well as the EIA process conforms to the principles of the National Environmental Management Act. In developing the EIA process Ninham Shand have been cognisant of this need, and accordingly the EIA process undertaken here has been informed by the underlying National Environmental Management Act principles.

1.2.3 Mineral and Petroleum Resources Development Act

In terms of the Mineral and Petroleum Resources Development Act (No. 28 of 2002) (MPRDA), all mining activities, including the extraction of material from borrow pits and quarries, require authorisation from the Department of Minerals and Energy (DME). As per the provisions of Section 106(1) of the Act, on 25 June 2004 the Minister of Minerals and Energy, by notice in Government Gazette No. 26501, exempted various organs of state, including the Department of Water Affairs and Forestry and Provincial Governments, from the provisions of sections 16, 20, 22 and 27 of the Act in respect of any activity to remove any mineral for the construction and maintenance of dams, harbours, roads and railway lines and for purposes incidental thereto. However, as per the provisions of Section 106(2) of the Act, an Environmental Management Programme would be required and would need to be submitted to DME for their approval, prior to the extraction of any material.

According to DME (pers. comm., Mr J Briers), material that is extracted from within the dam basin is considered to be mining activity, and would require authorisation, as described above. However, since borrow pits within the dam basin would be flooded, a comprehensive rehabilitation plan would not be required as part of the Environmental Management Programme.

As related to raising of Clanwilliam Dam, the mining of material from the existing quarry to the west of the dam wall, the expansion of the quarry, and the establishment of a new quarry or the establishment of borrow pits within the dam basin would require the DWAF to apply for an exemption. However, the environmental management programme for mining within the dam basin is likely to require a lesser level of detail (pers. comm., Mr J Briers).

1.2.4 National Heritage Resources Act

In terms of the National Heritage Resources Act (No. 25 of 1999), any person who intends to undertake "any development … which will change the character of a site exceeding 5000 m2 in extent" or "the construction of a road…exceeding 300m in length" must at the very earliest stages of initiating the development notify the responsible heritage resources authority, viz. the South African Heritage Resources Agency (SAHRA) or Heritage Western Cape (HWC). SAHRA/ HWC would in turn indicate whether or not a Heritage Impact Assessment (HIA) would need to be undertaken.

Section 38(8) of the National Heritage Resources Act specifically excludes the need for a separate HIA where the evaluation of the impact of a development on heritage resources is required in terms of the Environment Conservation Act. Accordingly, since the impact on heritage resources would be considered as part of the EIA process outlined here, no separate HIA would be required. HWC would review the EIA reports and provide comments to DEA&DP, who would include these in their final Record of Decision. However, should a permit be required for the inundation or relocation of specific heritage resources, a separate application would have to be submitted to HWC for the approval of such an activity once the desired level of raising had been determined.

1.2.5 Other applicable legislation and policies

(a) National Water Act

In terms of Section 21 of the National Water Act (No. 36 of 1998), the storage of water and the impeding and diverting of the flow in a river is considered a water use, which in general must be licensed, unless permitted as a Schedule 1 activity. In terms of Section 118 of the Act, the Minister may declare a category of dams as having a safety risk, and therefore these dams have to comply with the dam safety legislation and also require registration of such a dam with the DWAF.

The requisite licenses or registrations would be obtained by the DWAF and do not form part of the scope of the current EIA process. Comment will however be sought from the DWAF, which will then be forwarded to DEA&DP to consider during its decision-making process.

Part 3 of the National Water Act deals with the Reserve, which is divided into the basic human needs Reserve and the ecological Reserve. The basic human needs Reserve provides for the essential needs of individuals served by the water resource in question and includes water for drinking, for food preparation and for personal hygiene. The ecological Reserve relates to the water required to protect the aquatic ecosystems of the water resource. The Reserve refers to both the quantity and quality of the water in the resource, and will vary depending on the class of the resource. In terms of Section 16 of the Act, as soon as reasonably practicable after the class of all or part of a water resource has been determined, the Minister must, by notice in the Gazette, determine the Reserve for all or part of that water resource. A High Confidence

Reserve Determination process is currently being undertaken for the Olifants/Doring river system, which includes the river and the estuary. Once the Reserve has been determined and set for this water resource, the DWAF will be obliged to give effect to the Reserve.

(b) Expropriation Act

Should the DWAF decide to raise Clanwilliam Dam, the Department will need to acquire additional land. The State can acquire the rights to use or possess the requisite land through the Expropriation Act (No. 63 of 1975). The Act requires the determination of compensation based on the principle of market value (i.e. what would the value be in the event of both a willing buyer and a willing seller trading the land). There is a suite of additional legislation, which, in conjunction with the Expropriation Act would be used to determine the compensation value.

The DWAF's policy on the acquisition of land states that there is a host of legislation and policies governing the acquisition of land, but that overall guidance is taken from the Constitution of South Africa (No. 108 of 1996). The policies used differ according to the type of land being acquired, as well as to the type of right required.

Partial land rights acquisition includes the acquisition of a right of way, or access to a private road. Compensation is based on the extent to which the loss of existing use is impacted upon.

In the event of the DWAF requiring all rights to land, the State acquires the land either through the Department of Public Works, the Department of Land Affairs, or by the DWAF itself.

The acquisition of the required portion(s) of private land and the determination of the requisite compensation is undertaken in terms of the Expropriation Act. The acquisition of land is based on the willing buyer willing seller principle. Persons living on the affected land, but not relatives of the owner are considered to have land rights, and are entitled to some form of compensation. Similarly, tenants may be entitled to compensation, dependent on the lease agreement stipulations. Land not in private ownership is either state owned or land held in trust by the Minister of Land Affairs. Occupants of the latter are considered to be possessors of land rights and are entitled to compensation.

Land is acquired by way of negotiation leading to a reasonable offer, without prejudice, which may be contested by the landowner or individual user of the land within a reasonable time.

1.3 Terms of Reference

In January 2004, the DWAF appointed the Clanwilliam Dam Raising Association to undertake a feasibility study for the raising of Clanwilliam Dam. The requisite environmental impact assessment formed part of the aforementioned project. The scope of the environmental work is as follows:

- Undertake an EIA process for the raising of Clanwilliam Dam and the associated realignment of primary roads, and comment on the impacts on secondary roads;
- Develop a framework Environmental Management Plan (EMP) for the construction and operational phases of the proposed dam wall raising and road realignment; and
- Compile the requisite Environmental Management Programme Report(s) for quarry sites, should these be necessary.

The Terms of Reference for the EIA as outlined in the *Feasibility for the Raising of the Clanwilliam Dam: Inception Report* has been included as **Annexure A**.

1.4 Scope of the EIA

Authorisation is being sought for the raising of the dam and the consequent realignment of portions of the N7 (Trunk Road 11 Section 4). The scope of work as defined in the Terms of Reference for this EIA process is focused on the direct inundation impacts associated with raising the Clanwilliam Dam by 5, 10 or 15 m. As sections of the N7 National Road would be inundated due to the dam raising, impacts associated with realigning those portions of the road are also investigated.

The indirect effects of the raising, for example the impacts of developing further areas of irrigation or changing irrigation practises, or changes to the canal system to utilise the additional yield will be identified and briefly commented upon, but are not assessed in detail as no specific information is available at this stage, and as these activities would not necessarily be the responsibility of the current applicant, i.e. the DWAF. Any downstream activities that require authorisation in terms of the ECA would be the subject of further independent EIA processes in the future. Similarly, further EIA processes are likely to be required before certain impacted activities can be resumed in new locations.

1.5 Approach to the project

As outlined in **Section 1.2.1**, there are three distinct phases in the EIA process, as required in terms of the Environment Conservation Act, namely the Initial Application, the Scoping Report and the EIR phases. This Report covers the second phase, *viz*. the Scoping Report phase. The Initial Application phase entailed the submission of the Application Form and Screening Checklist and Plan of Study for Scoping (**Annexures B** and **C**).

Scoping is defined as a procedure for determining the extent of and approach to an Impact Assessment and involves the following key tasks:

- Involvement of relevant authorities and I&APs;
- Identification and selection of alternatives;
- Identification of significant issues to be examined in the EIR; and
- Determination of specific guidelines/ terms of reference for the EIR.

As part of the Feasibility Study, a strategic level assessment of previously identified development options in the Olifants and Doring River catchments was undertaken. The results of this process (discussed in **Section 2.4.1**) were fed into the Scoping Phase of the EIA process.

1.5.1 The Scoping Report phase

A desktop review of relevant literature, including a review of previous environmental studies undertaken in the area was undertaken. These included the *Olifants/Doring River Basin Study Phase I* (1998), the *Olifants/Doring River Basin Study Phase II* (2003), the Western *Cape Olifants/Doring River Irrigation Study* (WODRIS) (2004) and the *Olifants-Doorn Water Management Area Internal Strategic Perspective* (2004).

An inception field trip and workshop was held from 23 to 24 June 2004 with key members of the study team and the client body. The purpose of the field trip was to facilitate an understanding of the key aspects such as:

- Biophysical issues:
  - vegetation and fauna;
  - natural resources; and
  - groundwater resources.

- Social issues:
  - surrounding land uses;
  - cultural/ historical/ archaeological resources; and
  - resource poor farming models.

- Construction issues.

The information gathered from the site visit and workshop was used in refining the Terms of Reference for the EIA process and the specialist studies to be undertaken during the EIR phase.

Consultation with the public forms an integral component of this investigation and enables interested and affected parties (I&APs), e.g. directly affected landowners, national, provincial and local authorities, businesses, environmental groups, civic associations and communities, to identify the issues and concerns, relating to the proposed activities, which they feel should be addressed in the Scoping Report. A detailed summary of the public participation process, and the issues and concerns raised by the various I&APs is provided in **Section 4**.

1.5.2 Authority involvement

In accordance with the requirements of Regulation 1183, an Application for Authorisation and a Plan of Study for Scoping for the proposed project were compiled and submitted to the DEAT on 20 June 2005 (refer to **Annexures B** and **C**). The documentation was also submitted to DEA&DP, Heritage Western Cape (HWC), the Provincial Government of the Western Cape: Transport and Public Works Department and the Applicant (i.e. the DWAF).

DEA&DP subsequently applied to DEAT for delegation of power to act as the competent authority, as the application falls within Western Cape and therefore within its jurisdiction. DEA&DP was granted the delegation of authority and subsequently ratified the proposed approach to the Scoping Report phase of this EIA process by approving the Plan of Study for Scoping on 19 August 2005. (Refer to **Annexure C** for a copy of this approval).

Furthermore, meetings were held with Mr Jan Briers of DME on 21 September 2005 and with Mr Calvin van Wyk of HWC on 27 September 2005 to discuss the requirements of these permitting authorities and to ensure that work undertaken as part of the EIA process is sufficient to fulfil their permitting requirements.

1.5.3 Decision making

Once the Final Scoping Report has been completed and all I&AP comments have been incorporated into the report, it will be submitted to DEA&DP for their review. DEA&DP will thereafter either issue a Record of Decision based on the information contained in the Final Scoping Report or indicate that further information is required in order to make an informed decision with regard to the proposed activities and instruct the applicant to proceed to the EIR phase.

Given the scale of the project and the nature of the affected environment, we believe that the latter is the more likely scenario. It should be noted that when a Record of Decision is issued, this would be communicated by means of letters to all identified I&APs. Following the issuing of the Record of Decision, there will be a 30-day appeal period within which I&APs will have an opportunity to appeal against the decision to the Provincial Minister of Environmental Affairs and Development Planning in terms of the Environment Conservation Act.

1.6 Assumptions and limitations

1.6.1 Assumptions

In undertaking this investigation and compiling the Scoping Report, the following has been assumed:

- The information provided by the applicant, engineers and specialists is accurate and unbiased.
- The scope of this investigation is limited to assessing the environmental impacts associated with raising the Clanwilliam Dam by 5, 10 or 15 m and the realignment of portions of the N7 national road.
- Strategic level water resource alternatives are not dealt with in this EIA process, as they were dealt with through a screening of options process which took place as part of the Feasibility Study for the Raising of Clanwilliam Dam.
- Should the proposed activities be authorised, the DWAF and PGWC: Transport and Public Works will meet the obligations as agreed to in its letter of application to DEA&DP.

1.6.2 Gaps in knowledge

In undertaking the Scoping Report phase of this EIA process, certain information was not available to the EIA team. Consequently, this Scoping Report has scoped the potential environmental impacts associated with the proposed activities. However, the scope of impacts presented in this report could change, should information become available during the EIR phase. The purpose of this section is therefore to highlight gaps in knowledge when the Scoping Report phase of the project was undertaken.

- As mentioned above, an Ecological Reserve Determination study for the Olifants/Doring River system is currently underway. The Reserve requirements and how to give effect to these have not been determined as yet and its impact on the viability and operation of the dam are therefore unknown. However, a preliminary EWR as determined during the Olifants/ Doring River Basin Study Phase II of 2003, has been applied when determining the potential yield from the various raising options.
- Several of the tasks of the Feasibility Study (of which this study is a component) are currently incomplete and therefore the Scoping Report is required to utilise information from the Reconnaissance Study. Some additional information should be available to inform the EIR.

1.6.3 Independence

The requirement for independence of the environmental consultant is aimed at reducing the potential for bias in the environmental process. The Applicant may, however, motivate for exemption from appointing an independent environmental consultant in terms of Section 28A of the ECA. It should be noted that the environmental consultants undertaking this work, namely Ninham Shand, are the lead consultant in the project team association (the Clanwilliam Dam Raising Association) undertaking the Feasibility Study. A declaration of interest was therefore submitted with the Application Form and Scoping Checklist.

The Environmental Department of Ninham Shand is well placed to undertake the EIA process since it has direct contact with the team undertaking the Feasibility Study, allowing efficient transfer of the technical information between the Feasibility Study and the EIA process. Since Ninham Shand's involvement is limited to the Feasibility Study, (neither design nor construction supervision which will be undertaken by the DWAF), we do not believe that there is any conflict of interest in undertaking both the Feasibility Study and the EIA process.

Further to this, the EIA Task Leader, Ms Karen Shippey and the internal EIA reviewer Mr Mike Luger are both certified environmental assessment practitioners. This means that they have been certified by Environmental Assessment Practitioners of South Africa as competent to undertake Environmental Impact Assessment Processes and are bound by code of conduct. Anyone wishing to find out more about EAPSA can visit their website at www.eapsa.co.za or contact the Secretariat at ph: 021 - 789 1385

2 THE PROPOSED ACTIVITY

2.1 Introduction

As outlined previously, the purpose of the current EIA process is to apply for authorisation in terms of the Environment Conservation Act for:

- The raising of the Clanwilliam Dam wall by either 5, 10 or 15 m; and the associated;
- Realignment of portions of the N7 National road, totalling some 2 700 m in length; and
- Raising of portions of the N7 National road and DR 1487, totalling some 600 m in length.

In informing this application, this Section considers the need for the proposed project, briefly outlines the nature of the proposed activities and provides a consideration of the various project alternatives.

2.2 The need for the proposed activity

2.2.1 The dam raising

The Clanwilliam Dam, constructed in 1935 and subsequently raised between 1962 and 1964 is a 43 m high (from the river bed to the non-overspill crest) concrete gravity dam with post-tensioned pre-stressed cables. The dam has a 101.27 m wide gated spillway with 13 gates. The net storage capacity of the dam is 122 million m^3/a. The dam forms part of the Olifants River (Vanrhynsdorp) Government Water Scheme (ORVRGWS) that supplies water for irrigation and domestic use in the region.

In order to comply with current dam safety standards applicable during extreme events, the DWAF envisages that remedial measures will be required at the dam by 2010. This presents an opportunity to raise the full supply level (FSL), if the marginal cost of raising, over and above the cost of strengthening the dam wall, is such that the raising is economically viable, socially desirable and environmentally acceptable. A preliminary cost estimate for the remedial work was determined during the Olifants/Doring River Basin Study – Phase II as R66 million. To raise the dam by 5 m, 10 m or 15 m would cost an additional R70 million, R106 million or R173 million, respectively (DWAF, 2003). It should be emphasised that even if the dam is not raised, the dam wall will be strengthened in the near future.

Water resources in the Olifants River catchment are currently over allocated i.e. demand exceeds supply. The water requirements from the Upper Olifants and Lower Olifants River[3] are 223 and 174 million m^3/a, respectively. However, available yields in the Upper Olifants and Lower Olifants River are 197 and 145 million m^3/a, respectively. This equates to a deficit of some 55 million m^3/a (DWAF, 2004). The raising of the Clanwilliam Dam wall could potentially provide

[3] The Clanwilliam Dam serves as the demarcation point between the Upper and Lower Olifants River.

an additional yield of some 40 million m^3/a[4] for a 15 m dam raising, which would alleviate pressure on the water users in the catchment.

The agricultural sector is by far the largest water use sector in the area, with estimated requirements of some 95% of the total water requirements. By raising the Clanwilliam Dam, irrigators could be provided with water at a higher assurance of supply, which would facilitate the production of permanent crops rather than cash crops as well alleviate the pressure placed on the existing crops from water deprivation, which is likely to improve productivity. Furthermore, the additional water could also be provided to emerging farmers, in order to aid development of emerging farmers and equity projects.

No releases for the Ecological Water Requirements (EWR) are currently made from the Clanwilliam Dam[5]. An Ecological Reserve Determination study for the river and estuary is currently nearing completion and once the study is concluded, the EWR will be known for the system. Previous work undertaken as part of the Pre-feasibility Study of the Olifants/ Doring River Basin Study (DWAF, 2003) suggested that making EWR releases would reduce the current yield by some 18 million m^3/a (reduction from 149 to 131 million m^3/a). If the dam were not to be raised, current water users may have to forego a portion of their allocation in order to satisfy the EWR. The report further suggests that if the dam is raised by at least 5 m, the EWR releases could be met without impacting on current water allocations.

2.2.2 The re-alignment of the N7 National Route and other affected roads

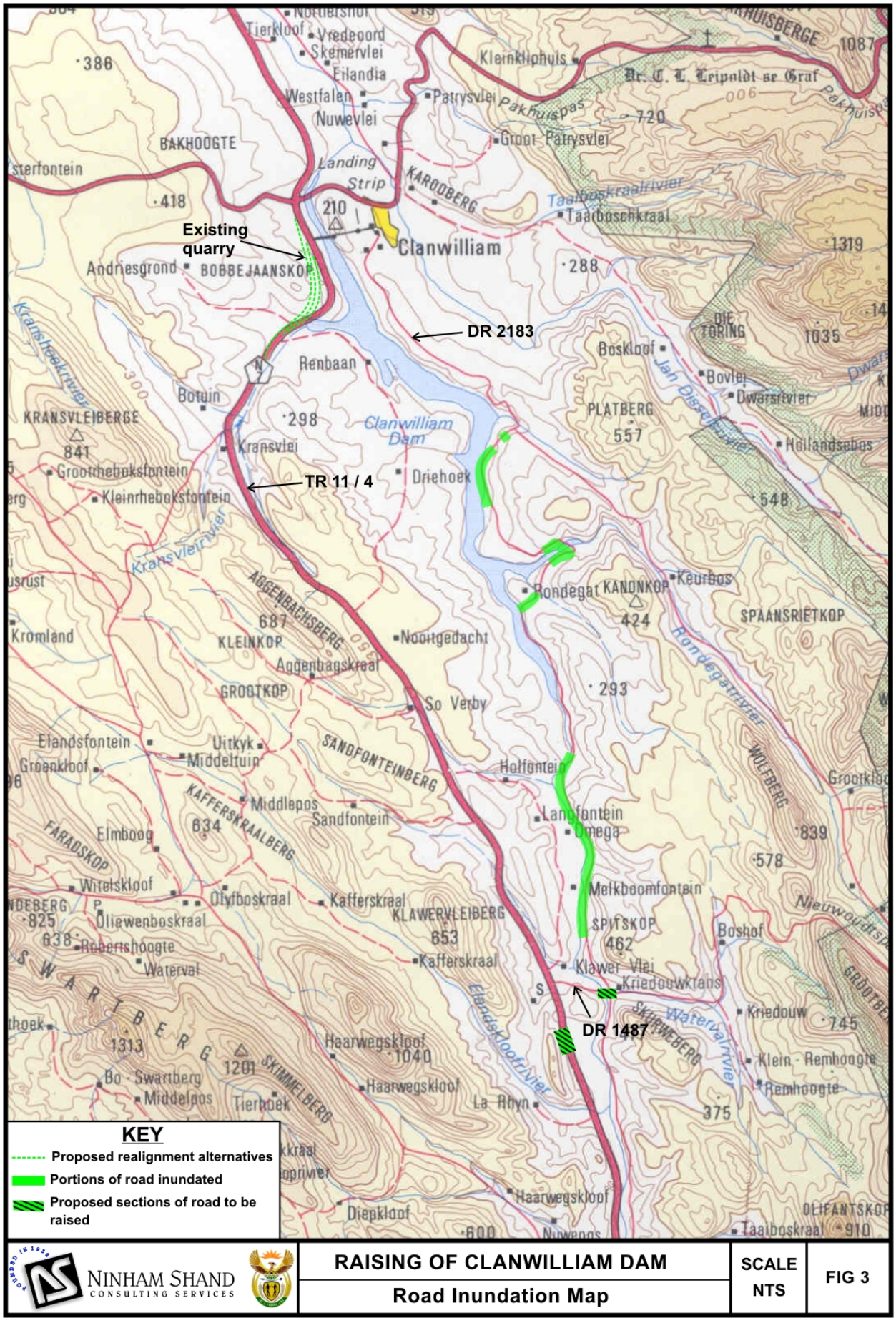
Based on the projected full supply levels (FSLs) for the dam if raised 5, 10 or 15 m, it is clear that between 1 600 m and 3 200 m[6] of the existing Trunk Road 11 Section 4 (TR11), also known as National Route 7 (N7), located on the western side of the dam would be inundated. The DWAF, in consultation with the PGWC: Transport and Public Works, has agreed to undertake the investigation and preliminary design work associated with the potential road realignment. The realignment of the road would only need to be undertaken if the Clanwilliam Dam were to be raised. Other roads in the area such as District Roads 1487 and 2183 may also be affected by inundation. Refer to **Figure 3** for a map of the affected roads.

2.3 Description of the proposed activity

2.3.1 The dam raising

Improving the safety of the existing 43 m high Clanwilliam Dam as well as the raising thereof would require the replacing of the spillway gates with a fixed concrete spillway and the possible raising of this spillway by up to 15 m above the existing FSL. This would be achieved by adding concrete on the downstream face of the existing overspill, as explained in further detail below.

[4] Historical firm yield for an assumed distributed Reserve
[5] However, considerable releases are made via the river channel to supply Bulshoek Barrage, and hence the irrigation canals.
[6] The total length is based on realignment of a portion of the N7 in the vicinity of the dam wall and the potential raising of another potion of the N7 in the vicinity of the intersection with DR1487.


Existing quarry
DR 2183
TR 11 / 4
DR 1487
Clanwilliam
Clanwilliam Dam
Landing Strip
KEY
Proposed realignment alternatives
Portions of road inundated
Proposed sections of road to be raised
NINHAM SHAND
CONSULTING SERVICES
RAISING OF CLANWILLIAM DAM
Road Inundation Map
SCALE NTS
FIG 3

The storage capacity and the area covered by the impounded lake of the dam would remain unchanged at 124 million m^3 and 1 124 ha if only dam safety remedial work was undertaken. However, if the dam was raised, the storage capacity and area covered by the impounded lake would increase to a maximum of 365 million m^3 and 2 100 ha, respectively (for a 15 m raising). Refer to **Annexure D** for aerial photographs depicting the level to which the state would be required to purchase for the 5, 10 and 15 m raising of the dam wall.

(a) Proposed activities

Shear resistance of the overspill would be increased with the addition of a concrete apron on the downstream face of the wall. The stability of the non-overspill structure would be restored by adding additional concrete on the crest and downstream face or a combination of concrete and rockfill on both faces.

The outlet works of the existing dam would be upgraded to accommodate the EWR release requirements. This may necessitate the construction of a multilevel intake structure on the upstream face of the dam wall, drilling and cutting through the existing dam wall, demolition of the mini-hydropower station and the construction of a new stilling basin for the outlets on the downstream side of the dam.

The proposed remedial work and possible raising of the dam would require numerous construction related activities associated typically with civil engineering construction projects, including the following:

- The establishment of a construction camp for the housing of temporary staff. This would include the rollout of basic infrastructural services such as water and electrical reticulation, sewerage and wastewater treatment, roads and storm water drainage as well as the erection of temporary/permanent housing.
- The establishment of a construction site. This would also include the rollout of basic infrastructural services such as water and electrical reticulation, sewerage and waste water treatment, roads and storm water drainage, as well as the erection of temporary administration offices, storage sheds, workshops and wash bays, and areas for the safe storage of hazardous material and explosives.
- The construction of a permanent gravel access road on the eastern side of the dam, to provide access to the raised dam wall, from the existing gravel access road.
- The establishment of quarries and borrow areas[7] to source construction materials such as sand and aggregates, as well as the stock piling of these materials. This would require the construction of temporary roads, opening of new and existing quarries and borrow areas and clearing of vegetation for the stock piles, as well as storm water drainage at the stock piles.
- The establishment of batching plants and a conveyor system for the mixing of concrete and transportation thereof. This would require basic infrastructural services such as water and electricity, access roads and storm water drainage, as well at the temporary erection of silos for the cement, fly-ash and chemical admixtures.
- The actual construction work at the dam. This would entail inter alia the construction of temporary access roads, demolition of various components of the existing dam, the clearing of the foundation foot print in the river and on the valley flanks downstream of the

[7] It must be noted that borrow areas would, where possible, be located within the full supply level of the proposed dam, and would be inundated once the dam has filled.

existing dam, drilling and cut-off grouting below the new foundation, drilling and blasting of drainage addits into the valley flanks below the raised dam, cutting of openings through the existing dam for the installation of mechanical components, erection of form work and casting of concrete.

2.3.2 The realignment of portions of the N7 National Road and other affected roads

If the Clanwilliam Dam were to be raised, between 1 600 m and 3 200 m of the existing N7 would be inundated. Furthermore, the section of DR 1487 crossing the Olifants River between the N7 and Algeria would also be inundated for raisings exceeding 5 m (refer to **Figure 3**). Re-alignment or raising of these portions of road have been investigated at a conceptual level, and are presented below.

The geometric design standards for the road realignment were based on the South African National Roads Agency Limited (SANRAL) G2 Design Manual. Alternative alignments have been proposed and were designed for the 1:50 year flood, based on the three levels of raising.

The realigned portions of the N7, in the vicinity of the dam wall, would be located to the west of the existing road. The construction activities would take place within the new road servitude, without disruption to traffic on the N7. Minor disruptions would however be experienced during the linking of the old and new portions of road. A portion of the N7 in the vicinity of the intersection with the DR 1487 road to Algeria, would be inundated and could be raised to avoid inundation. In this case, the N7 is likely to be reduced to single lane traffic, to allow each lane to be raised, without the need to construct a temporary road. The raising of the DR 1487 road in the vicinity of the Olifants River crossing is likely to require a road closure during the construction period, due to the width of this road.

Portions of DR 2183, the gravel road on the eastern shore of the dam, would be inundated if the Clanwilliam Dam was raised. The extent of inundation would depend on the level of raising, being fairly minor at the 5 m level of raising to extensive for a 15 m raising. Geometric design for the realignment or raising of these sections of road has not been undertaken due to the biophysical, technical and economic constraints of realigning portions of this road. Access to some farms would be compromised. The possibility of providing alternative access would be investigated.

Infrastructure required for the construction of the road, such as a construction campsite and stockpile areas would be consolidated with activities for the dam work, so as to minimise on cost and infrastructure required. Sourcing of material required for the road construction will be co-ordinated with that of the material required for the dam. Where possible, stockpiling of material would be minimised through the balancing of cut and fill (i.e. material removed balanced with material required).

2.4 Consideration of alternatives

A requirement of Regulation 1183 of the Environment Conservation Act, as well as of the National Environmental Management Act, is due consideration of reasonable alternatives. As outlined in the DEAT's "Guideline Document for the Implementation of Sections 21, 22 and 26 of

the Environment Conservation Act" (1998), not all alternatives are investigated in the same detail. Rather, an analysis of the alternatives which should be carried forward for further investigation in the Environmental Impact Report (EIR) phase is provided in the Scoping Report.

The purpose of this section is thus to provide an overview of the full range of alternatives identified for the raising of Clanwilliam Dam and the road realignment with a view to identifying alternatives that are "practicable, feasible, relevant, reasonable and viable" (Department of Environmental Affairs and Tourism, 2004).

Strategic level alternatives with respect to water augmentation options were addressed as part of the Feasibility Study and have fed into the EIA process. Project level alternatives for the EIA process are addressed in a tiered fashion. The first tier of alternatives is at the project level and relate to the raising of Clanwilliam Dam. At the second tier, the alternatives focus on the potential road realignment options. The third tier of alternatives relate to other within project alternatives. The fourth tier of alternatives relate to construction specific layout alternatives that would take place within the designated construction site.

2.4.1 Strategic level water augmentation alternatives

As part of the Feasibility Study for the Raising of Clanwilliam Dam, it was believed that, to gain acceptance of the study of a specific development option, namely the raising of Clanwilliam Dam, a comprehensive options assessment of all the potential development schemes (surface and groundwater) in the Olifants/Doorn Water Management Area (WMA) was required. Furthermore, the options assessment and screening process would also determine how the raising of Clanwilliam Dam would influence the viability of other options and *vice versa*. The objectives of the screening process were:

- to clarify the policy of the DWAF and its co-operative partners regarding the need for development in the Olifants/Doorn WMA;
- to review the acceptability of the various potential options identified in previous studies in terms of technical, financial, environmental and social criteria;
- to augment existing information with limited specialist inputs where required; and
- to ascertain whether or not the raising of Clanwilliam Dam is a preferable and defendable development option, for further study with a view to implementation.

The approach to the screening of options process included the following:

- Review of all previously identified/assessed potential development options in the WMA;
- Evaluation of each option in terms of its capital-to-yield ratio, the associated environmental impacts and the potential beneficiaries of the scheme; and
- A public participation process to obtain input on the acceptability of the most suitable development options.

In this regard, a 'Screening of Options' Specialist Workshop was held on 23 November 2004. It was attended by selected the DWAF officials, study team members, selected identified stakeholders and specialists in order to workshop the acceptability of the various surface water development options as compared to the raising of Clanwilliam Dam. A Key Stakeholder Workshop was held on 10 February 2005, targeting the WMA Reference Group where the results of the screening of options process were presented, and comments and concerns gathered. The

potential development of groundwater supply schemes and conjunctive use of groundwater in the region were also addressed.

The screening of options investigation concluded that the raising of Clanwilliam Dam was one of the most favourable options for the following reasons:

- the raised dam would not introduce new environmental and social impacts, but rather extend the existing impacts;
- the lower Olifants River has been historically disturbed, while the Doring River is relatively impoundment free;
- the raising of the dam could make allowance for the installation of a multi-level outlet structure, which would provide the means to give effect to the EWR, thereby maintaining and potentially even improving the ecological state of the lower Olifants River and estuary;
- there is strong support for expansion of existing agricultural activity rather than the development of new dispersed agricultural areas, which the raising of Clanwilliam would facilitate; and
- the option provides flexibility in terms of providing water to a suite of potential beneficiaries, and specifically resource poor farmers.

The investigation also concluded that other feasible options included the development of groundwater schemes and the further development of off-channel dams by farmers in certain areas. Conjunctive surface and groundwater options also appear attractive.

A Screening of Options Report (refer to **Annexure E**) was made available at the start of the public participation process, in order to set the broader context within which the EIA process was taking place. Alternatives at a strategic level are deemed to have been addressed and screened through the Screening of Options Report and will not receive any further attention during the EIA process. Consequently, the EIA process will focus on the raising of Clanwilliam Dam and site-specific alternatives.

2.4.2 First tier alternatives: Clanwilliam Dam raising

As mentioned above, the focus of the investigation will be on the raising of Clanwilliam Dam, as it is deemed to be one of the most feasible water augmentation options in the WMA, and on the Olifants River in particular. For the purposes of raising Clanwilliam Dam, the following alternatives will be considered:

- "No-go"/ Do nothing option;
- Strengthening of the dam wall;
- Raising the dam wall by 5 m;
- Raising the dam wall by 10 m;
- Raising the dam wall by 15 m.

The final level of raising may not be one of the above levels, but would be between 5 and 15 metres. This range of raisings was informed by the findings of the Environmental Screening of the Proposed Raising of Clanwilliam Dam (DWAF, 2002) and represents the full range of technically feasible dam heights. The results of this investigation would however be used to determine the acceptability of the impacts at the chosen level of raising, based on an extrapolation of the results from this investigation.

2.4.3 Second tier alternatives: The realignment of the N7 National Route and other affected roads

As mentioned above, certain sections of the N7 and other roads would be inundated if the Clanwilliam Dam was raised. These sections include:

- Portions of Section 4 of the N7, in the vicinity of the dam wall;
- A portion of the N7 in the vicinity of the intersection with the DR 1487 road to Algeria; and
- Section of DR1487 in the vicinity of the Olifants River crossing.

Clearly, since the realignment needs to occur on the sections of road described above, there can be no geographic alternatives for this activity. Rather design alternatives would be considered. The geometric realignment of the road must be informed by current road safety standards hence the design alternatives are limited.

For the purposes of realigning affected roads, the following alternatives have been identified:

The re-alignment of the N7 in the vicinity of the dam wall:

- The "no-go" option; and
- Three alternative re-alignment options for Section 4 of the N7 with a total length of up to 2 700 m, in the vicinity of the Clanwilliam Dam wall.

Raising of a 500 m length of the N7 in the vicinity of the intersection with the DR 1487 road to Algeria:

- The "no-go" option; and
- Design and layout considerations.

Raising of a 100 m length of DR1487 in the vicinity of the Olifants River crossing.

- The "no-go" option; and
- Design and layout considerations.

2.4.4 Third tier alternatives: Within project alternatives

In order to meet the ecological water quality requirements in the Olifants River downstream of the dam, it has been suggested that a multi-level outlet may be required. The design of this structure is dependent on the discharge capacity as well as the water quality requirements, which would be informed by the aforementioned Olifants/Doring Reserve Determination study as well as a water quality reservoir modelling study being undertaken as part of the Feasibility Study.

Alternative outlet designs and methods of construction will be assessed during the EIR.

2.4.5 Fourth tier alternatives: Construction specific layout alternatives

As mentioned above, during the construction phase, a suite of activities typically associated with large construction projects would take place. These include the establishment of a construction village to house a part of the work force, provision of services (potable water, electricity and

waste water) to the construction village, and the establishment of temporary access tracks. All of these activities would take place within the boundaries of the construction site. Although the footprint of the construction site will be investigated, the services for the site and site layout will only be determined during detailed design and therefore can not be assessed in detail during this EIA process. Detailed design would only take place once the DWAF had made the decision to pursue raising the dam wall.

Layout alternatives would therefore exist for the above activities, but these would only be determined at a much later stage in the project, and could therefore not be assessed in detail during this EIA process.

2.5 Summary of alternatives

In summary, strategic level water augmentation alternatives have been addressed in the Feasibility Study, summarised in the Screening of Options Report (**Annexure E**) and are consequently not assessed in this EIA process. First tier alternatives relate to the raising of Clanwilliam Dam, and are focused on either strengthening the dam, or raising the dam by either 5, 10 or 15 m. Second tier alternatives focus on the realignment of affected roads, as a consequence of raising the dam. These include realignment and raising of portions of the N7 and raising a portion of DR1487. Third tier alternatives are focused on within project alternatives. The main alternative relates to the type of outlet structure and the design and construction method alternatives.

Fourth tier alternatives relate to the activities typically associated with large construction projects, such as the establishment of a construction village, provision of services and provision of access tracks and their alternative layout options. Since the dam design is at a feasibility level, this level of design detail is not available, and would only be available during the detailed design phase. Consequently, these alternatives could not be assessed in detail during the EIA process.

3 THE AFFECTED ENVIRONMENT

3.1 Introduction

This chapter provides a brief description of the existing biophysical and socio-economic environment within the immediate vicinity of the proposed activity. It draws on extensive existing knowledge from previous studies, specialist investigations, site visits and discussions with various role-players. It serves to present the context to inform the level or degree of specialist study or detailed assessment required for each potential positive or negative impact of the proposed activities.

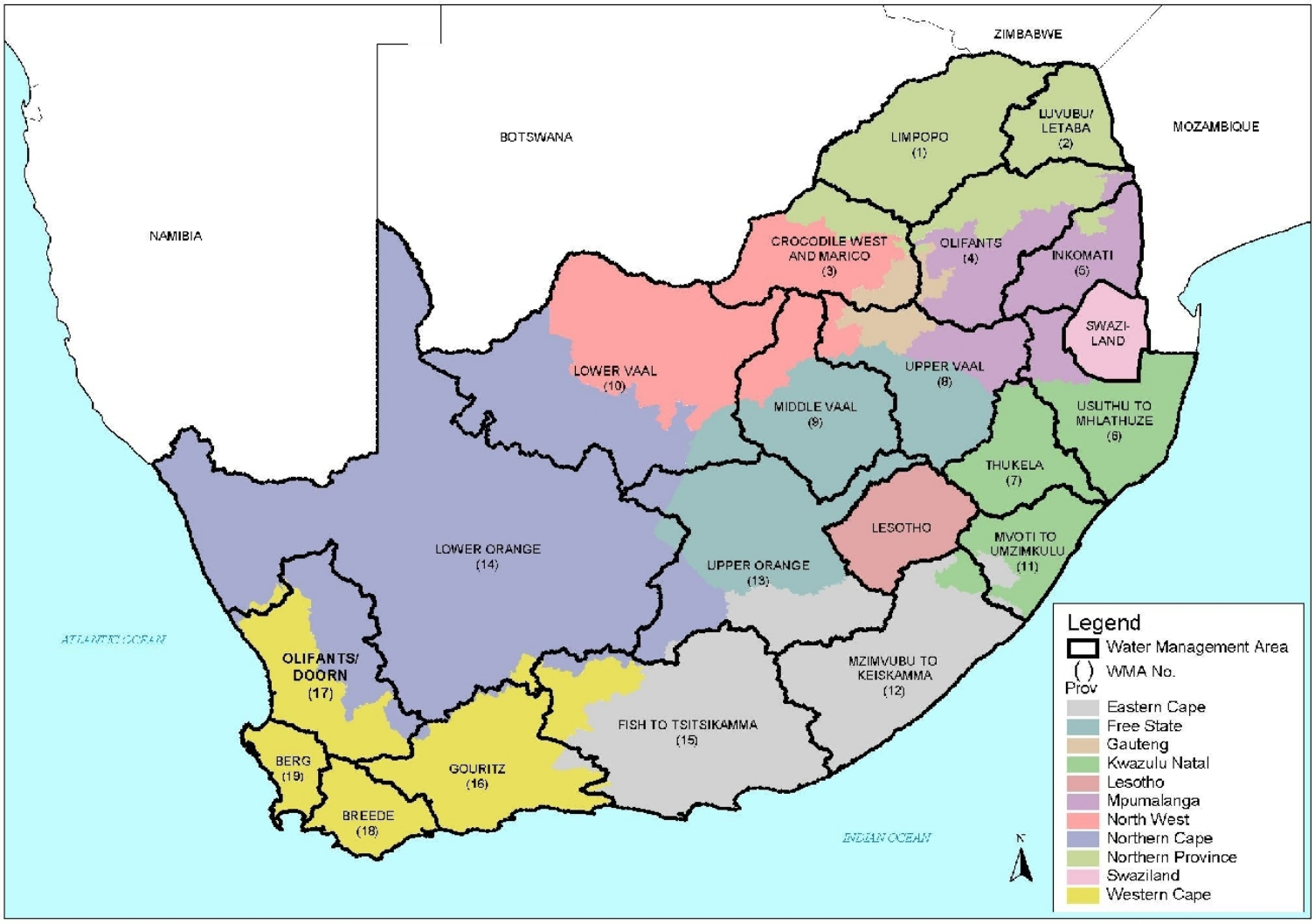
South Africa has been divided into 19 water management areas (WMAs), and the Olifants/Doorn WMA is WMA number 17. It is located in the Northern and Western Cape, stretching from 100 km north of Cape Town to 450 km north of Cape Town (refer to **Figure 4**). The total area of the WMA is some 56 400 km^2. The Olifants River is the major river of the WMA, with the Doring River and Sout River as its major tributaries.

3.2 The biophysical environment

3.2.1 Topography and geology

The Olifants/Doring River Basin has developed between the coastline and the Southern African Escarpment under structural and lithological controls constrained by the north/south trending Cape Fold Belt. The southern boundary divide, between the Olifants/Doring River Basin and the Breede River catchment, is formed by a change in the fold trend from north/south to east north-east/west south-west forming the Hex River Mountains (refer to **Figure 5**).

The Clanwilliam Dam is situated on the Olifants River, within the Olifants River catchment. The catchment is a long and narrow having a southeast to northwest orientation. The Olifants River rises in the Agter Witzenberg to the north of Ceres at an elevation of some 750 mamsl with the mountains to the east and west rising to some 1800 mamsl. Mountain ranges along the west include those of the Witzenberg, Groot Winterhoek and Olifants River Mountains, and along the east the Skurweberg, Koue Bokkeveld, Middelberg and Cederberg Mountains. The valley then drops down, through a narrow gorge, to a narrow valley at 250 mamsl in the vicinity of Visgat. Here the watershed to the west, the Olifants River Mountains, rise to some 1 000 mamsl while the easterly Kouebokkeveld Mountains still rise to some 1 800 mamsl. From this point, the valley drops gently to sea level. In the vicinity of Clanwilliam, the escarpments on either side start to drop and disappear completely near Klawer, some 50 km north west of Clanwilliam.



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RAISING OF CLANWILLIAM DAM	SCALE	FIGURE 4
WMA MAP	NTS	


N
Legend
Towns
Dams
WMA Boundaries
Rivers
Elevation (m)
0 - 200
200 - 400
400 - 800
800 - 1200
1200 - 1600
LOWER ORANGE WMA
Loeriesfontein
Bitterfontein
Nuwerus
Nieuwoudtville
Lutzville
Vredendal
Vanrhynsdorp
Strandfontein
Doringbaai
Klawer
OLIFANTS/DOORN
Cederberg
Lambertsbaai
Graafwater
Clanwilliam
Wuppertal
Elandsbaai
Olifants River Mountains
Citrusdal
BERG WMA
Skurweberge
Witzenberg
Koue Bokkeveld
GOURITZ WMA
BREEDE WMA
Prepared By :
NINHAM SHAND
CONSULTING SERVICES
Raising of Clanwilliam Dam
0 0.3 0.6 1.2 Kilometers
Path :
i:/hydro/400415/arcview/projects/raising_clanw_dam.mxd
Client :
Department: Water Affairs and Forestry
Directorate: Options Analysis
Topography
Figure 5

The geology of the Olifants/Doring River Basin is dominated by sedimentary rocks of the Cape Supergroup to the south and west and by the lower part of the Karoo Supergroup to the north-east. The oldest member of the Cape Supergroup rocks in the Western Cape is the Table Mountain Group which comprises predominantly quartzitic sandstone with minor shale horizons. In the western Cederberg a basal conglomerate known as the Piekenierskloof Formation is locally well developed. Halfway through the succession of the quartzitic sandstones is the conspicuous shale marker known as the Cedarberg Formation. The sandstones below this belong to the Peninsula Formation while those above it form the Nardouw Formation. Water flowing over quartzitic strata is characteristically acidic and low in nutrients and dissolved solids.

North of the Cederberg in the lower Doring River valley and the Matsikama Mountains, the Nardouw Formation is the main representative of the Cape Supergroup, resting on Pre-Cape rocks. Further north, the basal Karoo Dwyka Tillite directly overlays the Pre-Cape Rocks. Most of the east and north of the Doring River catchment is in the Karoo rocks, mainly Ecca and Beaufort Shales. The shales contain large quantities of leachable ions, causing the water to have a higher total dissolved solid concentration.

3.2.2 Climate

In general, the area is arid with mean annual precipitation (MAP) figures of less than 300 mm/a. MAP increases to under 600 mm/a in the southwestern mountainous areas, with a small portion of the Olifants River catchment receiving rainfall up to 1 500 mm/a (DWAF, 1998(a)). MAP decreases to less than 100 mm/a in the far northern areas near the Olifants River Estuary. MAP recorded at the Clanwilliam Dam (1981 to 1999) was 250 mm/a (PGWC, 2001). Most of the Olifants River catchment and western tributaries of the Doring River receive winter rainfall, while the north and east receives summer rainfall.

Evaporation in the Olifants/Doring catchment is relatively high and varies from about 1 600 mm/a in the south west to about 2 400 mm/a in the north. Evaporation in the vicinity of Clanwilliam Dam and surrounds ranges from 1 700 to 1 800 mm/a.

Summer temperatures are very high during the day but cool at night. The average maximum summer temperature in the vicinity of the dam range is 37.9ºC; with the average minimum temperature dropping to 13.3ºC. Extreme temperatures of up to 49.5ºC have been recorded in vicinity of the dam (PGWC, 2001). Winter temperatures drop very low at night. The average maximum winter temperature is 32.1ºC, with the average minimum temperature dropping to 7.4ºC. The possible maximum sunshine duration in the summer is about 13.6 hours and in the winter is 13.0 hours (PGWC, 2001).

Summers are dry with low humidity throughout the area. The summer humidity ranges from 30.1% to 86.1%. During winter the area is wet with higher humidity with a range between 40% and 91.2%. The area experiences one of the highest sunshine durations in the country.

3.2.3 Flora

Some botanical work has been undertaken within the catchment during the earlier Olifants/ Doring River Basin Study Phase I, which considered the Clanwilliam Dam basin, and in the WODRIS study, which mainly focussed on the areas downstream of the confluence on the Olifants and Doring Rivers.

The vegetation of the Olifants River catchment is characterised by two main vegetation types, namely Fynbos and Succulent Karoo, as described by Low and Rebelo (1998). Acocks (1988)

describes the area as being characterised by Mountain Fynbos (64), Lowland Succulent Karoo (57) and Upland Succulent Karoo (56). The area in the vicinity of the dam basin is characterised by Fynbos.

The Fynbos Biome is world renowned and recognised as one of the six Floral Kingdoms of the world. Fynbos has an exceptionally large variety of species. More than 8 500 species have been described, with more than 6 000 being endemic.

Fynbos is confined to sandstones derived from the Cape Supergroup. Tall shrubs such as *Lycium ferocissimum* and *Rhus glauca* intermingle with medium tall fynbos shrubs, such as *Eriocephalus africanus* and *Montinia caryophyllacea* or shrubs with karroid affinities, often having succulent leaves or stems, such as *Euphorbia mauretanica*, *Galenia africana*, *Ruschia sp*. and *Zygophyllum foetidum*.

The vegetation type typically contains many rare and endemic plant species. The most notable are the Clanwilliam cedar (*Widdringtonia cederbergensis*) and the Snow protea (*Protea cryophila*) (DWAF, 1998). A number of other rare species (e.g. *Leucadendron diemontianum, Macrostylis barbigera, Moraea barkerae, Serruria confragosa, S. reflexa*) occur in the upper Olifants River area. Rooibos tea (*Aspalathus linearis*) is an endemic fynbos plant grown commercially and buchu (*Agathosma betunia*) is a much sought-after medicinal herb.

Agricultural crops, comprising mainly of citrus orchards, have replaced some of the natural vegetation in the area surrounding the Clanwilliam Dam. The riparian vegetation on the banks of the river is in a moderately disturbed state, although restorable, and is partly infested by alien vegetation. There are also several rooibos farms on the western side of the N7.

3.2.4 Fauna

The relatively flat areas of the Olifants River valley are largely transformed through the expansion of agriculture. However, the mountainous areas to the east and west of the river valley are less disturbed and host a variety of animals and birds.

Baboons (*Papio ursinus*), dassies, grey rhebok (*Pelea capreolus*), klipspringers (*Oreotragus oreotragus*), duiker (*Sylvicapra grimmia*) and grysbok (*Raphicerus melanotis*) are fairly common in the Cederberg. Porcupine, honeybadger (*Mellivora capensis*), Cape clawless otter (*Aonyx capensis*) and aardvark (*Orycteropus afer*) also occur but are seldom seen. The leopard (*Panthera pardus*) is the Cederberg's largest predator and is fairly common. More than 100 bird species occur in the area, with the black eagle (*Aquila verreauxii*), rock kestrel (*Falco rupicolus*) and jackal buzzard (*Buteo rufofuscus*) being the most common raptors.

Some 16 snake species are found in the Cederberg, the most common being the berg adder (*Bitis atropos*), puff adder (*B. arietans*) and the black spitting cobra (*Naja nigricollis woodi*) (Cape Nature, 2005).

3.2.5 Aquatic ecosystem

The aquatic environment of the Olifants River has been extensively investigated through specialist riverine and estuarine investigations undertaken as part of such studies as the *Olifants/ Doring River Basin Study Phase I*, the WODRIS study and the Olifants/Doring Reserve Determination process.

The Olifants/Doring River system is important from a conservation perspective because it contains eight endemic fish species, the highest number of endemic fish south of the Zambezi River. Two *Austroglanis* species are endemic to the Olifants River, namely the critically endangered Barnard's rock catfish, *Austroglanis barnardii* and the vulnerable Clanwilliam catfish, *Austroglanis gilli*. Both of these species are found in the tributaries of the Olifants River, in mountain streams characterised by clear, oligotrophic waters.

The vulnerable Clanwilliam yellowfish, *Barbus capensis*, is one of seven yellowfish in southern Africa. This fish favours deep pools and runs of large tributaries and mainstreams, as well as impounded waters. Experimental research has shown that high flow pulses released from Clanwilliam Dam could trigger spawning of *B. capensis*. The endangered sawfin, *Barbus serra* favours deep pools and runs, and breeds in the summer.

The endangered Clanwilliam redfin, *Barbus calidus*, favours pools in clear streams and feeds mainly on insects from the surface waters. Breeding takes place in summer, with juveniles described as edge dwellers, favouring vegetative cover. The endangered fiery redfin, *Pseudobarbis phlegethon*, lives in pools and riffles of clear flowing rocky-bottomed streams, feeding on detritus and small bottom-dwelling insects.

The critically endangered Clanwilliam sandfish, *Labeo seeberi* lives in the mainstream of large tributaries and favours pools and deep runs. Previously widespread and abundant throughout the Olifants River system, its numbers and range have been reduced by the impacts of invasive alien fish and expanding agricultural development. *Barbus erubescens* is the last critically endangered endemic fish found in the Olifants River.

The chubbyhead barb, *Barbus anoplus* and the Cape Galaxias, *Galaxia zebratus* are both indigenous fish common in the Western Cape, are found in a diversity of habitats, tolerant of a wide range of water quality and temperature conditions.

Alien fish introduced to the Olifants River system include the smallmouth bass (*Micropterus dolomieui*), the largemouth bass (*M. salmoides*) the bluegill sunfish (*Lepomis macrochirus*), the brown trout (*Salmo trutta*) and the banded tilapia (*Tilapia sparmanii*) (DWAF, 1998(b); PGWC, 2004).

The major threat to indigenous and endemic fish species were identified as:

- Invasive alien predatory fish;
- Invasive alien plants;
- Destruction of habitat and the riverbed by anthropogenic activities;
- Changes in water quality, due to farming practices;
- Unsustainable water abstraction (effects compounded by bad farming practices); and
- Instream barriers.

The Olifants River mouth is permanently open, with seawater intrusion up to 36 km upstream during spring tides. The estuary has the highest botanical importance rating of all South African estuaries investigated. Its botanical importance derives from the good condition and large areas of intertidal and supratidal salt marshes in the lower reaches. The estuary is sensitive to decreases in river flow, flood frequency and water quality (DWAF, 2004).

The estuary represents a critical habitat to many estuarine-associated fish species, with 30 species from 21 families recorded. Benthic invertebrate species diversity is lower with some 45

species recorded. The estuary also supports at least 86 estuarine water birds and is one of the top South African locations of importance for waterbird conservation (DWAF, 2004).

3.3 The social environment

3.3.1 Demography

The Cederberg Municipality consists of a suite of towns within the study area, including inter alia Clanwilliam, Citrusdal, and the Clanwilliam rural areas. The total population of the Cederberg Municipality is 39 288 (StatsSA, 2001), with an almost even distribution of men and women. Growth estimates for the District suggest 2% per annum for towns like Vredendal, north of Clanwilliam, and only 1% for towns like Clanwilliam (PGWC, 2001).

Some 17 000 people[8] within the Cederberg Municipal area have some form of employment, with the majority of workers falling into the elementary employment (e.g. general farm labourers) category. The second highest category is skilled agriculture and fishery workers (StatsSA, 2001).

3.3.2 Land-use

The dominant land-use in the Olifants River catchment is commercial agriculture, and more specifically irrigated citrus orchards and wine grape vineyards. In the vicinity of the Clanwilliam Dam, some 1 650 ha of mainly citrus and vegetables are under irrigation. Irrigated land between Bulshoek Dam and Ebenhaeser totals some 11 500 ha consisting mainly of vineyards and vegetables. Total agriculture in the Olifants River valley, including the abovementioned areas totals some 21 450 ha, comprising deciduous fruit, citrus, grapes, vegetables and lucerne (PGWC, 2001).

There are some commercial forest plantations to the east and southeast of the Clanwilliam Dam, namely the 30 ha plantation at Heuningvlei and a 350 ha plantation at the Algeria Forest Station, which are within the Cederberg State Forest. A further 100 ha of plantations are found in the Witzenberg valley in the Groot Winterhoek State Forest, which is located at the south-western corner of the Olifants/Doring River Basin (PGWC, 2001). Recreational facilities located on or near the banks of the Clanwilliam Dam include a holiday camping site, the boat club and the Ramskop Nature Reserve.

Land ownership is dominated by commercial farmers. Resource poor farmers have limited access to good quality agricultural land and have been historically sidelined in terms of access to water. The local authorities and provincial departments of land and agriculture as well as the Department of Water Affairs and Forestry, Department of Land Affairs and the Department of Agriculture have established programmes to actively transform these historical ownership patterns.

3.3.3 Planning context

The Clanwilliam Dam is owned and operated by the Department of Water Affairs and Forestry. The Departmental policy is to purchase a buffer strip around the periphery of the dam, based on

[8] The survey considered people between the ages of 15 and 65.

the high flood (1:100 year flood) line plus 1.5 m vertically or at least 15 m horizontally outside the high flood line, whichever results in the greater horizontal distance, and for ownership of this buffer to reside with the State.

Above the current purchase line, the majority of the land surrounding the Clanwilliam Dam is privately owned, and is mostly zoned agricultural. There are however some residential housing developments on the shores of the Clanwilliam Dam, such as 'Caleta Cove' and the 'Nooitgedacht' developments. Should the Clanwilliam Dam be raised, large areas of additional land would be inundated and would have to be acquired by the DWAF. Liaison with the potentially affected landowners is taking place as part of the EIA process. However, negotiations with respect to the acquisition of land will only take place if and when the DWAF makes the decision to pursue the raising of Clanwilliam Dam. This decision will be based on the outcomes of the aforementioned Feasibility Study, subject to a positive Record of Decision by the DEA&DP and various financing and other arrangements. A decision is likely to be made by the end of 2006.

3.3.4 Socio-economic context

Some 0.3% of the gross domestic product (GDP) of South Africa originates from the Olifants/Doorn WMA. Economic activity is concentrated around the irrigation areas and towns in the south-western parts of the WMA. Agriculture contributes some 43.3% of the region's gross geographic product (GGP), which is tenfold higher than the contribution of 4.5% by the agriculture sector to the national economy (DWAF, 2002(a)).

The Olifants/Doring catchment is marked by inequality in income distribution along racial and urban/rural lines. Roughly 30% of the population in the area has only a primary school education, with 30% of the population having some secondary school education, but not matric. Only 15% of the population in the area has matric or a higher qualification (PGWC, 2003).

Migratory patterns in the area reflect great differences for the different races, with coloured seasonal workers contributing mostly to the phenomenon. They are mostly employed in the agricultural and fishing industries. Emigration is a great cause for concern, with younger people leaving to work in bigger towns and cities, and the elderly remaining at home.

The majority of people living in the area have very low income. In Clanwilliam, some 78% of individuals surveyed earned less than R2,500 p/a. 35% of households in the area earn between R12,000 and R42,000 p/a, while 21% of households earn between R42,001 and R96,000 p/a. This disparity in individual versus household income is due to the fact that many households have one or two people who have relatively higher salaries, which pushes up the overall household income (PGWC, 2003). The seasonal nature of employment in the agricultural sector contributes to the low income for the majority of the population, which contributes to the high level of poverty experienced in the region.

Land ownership remains dominated by the commercial farmers and previously disadvantaged communities struggle with a lack of skills and capital to change the status quo. In a needs assessment carried out in the 1990s, security of tenure, adequate housing and access to productive land were identified as the key development needs in the area (DWAF, 1997).

3.3.5 Visual aesthetics

The landscape is characterised by steep mountains to the east and west of the Olifants River. The area adjacent to the river is relatively uniform and characterised by fruit orchards, punctuated

with irrigation canals, small farm dams and some farmhouses. The natural vegetation of the area is characterised by low scrubby bush or where disturbed by agriculture, tall, dense fruit orchards. The Olifants River valley is considered to be scenic, and is especially popular with hikers and campers.

The construction of a new dam or the expansion of an existing dam would not alter the aesthetic or sense of the region, given its rural agricultural nature. The design and proportions of a raised dam wall may change the sense of place when entering and leaving Clanwilliam town. The dam has been present for over 60 years, and has become an integral vista as one enters and leaves Clanwilliam or travels along the N7, however the dam was visually changed significantly 30 years ago. The raising of the dam/dam safety work will change it back to resembling approximately the original dam.

There are remnants of the previous raising of Clanwilliam Dam, including the old quarry site on the western side of the N7, in the vicinity of the Clanwilliam Dam wall, and a concrete batching plant. This quarry site is partially rehabilitated, not really visible from the road and therefore is not considered to be visually obtrusive.

3.3.6 Heritage resources

The cultural and archaeological heritage resources of the Olifants River valley have been extensively investigated, in past studies such as the Olifants/Doring River Basin Study Phase I, the WODRIS study and other studies. Consequently, much information and knowledge is available on the types of resources in the area and their locations.

The history of the Western and Northern Cape regions within the study area is long and complex, spanning many thousands of years. Four distinct periods of this history can be defined, namely the Early Stone Age (200 000 to 1 000 000 years ago) (ESA), the Middle Stone Age (40 000 to 200 000 years ago) (MSA), the Late Stone Age ((LSA) and the Colonial Period.

Artefacts that are likely to be present in the area include hand axes, cleavers and various bifaces, along with large cores and flakes that represent the ESA. These artefacts are normally found in close proximity to the original raw materials, for example adjacent to riverbeds, on river terraces and quartzitic outcrops. Artefacts typical of the MSA such as triangular points, blades and prepared cores are common throughout the study area, and occur in the same localities as the ESA artefacts.

Numerous rock art sites from the LSA have been reported in the area, and more specifically in the vicinity of the Clanwilliam Dam. Small stone tools such as bladelets, segments, arrow points, thumbnail scrapers and micro cores are also characteristic of the LSA, and are likely to be present (DWAF, 1998(c)).

From a palaeontological perspective, the Cedarberg Formation, a thin post-glacial sequence which lies stratigraphically above the Pakhuis Formation glacial beds, between the Peninsula and Nardouw successions are of great interest. The lower mudrock-dominated portion of the Cedarberg Formation has yielded internationally renowned fossil biota from sites in the Cederberg region. The fossils include well preserved water scorpions, primitive jawless vertebrates, nautiliods, brachiopods, and trilobites amongst others. The upper sandier portion of the Cedarberg Formation has yielded more conventional shelly invertebrate fossils and trace fossil biota from the Olifants River valley, north of Clanwilliam.

Younger sediments of the Bokkeveld Group lying in the core of the Olifants River valley syncline outcrop in the region of Clanwilliam and Citrusdal, and are highly fossiliferous, yielding marine shelly invertebrates and rare fish fragments. The youngest rocks in the Olifants River valley are assorted deposits of scree, colluvium and river alluvium, of which the last could conceivably yield fossil or subfossil remains of the Caenozoic age, such as mammalian bones and teeth (DWAF, 2002(b)).

4 THE PUBLIC PARTICIPATION PROCESS

4.1 Introduction

The DWAF acknowledges the importance of public participation in its activities and in 2001 the 'Generic Public Participation Guidelines' were published to assist the department in the implementation of public participation. The guideline outlines 16 principles that should underpin public participation, and include amongst others, the principles of inclusivity, flexibility, transparency, access to information, capacity building, feedback and monitoring and evaluation. These principles tie closely to the findings of the World Commission on Dams' Global Review of 2000 which recommended recognising rights and assessing risks when identifying and including stakeholders, providing access to information to enable informed participation by the stakeholders, and demonstrating public acceptance of all key decisions through an open and transparent process.

Consultation with the public forms an integral component of an EIA process and enables *inter alia* directly affected landowners, neighbouring landowners and communities, to identify the issues and concerns relating to the proposed activity, which they feel should be addressed in the process. The approach to this public participation process, summarised in the Plan of Study for Scoping (**Annexure C**), has taken cognisance of the DWAF Generic Public Participation Guidelines, and has attempted to incorporate the principles of public participation as mentioned above.

Public participation, as required in terms of Regulation 1183, for scoping level investigations can, in general, be separated into the following phases:

- *Initiation of the Public Process:* during this phase members of the public and key stakeholders are notified of the initiation of the environmental investigation, to enable them to raise issues and concerns at the outset of the investigation.

- *Comment on the Draft Reports*[9]*:* during this phase I&APs are given an opportunity to comment on the Draft Reports. This is facilitated by the lodging of the report at suitable locations and holding a public meeting.

- *Decision and Appeal period:* this is the final phase of the public participation process. Once the competent authority have made their decision and issued the Record of Decision, the applicant and I&APs are notified of the decision and have the opportunity to appeal to the Provincial Minister of Environmental Affairs.

Progress with respect to these various stages for the current project is discussed in more detail below. It should be noted that the public process developed for this investigation exceeds the minimum requirements of both the Environment Conservation Act and the National Environmental Management Act.

[9] Depending on the nature of the project comment may be restricted to the Draft Scoping Report (where the project is concluded at the end of the Scoping Phase), or the Draft Scoping Report and the Draft Environmental Impact Report (where the full EIA process is being undertaken).

The Public Participation Process was facilitated by Nosipho Consultancy, an organisation that specialises in public facilitation and has extensive experience of working in the Olifants/Doring River area.

4.2 Initiation of the public process

The approach adopted for the current investigation was to identify as many as possible interested and affected parties (I&APs) initially, before focussing the remainder of the communications on registered I&APs. Consequently, the initial advertising campaign was broad and thorough and invited the members of the public to register as I&APs. All subsequent correspondence has been focussed on registered I&APs. This approach was outlined in the Plan of Study for Scoping (**Annexure C**, Section 4.3.2.1) and was supported by DEA&DP.

4.2.1 Compilation of the I&AP Database

The initial database of I&APs was compiled using databases from the recent WODRIS study, the Olifants/Doorn Water Management Area Reference Group, and through liaison with the West Coast District Municipality and the Cederberg Municipality. The initial database included directly affected landowners, relevant district and local municipal officials, relevant national and provincial government officials, and stakeholders from previous studies. This database was augmented via chain referral, and was continually updated as new I&APs were identified throughout the project. A complete list of I&APs is included in **Annexure F**.

4.2.2 Compilation and distribution of Background Information Document

A Background Information Document (BID) for the proposed project was compiled in English and translated into Afrikaans. The English and Afrikaans BIDs and a Response Form were distributed via post, fax or e-mail to all I&APs on 10 June 2005. The BID provided a background to the proposed project and highlighted the legal requirements and EIA process to be followed for the project. A Response Form and business reply envelope was enclosed/ attached, inviting I&APs to provide any comments regarding the proposed activities, to identify any further I&APs who should be consulted, and to register on the I&AP database. A copy of the BID is included in **Annexure G**.

4.2.3 Advertising in the regional and local newspapers

Advertisements for the EIA process appeared in English and Afrikaans in the *Cape Times* and *Die Burger,* respectively on 20 June 2005 and in local newspapers, namely *Die Weslander* on 23 June 2005 and in *Ons Kontrei* on 24 June 2005 (see **Annexure G**). The advertisements provided a background to the proposed activities and EIA process, and invited members of the public to register as I&APs, raise any issues or concerns, and attend the initial Public Meeting.

4.2.4 Community liaison

The Public Participation facilitator liaised with identified resource poor farmer (RPF) communities in the area, identified through the Olifants/Doorn Catchment Management Agency Reference Group. They were provided with the BID, and invited to attend the initial Public Meeting. Furthermore, the DWAF Western Cape Regional office provided funding for transportation for

RPF communities in the area to attend the initial Public Meeting, so as to ensure representation and participation by this sector of the stakeholder group.

4.2.5 Initial public meetings

An initial Public Meeting was held at the Clanwilliam Bowling Club, in Clanwilliam on 20 July 2005 and was attended by some 88 people. The main purpose of this meeting was to provide the public with an opportunity to meet the study team and to raise any issues and concerns regarding the project. A brief background to the EIA process was provided at the meeting, including a summary of the broader Feasibility Study for the Raising of Clanwilliam Dam, which is currently underway. Presentations were delivered in English and Afrikaans, and translation into Xhosa was also made available.

At the initial Public Meeting, there was a request from the potentially directly affected landowners to meet with the study team on a separate occasion to discuss their issues and concerns. As a result two further meetings were held with landowners on 16 August 2005 at the Clanwilliam Town Hall, Clanwilliam and on 18 August 2005 at the Ninham Shand offices in Cape Town.

4.2.6 Issues and concerns raised

Issues were submitted to the public participation facilitator via a free business reply envelope system, by fax and email. Comments and concerns raised by I&APs with regard to the proposed activities have been incorporated into a detailed 'Issues Trail' which is included as **Annexure H**. The Issues Trail records all the issues and concerns raised by the I&APs during the Scoping Process, and provides the project team and proponent's response thereto. The major issues raised by I&APs can briefly be summarised as follows:

- Inundation impacts on existing development (such as houses, orchards, pumps etc.) adjacent to the dam;
- Inundation of the district road on the eastern side of the dam;
- Disruption of traffic during the realignment of the roads;
- Impact that the raised dam would have on groundwater in the area;
- Impact of the raised dam on the Olifants River Estuary;
- Impact on fishing activities downstream of the dam;
- Impact on the emerging farmers;
- The cost of water, once the dam is raised; and
- Construction related impacts such as increased prevalence of HIV/Aids in the area.

4.2.7 Minutes of the initial public meetings

Detailed notes were taken during the Public Meeting and landowner meetings in order to capture the issues and concerns raised. Thereafter, minutes of the meetings were compiled, translated into Afrikaans and distributed to all meeting attendees. Copies of the presentations given at the meetings and copies of the attendance lists were attached and distributed with the minutes. The minutes of these meetings are included in **Annexure I**.

4.3 Comment on the Draft Scoping Report

The next stage of the public participation process involves the lodging of this Draft Scoping Report in public libraries and on the Internet, and the hosting of a second Public Meeting.

The second Public Meeting will be held on Tuesday, 1 November 2005 at the Clanwilliam Bowling Club from 10h00 till 12h00. The purpose of this meeting is to present the draft Scoping Report and provide the public with an opportunity to comment on the findings. All registered I&APs have been notified of the Public Meeting by means of a letter sent by post, fax or email on 17 October 2005. These letters of notification also included a copy of the Executive Summary and a Response Form for comments in English and Afrikaans. Copies of this Draft Scoping Report have been lodged in the Clanwilliam public library, the Municipal Office in Clanwilliam and the Ninham Shand (www.ninhamshand.co.za) website from Wednesday, 19 October 2005.

I&APs will have until Tuesday, 8 November 2005 to submit their written comments on the Draft Scoping Report to Ninham Shand. Cognisance will be taken of all comments when compiling the final report, and the comments, together with the study team and client's responses thereto, will be included as an annexure in the final report. Where appropriate, the report will be updated.

4.4 Decision and appeal period

Once the Final Scoping Report has been compiled and all I&APs' comments incorporated into the report, it will be submitted to DEA&DP for their review and decision-making. DEA&DP will thereafter either issue a Record of Decision or indicate that further information is required in order to make an informed decision and instruct the DWAF to proceed to the EIR phase. Given the nature and scale of this proposed project, it is likely that the project will proceed to the EIR phase.

It should be noted that if a Record of Decision is issued, this would be communicated to all registered I&APs by means of a letter. Following the issuing of the Record of Decision, there will be a 30-day appeal period within which I&APs will have an opportunity to appeal against DEA&DP's decision as described in **Section 1.5.3**.

5 DESCRIPTION OF POTENTIAL IMPACTS

5.1 Introduction

This chapter describes the potential impacts on the biophysical and social environments, which may occur due to the proposed activity described in **Section 2**. These include potential impacts, which may arise during the operation of the dam, and the realigned sections of road (i.e. long-term impacts) as well as the potential construction related impacts (i.e. short to medium-term). The purpose of this section is to consider the full suite of potential impacts associated with the proposed activity with a view to identifying significant impacts that need further information/ specialist investigation to inform the detailed assessment to be conducted during the EIR phase. In cases where there is currently inadequate information, a draft terms of reference and proposed specialist consultant is provided[10]. Impacts of lesser importance are also screened out, with reasons, to avoid having to address all possible impacts during the EIR.

The DWAF call for proposals to undertake the Feasibility Study and EIA process highlighted areas of particular concern, based on the wealth of information collected during previous studies. The proposal submitted by the Ninham Shand Association responded by identifying and securing the services of the requisite specialists.

5.2 Operational phase impacts on the biophysical environment

This section considers the range of long-term or operational phase impacts on the biophysical environment that may be associated with the proposed activities, including the following:

- Impact on flora;
- Impact on fauna;
- Impact on the aquatic environment;
- Impact on groundwater resources;
- Impact of sourcing construction material; and
- Impact of inundation on the roads.

5.2.1 Impact on flora

The raising of the dam and concomitant inundation of land surrounding the dam is likely to impact on natural vegetation. However, the area of natural vegetation is limited as the land surrounding the dam is mostly cultivated (refer to **Section 3.2.3**). The realignment of portions of the N7 could have a negative impact on the flora within the proposed alternative road alignments.

The broader area is however known to support areas of high conservation importance. It is therefore recommended that a specialist botanical assessment be undertaken, focussed on the proposed area of inundation and the area affected by the N7 road realignment alternatives to

[10] The Plan of Study for EIA provides an overview of the remainder of the study and provides detail on the proposed specialist investigations and their terms of reference.

determine the impact on the floral communities. The proposed Terms of Reference for this specialist botanical assessment are as follows:

- Collate and review all available existing vegetation documentation;
- Obtain and collate information about rare and endangered plants in the area;
- Consult with relevant botanists and institutions to obtain information not in the public domain;
- Undertake a survey and analysis of the vegetation in the potential inundation area and in the alternative road alignments; and
- Produce a report and vegetation map describing and assessing the implications of raising the dam and the alternative road alignments.

Dr C Boucher, formerly of the University of Stellenbosch, currently consulting in his private capacity, has been appointed to undertake the botanical investigation since he has previously worked in this area and has an extensive knowledge of the Cape Floristic Kingdom. Dr Boucher's CV is included in **Annexure K**.

5.2.2 Impact on fauna

The raising of Clanwilliam Dam and the road realignment of portions of N7 could have a negative impact on the fauna in the immediately affected areas. This potential impact would be mitigated by the relatively small area of natural vegetation and habitat within the proposed inundation area and road realignment areas. Moreover, the inherent mobility of most faunal species would enable those communities within the affected area to move away from the construction zone to undisturbed land in the immediate vicinity. Therefore the scale and severity of this impact is deemed to be low and not requiring a specialist study. Nevertheless, it is proposed that this potential impact be assessed in more detail in the EIR phase in terms of the methodology outlined in the Plan of Study for EIA. This would include the following:

- Review of previous investigations in the area;
- Discussion with relevant specialists, as required; and
- Assessment of impact using the aforementioned assessment methodology.

5.2.3 Impact on the aquatic environment

The raising of Clanwilliam Dam is likely to have negative impacts in the Olifants River upstream of the dam, by replacing the natural riverine environment with an artificial lake environment, thereby increasing habitat for exotic fish that pose a threat to endemic or indigenous fish even beyond the inundation area, and especially up the tributaries. In particular, the Rondegat River is a priority river rehabilitation site, according to CapeNature, and flooding of the Rondegat weir could have an impact on this river rehabilitation programme. However, the raising of the dam would facilitate meeting the ecological water requirements downstream, and could through the installation of an outlet structure have a positive impact on the riverine and estuarine environment, downstream of the dam wall.

It is suggested that a specialist freshwater fish assessment be undertaken, in order to determine the impact of a raised dam on the habitat requirements of indigenous fish and the impact on the Rondegat River, a tributary of the Olifants River. The Terms of Reference for the specialist freshwater fish assessment are as follows:

- Undertake a desktop review of existing information on the area to be inundated by the raised dam in the Olifants and Rondegat Rivers;
- Comment on the proposed outlet structure; and
- Comment on the area immediately downstream of the Clanwilliam Dam, which acts as a sanctuary for the Clanwilliam yellowfish.

Mr Dean Impson has been appointed to undertake this specialist fish assessment. He is a recognised expert in this field with extensive experience in the Olifants River valley. It must be noted that although Mr Impson is employed by CapeNature, he would undertake this work in his private capacity, and not as a representative of CapeNature. Mr Impson's CV is included in **Annexure K**.

5.2.4 Impact on groundwater resources

Historical observations suggest that when the Clanwilliam Dam is full, a spring located 100 m downstream of the dam wall discharges at a faster rate. The raising of Clanwilliam Dam could raise the local groundwater table, and could result in the discharge of groundwater in the surrounding areas, the springs in Clanwilliam town being of particular concern. However if the flows increase in the springs, this additional water could be utilised productively within the town. An extensive hydrogeological survey is unlikely to add much knowledge to the data collected in the previous investigations. It is therefore suggested that a focused hydrogeological assessment be undertaken, to determine the impact that a raised Clanwilliam Dam could have on the hydrogeology of the adjacent areas. The Terms of Reference for the hydrogeological assessment are as follows:

- The production of a hydrogeological scoping report covering the following:
  - The hydrogeological context of the area, fluctuations in the groundwater table and spring flows with changes in the dam levels and rainfall trends;
  - A schematic cross-sectional diagram showing the relationship the water table in the Skurweburg and Peninsula aquifers as related to the three levels of potential raising of Clanwilliam Dam; and
  - Data limits and recommendations.

Umvoto Africa, led Ms Rowena Hay, has been appointed to undertake the hydrogeological assessment. Ms Hay has undertaken extensive work in the area, most recently as part of the WODRIS Study, and has an extensive knowledge of the aquifer systems in the area. Ms Hay's CV is included in **Annexure K**.

5.2.5 Impact of sourcing construction material

A range of material would be required for the raising of the dam wall and for road realignment, including different grades of hard rock, clay, gravel and sand. A quarry site, used during the previous raising of Clanwilliam Dam is located to the west of the dam wall (Refer to **Figure 3**). Initial geotechnical investigations have indicated that the material within the boundaries of the existing quarry area is unlikely to be sufficient and investigations are now focussed on extending the existing quarry area in order to obtain the requisite material. The extension of the existing quarry is likely to have an impact on the indigenous flora in the area. Other impacts associated with sourcing construction material are discussed under **Sections 5.3** and **5.4**.

This potential impact would be mitigated by the localised extent of the proposed activity. It is however proposed that this potential impact be assessed in more detail in the EIR phase in terms

of the methodology outlined in the Plan of Study for EIA. This would include appropriate consultation with recognised specialists, if required.

The DWAF would also endeavour to source material from within the FSL of the dam basin. As mentioned in **Section 1.2.3**, according to DME the sourcing of material from borrow pits and quarry sites within the FSL of dam is considered to be mining and does therefore require authorisation from DME. This could however be undertaken in terms of an application for exemption and would entail a limited process. Rehabilitation of the sites within the FSL would not be required, because these would be inundated. Since the dam basin is the area which will be flooded with water, any impact of sourcing material from this area will be negligible in comparison with the flooding. The construction phase impacts such as dust, noise, visual, and increased traffic related to extracting source material will be dealt with comprehensively under construction phase impacts. Consequently, it is recommended that these borrow pit and quarry sites within the FSL not be assessed in this EIA process.

5.2.6 Impact of inundation on the roads

a) National Road

The raising of Clanwilliam Dam will result in a raised FSL, inundating surrounding infrastructure, including various roads. Roads that would be inundated include sections of the N7. Consequently, the realignment of the relevant sections of the N7 are being investigated. The re-alignment of the N7 is likely to have a negative impact on flora and fauna within the new road corridor, as described in **Sections 5.2.1** and **5.2.2**.

b) District Roads

Various sections of DR 2183 (eastern side of the Clanwilliam Dam) and DR 1487 (section crossing the Olifants River to Algeria) are likely to be inundated if the Clanwilliam Dam is raised. The raising of DR 1487 is being investigated[11], so that the road is passable at the new FSL. The raising of the road is likely to have an impact on the riverine environment, but this would be limited to the duration of the construction phase.

The inundating of DR 2183 is likely to limit access to certain properties on the eastern side of Clanwilliam Dam, which would have socio-economic impacts. These are discussed in **Section 5.3.3**. Due to the steep slopes on the eastern side of the dam, the realignment of DR 2183 is likely to have large construction phase and operational phase impacts, including the loss of indigenous vegetation, visual impact, erosion and landscape scarring.

c) Other roads

Other private roads within the FSL will be inundated if the dam is raised. The significance of this impact may be reduced if the DWAF expropriates the entire property that the road provides access to, thereby negating the need for access to the property. This may however have significant cost implications. This would however only be resolved if the DWAF makes the decision to raise the dam and enters into negotiation with landowners regarding the acquisition of land. It may also have significant cost implications.

In light of the significance of the road inundation and realignment alternatives on the biophysical and socio-economic environment, the impacts associated with the road realignment are being

[11] The investigation and design of the road realignment alternatives for the N7 and DR1487 are being undertaken as part of the Feasibility Study.

investigated as described in the relevant **Sections of 5.2** above and **Sections of 5.3** and **5.4** below.

5.3 Operational phase impacts on the socio-economic environment

This section considers the range of long-term or operational phase impacts on the socio-economic environment that may be associated with the proposed activities, including the following:

- Visual impacts;
- Impact on heritage resources;
- Impact of inundation of existing infrastructure, other than roads;
- Impact on livelihood security;
- Impact on recreational facilities;
- Impact on the local economy; and
- Macro-economic impacts.

5.3.1 Visual impacts

The raising of Clanwilliam Dam would result in the lake surface area increasing from some 1120 ha to a maximum of some 2100 ha[12,] when the dam is full. However, this will increase the expanse of "beach" when the dam is drawn down. Given the rural nature and the agricultural focus of the Olifants River valley, an increase in the existing dam surface area is unlikely to change the character of the area. As mentioned previously, the Clanwilliam Dam wall is over 60 years old, and creates a particular sense of place when entering or leaving Clanwilliam, as it is visible from the Clanwilliam intersection with the N7. Raising the dam wall by up to 15 m could have an effect on the sense of place, but as mentioned previously the dam was changed significantly 30 years ago and the new raising will change it back to approximate the dam's original shape.

The realignment of portions of the N7 would require some significant cuttings and spoiling of fill material, which is likely to leave scars that would not be easy to rehabilitate. If the quarry were to be extended, it is likely to be visible from the realigned N7, and may be considered visually obtrusive.

In light of the scale of the visual impact and context in which the development would take place, a specialist study was deemed not to be required. However, it is proposed that this potential impact be assessed in more detail in the EIR phase in terms of the methodology outlined in the Plan of Study for EIA (**Annexure J**), and would include the following:

- Consideration of Visual Absorption Capacity;
- Consideration of viewing distances;
- Consideration of critical views;
- Consideration of architectural style; and
- Consultation with specialists, where appropriate.

[12] A lake surface area of 2100 ha relates to a 15 m dam raising.

5.3.2 Impact on heritage resources

Within the basin of the potentially raised Clanwilliam Dam, there are numerous known sites containing rock art and stone tools dated to the LSA. These sites are considered to be a significant heritage resource. Similarly, heritage resources are likely to be found in the areas to the west of the N7, and may be destroyed when those portions of the N7 are realigned.

In light of the significance of heritage resource considerations in the area surrounding the Clanwilliam Dam and the road realignment corridors, it is suggested that a heritage assessment be undertaken to determine the relative impact of the various alternatives being considered on heritage resources. The Terms of Reference for this heritage assessment should be as follows:

- Undertake a field survey of the area that may be affected by inundation and the road realignment corridor alternatives;
- Identify rock art sites, completing site record forms for each site;
- Identify open scatters of artefacts, completing site record forms for each site;
- Identify built structures, completing site record forms for each site; and
- Compile a detailed assessment of the heritage sites that may be affected by the various dam raising scenarios and road alignment alternatives.

The Archaeology Contracts Office (ACO), led by Mr. Tim Hart has been appointed to undertake the heritage assessment. ACO undertook the heritage assessments that formed part of the *Olifants/Doring River Basin Study Phase I* (1999) and was referred to in the *Olifants/Doring River Basin Study Phase II* (2003), and consequently know the area and subject matter well. Mr Hart's CV is included in **Annexure K**.

5.3.3 Impact of inundation of existing infrastructure, other than roads

There is a suite of infrastructure adjacent to the dam that would be inundated if the dam were to be raised, other than the provincial and district roads highlighted above. Affected infrastructure includes portions of various housing developments, such as amongst others the Caleta Cove and Nooitgedacht housing developments, the camping site, and the boat club. Furthermore, some areas under commercial fruit orchards would also be inundated.

There is concern from landowners with regard to loss of property and compensation for those losses. Furthermore, there is concern from the farmers regarding the loss of productive land and the time required to establish new orchards, to offset the loss in income. The acquisition of land would be dealt with by the relevant Government Department[13], should the DWAF decide to pursue the raising of Clanwilliam Dam. The process would include inter alia an aerial survey of the affected land, discussions with affected parties and the determination of compensation.

However, even though this impact would be dealt with through a separate acquisition of land process, it is proposed that the impacts of inundation of existing infrastructure, other than roads be assessed in more detail during the EIR phase, in terms of the assessment methodology outlined in the Plan of Study for EIA. The investigation would consider the following:

- Area of land, number of houses and related infrastructure that would be inundated;
- Typical establishment times for new crops;
- Loss of access to accommodation and/or land by farm workers and
- Impacts on the viability of farming units if partially inundated/ purchased.

[13] Government Departments involved in the acquisition of land include the Department of Land Affairs and the Department of Public Works.

The above assessment would rely principally on information from the Financial and Economic Analysis task of the Feasibility Study.

5.3.4 Impact on livelihood security

The raising of Clanwilliam Dam would result in additional land around the periphery of the current dam being lost either through inundation, or through acquisition, to serve as a safety buffer in terms of the DWAF's dam safety policy. As mentioned in **Section 3.3.2**, a large proportion of the aforementioned land is cultivated. If a portion of a farm was inundated and the land acquired, the remaining portion may not be viable as a commercial entity. Furthermore, farm workers may loose their places of residence and employment, if commercial farms become economically non-viable and have to be bought out by the DWAF.

The inundation of portions of DR2183 (eastern gravel road) has been raised as a concern by commercial farmers in the area. The road is utilised to transport produce from the farms to Citrusdal and then on to Cape Town, supplying local, national and international markets. Alternative access to the affected farms via Clanwilliam is undesirable due to the increased haulage costs associated with the greater distance.

Concern has been raised on the impact that the raising of Clanwilliam Dam would have on the downstream riverine environment, and more specifically on the fishermen in the Ebenhaeser area, who fish in the lower Olifants River as a means of income. As mentioned previously, it is assumed that the EWR releases will maintain or improve the ecological functioning of the river, and the raising of the dam should therefore have no effect on the fishing activities in the lower Olifants River and coastal zone. Similarly, reductions in river flow downstream could exacerbate salinity concerns with concomitant impacts on agriculture reliant on abstraction from the river.

In light of the social implications of, amongst other things, loss of land and infrastructure, impacts on livelihoods, and the potential benefits of additional water in the area, it is suggested that a Social Impact Assessment (SIA) be undertaken. This SIA would build on the social component of the Olifants Doring Reserve Determination study, which is currently underway. The Terms of Reference for this assessment would be as follows:

- The identification and assessment of the social impacts associated with the loss of land and infrastructure due to the raising of the dam wall and realignment of the N7;
- The identification and assessment of social and development opportunities and constraints associated with changing land-uses in and around the dam, as a result of the raised dam and realigned road;
- The identification and assessment of the social impacts on other downstream users;
- The identification and assessment of the social impacts associated with the construction phase of the project, including the potential influx of job seekers and construction workers to the area; and
- The identification and assessment of the social impacts on upstream water users.

Mr Tony Barbour, a private consultant has been appointed to undertake the social impact assessment. He would be assisted by staff from UCT's Environmental Evaluation Unit. Mr Barbour has undertaken many SIAs and has experience of working in the study area. Mr Barbour's CV is included in **Annexure K**.

5.3.5 Impact on recreational activities

The Clanwilliam Dam is utilised for recreational activities including boating and fishing, especially in the summer holiday season. The raising of the dam would result in the inundation of land and various pieces of infrastructure, including inter alia the Clanwilliam camping site and the Clanwilliam boat club. There has been public concern regarding the loss of these recreational facilities through inundation. These facilities could however be re-established at the new FSL.

The Terms of Reference for the proposed Social Impact Assessment are described in **Section 5.3.4**, and would address the impacts related to loss of recreational activities.

5.3.6 Impact on the local economy

The raising of Clanwilliam Dam would result in increased storage in the system and consequently a greater volume of water available to users. Concern has been raised by I&APs regarding the distribution and cost of the water once the dam has been raised. The additional water is likely to be provided to a suite of recipients, including emerging farmers and current farmers. As part of the Feasibility Study for the Raising of Clanwilliam Dam, the need for social upliftment, and opportunities and mechanisms for emerging farmers to enter the market will be investigated.

Given that the Olifants River valley is characterised by significant poverty, social disparities and fluctuating levels of employment, the potential impacts on the economy are of great interest. Consequently, the SIA would also include the identification and assessment of the social and development opportunities and constraints associated with changing land-uses as a result of the dam raising and road realignment. The SIA would be augmented with information from the Feasibility Study, where appropriate.

5.3.7 Macro-economic impacts

Agriculture generates the second largest contribution towards the regional economy. Furthermore, the Western Cape generates the most income from agricultural products in South Africa (Stats SA, 2004). The impact of raising the dam on agriculture is therefore significant on a regional, provincial and national scale.

The construction of the dam is likely to result in an influx of jobseekers to the area during the construction phase. All jobseekers may not find employment, or those who find employment may remain in the region beyond the construction period. Those that do not leave the area after the completion of construction may not find new employment, exacerbating poverty and low levels of income experienced in the area, which will have knock-on effects for the region and those living in the region.

It is proposed that these potential impacts be assessed in more detail in the EIR phase in terms of the methodology outlined in the Plan of Study for EIA. This would include appropriate consultation with recognised specialists, and reference to the financial and economic analysis, being undertaken as part of the Feasibility Study.

5.4 Construction phase impacts on the biophysical and social environments

The construction phase is likely to result in a number of negative impacts on the biophysical and the social environments. These could potentially include:

- Disturbance of flora and fauna;
- Sedimentation and erosion;
- Deterioration of water quality;
- Increase in traffic volumes;
- Interruption of road services;
- Interruption of water services;
- Storage and utilisation of hazardous substances on site;
- Risk of fire;
- Disturbance to sense of place, visual aesthetics;
- Security risks;
- Health issues;
- Windblown dust;
- Litter/waste pollution;
- Noise pollution; and
- Light pollution.

The significance of construction phase impacts is likely to be limited by their relatively short duration, since the construction phase should last no longer than three years. Moreover, many of the construction phase impacts could be mitigated through the implementation of an appropriate Environmental Management Plan (EMP). During the EIR phase, the construction phase impacts on the biophysical and socio-economic environment will be assessed in terms of the methodology outlined in the Plan of Study for EIR. Furthermore a framework EMP will be compiled as part of the EIA process, and submitted as part of the EIR, to provide mitigation for many of the construction phase impacts.

a) Disturbance of flora and fauna

This impact considers impacts beyond the permanent footprint impacts of the inundation and road realignment. Alien plant seeds could be introduced with construction material such as sand or other materials, with all disturbed areas being particularly vulnerable.

As outlined above, the affected fauna are mobile and would relocate during the construction phase and are likely to colonise suitable habitat in the surrounding areas. Furthermore, fauna are likely to recolonise the area once the construction phase has been completed and the disturbed areas rehabilitated.

b) Sedimentation and erosion

The sediment load of the Olifants River may increase due to disturbance of the riverbed, demolition of existing structures and other construction related activities. The increased sediment load may have an impact for irrigation farmers as far downstream as Bulshoek Barrage and may also affect the river channel habitats, with consequent ecological impacts.

c) Deterioration of water quality

Water quality, especially turbidity and pH, in the Olifants River immediately downstream of the construction site may deteriorate due to construction related activities. Furthermore, once the dam starts to fill, any inundated vegetation and organic soils would die off, releasing nutrients into the system with the consequent ecological implications.

d) Increase in traffic volumes and traffic safety

Construction vehicles would make use of the existing roads, including the N7 to transport material to the dam site and the road realignment corridors. Furthermore, the construction site would operate on a 24-hour basis. A high volume of traffic currently travels on the N7 between Clanwilliam and Citrusdal, and the road is poor, in parts with no shoulders or passing lanes. Construction related traffic could impact negatively on the traffic flow and the integrity of the N7. Furthermore, construction may exacerbate the risk of vehicular accidents, especially at night

e) Interruption of road services

Traffic flow on the N7 may be interrupted during the road realignment process, most notably at the points where the new alignments merge with the existing alignments. While some level of service would always be maintained, time delays are likely to be experienced.

f) Interruption of water services

Water is currently released from the Clanwilliam Dam to supply water users in the downstream reaches of the river during mainly the summer months. This release of water may be interrupted for periods during the raising of the wall and the installation of the outlet works. The DWAF has stated that it would attempt to meet the water requirements of the water users, or if not possible, to provide sufficient notice, to allow for forward planning by the irrigation farmers, as well as the municipal and industrial water users.

Furthermore, the reduction or interruption of irrigation water releases into the river is likely to have a negative effect on the Olifants River. This impact would be exacerbated if construction took place during a drought year, which put the ecological functioning of the estuarine environment under greater stress.

g) Storage and utilisation of hazardous substances on site

As at any construction site, various hazardous substances are likely to be used and stored on site. These substances include amongst other things, diesel, curing compounds, shutter oil and cement. Utilisation of such substances in the aquatic environment is of greater concern than when used in a terrestrial environment. The spillage of any of these substances is difficult to contain in a river and is challenging to clean up. Furthermore, spillage could have an impact on the aquatic ecosystem as well as on irrigation farmers utilising the river water downstream.

Use of hazardous substances at a construction site is controlled by various pieces of legislation. The management and protection of the environment would however be achieved through the implementation of an EMP, which would *inter alia* detail the storage of hazardous compounds and the emergency procedures to follow in the event of a spillage.

h) Risk of fire

As described in **Section 3.2.2**, temperatures in the Clanwilliam area can rise to above 40ºC. Furthermore, the fynbos vegetation that is characteristic of the area is dry and prone to fires. Construction activities in the area may increase the risk of fire in the area. The outbreak of fire at the construction sites could have serious safety, economic and ecological implications. The risk

of fire would be managed through the EMP, which would include procedures for dealing with emergency situations such as fires.

i) Disturbance to sense of place and visual aesthetics

The Clanwilliam Dam is a recreational amenity, utilised especially by seasonal holidaymakers for amongst other things, fishing and boating. The presence of a construction site and camp and the associated increase in noise, wind blown dust and general disturbance caused by construction activities is likely to change the environment and peoples experience of it. Furthermore, the disturbance is likely to have an impact on tourism to the area, especially with respect to the recreational facilities such as the camping site and boat club based in close proximity to the dam wall.

j) Security risks

A construction site such as this is likely to employ a large number of people, with numbers rising and falling throughout the construction period, dependent on the activities taking place at the time. The large increase in people to the area, as well as the potential periods where some construction workers are unemployed could lead to an increase in crime in Clanwilliam and the surrounding areas. This could be further exacerbated by the use of alcohol and drugs.

k) Health issues

The migration of construction workers into the Clanwilliam area could result in an increase in the prevalence of diseases in the area including *inter alia* HIV/Aids and tuberculosis. Health risks could be increased by an increase in prostitution in the area, fed by a large number of construction workers who are away from their families. Medical facilities in the area may be not be equipped to deal with the increased requirement for healthcare as a result of the construction activities.

l) Windblown dust

Construction activities associated with the dam raising, realignment of portions of the N7 and extraction of construction material from quarry and borrow sites are likely to result in the increased production of windblown dust. This may result in an impact on orchards, and on recreational activities associated with the dam and consequently an impact on tourism.

m) Litter/waste pollution

The effect of litter or waste pollution on the biophysical environment in the vicinity of the dam and the road realignment corridors would be relatively small but could be more significant for the aesthetics of the area, if not properly controlled.

n) Noise pollution

As mentioned above, the construction site would operate 24-hours per day, for a portion of the construction period, if not for the full duration. An increase in noise pollution would be expected from the operation of heavy machinery during the construction period. The severity of this impact is reduced due to the low density of houses in close proximity to the dam, quarry and road re-alignment corridors.

o) Light pollution

Large floodlights are likely to be installed at the dam and quarry site to enable construction activities to continue 24 hours per day, when required. As mentioned above, there are relatively low numbers of people resident in close proximity to the dam wall or quarry site, which would reduce the severity of this impact.

As mentioned, many of the construction phase impacts could be managed or mitigated through the implementation of an approved Environmental Management Plan (EMP). A framework EMP will be compiled as part of this EIA process and will be contained in the EIR.

6 CONCLUSIONS AND RECOMMENDATIONS

6.1 Conclusions

As per the requirements of the Environment Conservation Act, and the underlying principles of NEMA, this Scoping investigation has reviewed a range of project alternatives and contemplated the array of potential environmental impacts associated with the following proposed activities at the Clanwilliam Dam and in the surrounding area:

- Raising of Clanwilliam Dam by 5, 10 or 15 m;
- Realignment and raising of sections of the N7 National Route (N7), with a total length of some 3 200 m of road;
- Raising a portion of District Road 1487 at the crossing of the Olifants River, a total length of some 100 m of road.

Pursuant to this scoping, which has been based on input from reports, the authorities, I&APs and various professionals, a shortlist of potentially significant environmental impacts and reasonable project alternatives have been identified for further, more detailed investigation during the EIR phase. Specifically the following potential environmental impacts have been identified:

- Operational phase impacts on the biophysical environment:
  - Impact on flora;
  - Impact on fauna;
  - Impact on the aquatic environment;
  - Impact on groundwater resources;
  - Impact of sourcing construction material; and
  - Impact of inundation on the roads.

- Operational phase impacts on the social environment:
  - Visual impacts;
  - Impact on heritage resources;
  - Impact of inundation of existing infrastructure (other than roads) adjacent to the dam;
  - Impact on recreational facilities;
  - Impact on livelihood security;
  - Impact on the local economy; and
  - Macro-economic impacts.

- Construction phase impacts on the biophysical and social environments

Furthermore, a suite of impacts may be attached to the site establishment activities such as the provision of housing, services and access roads for the construction team. These activities would be confined to the boundaries of the construction site.

6.2 Recommendations

In light of the findings of this investigation, it is the recommendation of the EIA project team that:

- This EIA process progresses to the next phase, viz. the EIR phase, where the various environmental impacts and project alternatives outlined above can be subjected to more detailed investigation.

- The approach to the EIR phase should be conducted in terms of the guidelines outlined in the Plan of Study for EIA included in **Annexure J**.

- The following specialist studies should be commissioned to provide more detailed information on those environmental impacts which have been identified as potentially being of most concern, and/or where insufficient information is available, namely:
  - A specialist botanical investigation;
  - A freshwater fish assessment;
  - A groundwater investigation;
  - A heritage assessment;
  - A social impact assessment.

- The following specialist have been appointed to undertake these investigations:
  - Specialist botanical investigation: Dr Charlie Boucher;
  - Freshwater fish assessment: Mr Dean Impson, private consultant;
  - Groundwater investigation: Umvoto Africa;
  - Heritage assessment: Archaeology Contracts Office;
  - Social Impact Assessment: Mr Tony Barbour.

- The Terms of Reference for these specialist investigations should be as detailed under the relevant impacts in **Section 5**.

- The scope of the assessment should be broadened to include the construction of a new gravel access road on the eastern side of the dam, from the existing gravel road to provide access to the top of the raised dam wall.

6.3 The way forward

The next stage of the public participation process involves the lodging of the Draft Scoping Report and the hosting of a public meeting to receive feedback on the Draft Scoping Report.

The public meeting will be held on 1 November 2005 from 10h00 to 12h00 at the Clanwilliam Bowling Club. Copies of this Draft Scoping Report have been lodged in the Clanwilliam public library, at the Clanwilliam Municipal offices and on the Ninham Shand website www.ninhamshand.co.za. Written comments on the report will be received until 8 November 2005. Cognisance will be taken of all comments when compiling the final report, and the comments, together with the study team's and client's responses thereto, will be included as an

Annexure in the final report. Where necessary, the report will be updated to take these comments into account.

Once the Final Scoping Report has been completed all I&AP comments have been incorporated into the report, and the client has approved the report, it will be submitted to DEA&DP for their review. Based on the scale and nature of the proposed project, DEA&DP is likely to either turn the applicant down or instruct the applicant to proceed to the EIR phase. Based on the Draft Scoping Report recommendations, the latter is the more likely scenario.

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APPENDIX A

Terms of Reference for the EIA Process

DEPARTMENT OF WATER AFFAIRS AND FORESTRY
DIRECTORATE OPTIONS ANALYSIS

FEASIBILITY STUDY FOR THE RAISING OF THE CLANWILLIAM DAM IN THE WESTERN CAPE

INCEPTION REPORT
Final

Prepared by: Ninham Shand Consulting
P O Box 1347
Cape Town
South Africa
8000

Tel: 021 – 481 2400
Fax: 021 - 424 5588
e-mail: hydro@shands.co.za

In association with: ASCH Professional Services (Pty) Ltd
Jakoet & Associates cc

Prepared for: Director: Options Analysis
Department of Water Affairs and Forestry
Private Bag X313
Pretoria
South Africa

Tel: 012 – 336 8321
Fax: 012 – 338 8295
e-mail: icb@dwaf.gov.za

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currently being experienced at Bulshoek Weir (but not yet at Clanwilliam Dam). The Department therefore requested the team to undertake additional work on eutrophication.

From discussions with Mr. Matthee, CEO of the Lower Olifants River Water Users Association, it appeared that problems were experienced with filamentous algae and free-floating algae. The filamentous algae cause problems in the weir and in the canal system. The LORWUA spends about R 170 000 per year to control the algae in the canals. He noted that in 2003, taste and odour problems were encountered with water abstracted from Bulshoek Weir. He ascribed these to phytoplankton, low water levels and the low flushing rate of water in the weir.

These symptoms appear to indicate that the eutrophication potential needs to be investigated as part of the feasibility study, even though it has not previously been identified as a concern. The raising of Clanwilliam Dam is expected to increase the retention time in the system, which can potentially increase eutrophication related water quality problems. In general, there is a direct relationship between the nutrient concentration in the water and amount of phytoplankton algae. However, with filamentous algae the relationship is more complex and these algae can occur even at low nutrient concentrations.

A reconnaissance level assessment will be undertaken of the present nutrient and eutrophication status, using available monitoring data and published or anecdotal information. This task would entail the collection of some water samples from Clanwilliam Dam and Bulshoek Weir for chlorophyll *a* analysis. This component would include a synthesis of data and information that is available about the growth of filamentous algae in the Bulshoek Weir and in the canal system.

Assessment of the potential impacts of raising Clanwilliam Dam on the eutrophication status of Clanwilliam Dam and of Bulshoek Weir will be determined.

A site visit, survey of algal status and Chlorophyll *a* analysis of eight samples has been provided for.

c. Report

A report describing the in-lake and downstream water quality implications of the various options and the necessity to investigate multi-level outlet works to ameliorate any downstream impacts will be written. The present status and potential impacts of eutrophication will also be addressed.

3.2.5 Environmental authorisation

The raising of the Clanwilliam Dam would require environmental authorisation in terms of sections 21, 22 and 26 of the Environment Conservation Act (ECA) 73 of 1989, within the framework of the National Environmental Management Act 107 of 1998. In particular, the upgrading of structures causing disturbances to the flow of a river, dams, and schemes for the abstraction of surface water for bulk supply purposes are all listed as activities requiring authorisation. Furthermore, the development of quarries and borrow pits, and the potential realignment or re-construction of roads, resorts and associated infrastructure due to inundation, could require environmental authorisation, as could certain changes in land use initiated directly or indirectly as a result of the proposed dam raising.

Spatially, the Environmental Impact Assessment (EIA) would focus on the area of potential inundation in terms of various dam-raising scenarios, and the associated direct impacts. However, consideration will be given to the broader, indirect and cumulative impacts that may arise as a result of the proposed scheme, particularly as it applies to the development of further irrigation areas.

Further to the above, DWAF has requested the Clanwilliam Dam Raising Association to undertake the EIA process for the road realignment to ensure that the relevant authorisations are obtained in time, so as not to compromise the programme for the dam raising. Consequently, the EIA process for the potential road realignment would be undertaken in parallel with the EIA for the dam raising, utilising the same specialists and public participation process. Adopting the proposed approach allows for cost and time savings, and more importantly, reduces the likelihood of stakeholder fatigue. The EIA process would evaluate the suite of road alignments developed during the conceptual planning process, which would be informed by the three levels of dam raising.

In addition to the ECA, the proposed activity would require approval from the Department of Mineral and Energy Affairs, via an Environmental Management Programme Report for proposed quarries and borrow pits, in terms of the Minerals Act 50 of 1991. This would be required for both the dam raising and the road realignment.

Heritage Western Cape would be notified and requested to comment on the implications of the proposed development in terms of the National Heritage Resources Act 25 of 1999.

The EIA process would be developed in consultation with the environmental authorities and the requisite public participation process would be integrated with the public participation process for the Feasibility Study as a whole. An Environmental Impact Report (EIR) and Environmental Management Plan (EMP) would be produced, and would serve as the basis for the environmental authority's decision on authorisation.

a. Scoping Phase (Ninham Shand)

The scoping task would be run as a distinct but integrated component of the overall public participation process. Two public meetings would be held in this phase, the first to inform interested and affected parties of the proposed project and to provide an opportunity to raise issues and concerns, and the second to present the draft Scoping Report. As mentioned previously, the EIA processes for both the dam raising and road realignment would be presented to the public through a joint public consultation process.

A background information document (Afrikaans and English), draft and final Scoping Reports (executive summaries in Afrikaans) and plan of study for Environmental Impact Assessment, will be produced.

b. Environmental impact assessment phase (Ninham Shand)

The Scoping Phase would inform the EIA. It would entail a public meeting and compilation of an EIA report for the dam raising and the road realignment projects. A number of specialist studies in the following disciplines have been allowed for: botany, icthyology, hydrogeology, archaeology and sociology/anthropology. The EIA would also incorporate information from the other tasks and would serve as the main communication tool with the public. The EIA would meet the legislated requirements.

A Scoping Report, Environmental Impact Report, Environmental Management Plans (for both the construction and implementation phases) and Environmental Management Programme Reports would be produced.

c. Specialist studies to be incorporated into the EIA

i. Vegetation impact assessment (Charlie Boucher)

This would entail the following:

- Obtain and collate information about rare and endangered plants;
- Collate and review all available existing vegetation documentation;
- Consult with relevant botanists and institutions to obtain information not in the public domain; and
- Undertaking of a survey and analysis of the vegetation during spring in the potential inundation area around the perimeter of the dam.

A vegetation map at 1:10 000 scale and specialist report describing and assessing the implications of raising the dam and the alternative road alignments on surrounding vegetation would be produced. This would include implications from the raising of the soil water table and from a reduction in the overall extent of plant cover due to the two developments, and a brief comment on the botanical implications of various further irrigation developments.

ii. Freshwater fish impact assessment (Dean Impson)

This would involve a detailed fish survey of the lower Olifants and Rondegat rivers, including snorkelling, seine and gill netting. Electrofishing is also recommended to allow rock catfishes to be caught. Angling clubs that fish Clanwilliam Dam will be contacted regarding catch statistics. A literature survey will be done to determine the habitat requirements of fishes historically and presently occurring in the study area. The impact of the raising of Clanwilliam Dam on the proposed Rondegat River rehabilitation project will be assessed, together with mitigation measures.

Based on the above, the negative and positive (if any) impacts of the raising of the dam on the fish community present will be ascertained. Mitigation measures will be proposed to minimise the potential impact of the enlarged dam on the indigenous fish community.

A specialist report on the potential impacts of dam raising options on indigenous fish populations and mitigation measures will be produced.

iii. Hydrogeological impact assessment (Umvoto Africa)

This would entail a desktop review of previous work and relevant data (e.g., CAGE structure database, existing hydrocensus information, current monitoring sites in area) and use of available data. A one-day trip to Clanwilliam is included, for mapping of springs. Development and population of a GIS-based digital model and geo-informatics system (database) covering a defined domain around the town and reservoir will be done.

A Hydrogeological Impact Assessment Report will be produced, detailing:

- The context and work outline;
- The hydrogeological context (topography, geology, hydrogeology, elevation of known springs, if possible (depending on data availability), fluctuations in groundwater table and spring flows with changes in dam levels and rainfall trends;
- A schematic cross section showing the relationship of dam elevations at 5 m, 10 m and 15 m to the water table in the Skurweburg and Peninsula aquifers (assuming that relevant data is available); and
- Data limits and recommendations.

iv. Social impact assessment (Environmental Evaluation Unit)

The key social issues that need to be addressed include:

- Identification and assessment of the social impacts associated with the loss of land and infrastructure due to the raising of the dam wall and realignment of the N7 National Road and secondary roads;
- Identification and assessment of social and developmental opportunities and constraints associated with changing land-uses in and around the dam as a result of the proposed raising of the dam wall and realignment of the N7 National Road and secondary roads.
- Identification and assessment of social impacts on other downstream users, including activities in the Olifants River estuary;
- Identification and assessment of the social impacts associated with the construction phase of the project, including the potential influx of job seekers and construction workers to the area;
- Identification and assessment of the social impacts on up-stream water users.

The study will engage with individuals, communities, organizations and institutions in the affected area in a sensitive and appropriate manner. The indirect and cumulative impacts will be described and recommendations made.

A Social Impact Assessment specialist report will be written.

v. Heritage investigation (Archaeology Contracts Office)

A heritage impact assessment will be undertaken in compliance with the requirements of the National Heritage Act 25 of 1999. This component will entail a review of available literature, field surveys and a report integrated into the Environmental Impact Assessment. Fieldwork will be conducted by two pairs of archaeologists working in separate teams, and entails:

- Walking the entire area that may be affected by inundation as well as the road alignment alternatives;
- Identifying rock art sites, completing site record forms for each and recording rock art images by means of digital photography;
- Identifying open scatters of artefacts, completing site record forms and recording each site photographically; and
- Identifying built structures such as ruins or graveyards and recording them as above (archival research may be necessary to identify the origin of such structures).

A detailed assessment of the heritage sites that may be affected by the various dam raising scenarios and road alignment alternatives will be provided.

vi. Impacts on the N7 and secondary roads (ASCH, Ninham Shand & specialists)

The raising of the dam wall will impact directly on Trunk Road 11 (TR11) in the vicinity of the dam wall. The higher the dam is raised, the greater will be the impact. An increase of 5 m in water level may necessitate the construction of a short viaduct section and some local relocations, while the raising by 15 m could require the complete relocation of TR11 for a distance of up to 10 km, including the current access to Clanwilliam from TR11. Secondary roads would also be affected.

In terms of the ECA (Act 73 of 1989) the upgrade of roads requires environmental authorisation. It has been decided by the DWAF that authorisation for the upgrade of the roads, affected by the possible raising of the dam, will be addressed in this study. Preliminary discussions have been held with Mr Steve Fanner of the Provincial Government of the Western Cape, who indicated that this would be acceptable, as long as design is according to their standards. The various alignment options and their impacts will therefore be considered during the EIA process.

For each increment of raising, the impacts on the current road alignment of TR11 and the secondary roads will need to be determined. The next step will be to review current planning for the future upgrading of TR11 and the secondary roads to assess the suitability thereof. Options for the treatment of TR11 required for each increment of raising will be identified and workshopped with the three relevant road authorities (SA National Roads Agency Ltd, Western Cape Provincial Administration and Cedarberg District Municipality). These options will be costed and this information will be fed into the impact assessment processes.

Potential material sources (quarries and borrow pits) will be identified and materials will be sampled and tested to confirm the quality thereof.

The road inputs will be undertaken at a conceptual planning level using 1: 50 000 or 1: 10 000 mapping (unless more detailed survey information and road planning is sourced). The cost for the conceptual planning would depend on the extent of the impacts of the raising.

vii. Environmental Management Plan (Ninham Shand)

The development of the framework EMP would entail the following:

- Identifying the activity, aspect and potential impact requiring management;
- Outlining the potential mitigation measures in terms of the objective and target;
- Identifying the performance indicators; and
- Highlighting the responsibilities for implementation, in terms of various criteria.

This framework EMP will highlight the key environmental aspects and identify the mechanism required to manage these concerns.

A framework EMP that clearly indicates all mitigation measures and responsibilities will be written.

viii. Environmental Management Programme Report (Ninham Shand)

In terms of the Minerals Act, Act 50 of 1991, all prospecting and mining activities require approval from the Department of Minerals and Energy (DME) via the compilation and submission of an Environmental Management Programme Report (EMPR) to DME. Preliminary discussions with Mr Jan Briers of the Western Cape office of DME indicate that they are unlikely to require authorisation of any borrow pits or quarries located within the full supply level of the dam. Material required for the road construction is unlikely to be located within the dam basin. Two quarry sites will therefore be identified and the requisite authorisations will be applied for.

Authorisation for borrow pits or quarries located outside of the full supply level of the dam would entail:

- Compilation of the requisite EMPR in terms of the Mineral and Petroleum Resources Development Act and it's Regulations; and
- Submission of the EMPR to DME for their review and decision.

An Environmental Management Programme Report will be written, as required in terms of the Minerals Act.

3.2.6 Yield analysis

a. Yield potential of various dam raisings (Ninham Shand and ASCH)

It is envisaged that the Water Resources Yield Model (WRYM) as further developed by Ninham Shand for use on the Kobwa and the Western Cape System would be utilised for this study. This model

APPENDIX B

DEA&DP Application Form and Scoping Checklist

Application Form and Checklist
in terms of Section 21, 22, 26 and 28A of the
Environment Conservation Act, 1989
(Act No. 73 of 1989)

APPLICATION DETAILS

Project Applicant /Agent of Applicant: (Please specify and attach copy of agency agreement if applicable)	Department of Water Affairs and Forestry		
Contact person:	Mr Alan Brown		
Postal Address:	Private Bag X313, Pretoria, South Africa		
Telephone:	(012) 336 8321	Cell:	
Email:	icb@dwaf.gov.za	Fax:	(012) 338 8295

Project title:	Raising of Clanwilliam Dam and associated realignment of affected roads in the Clanwilliam area				
Project location:	Clanwilliam, Western Cape				
Co-ordinates:	Latitude:	32º	12’	20”	South
	Longitude:	18º	52’	30”	East
Magisterial District:	Clanwilliam				
Name of Property:	Clanwilliam Dam				
Farm/Erf name and number	To be confirmed during Scoping				
Size of Property: (as per title deed)	To be confirmed during Scoping				
Closest City/Town:	Clanwilliam		Distance (in km) <1		

Project Consultant:	Clanwilliam Dam Raising Association		
Contact person:	Mr Erik van der Berg		
Postal Address:	PO Box 1347, Cape Town, 8000		
Telephone:	(021) 481 2400	Cell:	
Email:	Erik.vanderBerg@shands.co.za	Fax:	(021) 424 5588

Fill in if applicable	Environmental Consultant	Ninham Shand (Pty) Ltd.		
	Contact person:	Karen Shippey / Ashwin West		
	Postal address:	PO Box 1347, Cape Town, 8000		
	Telephone:	(021) 481 2400	Cell:	072 127 8580
	Email:	Karen.shippey@shands.co.za	Fax:	(021) 424 5588

Fill in if applicable	Planning Consultant	N/A		
	Contact person:			
	Postal address:			
	Telephone:		Cell:	
	Email:		Fax:	

Is there a Terms of Reference?
If so, please attach a copy thereof to this application form and scoping checklist — Yes

Feasibility Study Draft Inception Report Attached

Registered landowner/s:	The Department of Water Affairs and Forestry, and various Private Land Owners to be determined during Scoping.		
Contact person:	Mr Alan Brown		
Postal Address:	Private Bag X313, Pretoria, South Africa		
Telephone:	(012) 336 8321	Cell:	
Email:	icb@dwaf.gov.za	Fax:	(012) 338 8295

Local authority/municipality:	Cederberg Municipality		
Contact person:	Municipal Manager		
Postal Address:	Private Bag X2, Clanwilliam, 8135		
Telephone:	(027) 482-2133	Cell:	
Email:	admin@cederbergraad.co.za	Fax:	(021) 482-1933

Registered owner of mining rights:	To be determined during Scoping		
Contact person:			
Postal Address:			
Telephone:		Cell:	
Email:		Fax:	

Declaration :
I hereby declare that I am fully aware of my responsibilities in terms of the EIA Regulations (Government Notice No R1183 of 5 September 1997, as amended), and that failure to comply with these requirements may constitute an offence in terms of the Environment Conservation Act, 1989 (Act No. 73 of 1989):

Applicant (Full names)_____Date:_____ Place: _____

Signature _____(duly authorised to sign on behalf of Applicant)

Witness (Full names)_____ Date:_____ Place:_____

Signature_____

PROJECT DESCRIPTION

Please provide the following:

a) **A <u>Locality Plan</u>, which clearly shows the site in relation to the surrounding area. The plan must be of sufficient quality to enable the Department to locate the site for the purposes of a site inspection**.
b) **A <u>Site Plan,</u> indicating the proposed new development, existing servitudes, 1:50 year flood line, 1:100 year flood line (if available), adjacent land use and developments, contours, existing infrastructure, and any additional information that may be of assistance to the Department in considering an application.**
c) **The above plans must be <u>clearly legible</u> and <u>must indicate the scale</u> and must indicate where <u>North</u> is,**
d) **<u>Photographs</u> of the site and its surroundings (taken of the site and from the site). The vantage points from which the photographs were taken, must be indicated on the site plan, or locality plan as applicable. If available, please also provide a recent aerial photograph.**
e) **A <u>letter of consent</u> from the landowner, if the site of the proposed development is rented or leased.**

1 Please provide a description of the proposed development.

The Department of Water Affairs and Forestry (DWAF) is proposing to raise the Clanwilliam Dam wall crest by up to 15m, through the addition of rollcrete on the downstream side of dam wall. As a consequence of the raising sections of the N7 National Road and certain secondary roads may be flooded, and would therefore require re- alignment.

(It should be noted that ***DWAF is proposing to undertake the investigation and design work for the proposed N7 road realignment, even though it does not own or operate the road. Consequently, this EIA process will ultimately have two applicants, namely DWAF and the Provincial Government of the Western Cape and will therefore require Presumably entail the issuing of two separate, but linked Records of Decision***).

2 Is the project a new development or an upgrade of an existing development?

Upgrade of existing development, and construction of new infrastructure.

3 Which of the listed activities in Schedule 1 of the EIA Regulations apply to the development (refer Annexure A)? Please indicate all activities that are applicable

The construction, erection or upgrading of-: (d) roads, railways, airfields and associated structures; (j) dams, levees and weirs affecting the flow of a river; The change of land use from- (c) agricultural or zoned undetermined use or an equivalent zoning to any other land use;

4 What is the estimated capital investment for the project? Please indicate if this information is confidential.

Up to R200 million

5 What does the proposed project comprise? Please provide details of all components of the proposed project and attach diagrams (e.g. architectural drawings or perspectives, engineering drawings, process flow charts).

Buildings		**No**
Provide brief description:		
Infrastructure (e.g. roads, power and water supply)	**Yes**	
Provide brief description:		
The raising of the Clanwilliam Dam will result in the N7 National Road inundated, depending on the height that the dam is raised. This road will therefore have to be realigned.		
Processing activities (e.g. manufacturing, storage, distribution)		**No**
Provide brief description:		
Storage facilities for raw materials and products (e.g. volume and substances to be stored)		
Provide brief description		**No**
Storage facilities for water	**Yes**	

Provide brief description		
The purpose of the project is to raise the existing Clanwilliam Dam by up to 15 m resulting in a larger volume of water being stored.		
Storage facilities for solid waste and effluent generated by the project		**No**
Provide brief description		
Other activities (e.g. water abstraction activities, crop planting activities)	**Yes**	
Provide brief description		
Hard rock material will be required for the raising of the dam wall, and the re-alignment of the N7 National Road. There is an existing quarry to the west of the dam, which would be expanded for the current project. This quarry will require authorisation from the Department of Minerals and Energy, through the submission of an Environmental Management Programme Report.		

6 Please provide the following information on the construction phase

How long will the construction phase last?	2 - 3 years	
Is the proposed project going to be undertaken in phases? If so, provide details.		**No**
Indicate the area of the site that will need to be disturbed in the construction phase in order allow the proposed activity to take place		
To be determined during Scoping		

7 What is the size/scale of the project?

Height of permanent structures (e.g. buildings, communication masts, dam walls, electricity pylons, storage tanks)
Clanwilliam Dam wall is currently 43 m high, therefore a maximum of 15 m raising would make the wall height 58 m
Indicate the extent of the footprint for the proposed activity in relation to the site in its entirety. (Please note that this is different to question 5 above regarding the surface area that requires to be disturbed in order for construction to take place)
To be confirmed during Scoping
Indicate the surface area taken up by buildings (e.g. accommodation units, offices, garages) and infrastructure (e.g. roads, parking, storage facilities etc.)
To be confirmed during Scoping
For residential or resort developments indicate the density of the development
N/A

If the development will be nodal or clustered, state the density (units per hectare) of development for each node or cluster.
N/A

8 Current land use of the proposed site(s) for the activity and surrounding land uses?

Are any of the following applicable to the proposed site?	**Yes/No**	**Details**
Actual agricultural use	Yes	Areas to the east and west of the current dam are under agriculture, mostly grapes and citrus. Sections of these areas would be either inundated or precluded from further development, through DWAF's exclusion zone around dams, if the dam wall was raised.
Zoned undetermined (or equivalent)		To be determined during Scoping.
Actual use for grazing		To be determined during Scoping.
Use for nature conservation		To be determined during Scoping.
Zoned open space		To be determined during Scoping.
Other (for example, natural vegetation)		To be determined during Scoping.
Surrounding land uses (describe) : The landuse surrounding the Clanwilliam Dam is mostly agricultural, mostly grapes and citrus. There is also a camping site on the western banks of the dam as well as some residential development, in the way of holiday houses.		
Regional Context (Planning vision – indicate how the project will comply with current forward planning documents for example, Integrated Development Plans, and Spatial Development Frameworks)		
Forward planning document	**Confirmed by whom?**	
To be determined in Scoping		

9 Please indicate whether any of the following emissions and wastes will be produced by the project during the construction and operational phases?

Item	**Yes / No**	**Source & Anticipated Volumes**	**How will this be managed? (Refer to existing permit conditions if applicable)**
Air emissions	No		
Odours	No		
Radiation	No		

Item	Yes / No	Source & Anticipated Volumes	How will this be managed? (Refer to existing permit conditions if applicable)
Noise	Yes	From plant during the construction	Limited to the construction phase.
Industrial or agricultural effluent	No		
Domestic, Industrial or agricultural solid waste	No		
Hazardous solid or liquid waste	No		

10 Will the project involve the use of, storage of or production of hazardous substances?

Substance	Volume	Control measures/solutions to minimise environmental impacts
N/A		Limited to the construction phase. Use of hazardous substances by construction plant will be dealt with during Scoping and addressed in the Environmental Management Plan.

11 How will the site be serviced and who will provide the services and/or infrastructure?

11.1 For projects where service infrastructure is available and where the project can be readily connected to the existing infrastructure (e.g. from the local authority, Eskom, Water Board). Can the project be catered for by the existing services infrastructure? Please provide details in the table below and attach correspondence confirming service provision from the relevant service provider, if available. (**NOTE**: A response to this question **must** be provided unless Question 11.2 is applicable to the project).

Item	Service Provider	Amount or capacity required	Capacity confirmed (Y/N)	Confirmed by whom?	Resource Conservation Measures

Item	Service Provider	Amount or capacity required	Capacity confirmed (Y/N)	Confirmed by whom?	Resource Conservation Measures
Water supply Peak demand (l/s) (If provided by the local authority, please submit written confirmation by the municipality of sufficient availability of water)	To be determined				
Average demand (kl/day)					
Electricity Peak demand (kVA)	To be determined	To be determined			
Average demand (kVA)					
Solid waste - Collection (m^3)	To be determined				
- Transport (m^3)					
- Disposal (m^3)					
- Treatment (m^3)					
Sewerage/effluent Peak flow (l/s)	To be determined				
Average flow (kl/day)					

Item	Service Provider	Amount or capacity required	Capacity confirmed (Y/N)	Comments
Stormwater Peak flow (l/s)	N/A			
Average flow (l/s)				
Access (roads, rail)				Access to the site is by existing roads. These are operated by the Provincial Government and local municipality.
Other	N/A			

11.2 For projects where service infrastructure is not available and will have to specifically be developed for the project. What services will the project require and how will these be provided? (**NOTE:** This question need only be answered for developments where infrastructure and services are not in place).

Item	Yes/No	Quantity	Control measures to minimise environmental impacts/Resource Conservation Measures
Water abstraction (indicate source and any existing water servitudes inc. applicable volumes)	N/A		
Water supply (Additional volume required)	N/A		
Proposed water conservation measures to be implemented			
Electricity	N/A		
Solid waste - Collection (m^3)	N/A		
- Transport (m^3)			
- Disposal (m^3)			
- Treatment (m^3)			
Sewerage/effluent Peak flow (l/s)	N/A		
Average flow (l/s)			
Stormwater Peak flow (l/s)	N/A		
Average flow (l/s)			
Access (roads, rail)	N/A		
Other			

12 Please describe any alternatives that address environmental issues related to the development that are being considered (e.g. project layout, project site, technology selection, access)? **NOTE: If alternatives are not being considered, please submit an adequately motivated request in terms of section 28A for exemption from considering alternatives together with this checklist.**

Alternative	**Description and Comments** (Indicate which environmental impacts will be mitigated by way of the alternatives proposed)
Alternatives will be addressed in the Scoping and EIR Reports. The Screening of Options Report provides a screening of water resources options for the Water Management Area at a strategic level.	

13 Please provide details on the following environmental management procedures as applicable to your project or your organisation.

Item	**Y/N**	**Details and examples**
Have environmental factors been taken into account in the design and layout of the project (e.g. location of buildings and infrastructure, architectural style, landscaping)? Provide details / examples.	Yes	The issues raised and assessed through the EIA process will feed into the design process and the Feasibility Study for the raising of the dam.
Does your organisation/company normally implement environmental management procedures during the construction phase of projects? Provide details / examples.	Yes	A requirement of the Terms of Reference for this project is the development of a framework environmental management plan. This will be incorporated into the tender and contract documentation, and would be binding on the successful contractor.
Has your organisation implemented environmental management procedures for ongoing operations (e.g. an ISO 14001 Environmental Management System)?	No	

14 Please provide additional information on mitigation measures or recommendations to manage environmental impacts, should you wish to supplement the information given in response to any of the previous questions.

Element of Project	**Control measures/ solutions to minimise impacts**
To be determine during Scoping	

PUBLIC PARTICIPATION

15 You are required, as a minimum, to advise the adjacent/immediate neighbours and other relevant authorities about the project. What are the comments of the neighbours? Please summarise below and attach their written comments. Please furnish this Department with proof of such notification. Where concerns or positive comments have been obtained from the neighbours, the applicant's response to these must also be attached. This information must be attached as an Appendix. **On review of this application, the Department may request that further public participation be undertaken in terms of the Guideline for Public Participation for the EIA Process, September 2001.**

It is envisaged that there will be three opportunities for public engagement with the EIA process. The first opportunity is at the start of the EIA process. Interested and Affected parties (I&APs) will be notified of the commencement of the EIA process, invited to a public meeting and given the opportunity to raise comments or concerns. Since a multitude of projects have been undertaken in the area, there are a suite of resources that can be relied on to develop the initial I&AP database. A Background Information Document (BID) providing background to the project and the EIA process will be distributed to I&APs. Public notices will be placed the 'Cape Times' (English) and 'Die Burger'(Afrikaans) and two local newspapers. The general public will be asked to register as an I&AP and invited to attend a public meeting. Future correspondence will only be distributed to registered I&APs.

The second and third opportunities for comment will be at the draft Scoping Report phase and the draft Environmental Impact Report phase. Registered I&APs will be made aware of the draft reports available for comment, and will be invited to attend public meetings. Opportunities will be made for I&APs to submit their comments on the draft Scoping and Environmental Impact reports. Comments will be captured into Issues Trails, be responded to by the project team and proponent, and included in the relevant Scoping Report and Environmental Impact Report.

Please be advised that if section 38 of the National Heritage Resources Act 25 of 1999 is applicable to your proposed development, then you are requested to furnish this Department with written comment from Heritage Western Cape as part of your public participation process. Section 38 of the Act states as follows:

38. (1) Subject to the provisions of subsections (7), (8) and (9), any person who intends to undertake a development categorised as-

(a) the construction of a road, wall, powerline, pipeline, canal or other similar form of linear development or barrier exceeding 300m in length;
(b) the construction of a bridge or similar structure exceeding 50 m in length;
(c) any development or other activity which will change the character of a site-

(i) exceeding 5 000 m2 in extent; or
(ii) involving three or more existing erven or subdivisions thereof; or
(iii) involving three or more erven or divisions thereof which have been consolidated within the past five years; or
(iv) the costs of which will exceed a sum set in terms of regulations by SAHRA or a provincial heritage resources

authority;

(d) the re-zoning of a site exceeding 10 000 m2 in extent; or
(e) any other category of development provided for in regulations by SAHRA or a provincial heritage resources authority,

must at the very earliest stages of initiating such a development, notify the responsible heritage resources authority and furnish it with details regarding the location, nature and extent of the proposed development.

SOCIO ECONOMIC CONSIDERATIONS

16 How many permanent jobs will be created by the project and how many jobs will be created during the construction phase?

Permanent jobs	0	**Comments** The raised dam would operate as it currently operates, with no additional personnel required.
Construction jobs		**Comments** To be determined during Scoping Phase

17 Please provide a brief description of the socio-economic characteristics of the area in which the project is proposed. Indicate possible negative and positive social consequences/implications.

To be determined during the Scoping phase.

GAPS IN KNOWLEDGE & ASSUMPTIONS

18 Please provide a brief description of gaps in information, any predictive measures used, and all underlying assumptions made pertaining to the project as well as any limitations (if no terms of reference are available); as well as any uncertainties encountered in the compiling of the required information.

To be determined during the Scoping phase.

II LEGAL AND POLICY ISSUES

The project may require approvals/permits from other authorities in the case of a new development, or revisions to existing permits in the case of an extension or upgrade of an existing development. If the response to any of the following questions is affirmative then you are advised to query the matter further with the relevant department in addition to submitting this checklist to the Department. If you are uncertain about the legislation that is applicable to your development, please consult the relevant authority shown in the table.

1 ***National and Provincial Legislation***: Please provide relevant details in the table below and attach any authorisations already issued for the project.

Authorisation	Y/N	Application submitted?		Application approved?	
		Y/N	Date	Y/N	Date
Air emissions - Refer to the Second Schedule of the Atmospheric Pollution Prevention Act, 1965 (Act No. 45 of 1965)	No				
(Dept of Environment Affairs & Tourism - Applicable to industrial and manufacturing projects where air emissions will be discharged to atmosphere generally via a smoke stack or to extractive industries where dust will be generated)	**Comments:**				
Effluent disposal - Refer to the Section 21 of the National Water Act, 1998 (Act No. 36 of 1998).	No				
(Dept of Water Affairs & Forestry – Applicable to projects where liquid waste is produced and will be disposed to a watercourse, wetland, dam or the sea. If effluent is to be discharged to a municipal sewer, application must be made to the relevant local authority)	**Comments:**				
Water use – Refer to section 7 of the Water Services Act, 1997 (Act No. 108 of 1997) and Chapter 4 of the National Water Act, Act 108 of 1998.	Yes	No		No	
Dept of Water Affairs & Forestry – Applicable to projects where the water required for the project will be obtained from a source other than from an established municipal supply system ()	**Comments:** The Department of Water Affairs and Forestry will require various permits to store water and from a dam safety perspective. As DWAF is undertaking the design of the dam, it will undertake to apply for and obtain the necessary permits.				
Solid waste disposal - Refer to section 20 of the Environmental Conservation Act, 1989 (Act No. 73 of 1989) and the Minimum requirements for Waste	No				

Authorisation	Y/N	Application submitted?		Application approved?	
		Y/N	Date	Y/N	Date
Minimum requirements for Waste Management from Dept. Water Affairs & Forestry ***(Dept of Water Affairs & Forestry – Applicable to any project where a solid waste disposal transfer station, treatment facility or disposal site is to be established or where a waste product will be stored for more than three months)***	**Comments:**				
Development of structures and lease of land below the high water mark- Refer to the Sea Shore Act, 1935 (Act No. 21 of 1935) (***Dept of Environmental Affairs & Tourism and the Western Cape Nature Conservation Board***)	No				
	Comments:				
Driving of vehicles and construction of boat launching sites within the coastal zone - Refer to the Control of Vehicles in the Coastal Zone Regulations promulgated in terms of section 44 of The National Environmental Management Act, 1998 (Act No. 107 of 1998) ***(Dept of Environmental Affairs & Tourism, Dept of Environmental Affairs & Development Planning, the Western Cape Nature Conservation Board, SANP and relevant local authority)***	No				
	Comments:				
Agricultural activities - refer to the Conservation of Agricultural Resources Act, 1983 (Act No. 43 of 1983) ***(Dept of Agriculture - Applies to projects where agricultural activities involving ploughing and clearing of virgin land is being considered)***	No				
	Comments				
Archaeological , cultural, historical and other resources related to national heritage - Refer to the National Heritage Resources Act, 1999 (Act No.	Yes	No		No	

Authorisation	Y/N	Application submitted?		Application approved?	
		Y/N	Date	Y/N	Date
Heritage Resources Act, 1999 (Act No. 25 of 1999) ***(Heritage Western Cape/SAHRA– Applies to projects where there are naturally and culturally significant features on or adjacent to the site where development is being proposed)***	**Comments:** A Heritage Impact Assessment will form part of the EIA. The EIA (including the HIA) will be submitted to Heritage Western Cape for comment. .				
Removal of indigenous fauna and flora - refer to the Nature Conservation Legislation: Nature and Environmental Conservation Ordinance, 1974 (Ordinance 19 of 1974) ***(Western Cape Nature Conservation Board - Applies where fauna and flora may need to be removed and relocated. Applies to projects that involve the establishment of private nature reserves, development within nature reserves, establishment of nurseries or zoos).***	No				
	Comments:				
Hazardous Installations - Refer to the Major Hazard Installation Regulations promulgated in 1998 in terms of the Occupational Health and Safety Act, 1993 (Act No. 85 of 1993) – Section on Major Hazard Installation). ***(Dept of Labour and Dept of Environmental Affairs & Tourism – Applicable to projects where hazardous substances are stored and /or produced. Also refer to section 2 (1) of the Hazardous Substances Act, 1973 (Act No. 15 of 1973)***	No				
	Comments				

Note: Although there is provincial legislation that deals with land use matters, the necessary application in terms of this legislation must be lodged with the relevant local authority/municipality – refer question 2 below.

2 Is the project subject to any local authority authorisations (e.g. effluent disposal, land use planning, permit for fuel burning devices, development in sensitive coastal areas or in designated protected natural areas)? If yes, please provide a summary of discussions and agreements with local authorities, if any.

Authorisation	Y/N	Application submitted?		Application approved?	
		Y/N	Date	Y/N	Date
Land use planning	N				
Type of land use planning application:					
Effluent disposal	N				
Water supply	N				
Fuel burning device (e.g. boiler, furnace)	N				
Protected natural environment (PNE)	N				
Sensitive coastal area (Eg. OSCA regs)	N				
Noise	N				
Odours	N				
Other	N				

3 Has any national, provincial or local authority considered any development applications on the property previously? If so, please give a brief description of these applications, indicating if the applications were successful or not, as well as the periods of validity or expiry dates.

Previous application		**No**
Type/nature of application		
Authority that considered application:		
Application approved	**Yes**	**No**
Reasons for decision		
Period of validity of decision and expiry dates		

4 Is an amendment to the Structure Plan (including regional structure plans and former guide plans) required in order to accommodate the proposed development? If so, please indicate whether an application has been lodged with the relevant authority in this regard.

Will be determined during the Scoping Phase

III ENVIRONMENTAL CHARACTERISTICS

1 Please provide information in the table below for **ALL THREE** questions for **EVERY SENSITIVE FEATURE** listed below. Please note that it is not necessary to commission specialist studies to respond to this table.

(a). Are any of the following located on or near the site earmarked for development (second column)? if yes provide brief explanation (sixth/last column)

(b). If yes, indicate distance from the site (third column)

(c). Has this information been verified (fourth column)? If yes, provide details (fifth column). Information can be verified through discussion with the relevant authorities, published scientific papers/knowledge, local agricultural extension officers, local nature conservation officers and other similar means.

Feature	Y/N	Distance (m)	How was it determined?	Verified	
				Y/N	By whom
Unique geological feature	YES		To be determined during Scoping		
Steep slopes (>1:4)	YES		To be detailed during Scoping		
High potential agricultural land/soil	YES		To be detailed during Scoping		
Mountainous area	YES		To be detailed during Scoping		
River, dam, lake or wetland	YES		To be detailed during Scoping		
A floodplain or within - 1:50 floodline / 1:100 floodline	YES		To be detailed during Scoping		
Currently used or potentially valuable groundwater resources			To be determined during Scoping		
Marine life	NO				

Feature	Y/N	Distance (m)	How was it determined?	Verified	
				Y/N	By whom
Area below the high water mark	NO				
Coastline or coastal feature such as dunes, estuaries and lagoons	NO				
Areas occupied by indigenous vegetation such as:					
- Forests					
- Lowland fynbos					
- Mountain fynbos	YES		To be detailed during Scoping		
- Renosterveld	YES		To be detailed during Scoping		
- Strandveld					
- Succulent Karroo					
A habitat that is essential for the conservation of threatened plant or animal species.	YES		To be determined during Scoping		
Breeding sites or migration routes of animal species			To be determined during Scoping		
Any protected plant or animal species or species that is known to be threatened (e.g. listed as a Red Data species)			To be determined during Scoping		
Unique architectural area (e.g. Urban Conservation Zone)			To be determined during Scoping		

Feature	Y/N	Distance (m)	How was it determined?	Verified	
				Y/N	By whom
Cultural or historical sites (e.g., battle site, historical monument, graveyard, sites for burial, worship, initiation)			To be determined during Scoping		
Archaeologically or paleontologically significant area (e.g. fossils, rock art)	YES		To be detailed during Scoping		
Designated or proposed nature conservation area (e.g. nature reserve, conservancy, Biosphere Reserve, World Heritage Site, RAMSAR site)			To be determined during Scoping		
A green belt or public open space			To be determined during Scoping		
A formal or informal residential area			To be determined during Scoping		
A community facility (school, hospital, sports hall/fields)			To be determined during Scoping		
A transition or buffer zone (e.g. urban edge, transition zone in a biosphere reserve)			To be determined during Scoping		
A scenic landscape			To be determined during Scoping		
Area or site of natural beauty			To be determined during Scoping		

Feature	Y/N	Distance (m)	How was it determined?	Verified	
				Y/N	By whom
A significant tourism route or scenic drive			To be determined during Scoping		

2 Please provide additional information on the environmental features of the site or the surroundings if you wish to supplement the details given in the above table.

IV INITIAL IDENTIFICATION OF ENVIRONMENTAL ISSUES

Please describe the environmental issues/concerns that have been identified in relation to the project. Environmental issues/concerns can be identified on the basis of the following:

(a). The characteristics of the environment that could be affected by the activity (refer to information given in Section III).

(b). Materials that are being used in the project during construction and operation (i.e. project inputs) (refer to information given in Section I).

(c). Products, emissions (gaseous and liquid) and wastes produced by the project (i.e. project outputs) (refer to information given in Section I).

It should be noted that it is not necessary to assess the significance of these issues. The purpose of this question is to provide descriptive information on the environmental issues/concerns that are evident or known at this stage. Hence, it is sufficient to identify the environmental issue and to describe why it is of concern.

Environmental Issues/Concern	Y/N	Explanation/Comments
Geology		To be determined during Scoping
Soils		To be determined during Scoping
Topography		To be determined during Scoping

Environmental Issues/Concern	Y/N	Explanation/Comments
Surface water (rivers, wetlands)	YES	To be determined during Scoping
Groundwater		To be determined during Scoping
Coastal features		To be determined during Scoping
Marine environment		To be determined during Scoping
Sensitive ecosystems/habitats		To be determined during Scoping
Sensitive plant species and communities		To be determined during Scoping
Sensitive animal species or communities		To be determined during Scoping
Cultural or Historic features		To be determined during Scoping
Archaeological / Palaeontological features	YES	To be determined during Scoping
Land use (site and surroundings)		To be determined during Scoping
Conservation areas		To be determined during Scoping
Scenic landscapes		To be determined during Scoping
Agricultural land	YES	To be determined during Scoping
Traffic and access	YES	To be determined during Scoping

Environmental Issues/Concern	Y/N	Explanation/Comments
Local community		To be determined during Scoping
Site of religious or spiritual importance		To be determined during Scoping
Aesthetics		To be determined during Scoping
Air quality		To be determined during Scoping
Water quality		To be determined during Scoping
Solid waste (general and hazardous)		To be determined during Scoping
Noise, light, radiation, vibration		To be determined during Scoping
Infrastructure services (water, electricity etc.)		To be determined during Scoping
Economic activity		To be determined during Scoping
Other		To be determined during Scoping

PLEASE NOTE: The Department will evaluate the information given in the application form and checklist and may:

1. **Indicate that the application may be considered for a decision in terms of Regulation 6 of GN No R1183 of 5 September 1997, as amended, and that additional scoping tasks will not be required.** This decision will be based on the information provided in the application form and checklist and is dependent on whether the Department deems this to fulfil the requirements of a final scoping report. In the case of an authorisation being considered, the proponent/developer may be required to advertise this in accordance with the Department's Guideline on Public Participation for EIA, September 2001. The final decision about whether or not to grant an authorisation will be made having given due consideration to the response to the advertisement.
2. **Request additional information on particular issues.** If limited additional information is required, it is in the interests of the developer/proponent to forward this timeously to expedite decision-making in terms of Regulation 6, without additional scoping requirements.
3. **Request that additional scoping tasks be undertaken.** In such cases a Plan of Study for Scoping may be required. The Plan of Study for Scoping must describe how these tasks will be undertaken. The Department may either authorise or refuse authorisation of the proposed activity in terms of Regulation 6 on the basis of the results of the scoping process.
4. **Require an EIA.** Having considered the final scoping report the Department may decide that an EIA is required before a decision about whether or not to authorise the activity can be made. Depending on the outcome of the EIA, the Department may authorise or refuse the application.
5. **Make the authorisation subject to conditions.** Any "Conditions of Authorisation" that are issued by Department are legally binding and **the applicant is responsible for ensuring compliance with these conditions**. Monitoring of compliance with the conditions by an independent party appointed by the proponent/developer may be required by the Department. Failure to comply with these conditions may result in withdrawal of the authorisation in terms of Section 22(4) of the ECA.

I _____ have read the completed application form and scoping checklist and hereby confirm that the information provided is to the best of my knowledge true and correct.

Applicant's signature _____ Date: _____

I _____ certify that the information provided is to the best of my knowledge true and correct and I acknowledge that I understand the authorisation process as outlined above

Consultant's signature_____ Date: _____
(Please attach relevant professional registration or certification)

DECLARATION OF INDEPENDENCE BY THE ENVIRONMENTAL CONSULTANT

I~~/We~~ ***Michael Karl Luger duly authorised to act on behalf of Ninham Shand (Pty) Ltd.*** as Environmental Consultant to:

Proponent: ***Department of Water Affairs and Forestry***

Project: ***Raising of Clanwilliam Dam and associated realignment of affected roads in the Clanwilliam area***

do hereby declare the following interests:

1. This consultancy ~~is/~~is not* a subsidiary, legally or financially, of the proponent/s. (*delete what is inapplicable and give details on what is applicable)

Details _____

_____

_____

2. Remuneration for services by the proponent in relation to this proposal ~~is / is partly/~~is not* linked to approval by **any** decision-making authority responsible for permitting this proposal (*delete what is inapplicable and give details on what is applicable)

Details _____

_____

_____

3. ~~My/~~our consultancy has the following interest in secondary or downstream developments as a result of the authorisation of this project.

Details ***Ninham Shand is part of the Clanwilliam Dam Raising Association, the consortium that is undertaking the feasibility study to determine whether or not to raise the dam, and if so by what increment.***

I hereby declare that I am fully aware of my responsibilities in terms of Government Notice No.R.1183 of 5 September 1997, as amended.

Consultant (Full names) ***Michael Karl Luger***

Signature: _____Date: _____

Witness _____ Date: _____

APPENDIX C

Plan of Study for Scoping and Letter of Approval

NINHAM SHAND
CONSULTING SERVICES

81 Church Street
P.O. Box 1347
CAPE TOWN 8000

Tel: (021) 481 2400
Fax: (021) 424 5588
Email: enviro@shands.co.za

RAISING OF CLANWILLIAM DAM AND ASSOCIATED REALIGNMENT OF AFFECTED ROADS IN THE CLANWILLIAM AREA

Plan of Study for Scoping

JUNE 2005

Director: Options Analyses
Department of Water Affairs and Forestry
Private Bag X313
Pretoria
South Africa

Tel: (012) 336 8321
Fax: (012) 338 8295
E-mail: icb@dwaf.gov.za

CONTENTS

ANNEXURES

RAISING OF CLANWILLIAM DAM AND THE ASSOCIATED REALIGNMENT OF AFFECTED ROADS IN THE CLANWILLIAM AREA

Plan of Study for Scoping

1 BACKGROUND TO THE STUDY

The Clanwilliam Dam was originally built in 1935, and was raised to a height of 43m in the 1970s by adding gates and through the use of pre-stressed cables. In order to comply with current dam safety standards applicable during extreme events, the Department of Water Affairs and Forestry (DWAF) envisages that remedial measures will be required at the dam in the near future. The required remedial work presents an opportunity to raise the dam by up to 15m, if the marginal cost of raising, over and above the cost of the strengthening, is economically viable and socially and ecologically acceptable. Refer to **Figure 1, Annexure A** for a map of the dam area.

The Reconnaissance Study (DWAF, 2003), which formed part of the Olifants/Doring River Basin Study Phase II, concluded that raising the dam could cost-effectively result in the provision of increased yield and recommended that it be investigated further at a feasibility level of study.

In January 2004, Ninham Shand in association with the Asch Consulting Engineers and Jakoet & Associates (hereinafter referred to as the Clanwilliam Dam Raising Association) was appointed by DWAF to undertake a Feasibility Study for the possible raising of the Clanwilliam Dam. Furthermore, DWAF in consultation with the Provincial Government of the Western Cape and the South African National Roads Agency has agreed to undertake the investigation and design work associated with the potential realignment of the N7 National Road, should the dam be raised.

2 LEGAL REQUIREMENTS

2.1 THE ENVIRONMENT CONSERVATION AND NATIONAL ENVIRONMENTAL MANAGEMENT ACTS

"…The construction, erection and upgrading of dams, levees and weirs affecting the flow of a river" and ***"roads, railways, airfields and associated structures"…***

are listed as activities with the potential to cause a substantial detrimental effect on the environment (Regulation 1182 [as amended] of the Environment Conservation Act [No 73 of 1989]). Accordingly, the proposed raising of Clanwilliam Dam and associated realignment of the N7 National Road requires authorisation from the competent environmental authority via the Environmental Impact Assessment (EIA) process outlined in Regulation 1183. Since the applicant is DWAF, a national organ

of state, DEAT is the competent environmental authority. The project is based in the Western Cape, and hence the Western Cape Department of Environmental Affairs and Development Planning (DEA&DP) is a commenting authority for this occasion, and all documentation will be copied to DEA&DP.

The proposed project may entail various other actions that would also be construed as scheduled activities in terms of Regulation 1182 and thus require authorisation. These include:

- ***"Construction, erection or upgrading:***
  - ***with regard to any substance which is dangerous or hazardous and is controlled by national legislation."***
- "***the change of land use from:***
  - ***agricultural or zoned undetermined use or an equivalent zoning to any other land use; and***

The approach outlined in this Plan of Study for Scoping has been developed to meet the requirements of the Environment Conservation Act as well as the principles [1]of the National Environmental Management Act (No 107 of 1998). This will culminate in a Scoping Report and Plan of Study for EIR, which will outline the remainder of the EIA process. The successful conclusion of the EIR phase (as guided by the Scoping Report and Plan of Study for EIR) will result in DEAT issuing a Record of Decision, which will be advertised in the required manner.

2.2 ADDITIONAL REQUIREMENTS

In addition to the Environment Conservation and National Environmental Management Acts, the proposed activities are likely to require authorisations/ permits in terms of a range of other legislation with environmental bearing, including:

- The National Heritage Resources Act (No. 25 of 1999);
- The National Water Act (No. 36 of 1998); and
- The Minerals and Petroleum Resources Development Act (No 28 of 2002).

A Heritage Impact Assessment will be undertaken as part of the EIA process. The requirements of the National Heritage Resources Act (as detailed in Section 38(8) of the Act) will therefore be met by forwarding the Scoping Report and Environmental Impact Report to Heritage Western Cape (HWC) for comment. Any comments arising will be submitted to DEAT and incorporated into their Record of Decision.

[1] We understand that as this application was made in terms of the Environment Conservation Act, Regulation 1182 and 1183 will continue to be applicable to the application even it EIA Regulations are promulgated in terms of the NEMA during the course of the investigation.

The requirements of the Mineral and Petroleum Resources Development Act will be addressed through the EIA process, but a separate Environmental Management Programme Report will be compiled for the relevant quarry and borrow pit site(s).

No authorisations will be applied for by the Clanwilliam Dam Raising Association in terms of the National Water Act. However, comment will be sought from the Department of Water Affairs and Forestry, which will then be forwarded to DEAT to consider during its decision-making process.

3 PURPOSE OF THIS PLAN OF STUDY FOR SCOPING

This Plan of Study for Scoping has been compiled in terms of the "***Directorate: Environmental Management: EIA Guideline series ~ Guideline for the Plan of Study for Scoping***"(DEA&DP, 2001) and the "***Guideline Document: EIA Regulations ~ Implementation of Sections 21, 22 and 26 of the Environment Conservation Act***" (DEAT[2], 1998) and its purpose is to ensure that the Scoping process and product satisfies the requirements of DEAT and DEA&DP.

The Plan of Study for Scoping covers the following aspects:

- A description of the activity;
- A description of the tasks to be performed; and
- A proposed programme.

In addition to the aforementioned aspects, consideration is also given to the question of alternatives, the legal requirements and the Ninham Shand environmental team personnel who would undertake the Scoping investigation.

It is our understanding that the nature of the activities and the likely interest from stakeholders dictates that a complete EIA process would be required for the raising of Clanwilliam Dam and associated realignment of the N7 National Road. The EIA process is composed of three phases:

- The Initial Application Phase[3];
- The Scoping Report Phase; and
- The Environmental Impact Report or EIR Phase.

This Plan of Study for Scoping outlines the anticipated process and products for the Scoping Report phase of the EIA process.

[2] National Department of Environmental Affairs and Tourism
[3] This entailed the submission of the DEA&DP Application Form and Scoping Checklist.

4 THE PLAN OF STUDY FOR SCOPING

4.1 DESCRIPTION OF THE ACTIVITY

4.1.1 General

In order to comply with current dam safety standards applicable during extreme events, DWAF envisages that remedial measures will be required at the dam in the near future. These remedial measures will include strengthening the dam wall by adding a rollcrete section to the downstream side of the wall. The proposed remedial work presents an opportunity for DWAF to combine the remedial work and the raising of the dam wall, thereby achieving cost savings and providing additional yield and assurance of supply.

The overall objective of the Feasibility Study is thus to determine whether the raising of Clanwilliam Dam is economically viable, taking into account the social and environmental implications of raising. If the raising is viable, the optimal height by which the dam wall should be raised would be determined. DWAF is currently determining the viability of raising the dam by wall up to 15 metres. As part of the Feasibility Study, an Environmental Impact Assessment will be undertaken for the raising of the dam by 5, 10 or 15 metres, and for the requisite road realignment associated with different levels of raising. The EIA project will thus address the following:

- The raising of Clanwilliam Dam wall, by either 5, 10 or 15 metres, through the addition of rollcrete on the downstream face of the dam wall; and
- The realignment of sections of the N7 National road.

The construction phase of the proposed project is anticipated to last approximately 2 to 3 years.

4.1.2 The environmental process

In January 2004, the Department of Water Affairs and Forestry appointed the Clanwilliam Dam Raising Association to undertake the requisite environmental investigations associated with the aforementioned project. The scope of work for the appointment is as follows:

- Undertake an EIA process for the raising of Clanwilliam Dam, and the associated realignment of primary and secondary roads;
- Develop a framework Environmental Management Plan (EMP) for the construction and operational phases of the proposed dam wall raising and road realignment; and
- Compiling the requisite Environmental Management Programme Report(s) for quarry sites, should these be necessary.

The Terms of Reference for the EIA as outlined in the Feasibility for the Raising of the Clanwilliam Dam in the Western Cape Inception Report has been included as **Annexure B**.

4.2 CONSIDERATION OF ALTERNATIVES

A requirement of the environmental regulations is due consideration of appropriate alternatives. A number of studies have been undertaken or are currently underway, investigating surface water and groundwater development options in the Olifants/Doorn Water Management Area (WMA). Many of the aforementioned studies have included an environmental screening component as part of the investigation. In this project, alternatives will be dealt with on two levels; (1) at a strategic level, considering how the raising of Clanwilliam Dam compares to other surface water and groundwater development options, and (2) at a project specific level.

In order to deal with strategic level alternatives, a Screening of Options Phase was undertaken to review and compare all water resource development options (surface water and groundwater) in the WMA, to determine how the raising of Clanwilliam Dam would influence the other development options and ***vice versa***. The Screening of Options phase included a specialist workshop, in order to workshop the acceptability of the various surface water development options in comparison to the raising of Clanwilliam Dam. This culminated in the production of a Screening of Options Report, which was subjected to key stakeholder comment and a workshopped with the Catchment Management Agency Reference Group. The consideration of strategic level alternatives has thus been dealt with outside of the EIA process, and while reference will be made to this work, no further assessment of strategic level alternatives will be undertaken in the EIA, which will focus on project specific level alternatives.

At project specific level, alternatives associated with the raising of the Clanwilliam Dam wall will be limited to the three possible levels of raising ***viz.*** a 5m, 10m and 15m raising. While any raising may not be limited to these levels, it should possible to extrapolate to any level between 0 and 15m. With respect to the realignment of the N7 National Road, alternatives would range from considering the construction of a viaduct to a complete rerouting of the road, dependent on the level of raising. Comment would be provided on the implications of flooding secondary roads, rather than an assessment of alternative alignments.

4.3 DESCRIPTION OF SCOPING TASKS

4.3.1 Project Inception

The main steps and associated activities in the project initiation phase are described below.

4.3.1.1 Initial discussions with the Proponent

Regular meetings have been held with DWAF and the technical members of the Association since the Inaugural meeting, on 15 March 2004. This is to ensure a thorough understanding of the project and of the proposed process to be undertaken.

4.3.1.2 Completion and submission of Application Form and Scoping Checklist

This is to facilitate compliance with the procedural requirements. An Application Form and Scoping Checklist (AF&SC) has been completed and will be submitted with this POSS.

4.3.1.3 Discussions with the competent authority

This is to facilitate compliance with the procedural requirements and to agree conceptually on the proposed approach outlined in this Plan of Study for Scoping.

Although DEAT has been identified as the lead authority for this project, this environmental process endeavours to ensure effective communication with all relevant local, provincial and national authorities who are likely to have an interest in, or be in a position to provide input into, the process. Accordingly, the following key authorities will also be included in the environmental process:

Provincial Department of Environmental Affairs and Development Planning, Cape Town Office;

- Local Municipality.
- District Municipality;
- Department of Agriculture; and
- Department of Minerals and Energy (DME)
- Heritage Western Cape
- South African Heritage Resources Agency.

These authorities will be informed of the start of the EIA process and background information provided to ensure that they have a thorough understanding of the project.

4.3.1.4 Literature Review

Available baseline information will be collected by means of a literature review. The proponent, specialists and consultants have been contacted to ensure that information from the suite of previous studies and local knowledge is accessed.

4.3.1.5 Inception Field Trip and workshop

An Inception Phase field trip and workshop was held with members of the study team and client body from 23 to 24 June 2004, to facilitate an understanding of aspects such as:

- Biophysical issues:
  - vegetation and fauna;
  - natural resources; and
  - groundwater resources.
- Social issues:
  - surrounding land uses;
  - cultural/ historical/ archaeological resources; and
  - Resource poor farming models.
- Construction issues.

The information gathered from the site visit was used in refining the Terms of Reference for the EIA and the specialist studies to be undertaken during the EIR phase.

4.3.2 Public Participation Process

The purpose of the Public Participation Process (PPP) is to provide Interested and Affected Parties (I&APs) with adequate opportunity to have input into the environmental process. The primary language of the PPP would be English, however certain key documents (***viz.*** newspaper adverts, the Background information Document, the Scoping Report and EIR executive summaries, letters to I&APs and response forms) would be in English and Afrikaans. The Public Meetings will be conducted in English and Afrikaans. Nosipho Consultancy, a public facilitation company with extensive experience working in the Olifants/Doorn WMA will facilitate the PPP. The PPP would include the following:

4.3.2.1 Initial I&AP engagement

To initiate the EIA process, I&APs will be notified of the commencement of the EIA process and given the opportunity to raise comments or concerns. Since a multitude of projects have been undertaken in the area, there are a suite of resources that can be relied on to develop the initial I&AP database. The initial database is likely to include the following:

- Directly affected landowners;
- WMA Reference Group members;
- I&APs from the WODRIS study;
- Relevant District and Local Municipality officials;
- Relevant National and Provincial government officials; and
- All local Councillors.

A detailed Background Information Document (BID) will be compiled and posted to identified I&APs. The BID will inform preliminary input to the project team by providing a background to the project, an overview of the screening report and an outline the purpose and scope of the EIA process. Furthermore, the Screening of Options report will be made available in the local library, the municipal offices and Ninham Shand website, and will provide I&APs with an outline of the initial screening of water resource development options that took place. Public notices in English and Afrikaans will be placed in 'The Cape Times' and 'Die Burger' respectively, and 'Die Kontrei' and 'Weslander', local newspapers for the Clanwilliam area. I&APs will be invited to register to participate in the process and to attend a public meeting. Correspondence after the public notices and meeting will only be directed to registered I&APs.

Issues raised during the initial public engagement will be captured in an Issues Trail and included in the draft Scoping Report. The draft Scoping Report would provide a summary of the issues raised, and reflect on the means by which the issues are to be addressed by the EIA process. Where relevant, the EIA process, specialist studies and reporting may be revised to make allowance for particular issues and concerns.

4.3.2.2 Public Comment on the draft Scoping Report

Following the completion of the draft Scoping Report, copies of the report would be lodged at appropriate venues, e.g. the public library/ municipal offices and on the Ninham Shand website. All registered I&APs will be notified of the lodging of the report and be provided with copies of the Executive Summary by mail. The public would have 30 days in which to comment on the draft Scoping Report.

During this comment period a Public Meeting will be held to present the draft Scoping Report and to elicit feedback from the public. Registered I&APs would be notified of the Public Meeting by mail. I&APs will be notified of the Public Meeting at the same time as the lodging of the draft Scoping Report.

The public process and comments elicited by the release of the draft Scoping Report will be consolidated into an Issues Trail for inclusion in the draft EIR. The Issues Trail would include a detailed summary of the issues raised and the project team's/ proponent's responses thereto. Where relevant, the EIA process may be revised to make allowance for particular issues and concerns.

4.3.2.3 Dispute Resolution

Section 24(7) of the National Environmental Management Act specifically requires "***conflict resolution in all phases of the investigation and assessment of impact***". However, since EIAs entail an objective assessment of the environmental implications of development proposals and public comment is simply an informant of such assessment, there is little opportunity for effective dispute resolution. This

notwithstanding, limited opportunity will be provided for the resolution of conflicts. All comment received by I&APs will be addressed in the EIA documentation. Depending on the nature of any particular I&AP submission, these may evoke a revised assessment in the EIA or result in a technical modification to the proposed project design.

4.3.3 Scoping Report

The purpose of the Scoping Report would be to provide an overview of the project, a screening of the potential positive and negative environmental impacts and the proposed approach for the EIR stage. The Scoping Report would include the following:

- A description of the activities that form the subject of the EIA process;
- A description of the affected environment;
- An overview of the legal requirements which have necessitated the EIA process;
- A detailed description of the process followed to date, including the public participation process conducted as part of the Scoping Phase;
- A summary of the strategic-level alternatives considered in the Screening of Options Report;
- A summary of the proposed project-specific alternatives in terms of the dam raising and the road realignments; and
- A summary of all of the potential environmental impacts identified during Scoping and a preliminary evaluation of their likely significance. On the basis of this preliminary evaluation the potential environmental impacts would be screened to identify those for detailed consideration during the EIR Phase.

All public comments would be consolidated into an Issues Trail that would form an annexure to the Scoping Report. It would summarise the issues raised and provide the proponent and project team's responses thereto. The Scoping Report would be finalised in light of the public feedback received and the Final Scoping Report submitted to DEAT and DEA&DP.

4.3.4 Plan of Study for EIR

The Scoping Report would provide the basis for drafting a detailed Plan of Study for EIR (POS EIR), which would outline the proposed approach to the EIR Phase. The POS EIR would be included as annexure in both the draft and final Scoping Report. This would provide I&APs with the opportunity to comment on the approach to the EIR Phase and on the specialist studies to be undertaken. As a consequence, the POS EIR will not be submitted again after submission of the Scoping Report to DEAT. Thus DEAT's review of the Scoping Report will also comprise reviewing the POS EIR.

4.4 PROPOSED PROGRAMME

Refer to **Annexure A** for a summary of the proposed programme.

5 PERSONNEL

5.1 NINHAM SHAND

Mike Luger, a Director and the Environmental Discipline Head based at the Cape Town Office, has over twelve years of experience in the field of Integrated Environmental Management, both on a project and management level. Mike is a Certified Environmental Assessment Practitioner. Mike has considerable experience of water resource assessments and will oversee the EIA process and provide review and guidance at strategic intervals.

Karen Shippey, an Associate in the Cape Town Office, has a masters in Environmental Science and over eight years of experience in Environmental Impact Assessment, public consultation and facilitation, monitoring of environmental compliance and the policy development at a local, regional and national level. Karen is a Certified Environmental Assessment Practitioner. Karen will manage the EIA process.

Ashwin West, a Senior Environmental Practitioner in the Cape Town Office, has a BSc (Honours) degree in Environmental and Geographical Science at the University of Cape Town. He has been involved in the development of Environmental Impact Assessments, the assessment of water resource developments, undertaking review work for DEAT and the development, implementation and review of Environmental Management Systems. Ashwin will assist Karen in undertaking the EIA.

Andrew Spinks, an Associate in the Cape Town Office, has a Doctorate in Zoology and undergraduate training in Botany. He has compiled and managed numerous environmental investigations, including Environmental Impact Assessments, Environmental Management Programme Reports and environmental constraints and opportunities reports. Andrew is a Certified Environmental Assessment Practitioner. Andrew will play a key role in compiling the framework EMP and the EMPR(s).

5.2 NOSIPHO CONSULTANCY

Doreen Februarie is a Social Development Consultant with experience in the study area. Current projects that she is facilitating include the establishment of the Olifants-Doring Water Management Area and the Catchment Management Agency process for the Breede-Overberg Water Management Area. Doreen will facilitate the public participation process.

5.3 UMOVOTO AFRICA

Rowena Hay has been involved in regional hydrogeological mapping, and exploration for rural and urban groundwater supplies in various parts of the Western Cape, with on-going research emphasis on the Table Mountain Group (TMG) fractured-rock aquifer. Rowena will undertake the groundwater resources assessment assisted by her colleagues amongst others, Dr Kornelius Riemann and Prof Chris Hartnady.

5.4 BOTANICAL ASSESSMENT SPECIALIST

Charlie Boucher has over 37 years botanical, ecological and vegetation survey research experience. Dr Boucher's major projects include ***inter alia*** being consultant botanist for the determination of the Instream Flow Requirements of the major rivers associated with the Lesotho Highlands Development Project, and the Olifants-Doring Irrigation Project. He has also been involved in surveys and the compilation of vegetation map of the Fynbos Biome and ecological studies of selected Cape endangered and invasive plants. He will undertake the botanical assessment for the EIA process.

5.5 CAPE NATURE

Dean Impson has over 12 years experience as a freshwater fish specialist and has a detailed knowledge of freshwater fish distribution and their status in the Olifants River system. Dean will undertake a fish survey as part of the EIA process.

5.6 ARCHAEOLOGY CONTRACTS OFFICE

Tim Hart has been involved in a wide rage of archaeological projects ranging from excavation of fossil sites to the conservation of historic buildings, places and industrial structures. Together with team members, he has also been involved in heritage policy development and development of the profession. He has teaching experience within a university setting and has given many public lectures on archaeology related matters. Tim will undertake the heritage impact assessment, assisted by Dave Halkett and senior students from the University of Cape Town.

5.7 SOCIAL IMPACT ASSESSMENT CONSULTANT

Tony Barbour has undertaken over 20 EIAs, and numerous social impact assessments, including SIAs for the Outeniqua Pass – N2 bypass EIA, the Coastal Park EIA, the Sparrebosch Golf Course EIA, the Riviersonderend – N2 bypass EIA, and a socio-economic assessment for the Darling Wind Farm EIA. Tony will be assisted by interns from the Environmental Evaluation Unit, University of Cape Town.

Copies of the relevant CV's are available on request.

6 INDEPENDENCE

It should be noted that the environmental consultants undertaking this EIA process, Ninham Shand Consulting Services, is the lead consultant in the Clanwilliam Dam Raising Association.

A declaration of interest and a motivation for exemption from appointing an "independent environmental consultant" were submitted with the Application Form and Scoping Checklist.

7 CONCLUSION

We believe that this Plan of Study for Scoping satisfies the requirements of Regulation 1183 of the ECA and the various guidelines compiled by DEAT and DEA&DP.

0214835124

400415/R30

Verwysing
Reference
Isalathiso E12/2/1-AC8-TRUNK ROAD 11/4, CLANWILLIAM

Navrae
Enquiries
Imibuzo AYANDA MATOTI

Datum
Date
Umhla 19 August 2005

Departement van Omgewingsake en Ontwikkelingsbeplanning
Department of Environmental Affairs and Development Planning
ISebe leMicimbi yeNdalo esiNgqongileyo noCwangciso loPhuhliso

No.:		File: 400415/R		
Date: 22/08/2005				
To		Seen	Act	Ct
BU/ Off.	Initials			
1552	MKL			
	KS			
	AVS			

The Director
Department of Water Affairs and Forestry
Private Bag x313
PRETORIA
0001
Attention: Mr Alan Brown

Tel : (021) 336 8321
Fax: (021) 338 8295

Dear Sir

APPLICATION: THE PROPOSED UPGRADING OF CLANWILLIAM DAM AND ASSOCIATED ALIGNMENT OF N7 (TRUNK ROAD 11/4), CLANWILLIAM.

The above and the correspondence dated 20 June 2005 refers.

You are hereby informed that the aforementioned document has been accepted by the Director: Integrated Environmental Management (Region B), with the following comments and amendments:

- If hazardous substances are going to be handled or stored during construction phase, the scoping checklist will need to be amended to reflect this activity.
- CapeNature must be included in the process as part of Interested and Affected Parties.
- The visual impacts of the proposed development should be determined during the scoping process.

You should now proceed with scoping as per the approved Plan of Study for Scoping. The scoping report must comply with the requirements of Regulation 6 of GN No R1183 of 5 September 1997, as amended.

Utilitasgebou, Dorpstraat 1
Privaatsak X9086 Kaapstad 8000

Utilitas Building, 1 Dorp Street
Private Bag X9086 Cape Town 8000

Tel No.: 021-483 2748/2596
Fax No.: 021-483 4372
E-mail: amatoti@pgwc.gov.za

(021) 483-3370/3185
(021) 483-4372
ibekko@pgwc.gov.za

0214835124

Department of Environmental Affairs & Development Planning
Directorate: Integrated Environmental Management (Region B)

This Department reserves the right to revise its initial comments and request further information from you based on any new or revised information received.

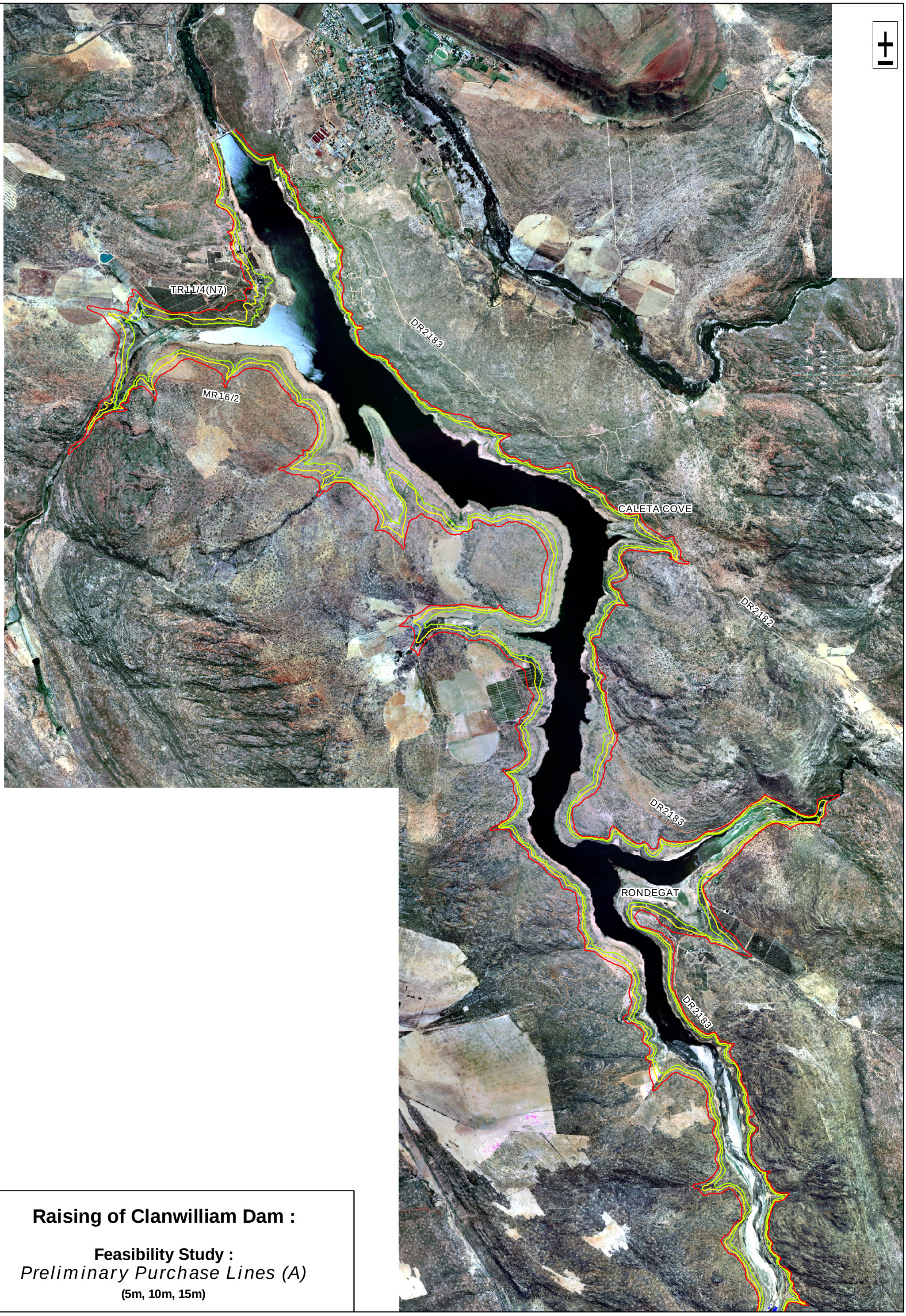
Yours faithfully

FOR DIRECTOR:INTEGRATED ENVIRONMENTAL MANAGEMENT (REGION B)

CC: Deon Wasserman-Cederberg Municipality Fax (027) 482 1933
Ashwin West – Ninham Shand (Pty) Ltd Fax (021) 424 5588

APPENDIX D

Purchase Line Maps for 5, 10 and 15 m Raisings



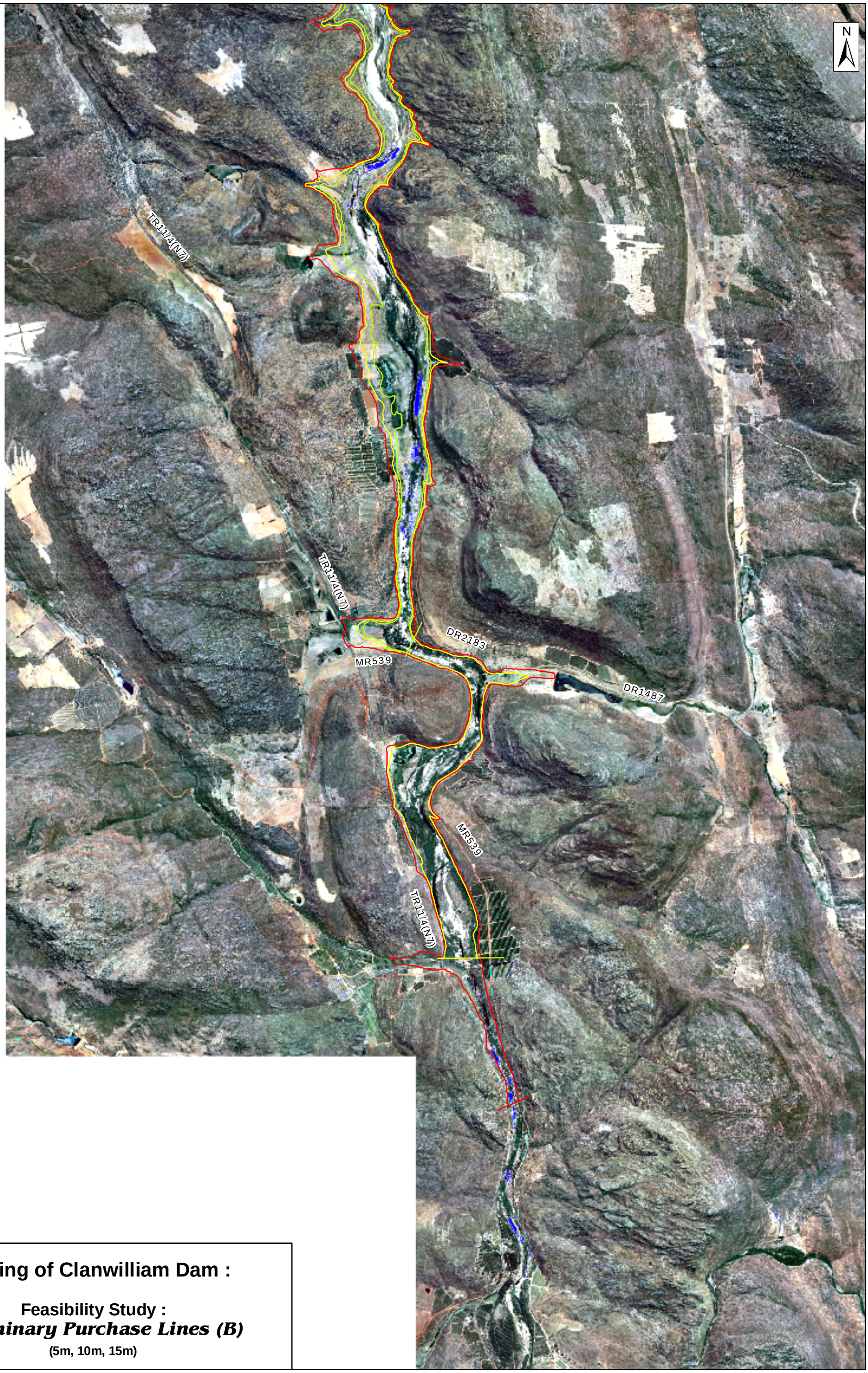
Raising of Clanwilliam Dam :

Feasibility Study :

Preliminary Purchase Lines (A)

(5m, 10m, 15m)

i:/hydro/400415/gis/gis_projects/prelim_pur_lines(A).mxd



Raising of Clanwilliam Dam :

Feasibility Study :

Preliminary Purchase Lines (B)

(5m, 10m, 15m)

i:/hydro/400415/gis/gis_projects/prelim_pur_lines(B).mxd

APPENDIX E

Screening of Options Report

DWAF Report No. P WMA 17/E10/00/0405

DEPARTMENT OF
WATER AFFAIRS
AND FORESTRY

Feasibility Study for the Raising of Clanwilliam Dam

Screening of Options

Draft
July 2007

NINHAM SHAND
CONSULTING SERVICES

ASCH

JAKOET & ASSOCIATES

DEPARTMENT OF WATER AFFAIRS AND FORESTRY
DIRECTORATE OPTIONS ANALYSIS

FEASIBILITY STUDY FOR THE RAISING OF THE CLANWILLIAM DAM

SCREENING OF OPTIONS

Draft

Prepared by:

Ninham Shand Consulting
P O Box 1347
Cape Town
South Africa
8000

Tel: 021 – 481 2400
Fax: 021 – 424 5588
e-mail: hydro@shands.co.za

In association with:

ASCH Professional Services (Pty) Ltd
Jakoet & Associates cc

Prepared for:

Director: Options Analyses
Department of Water Affairs and Forestry
Private Bag X313
Pretoria
South Africa

Tel: 012 – 336 8321
Fax: 012 – 338 8295
e-mail: icb@dwaf.gov.za

This report is to be referred to in bibliographies as:

Department of Water Affairs and Forestry, South Africa. 2005. *Screening of Options*. Prepared by A West and M Luger of Ninham Shand (Pty) Ltd, in association with ASCH Consulting Engineers and Jakoet & Associates, as part of the Feasibility Study for the Raising of Clanwilliam Dam. DWAF Report No. P WMA 17/E10/00/0405.

Department of Water Affairs and Forestry
Directorate Options Analysis

FEASIBILITY STUDY FOR THE RAISING OF THE CLANWILLIAM DAM

APPROVAL

Title	:	Screening of Options
DWAF Report no.	:	P WMA 17/E10/00/0405
NS Report No.	:	4415/400415
Authors	:	A West, M Luger
Status of Report	:	Draft
Date	:	July 2007

STUDY TEAM **:** **Approved for the Clanwilliam Dam Raising Association by:**

…….. ……..
E. VAN DER BERG *M J SHAND*
Study Leader *Study Director)*

DEPARTMENT OF WATER AFFAIRS AND FORESTRY
Directorate Options Analysis
Approved for Department of Water Affairs and Forestry by:

…….. ……..
A D BROWN *L S MABUDA*
Study Manager *Manager: OA*

EXECUTIVE SUMMARY

Need for the Screening Process

A number of surface water and groundwater resource studies have been undertaken within the water management area (WMA). Various development schemes were investigated and re-investigated in these studies.

To gain acceptance for the study of the raising of Clanwilliam Dam as a specific development option, a review and comparison of all the potential development schemes (surface and groundwater) in the Water Management Area (WMA) was required to determine how the raising of Clanwilliam Dam would influence the viability of other development options, and *vice versa*. The objective of the screening process were :

- to clarify the policy of the Department of Water Affairs and Forestry (DWAF) and its co-operative partners regarding the need for development in the Olifants/Doorn WMA;
- to review the acceptability of the various potential options identified in previous studies in terms of technical, financial, environmental and social criteria;
- to augment existing information with limited specialist inputs where required; and
- to ascertain whether or not the raising of Clanwilliam Dam is a preferable and defendable development option, for further study with a view to implementation.

This process therefore entailed the comparison of the potential raising of Clanwilliam Dam with other potential water infrastructure development opportunities in the WMA. As part of the screening process, a "Screening of Options" Specialist Workshop was held on 23 November 2004. It was attended by selected DWAF staff, study team members, selected identified stakeholders and specialists in order to workshop the acceptability of the various surface water development options as compared to the raising of Clanwilliam Dam. The potential development of groundwater supply schemes and conjunctive use of groundwater in the region were also addressed.

Summary of Development Options

There are a number of potential surface water schemes that could be developed to increase the availability of water within the Olifants and Doring river catchments. **Figure E1** shows where these potential schemes are located.

Specialist Screening of Options Workshop

A Specialist Screening Workshop was held to discuss and critically evaluate the suite of development options in the Olifants and Doring River catchments and compare these to the potential raising of Clanwilliam Dam, so as to ascertain whether or not the raising of Clanwilliam Dam is a preferable and defendable development option. This key stakeholder workshop was held on 10 February 2005, targeting the WMA Reference Group, where the draft Screening of Options report was presented, so as to solicit further comments and inputs.

A four-point scale was used to evaluate all development options in terms of the following variables :

- capital to yield ratio;
- environmental impacts (barrier/sediment, inundation and downstream effects); and
- beneficiaries (cost, agricultural impact, benefits to users and resource-poor farmer opportunities).

Figure E1 Potential surface water and groundwater schemes in the Olifants and Doring River catchments

It is important to note that the yields of individual wellfields cannot be compared directly to surface water schemes, as there is a lack of data with respect to groundwater yields. Further data collection is required to enable groundwater schemes to be modelled in order to determine comparative costs of groundwater scheme development for comparison with surface water development options.

Summary of Screening Process

The results of the screening process are shown in **Table E1** and **Table E2**.

Table E1 Summary of surface water development options

Colour Rating Index			Low Impact 1 Low Cost	Medium Impact 2 Medium Cost	High Impact 3 High Cost	Very High Impact 4 Very High Cost			
Potential Source	Yield (No Reserve)	Capital to Yield Ratio	Environmental Impacts			Beneficiaries			
	(Mm^3/a)		Barrier and Sediment	Inundation	Down-stream	Area Supplied	Infrastructure cost	Agric. impacts (Environ-mental)	Benefit to users
OLIFANTS RIVER CATCHMENT									
Raise Clanwilliam	66	2	1	1	3	Not rated	1	1	1
Rosendaal	14	3	2	3	3	Not rated	1	2	1
Visgat	Not Determined	4	3	4	3	Not rated	1	2	1
Grootfontein	90	3	3	4	3	Not rated	1	2	1
Keerom	100	3	3	3	3	Not rated	1	2	1
Additional Farm Dams	10	2	1	1	1	Not rated	1 to 2	1	1
DORING RIVER CATCHMENT									
Leeu River	Not Determined	3	3	Not rated	3	Not rated	3	2	3
Groot River	64	Not rated	4	4	4	Not rated	4	4	4
Aspoort	76	Not rated	4	4	4	Not rated	4	4	4
Reenen		Not rated	Not rated	Not rated	Not rated	Not rated	Not rated	Not rated	Not rated
Melkbosrug	116		4	4	3	Not rated	2	2	2
Melkboom	121	Not rated	4	4	3	Not rated	2	2	2
Brandewyn	50	Not rated	3	3	3	Not rated	2	2	2
Additional Farm Dams	5	Not rated	1	1	1	Not rated	1 to 2	1	1

Table E2 Summary of groundwater development options

Colour Rating Index		Low Impact 1 Low Cost	Medium Impact 2 Medium Cost	High Impact 3 High Cost	Very High Impact 4 Very High Cost	
Name	Yield	Unit Reference Value (1)	Capital to Yield Ratio (2)	Scheme	Environmental Impacts	
	(Mm^3/a)	(R/m^3)	(R/m^3)			
DORING RIVER CATCHMENT						
T1a Wellfield (conventional)	5	0.25	2.4	1	2	
T1b Wellfield (conventional)	5	0.23	2.1	1	2	
OLIFANTS RIVER CATCHMENT						
T2 Wellfield (Conventional)	3.2	0.35	3.5	1	1	
T3 Wellfield (Conventional)	2.5	0.49	5.7	1	1	
T5 Wellfield (ASR)	20 min but up to 90	0.82	Not determined	1	1	
T7 Wellfield (ASR)	121 (Avg)	0.12	1.2	2 to 3	2 to 3	
Citrusdal Trough	50 to 100	Not determined	Not determined	1	1	
Clanwilliam Trough	Unknown but comparable	Not determined	Not determined	2	1	

(1) The URV takes both capital and operating costs into account. The yields are conservative estimates. The URV would reduce for less conservative yield estimates.

(2) The yields are conservative estimates.

Recommendations

The three most favourable and recommended development options for the Olifants/Doorn WMA were :

- the development of off-channel farm dams;
- the development of groundwater schemes;
- the raising of Clanwilliam Dam

or combinations of the above three options.

The raising of Clanwilliam Dam was considered to be a favourable option because it does not introduce a new suite of associated environmental and social impacts, but rather extends existing impacts. Furthermore, the lower Olifants River has already been disturbed by the presence of the Clanwilliam Dam and the Bulshoek Weir. In terms of local and international policy and experience, there is strong support for expanding existing agricultural development rather than creating new dispersed agricultural areas. However, as mentioned above, with the exception of groundwater, the raised Clanwilliam Dam could potentially exclude or diminish other development options in both the Olifants and Doring river catchments.

The raising of Clanwilliam Dam provides flexibility in terms of supplying potential beneficiaries, opportunities and development options for resource-poor farmers (RPFs), the position of new irrigation

development and crop variety. Other potential development options on the Olifants and Doring Rivers do not appear to provide the same level of flexibility. Furthermore, Clanwilliam Dam can provide relatively affordable water. This scheme also provides the option of either large-scale RPF development or incremental development over time, depending on the flexibility in terms of funding the scheme.

Based on the feedback received at the Key Stakeholder Workshop, it was evident that there is broad support for the abovementioned most favourable development options, and more specifically for the raising of Clanwilliam Dam.

It was recommended that a study be undertaken to confirm the feasibility of the raising of Clanwilliam Dam for the following reasons :

- The remedial work to be undertaken provides the opportunity to raise Clanwilliam Dam;
- The scheme would have relatively low environmental impacts compared to other development options;
- The scheme would provide flexibility with respect to potential beneficiaries;
- The scheme would provide the possibility to make water available for resource-poor farmers;
- The scheme would provide the opportunity to satisfy the ecological Reserve of the Olifants River and Estuary; and
- The scheme would provide the possibility of expanding existing agricultural development rather than creating new unsupported agricultural areas.

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GLOSSARY AND ABBREVIATIONS

DWAF	Department of Water Affairs and Forestry
EIA	Environmental Impact Assessment
FSL	full supply level
LORWUA	Lower Orange River Water User Association
RPF	Resource-poor farmers
TMG	Table Mountain Group
WMA	Water Management Area
WUA	Water User Association

1. INTRODUCTION

1.1 Background and need for the study

The Clanwilliam Dam was originally built in 1935, and was raised in the 1970s by adding gates and the use of pre-stressed cables. In order to comply with current dam safety standards applicable for extreme events the Department of Water Affairs and Forestry (DWAF) plans to implement remedial measures in the near future. This presents an opportunity to raise the full supply level (FSL), if the marginal cost of raising, over and above the cost of the strengthening, is economically viable. The necessity of a multi-level outlet also needs to be assessed, in light of the pending recommendations from the Comprehensive Reserve Determination Study, which is currently being undertaken for DWAF.

The required remedial work presents an opportunity to raise the dam by up to 15 m. The Reconnaissance Study (DWAF, 2003), which formed part of the Olifants/Doring River Basin Study Phase II, concluded that raising the dam could cost-effectively result in the provision of increased yield and recommended that it be investigated further at a feasibility level of study.

1.2 Need for water resource development in the WMA

Parts of the Olifants/Doorn Water Management Area (WMA) are extensively developed and often experience shortages in meeting water demands, notably so in the Olifants River catchment downstream of Clanwilliam Dam. There are frequent shortfalls in the supply to the Lower Olifants River Water User Association (LORWUA), despite the fact that no releases are currently being made from Clanwilliam Dam to meet the requirements of the Reserve. Any new development would have to make provision to meet the requirements of the Reserve, which may lead to a further shortfall in supply.

A number of surface water and groundwater resource studies have been undertaken or are underway within the WMA, including *inter alia* the:

- Olifants Doring River Basin Study - Phase 1 (1998);
- Citrusdal Artesian Groundwater Exploration (CAGE) Study (2000);
- Olifants Doring River Basin Study - Phase 2 (2003);
- Olifants-Doorn WMA Water Resources Situation Assessment (2002);
- Olifants-Doorn WMA Overview of Water Resources and Utilisation (2003);
- DANIDA Integrated Water Resource Management (2003);
- Olifants-Doorn Internal Strategic Perspective (2004), and the
- Western Cape Olifants/Doring River Irrigation Study (WODRIS, 2004).

Various development schemes were investigated and re-investigated in the above studies.

1.3 Need for the Screening Process

It was believed that, to gain acceptance for the study of a specific development option, namely the raising of Clanwilliam Dam, a review and comparison of all the potential development schemes (surface and groundwater) in the WMA was required to determine how the raising of Clanwilliam Dam would influence the viability of other development options, and *vice versa*. The objectives of the screening process were:

- to clarify the policy of DWAF and its co-operative partners regarding the need for development in the Olifants/Doorn WMA;
- to review the acceptability of the various potential options identified in previous studies in terms of technical, financial, environmental and social criteria;
- to augment existing information with limited specialist inputs where required; and
- to ascertain whether or not the raising of Clanwilliam Dam is a preferable and defendable development option, for further study with a view to implementation.

This process therefore entailed the comparison of the potential raising of Clanwilliam Dam with other potential water infrastructure development opportunities in the WMA. As part of the screening process, a 'Screening of Options' Specialist Workshop was held on 23 November 2004. It was attended by selected DWAF staff, study team members, selected identified stakeholders and specialists in order to workshop the acceptability of the various surface water development options as compared to the raising of Clanwilliam Dam. The potential development of groundwater supply schemes and conjunctive use of groundwater in the region were also addressed. The Peninsula and Skurweberg aquifers of the Table Mountain Group (TMG) offer significant potential in terms of aquifer storage and recharge.

The purpose of this report is to summarise and document the screening of options that took place during the aforementioned Specialist Workshop with a view to informing a wider range of debate as to the acceptability and desirability of investigating the raising of Clanwilliam Dam.

1.4 Stakeholder Engagement

Stakeholder engagement formed a key component of the screening process. The draft *Screening of Options* Report was distributed to all participants who attended the Specialist Workshop, for their review and further inputs.

Importantly, a Key Stakeholder Workshop was held on 10 February 2005, targeting the WMA Reference Group, where the draft *Screening of Options* report was presented so as to solicit further comments and inputs. Participants were given a further 14 days in which to submit further comments or raise further issues. Notes of the Key Stakeholder Workshop are contained in **Appendix C**, while a summary of the issues raised by key stakeholders is contained in **Appendix D**.

This *Screening of Options* report has been finalised based on outcomes of the Key Stakeholder Workshop and, should the study proceed, will feed into the environmental impact assessment (EIA) process, as part of the contextualisation and consideration of broader alternatives to the raising of Clanwilliam Dam.

2. SUMMARY OF DEVELOPMENT OPTIONS

There are a number of potential surface water schemes that could be developed to increase the availability of water within the Olifants and Doring River catchments. These are summarised in **Table 2.1** yields based on 1MAR dam at each site. **Table 2.2** lists the potential wellfields which could be developed within groundwater schemes. For a detailed description of each site, refer to **Appendix A** for the Updated Specialist Workshop Starter Document.

Table 2.1 List of potential surface water schemes

Olifants River Catchment			Doring River Catchment		
Name of Potential Scheme	**Additional Storage (Mm^3)**	**Additional Yield (Mm^3/a) (1)**	**Name of Potential Scheme**	**Additional Storage (Mm^3)**	**Additional Yield (Mm^3/a) (1)**
Rosendaal Dam	26	14	Leeu River Dam	35	6
Visgat Dam	unknown	unknown	Groot River Dam	159	64
Grootfontein Dam	138	90	Aspoort Dam	395	76
Keerom Dam	153	100	Reenen Dam	250	88
Raise Clanwilliam Dam 5m	63	36	Melkbosrug Dam	400 (4)	116 (3)
Raise Clanwilliam Dam 10m	143	66	Melkboom Dam	400 (4)	121 (3)
Raise Clanwilliam Dam 15m	240	86	Brandewyn Dam	160	± 50 (2)
Farm Dams (Off Channel)	14	10	Farm Dams (Off Channel)	8	5

(1) The yields are gross yields before provision for the Reserve and before any compensation releases other than as indicated in Note (2)
(2) The Yield for Brandewyn Dam has already allowed for IFRs as determined in the WODRIS Study.
(3) Ref: Olifants Doring River Basin Study, 1998
(4) Ref: WODRIS, 2003

Table 2.2 List of potential wellfields

Wellfield Name and Location	Potential Yield
T1 - Two wellfields (T1a and T1b) at the confluence of the Doring and Olifants Rivers. Abstraction out of the Peninsula Aquifer.	T1a + T1b, T2, T3: realistic combined yield of 20 Mm^3/a. Maximum combined yield for T1a + T1b and T2 of 60 Mm^3
T2 - Wellfield on the right bank of the Olifants River, above the Bulshoek Weir. Wellfield to abstract groundwater from the Peninsula Aquifer.	
T3 - Wellfield on the left bank of the Sandlaagte valley at Skurfkop Syncline. Abstract groundwater from the Peninsula Aquifer.	
T4 - Brandewyn River valley above confluence with Doring River. Wellfield in river valley to abstract groundwater from both Skurweberg and Peninsula Aquifers.	Capacity not assessed
T5 - Aquifer Storage Recovery Scheme in the unutilised Sandlaagte Valley Aquifer.	Recharge and storage Olifants River water
T6 - Katmakoep area between Vredendal and Strandfontein. Wellfield to abstract groundwater from the Peninsula Aquifer.	Only small-scale abstraction
T7 - Aquifer Storage Recovery Scheme in under-utilised Vanrhynsdorp dolomitic aquifer.	Recharge and storage Olifants River water
Citrusdal Trough - Expansion of the Boschkloof Wellfield at Citrusdal, which presently supplements municipal bulk water supply for Citrusdal. Current abstraction: 1.5 to 2.0 Mm3/a	Not available
Citrusdal Trough - Peninsula Aquifer in E10 catchment.	45 Mm^3/a
Clanwilliam Trough – No wellfield target zones yet identified.	80 – 100 Mm^3/a
Koue Bokkeveld – No wellfield target zones yet identified.	40 – 80 Mm^3/a

It is important to note that the yields of individual wellfields cannot be compared directly to surface water schemes, as there is a lack of data with respect to groundwater yields. Further data collection is required to enable groundwater schemes to be modelled in order to determine comparative costs of groundwater scheme development for comparison with surface water development options.

Figure 2.1 Potential surface water and groundwater schemes in the Olifants and Doring River catchments

3. SCREENING METHODOLOGY USED DURING THE SPECIALIST SCREENING OF OPTIONS WORKSHOP

The purpose of the Specialist Screening Workshop was to discuss and critically evaluate the suite of development options in the Olifants and Doring River catchments and compare these to the potential raising of Clanwilliam Dam, so as to ascertain whether or not the raising of Clanwilliam Dam is a preferable and defendable development option.

A four-point scale was used to evaluate all development options in terms of the following variables:

- capital to yield ratio;
- environmental impacts (barrier/sediment, inundation and downstream effects); and
- beneficiaries (cost, agricultural impact, benefits to users and resource-poor farmer opportunities).

Workshop participants rated each of the above variables using the following scale as follows:

Low Impact **1** Low Cost	Medium Impact **2** Medium Cost	High Impact **3** High Cost	Very High Impact **4** Very High Cost

All the workshop participants rated the raising of Clanwilliam Dam option as a single group before dividing into two groups, one to evaluate the remaining options in the Olifants River Catchment and the other group, the Doring River Catchment. The two groups rated the remaining options in each catchment relative to the raising of Clanwilliam Dam. Participants were divided to make input according to their areas of knowledge or interest, while some specialists moved between the groups.

4. SCREENING OF POTENTIAL DEVELOPMENT OPTIONS

Identified development options that have already been screened out in earlier reports or processes, were not included in this screening process. The more favourable potential surface and groundwater development options were screened in terms of nine technical, ecological and social criteria and were rated in terms of their impacts or cost. The results of this screening process are presented below and are summarised in **Tables 5.1** and **5.2**.

4.1 Environmental Impacts of Surface Water Options

4.1.1 Barrier and Sediment Effects

The raising of Clanwilliam Dam, being an existing dam, is unlikely to have a significant impact on the sediment dynamics of the Olifants River, or further restrict the migration of fish. Given that the raising of the dam would result in an extension of existing impacts rather than the creation of new impacts, this option was awarded a low impact rating.

The potential Rosendaal and Visgat Dams, located on the upper Olifants River above the Visgat gorge, are likely to result in some barrier effect, even though the waterfall forms a natural barrier. Change in sediment dynamics downstream of either dam is unlikely to be of concern. Similarly, the potential Grootfontein and Keerom dams, located downstream of the Visgat Gorge, would also result in some barrier and sediment effects. The Keerom Dam would affect both the Olifants and Ratel Rivers. These options were therefore rated as having a greater impact than the raising of Clanwilliam Dam.

Off-channel farm dams in the upper catchment of the Olifants River are unlikely to have a barrier or sediment effect on the main stem of the river. This option was rated as having a similar impact to the raising of Clanwilliam Dam.

The potential Groot River Dam, located on the Groot River, a major tributary of the Doring River, would create a barrier to the migration of three fish species endemic to the Olifants-Doring River system, preventing migration to spawning areas upstream of the dam, or over-wintering areas in the lower Doring and Olifants rivers. Sediment loads in the Groot River are low, and are likely to be unchanged by the potential dam. This option was rated as having a very high impact due to its potential barrier effect. The potential Leeu River Dam, located on a tributary of the Groot River, would have less of a barrier effect than the Groot River Dam.

The potential Aspoort Dam would have a similar barrier effect to the Groot River Dam, blocking the passage of migratory fish to their spawning areas, in the upstream areas of the river. The Doring River is rich in sediment and the dam would trap large amounts of sediment, having a detrimental impact on the river downstream of the dam. This option was rated as having a very high impact.

The potential Melkbosrug, Melkboom and Brandewyn Dams would each create a barrier to the migration of fish. The effect of the Brandewyn Dam abstraction weir could be mitigated through the installation of a fish ladder. Melkbosrug, Melkboom dams and Brandewyn Dam weir, would also impact on winter river rafting activities. The dams would also act as sediment traps, which would have negative consequences for the downstream river channel and potentially for the estuary. The Melkbosrug and Melkboom dams were considered to have a very high impact,

while the Brandewyn Dam located on the Brandewyn tributary were considered to have a high impact.

Off-channel farm dams in the upper catchment of the Doring River and the Koue Bokkeveld are unlikely to have a barrier or sediment effect on the main stem of the river. This option was considered to be similar to the raising of Clanwilliam Dam, and was rated to have a low impact.

4.1.2 Inundation Effects

The increased full supply level associated with the raising of Clanwilliam Dam would inundate some irrigated areas, indigenous vegetation, infrastructure, and cultural heritage sites. The raising of Clanwilliam Dam will result in an extension of existing impacts and was therefore rated as having a low impact, with respect to the inundation effects.

The area of inundation of the potential Rosendaal Dam is already disturbed, comprising largely cultivated land. There are however small areas of fynbos that are relatively undisturbed. The Visgat Dam basin supports rare riverine and mountain fynbos. Consequently the inundation impacts of Rosendaal Dam were rated as high, while the inundation impacts of the Visgat Dam were rated as very high.

The potential Grootfontein Dam would result in the inundation of part of the Visgat Gorge. Previous studies deemed this to be environmentally and socially unacceptable due to the geological and biological importance of the gorge. Consequently the inundation effects of this option were rated as very high. The Keerom Dam site would have a similar effect on the Visgat Gorge, although the extent of area flooded would be less.

The inundation effects associated with the Groot River, Aspoort, Melkbosrug and Melkboom dams were all rated as very high. At each site indigenous terrestrial and riparian vegetation would be inundated. Furthermore, there are unique cultural heritage sites present within the catchments of each of these dams. Inundation of the Brandewyn Dam site is likely to result in the loss of rare and endangered plants. The inundation effects of the Brandewyn Dam were rated as high.

4.1.3 Downstream Effects

A raised Clanwilliam Dam would further absorb small floods, which is likely to further impact on the yellowfish population downstream of the dam, unless specific releases are made as part of the Reserve requirements. Flood attenuation will also have an impact on the estuary. The critical factor for the functioning of the estuary is the size of the saline water ‘wedge’ and its upstream penetration, which is likely to be affected by a decrease in floods. Flood attenuation is however an effect associated with all large dams, and not specific to the raising of Clanwilliam Dam. The downstream effects as a result of the raised dam were rated as high.

The cumulative impacts of many farm dams in the upper catchments of the Olifants and Doring rivers could be significant. Releases made for the Reserve from farm dams are also difficult to manage and control, which could have a significant downstream effect.

Release of irrigation water from Rosendaal or Visgat dams would increase the summer base flows in the Olifants River, potentially threatening indigenous fish species. Furthermore, the introduction of alien fish into the dams could affect the survival of indigenous fish species. The potential Grootfontein or Keerom dams would result in similar downstream effects to the Rosendaal and Visgat dams. These dams would also likely result in the significant absorption

and attenuation of floods. The downstream effects of these four dams were considered to be greater than that of Clanwilliam Dam and were rated as high impact.

If Clanwilliam Dam is raised, consideration could be given to concurrently increase off-channel storage in the Olifants River catchment upstream of the dam, for increased irrigation and/or to enable summer Reserve release requirements to be met. This would depend on the feasibility of further irrigation development in the catchment upstream of the dam.

The Groot River provides almost half of the mean annual run-off to the Doring River and much of the base flow. A dam on the Groot River would result in delayed or completely attenuated winter floods, with consequences for the geomorphology and salinity of the middle Doring River. The downstream effects of a dam on the Groot River were therefore rated as being of very high impact. A dam on the Leeu River would have a similar effect, albeit with a smaller magnitude. The downstream effects of the Leeu River Dam were rated as high impact.

The Aspoort Dam is likely to have high evaporation due to the characteristics of the dam basin, leading to an increase in salinity of the dam water, with consequences for flora and fauna downstream. A reduction of freshwater and floodwater flows is also likely to have a negative impact on the Doring River downstream of the dam as well as on the Olifants River Estuary. Consequently, the downstream effects of the Aspoort Dam were rated as very high.

The downstream effects of the Melkbosrug or Melkboom dams would include the loss of winter flushing floods, resulting in increased salinity levels of the lower Olifants River. These downstream effects were rated as high impact. The Brandewyn Dam abstraction weir would affect low flow and small floods in the Doring River, and would facilitate the invasion of alien fish species. The downstream effects of the Brandewyn Dam and weir were rated as high.

4.2 Beneficiaries of surface water options

4.2.1 Areas of Supply, Infrastructure Requirements and Resource-poor Farmer Opportunities

Beneficiaries of increased water availability from the raising of Clanwilliam Dam were mainly considered to be the Clanwilliam Water User Association (WUA), the Lower Olifants River Water User Association (LORWUA), and the Citrusdal Water User Association, with the focus on the provision of water for resource-poor farmers. Upgrading of canals may be required for distribution, however water could also be released down the river for abstraction further downstream. Increased canal usage (up to 168 hrs/week) during peak periods is also an option. New off-channel dams could be provided and filled from the canals in winter, when demands on the existing canal system are lower. A raised dam could potentially also provide an increased assurance of supply to the existing farmers or the opportunity for irrigation expansion. Where high value crops are being farmed, joint ventures between resource-poor farmers (RPFs) and commercial farmers may be most likely to be successful, although this needs to be confirmed. However, other farming models could also be applied successfully. The raising of Clanwilliam Dam was rated as a low cost option.

Being located in the upper Olifants River, the Rosendaal, Visgat, Grootfontein or Keerom dams could supply water to the Citrusdal WUA, or enhance the yield of Clanwilliam Dam, thereby potentially supplying users downstream of Clanwilliam Dam. Existing infrastructure could be utilised by the Citrusdal WUA. However similar infrastructure would need to be provided for new

users. Once again there are opportunities for joint venture farming and RPFs downstream of Clanwilliam Dam could also benefit.

Farm dams in the upper catchment of the Olifants River would serve the relevant local farms. Due to the high-tech nature of farming of high-value crops in the area, RPFs are likely to be best supported by and be most successful in joint ventures. However other farming models have also been shown to be viable. This option was also rated as having a low to medium cost.

In 1998 the Northern Cape Government stated its intention to establish a RPF development in the vicinity of Aspoort. This could be supplied either from the Aspoort Dam or the Groot River Dam. The Aspoort, Groot River and Leeu River Dams would be located in remote areas, where there is little or no existing development, no RPFs and a poor road and other infrastructure. A weir downstream of Elandsvlei and pumping mains would be required to supply the irrigation areas in the Northern Cape. These options were rated as having a very high cost.

Dams at either Melkbosrug, Melkboom or the Brandewyn sites could supply a vast area in the lower Olifants River, including Klawer and the proposed Coastal Scheme, or irrigation areas in the immediate vicinity of the dams. RPF developments are already established in these areas, and there is potential to expand these further. However, financial support would have to be provided to the RPFs, due to the high cost of the water supplied from these dams. Infrastructure such as canals, pipelines and pump stations would be required and therefore these development options were rated as being high cost.

Additional farm dams in the upper Doring River would supply water to farms in the area and create potential opportunities for RPFs. This option was rated as having a low to medium cost.

4.2.2 Benefit to Users

The raising of Clanwilliam Dam could provide water to resource-poor farmers, provide improved assurance of supply to existing farmers, provide water for expansion of agricultural activities, or ensure the availability of water for Reserve releases. Additional water from the Rosendaal or Visgat dams would allow for expansion of the areas under irrigation by approximately 750 ha. The Grootfontein and Keerom dams would allow for the supply of an additional 4200 ha and 4700 ha of irrigated land respectively. The Aspoort Scheme, supplied by either the Aspoort Dam or Groot River Dam, does not appear favourable due to the remoteness of the area, poor soils and a small and diminishing window of opportunity to meet the market requirements, making this scheme less favourable than schemes on the Olifants River.

In the areas supplied by the Melkbosrug, Melkboom and Brandewyn dams, the impacts of water quality would need to be further investigated. Economies-of-scale are currently a problem for commercial farmers who need to expand their irrigation areas in order to remain competitive, but are unable to do so without additional water.

4.2.3 Agricultural Impacts

The expansion of agricultural areas associated with the raising of the Clanwilliam Dam would result in the clearing of some natural vegetation. Water supplied from other potential dams on the Olifants River would result in an increase in summer base flows, due to irrigation releases. These options were rated as being of a medium impact.

Agricultural development around the Leeu River Dam would have a medium environmental impact, because large tracts of land have already been cleared. Irrigation return flows may also

have an effect on the water quality of the Leeu River Dam. The environmental impacts of supplying water from the Groot River and Aspoort dams for irrigation at the potential Aspoort Scheme include increasing summer base flows by using the river for conveyance, and the impact of the return flows on water quality. These schemes were rated as having a very high impact.

Similarly, for the Melkbosrug, Melkboom and Brandewyn dams, increasing the summer flows would be ecologically undesirable. However, the main issue for these schemes is the impact on water quality from return flows and the resultant increase in salinity. These options were rated as having a medium impact.

4.3 Environmental Impacts of Groundwater Options

Groundwater provides for storage of water without the effects of evaporation impacting on the resource. Impacts during construction associated with the siting of exploration and production boreholes are generally localised and are considered to be low. A possible impact associated with the abstraction of groundwater is its impact on springs in the area, as may be the case with the T2 wellfield. Consequently, most schemes were rated as having a low environmental impact. However, the T7 wellfield was rated as having a medium to high impact, due to uncertainty regarding the water quality from the limestone aquifer. The T1 wellfield was considered to have a medium impact due to an absence of data, making a prediction of the impact on baseflows via springs and subsurface flow difficult.

4.4 Beneficiaries of groundwater options

The supplies from groundwater schemes could be integrated into the system in a similar way to the surface water schemes. However, the cost of groundwater schemes could be further reduced if these are developed to serve nearby areas thus reducing the need for and cost of conveyance infrastructure.

5. SUMMARY OF THE BASIS FOR A DECISION

5.1 Summary of screening process

The results of the screening process are shown in **Table 5.1** and **Table 5.2** below.

Table 5.1 Summary of surface water development options

Colour Rating Index			Low Impact 1 Low Cost	Medium Impact 2 Medium Cost	High Impact 3 High Cost	Very High Impact 4 Very High Cost			
Potential Source	Yield (No Reserve) (Mm³/a)	Capital to Yield Ratio	Environmental Impacts			Beneficiaries			
			Barrier and Sediment	Inundation	Down-stream	Area Supplied	Infrastructure cost	Agric. impacts (Environ-mental)	Benefit to users
OLIFANTS RIVER CATCHMENT									
Raise Clanwilliam	66	2	1	1	3	Not rated	1	1	1
Rosendaal	14	3	2	3	3	Not rated	1	2	1
Visgat	Not Determined	4	3	4	3	Not rated	1	2	1
Grootfontein	90	3	3	4	3	Not rated	1	2	1
Keerom	100	3	3	3	3	Not rated	1	2	1
Additional Farm Dams	10	2	1	1	1	Not rated	1 to 2	1	1
DORING RIVER CATCHMENT									
Leeu River	Not Determined	3	3	Not rated	3	Not rated	3	2	3
Groot River	64	Not rated	4	4	4	Not rated	4	4	4
Aspoort	76	Not rated	4	4	4	Not rated	4	4	4
Reenen		Not rated	Not rated	Not rated	Not rated	Not rated	Not rated	Not rated	Not rated
Melkbosrug	116		4	4	3	Not rated	2	2	2
Melkboom	121	Not rated	4	4	3	Not rated	2	2	2
Brandewyn	50	Not rated	3	3	3	Not rated	2	2	2
Additional Farm Dams	5	Not rated	1	1	1	Not rated	1 to 2	1	1

Table 5.2 Summary of groundwater development options

Colour Rating Index		Low Impact 1 Low Cost	Medium Impact 2 Medium Cost	High Impact 3 High Cost	Very High Impact 4 Very High Cost	
Name	Yield (Mm^3/a)	Unit Reference Value (1) (R/m^3)	Capital to Yield Ratio (2) (R/m^3)	Scheme	Environmental Impacts	
DORING RIVER CATCHMENT						
T1a Wellfield (conventional)	5	0.25	2.4	1	2	
T1b Wellfield (conventional)	5	0.23	2.1	1	2	
OLIFANTS RIVER CATCHMENT						
T2 Wellfield (Conventional)	3.2	0.35	3.5	1	1	
T3 Wellfield (Conventional)	2.5	0.49	5.7	1	1	
T5 Wellfield (ASR)	20 min but up to 90	0.82	Not determined	1	1	
T7 Wellfield (ASR)	121 (Avg)	0.12	1.2	2 to 3	2 to 3	
Citrusdal Trough	50 to 100	Not determined	Not determined	1	1	
Clanwilliam Trough	Unknown but comparable	Not determined	Not determined	2	1	

(1) The URV takes both capital and operating costs into account. The yields are conservative estimates. The URV would reduce for less conservative yield estimates.
(2) The yields are conservative estimates.

5.2 WMA scale perspectives

Developments on the Olifants River would only provide benefit for new or current farmers in the Western Cape Province, with little or no benefit to farmers in the Northern Cape Province.

Significant factors that will have major impacts on the feasibility of the development options situated within the WMA are the requirements of the ecological Reserve for the rivers in the WMA and especially for the estuary. The requirements of the Reserve may preclude further development of some of the rivers, however the study to establish the comprehensive Reserve is still underway and study recommendations are only expected towards the end of 2005.

5.3 Perspectives on the potential development options

The construction of the Keerom or Grootfontein Dam would result in the inundation of the Visgat Gorge with significant environmental and social impacts and therefore these options are not considered further.

The development of farm dams, in the upper catchments of both the Olifants and Doring rivers, appears to have the lowest environmental impact with the greatest benefit to potential beneficiaries. A large proportion of the suitable off-channel dam sites along the Olifants and Doring rivers have already been developed, leaving poorer sites, which are relatively more expensive to develop. The cost of such development could potentially be more feasible for an existing farmer who is expanding, for whom this would only be an incremental cost, whereas this is likely to be a barrier for new or emerging farmers.

Groundwater schemes also appear to have the lowest environmental impacts with the greatest benefit to potential beneficiaries. However, wellfield T7 is considered to have poor water quality and is therefore deemed undesirable, and wellfield T1 requires additional investigation to determine its effect on baseflows and springs. Groundwater or aquifer development schemes comprise more than the development of a single wellfield. The potential development of the six defined groundwater schemes within the study area has not been sufficiently researched. To date, limited information is available to assess potential impacts of groundwater development, and the associated financial costs. Consequently, the information presented in **Table 5.2** is for individual wellfields only and cannot be compared directly to the equivalent cost of the surface water development options.

The raising of Clanwilliam Dam with a potential additional yield of 86 million m^3/a has been rated as the next most favourable option. As the raising of the dam is an expansion of existing activities, this option is favourable from a barrier and sediment effect, an inundation effect, cost of infrastructure, agricultural impact and benefits to users perspective. This dam also provides a realistic opportunity to benefit new RPFs. The required dam safety remedial work provides a window of opportunity to simultaneously raise the dam wall. It is possible that a raised Clanwilliam Dam could affect the incremental yield of other potential surface water development options in both the Olifants and Doring River catchments, especially if the Reserve has to be met. The extent of this impact would depend on the amount by which the Clanwilliam Dam is raised, as well as the specific Reserve requirements.

The Rosendaal and Visgat Dams were rated as having a medium to high impacts with respect to barrier and sediment effects, inundation effects, downstream effects and agricultural impacts. These were however considered to be favourable options, due to existing distribution infrastructure. The impact on the downstream Reserve requirements, particularly in summer when elevated flows in the Visgat Gorge would be undesirable, would however have to be evaluated.

The Doring River is the only major river in the region that is not impounded. It is mostly seasonal, however the perennial Groot River, a major tributary of the Doring River provides a degree of perenniality to the Doring River between the Groot River confluence and the Olifants-Doring confluence. A key issue is that water quality is naturally highly variable. Water quality in the Groot River is good but any flow from the upper Doring and the lower Doring tributaries in the

Tankwa Karoo tends to be highly saline. The riverine biota and the riparian vegetation reflect this situation. The building of dams on the Doring River will disturb the present ecological situation but the extent thereof is poorly understood. These factors are critical in determining the acceptability of any development within this river's catchment.

The Groot River Dam is considered unfavourable from an environmental and beneficiaries perspective, due to the reduction of flow to the Doring River, with its associated consequences, and the required new infrastructure to distribute the water. The Leeu River Dam is considered to be unfavourable for the same reasons but to a lesser extent. These options were rated as having high to very high impacts, from an environmental and cost perspective.

Aspoort Dam was rated as having a very high impact, in comparison to the raising of Clanwilliam Dam, and is therefore considered unfavourable. The dam would have an impact on migratory fish populations, unique rock paintings, and the water quality downstream of the dam. Furthermore, new infrastructure involving pumping would be required to establish farming in the area. Evaporation losses would be high and represent the loss of a valuable resource.

The Melkbosrug Dam and Melkboom Dam were considered to have a very high environmental impact, due to the loss of rare and endangered fauna, creating a barrier for various endemic fish species, and impacting on sediment dynamics, unique cultural heritage sites and recreational opportunities. The Brandewyn Dam and weir would have a lower impact but this is still considered high. The cost to beneficiaries was rated as being medium, as there are existing commercial farmers who could assist resource-poor farmers. However, additional conveyance infrastructure would be required.

6. RECOMMENDATIONS

It is clear from **Tables 5.1** and **5.2** above that the three most favourable development options for the Olifants/Doorn WMA are:

- the development of off-channel farm dams;
- the development of groundwater schemes;
- the raising of Clanwilliam Dam;

or combinations of the above three options.

The raising of Clanwilliam Dam was considered to be a favourable option because it does not introduce a new suite of associated environmental and social impacts, but rather extends existing impacts. Furthermore, the lower Olifants River has already been disturbed by the presence of the Clanwilliam Dam and the Bulshoek Weir. In terms of local and international policy and experience, there is strong support for expanding existing agricultural development rather than creating new dispersed agricultural areas. However, as mentioned above, with the exception of groundwater, the raised Clanwilliam Dam could potentially exclude or diminish other development options in both the Olifants and Doring River catchments.

The raising of Clanwilliam Dam provides flexibility in terms of supplying potential beneficiaries, opportunities and development options for RPFs, the position of new irrigation development and crop variety. Other potential development options on the Olifants and Doring rivers do not appear to provide the same level of flexibility. Furthermore, Clanwilliam Dam can provide relatively affordable water. This scheme also provides the option of either large-scale RPF development or incremental development over time, depending on the flexibility in terms of funding the scheme.

Based on the feedback received at the Key Stakeholder Workshop, it was evident that there is broad support for the abovementioned most favourable development options, and more specifically for the raising of Clanwilliam Dam.

It is recommended that a study be undertaken to confirm the feasibility of the Raising of Clanwilliam Dam for the following reasons:

- The remedial work to be undertaken provides the opportunity to raise Clanwilliam Dam a
- The scheme would have relatively low environmental impacts compared to other development options;
- The scheme would provide flexibility with respect to potential beneficiaries;
- The scheme would provide the possibility to make water available for resource-poor farmers;
- The scheme would provide the opportunity to satisfy the ecological Reserve of the Olifants River and Estuary; and
- The scheme would provide the possibility of expanding existing agricultural development rather than creating new unsupported agricultural areas.

APPENDIX A

Clanwilliam Dam Raising Study : Updated Specialist Workshop Starter Document (23 November 2004)

CLANWILLIAM DAM RAISING STUDY

SPECIALIST SCREENING WORKSHOP

23 NOVEMBER 2004

Workshop Starter Document

CLANWILLIAM DAM RAISING STUDY

SPECIALIST SCREENING WORKSHOP

23 November 2004
Workshop Starter Document

The purpose of this Starter Document is to serve as a basis for the Specialist Screening Workshop scheduled for 23 November 2004.

The workshop will bring together selected DWAF staff, study team members and other identified key stakeholders within the area of interest. They will discuss options for the future development of water resources in the WMA, with particular focus on the catchments of the Olifants and Doring Rivers and on resource poor farmers.

The document consists of the following sections :

- Background and introduction to the Olifants Doorn WMA
- Description of the proposed schemes in the Olifants River sub catchment
- Description of possible schemes in the Doring River sub catchment

Annexure A contains further information on groundwater resources.

A summary table of templates for comparing the various schemes will be supplied at the workshop.

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1. INTRODUCTION

1.1 BACKGROUND TO THE SCREENING WORKSHOP

The Clanwilliam Dam Raising Association, comprising Ninham Shand, Asch Consulting Engineers and Jakoet & Associates was appointed by the Department of Water Affairs and Forestry (DWAF) to undertake a Feasibility Study for the possible raising of the Clanwilliam Dam. An Inception Phase fieldtrip and workshop was undertaken on 23 and 24 June 2004. Following the workshop, DWAF agreed that the Association should revisit the need for a process that addressed the screening of possible future development options.

It was the view that to gain acceptance of a specific development option (in this case the raising of Clanwilliam Dam), a strategic but holistic options assessment should precede the selection of a possible development option for further study at feasibility level, as part of a widely accepted process. Furthermore, the raising of Clanwilliam Dam would be subject to environmental authorisation through an Environmental Impact Assessment (EIA) process. The consideration of alternatives is a key principle in the EIA process. The outputs of this screening process will therefore feed into the EIA process, in terms of the consideration of broad alternatives, allowing the Feasibility Study and in particular the EIA process[1] to focus on the implications of raising Clanwilliam Dam by 5, 10 or 15m.

1.2 OBJECTIVES OF THE SCREENING PROCESS

The objectives of the screening process are to:

- Clarify the policy of DWAF and its co-operative governance partners regarding the need for development in the Olifants-Doorn WMA;
- Clarify development needs, objectives and intended beneficiaries, particularly resource poor farmers, at a strategic level;
- From existing information, assess the acceptability of the various options identified in previous studies in terms of technical, financial, environmental and social criteria[2];
- Augment the existing information with specialist inputs from DWAF and other key stakeholders;
- Ascertain whether or not the raising of Clanwilliam Dam is a preferable and defendable development option.

This screening process entails three main tasks. Firstly the compilation of this Starter Document, secondly the Specialist Screening Workshop, and thirdly obtaining input on the draft Screening Report from members of the WMA Reference Group.

The purpose of the Specialist Screening Workshop is to work with selected DWAF staff, team members and other identified stakeholders to agree on the development needs, objectives and

1 Presuming that the Screening process concludes that it is desirable to pursue the raising of Clanwilliam Dam.
2 An additional outcome of this will be the identification of options for which adequate required information is not available.

intended beneficiaries in the WMA, and the Clanwilliam Dam raising option in particular. Following that, screening of the various identified development options would take place based on a number of criteria, including but not limited to:

- financial costs and incremental yields;
- the likely social and ecological implications;
- the prospective beneficiaries and impacts associated with the utilisation of the water; and
- the opportunities for redressing inequity in terms of access to water (by resource poor farmers).

All comparable/mutually exclusive possible surface and groundwater options need to be assessed at this strategic level in order to support or refute the decision to continue with the Feasibility Study on the raising of the Clanwilliam Dam.

1.3 THIS WORKSHOP STARTER DOCUMENT

This Starter Document provides information for discussion purposes. The content is based on available documentation, which for the purposes of this workshop provides information that can be used for strategic level decisions. It is anticipated that the workshop participants will provide further information and critically review the information contained in the Starter Document, which has been drawn from disparate sources, is based on different assumptions and is of varying detail, age and confidence.

It is important to note that unless otherwise stated, the yields of the various options described in the report do NOT make allowance for the impact of Ecological Flow Requirements (EFRs). In the case of Clanwilliam Dam, available information has allowed for a rough estimate of the percentage impact that the EFR may have on the yield. Until the EFR and ultimately the Reserve is determined, this however remains a provisional order of magnitude estimate.

The purpose of this document is to facilitate informed discussion at the Specialist Screening Workshop in order to confirm whether or not the raising of Clanwilliam Dam is a favourable, acceptable and defendable development option.

1.4 ANTICIPATED OUTCOMES OF THE WORKSHOP

Following this Specialist Workshop, an internal draft *Screening of Options* report will be prepared based on this Starter Document and the information derived from the Workshop. The internal draft *Screening of Options* report will be distributed to all participants for their review and further inputs.

A Key Stakeholder Workshop will be held in February 2005, targeting the CMA Reference Group members. The purpose of that workshop will be to present the draft Screening of Options report and to solicit further comments and input.

The final *Screening of Options* report would feed into the EIA process, as part of the contextualisation and consideration of broader alternatives.

1.5 BACKGROUND TO THE WATER MANAGEMENT AREA

The demand for additional water in the Olifants/Doorn Water Management Area (WMA) is largely centred around the catchments of the Olifants River and the Doring River (see Figure 2.1). These catchments border on the Cederberg Mountains in the south-west, where the mean annual precipitation in the upper reaches is more than 900 mm per annum. In the northern half of the Olifants/Doorn WMA, there is no potential for any significant surface water resource development, due to the dry nature of that region (mean annual precipitation of between 100 and 200 mm). Consequently, all surface water resource development options presented in this document are located in the southern half of the Olifants/Doorn WMA, notably the Olifants River and Doring River catchments. Local small schemes were considered where these may have a significant cumulative impact.

Groundwater development potential in the northern sector of the WMA is limited to local development for small town and rural or domestic supply. The water quality varies and recharge depends upon the extreme rainfall events. The groundwater development options presented in this document are located in the Olifants River catchment and the lower reaches of the Doring River catchment. The reason is that this area is dominated by the Table Mountain Group (TMG), comprising two of the most important aquifers; the Peninsula and the Skurweberg Aquifers. These are the aquifers having the greatest storage and recharge potential in the TMG and are in closest proximity to existing surface water storage and also having the greatest as yet unused storage of water. The greatest potential and economic incentive for initiating and developing integrated water resource development and management exists in the south.

About 85% of the total river flow volume occurs during the winter months. In contrast, over 60% of the annual urban demand and 90% of the irrigation demand occurs in summer. This pattern necessitates high levels of assurance in water resource development and management. Consequently, considerable storage capacity is required to store the winter surplus for use in summer.

1.5.1 Groundwater

Appendix B contains a preliminary and summary description of possible approaches to the regional development of groundwater in the WMA with an emphasis on Integrated Water Resource Management and conjunctive use with surface water resources.

The aquifers in the study domain have significant storage potential varying between hundreds and thousands of million m^3 depending upon the aquifer management strategy adopted. A groundwater scheme would comprise upwards of at least 20 wellfields within different scheme domains and strategically located to abstract the water from aquifer storage. Such wellfield siting would take existing infrastructure, site of demand and optimal access to source into account.

Thus individual wellfields cannot be considered as options to facilitate a comparison with surface water schemes as they do not indicate the yield of a groundwater scheme. The latter can only be established once scheme domains are defined, aquifer storage is modelled and preliminary wellfield siting is undertaken (i.e. can the water in storage be cost effectively abstracted). To date, this information is only available for the area north of Bulshoek Weir at a pre-feasibility level and

for purposes of exploration (not comprehensive scheme design). Regional information on the relevant aquifers is available south of Bulshoek Weir.

Thus, whilst it would be desirable to be able to compare groundwater schemes with surface water schemes such is not realistically possible and it is more important in this report to illustrate how and where such schemes should be conceptualised and to present relative estimates of cost, impact on the environment and on potential beneficiaries.

Wellfields identified in the WODRIS are listed individually for illustrative purposes. Together, these wellfields would comprise part of a groundwater scheme. The amount of groundwater that could sustainably be abstracted from aquifer storage south of Bulshoek Weir is also presented. Cost estimates, possible environmental impacts and potential beneficiaries are based on comparable schemes and current knowledge.

The following briefly contextualises the groundwater component of the water resource.

The Peninsula Formation constitutes the middle aquifer in the Table Mountain Group (TMG), and is a topographically dominant unit, building most of the high mountain ranges. It is hydrogeologically most important because of its wide areal extent in the areas of maximum precipitation and recharge potential, as well as the considerable sub-surface volume of permeable fractured rock (storage). Two models that demonstrate the potential benefits of accessing this storage in the Peninsula Aquifer using different aquifer management models are contained in Appendix B.

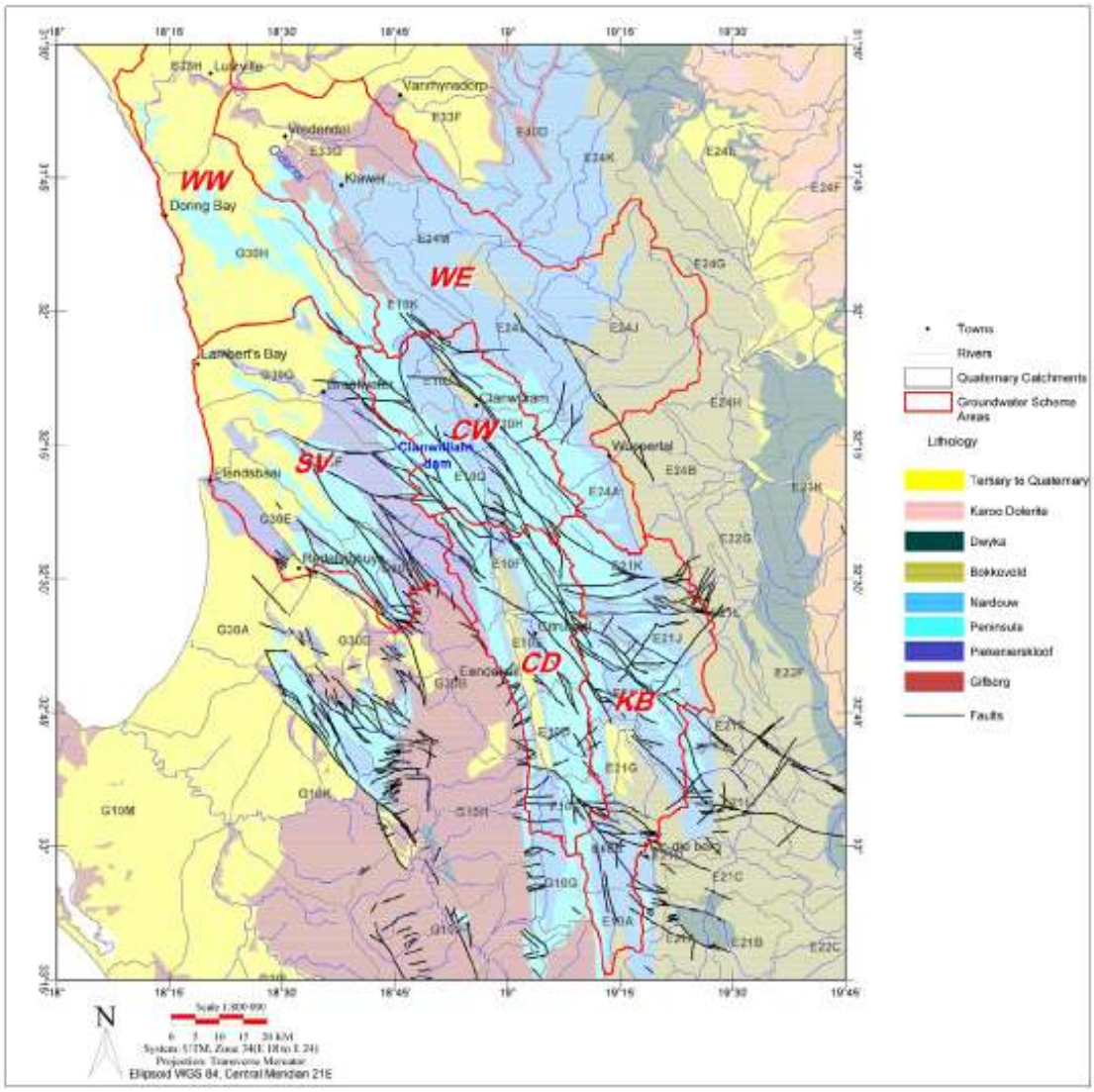
There are six groundwater scheme domains within the study area. These are shown in Figure 1.1 and summarised in Table 1.1. As stated above, it is only in the WODRIS East and West scheme domains that wellfields and Aquifer Storage and Recovery options have been presented at a conceptual and pre-feasibility level. Preliminary aquifer storage estimates are available for the Peninsula Aquifer in the WODRIS East and West domain and in the Citrusdal Domain. No comparable information is available in the Clanwilliam trough or Kouebokkeveld Domains. The Sandveld Domain is not considered in this study, but ought not be to excluded conceptually.

Both the Peninsula and the Skurweberg Aquifers are currently little exploited although they constitute the largest natural storage facility in the area. The reason for this pattern of little exploitation has been limiting scientific or professional input to the development of groundwater resources by local farmers, who are the primary users.

The Citrusdal Deep Artesian Groundwater Exploration (CAGE) Study estimated that approximately 12 million m^3/a were being abstracted from the Nardouw Aquifers by local farmers. At that time (1998) there was limited abstraction from the Peninsula Aquifer viz. 1,5 – 2,0 million m^3/a from the Boschkloof Wellfield. Abstraction from the primary aquifers along the coast are excluded from further consideration in this Starter Document other than in association with development of the TMG aquifers and surface water in Aquifer Storage Recovery Schemes (ASR).

Two formations viz. the Rietvlei and the Skurweberg are preferred aquifer targets of the farming sector. The reason for this is that these aquifers are close to the homes and developed lands and the water table is relatively high, although the iron content and Total Dissolved Solids (TDS) of the

water can be variable, depending upon proximity to the Bokkeveld Shales. The farmers use the groundwater to augment surface water supplies or for use as an emergency supply during summer, largely for the irrigation of citrus in the area upstream and downstream of Clanwilliam Dam, but increasingly groundwater is being developed in order to open new land for development.



WW	*WODRIS West*	*SV*	*Sandveld*
WE	*WODRIS East*	*CD*	*Citrusdal Trough*
CW	*Clanwilliam Trough*	*KB*	*Kouebokkeveld*

Figure 1.1 Groundwater scheme domains

Table 1.1 Groundwater Scheme Domains

Scheme Domain	Area [km]	Quaternary Catchments
WODRIS West	1796	G30H E33H
WODRIS East	3606	E24A E24J E24L E24M E10K E33G
Clanwilliam Trough	1139	E10G E10H E10J
Sandveld	2130	G30E G30F G30G
Citrusdal Trough	1179	E10C E10D E10E E10F
Kouebokkeveld	1653	E10A E10B E21G E21H E21J E21K

In terms of recharge to the Peninsula Aquifer in the Citrusdal Scheme Domain, the CAGE Study indicates a spatially weighted average of 23% in a range of 8 to 52% of MAP. Aquifer recharge to the TMG in these scheme domains is considered adequate to warrant further exploration and planning of groundwater schemes and wellfields.

The current, but not definitive estimates of groundwater sustainably available for abstraction from the Peninsula Aquifer in the Citrusdal Scheme Domain varies between 25 million m^3/a and 45 million m^3/a and up to at least 250 million m^3/a depending upon the storage model, conjunctive use of surface water storage facilities and the aquifer management model taking into account environmental impacts.

1.5.2 Previous Studies

A number of major surface water resource studies have been undertaken within specific areas of the WMA during the past six years. These include :

The Olifants Doring River Basin Study - Phase 1 (1998)
The Olifants Doring River Basin Study - Phase 2 (2003)
The Olifants/Doorn WMA Water Resources Situation Assessment (2002)
The Olifants/Doorn WMA Overview of Water Resources and Utilisation (2003)
The Olifants/Doorn Internal Strategic perspective (2004)
The Western Cape Olifants/Doring River Irrigation Study (WODRIS, 2004)
The Possible Raising of Clanwilliam Dam Feasibility Study (in progress)
DANIDA Integrated Water Resource Management (2003)

The purpose of these studies was not to identify groundwater schemes. There has been no investment for this purpose in the region other than the WODRIS wherein groundwater development options were undertaken at pre-feasibility level as an adjunct to a feasibility study for Melkboom Dam. Refer to Appendix B for details of these studies.

1.5.3 The Need for Water Resource Development

From information extracted from the latest draft (January 2005) of the Olifants/Doorn Internal Strategic Perspective (ISP), the Olifants/Doorn WMA currently experiences significant shortages in meeting current irrigation water requirements. This is particularly severe in the Olifants River catchment downstream of Clanwilliam Dam, where the shortfall is 29 million m^3/a. Table 1.2 shows the reconciliation of water requirements and availability for the Olifants River and Doring River catchments. It should be noted that these shortfalls arise in part on account of the provisions made for the preliminary Reserve (37 million m^3/a), however downstream of Clanwilliam Dam there are currently frequent shortfalls in the supply to the Lower Olifants River WUA although no releases are made for the Reserve.

Table 1.2: Reconciliation of Water Requirements and Availability (Olifants and Doring River Catchments)

Catchment (see Figure 2.1)	Available Yield (million m^3/a)	Water Requirements (million m^3/a)	Balance (million m^3/a)
Olifants u/s of Clanwilliam Dam	197	197	0[3]
Olifants d/s of Clanwilliam Dam	145	174	- 29
Doring River (incl. Kouebokkeveld catchments)	81	81	0
		Total shortfall	- 29

(Ref : Draft Olifants/Doorn ISP, 2005)

The information presented in Table 1.2 is for the NWRS sub-areas within the Olifants River and Doring River catchments. The urban requirement supplied out of the Olifants River catchment is 4 million m^3/a and represents only 1% of the total water requirement out of that catchment. The remaining 99% is utilised for irrigation.

Whilst the growth in the urban water requirement is not expected to be significant, there is a significant interest by farmers to expand their irrigation potential. To do so, interventions such as the following will be required :

- reduction of conveyance losses in canal systems
- improved irrigation efficiency
- improved management of releases
- targeted removal of invasive alien plants
- development of new surface and groundwater schemes
- water trading

[3] If the reserve were to be implemented upstream of Clanwilliam Dam, there would likely be less water available for abstraction by the farmers during the summer months. Farmers would therefore have to store additional winter water in order to meet their summer demands.

The estimated proportions of sectoral water requirements for the whole of the Olifants/Doorn WMA are as follows :

Irrigation	:	95%
Urban	:	2%
Rural	:	2%
Mining and Bulk Industrial	:	1%
Afforestation	:	< 1%

Of the total irrigation water requirement in the WMA (356 million m^3/a), 90% takes place within the catchments of the Olifants and Doring Rivers.

1.6 ENVIRONMENTAL OVERVIEW OF THE DORING AND OLIFANTS RIVERS

The Olifants River, rising in the Agter Witzenberg plateau, is flanked by the Cederberg mountains in the east and the Olifants River mountains and Swartberge in the west. It is a perennial river that drains an area consisting almost entirely of quartzitic sandstone and quartzites of the Table Mountain Group. As a result, the water in the upper reaches of the river, upstream of the confluence with the Doring River, is clear and fresh. Downstream of the Doring River confluence, the concentrations of suspended solids and dissolved salts increases. The Olifants River is important from a conservation perspective because it contains eight endemic fish species.

The Doring River rises on the Northern slopes of the Hex River mountains, and flows in a north westerly direction into the Ceres-Karoo region. It joins with the Olifants River just upstream of the town of Klawer. The Doring River is mostly seasonal, however a section between the Olifants/Doring confluence and the Groot River confluence flows throughout the year, mainly due to the perennial Groot River. Runoff into the Doring River from the northern Cederberg (TMG) area produces good quality water. However, runoff from the Tankwa Karoo is characteristically more saline and turbid due to the presence of shales and mudstones. The Doring River is inhabited by nine indigenous fish species, seven of which are endemic to the river system. Furthermore, the area upstream of the confluence with the Tankwa River is a vital breeding area for the sawfin (*Barbus serra*), the Clanwilliam yellowfish and the Clanwilliam sandfish (*Labeo seeberi*). Lastly, and very importantly, the Doring River is the only major river in the region that is not impounded.

1.6.1 Impacts of Dams on Rivers

The construction of dams on rivers frequently results in a suite of local and remote environmental impacts, which should be taken into account when determining whether or not to construct the dam. Although these impacts are often river specific and difficult to predict, sufficient data exists to enable a general prediction of likely impacts of dams on river systems. The likely impacts include:

Inundation effect – the permanent inundation of wetlands, riparian vegetation and their associated fauna. River and floodplain habitats are some of the most diverse habitats, and the most fertile farming areas. Dams are often built in remote areas, which act as refuges for species that have been displaced from other areas. Furthermore, dams create a new habitat which often favours

alien invasive fish species, such as carp and bass. These species out-compete their indigenous counterparts leading to further decline in the indigenous population.

Alteration of downstream flow regime – the construction of a dam leads to the manipulation of the natural flow regime. Consequences of an altered flow regime include:

- Disruption to the hydrological cues for fish spawning;
- Changes in hydraulic and thermal conditions may make the system incompatible for the life-cycle requirements of various organisms;
- Certain species, often seen as pests, may take advantage of the changed environmental conditions or lack of competition and increase in abundance;
- Riparian vegetation may die due to the rapid lowering of the water table or seedlings may not grow due to a lack of bank flooding;
- Lack of floods reduces the scouring of the river bed, with a resultant reduction in habitat diversity; and
- The loss of medium sized floods can cause estuary mouths to close for longer periods or more frequently, with the resultant barrier to nursery areas for certain marine fish species.

Change in sediment loads – dams and reservoirs trap sediment and starve the river downstream of its normal sediment load. The clear water downstream of the dam seeks to recapture its sediment load by eroding the bed and banks of the river. Cobbles and gravel are also eroded, reducing the habitat diversity and exposing the bedrock.

Changes in downstream water quality – dams trap nutrients in the same way as sediments, with the result that blooms of algae and macrophytes are often associated with impoundments. Furthermore, the increased surface area leads to increased evaporation and resultant increase in salinity of the water, which has a negative effect on most aquatic organisms.

Barrier effect – high dam walls form barriers to natural movement of fish and other organisms. Furthermore, dams trap the seeds of riparian plants, affecting recruitment of these species in the river reaches downstream of the dam. Dams and alien fish have been identified as the major contributors to the dramatic decline in the Clanwilliam yellowfish population in the Olifants River.

2. SCHEMES TO BE CONSIDERED FOR IMPLEMENTATION IN THE OLIFANTS RIVER AND DORING RIVER CATCHMENTS

2.1 WATER DEMAND MANAGEMENT

The implementation of urban water demand management will not make any significant impact on the availability of water on a catchment wide scale. However, it is a crucial intervention that must be implemented by all local authorities, so as to prolong the life of existing urban sources of supply. Whilst local authorities are responsible for supplying their consumers, DWAF will not give consideration to the development of any local supply schemes unless water demand management has been conscientiously and rigorously implemented.

In the agricultural sector, there is significant opportunity to save water through water conservation and demand management. It has been estimated that losses in the canal distribution system downstream of Clanwilliam Dam are in the order of 28%. It is considered that a reduction to 15% (Ref : DANIDA Integrated Water Resource Management Study, 2002/2003) could be achieved through maintenance. This alone could substantially reduce the shortfall in the Olifants River catchment downstream of Clanwilliam Dam.

Water demand management, however, will not be sufficient to address the current shortfall in the entire Olifants River catchment. To meet current demands, new sources will have to be developed to firstly address current shortfalls and secondly, for new irrigation development. Alternatively, current demands could be curtailed through the acceptance of lower assurances of supply. Although the Doring River catchment is currently essentially in a state of balance, further irrigation expansion will not be possible without developing additional sources of supply.

2.2 INTRODUCTION TO POTENTIAL SCHEMES

There are a number of potential surface and groundwater schemes that could be developed to increase the availability of water within the Olifants and Doring River catchment. These are summarised in Table 2.1 and Table 2.2. Unless otherwise noted, the yields exclude any allowance for Ecological Water Requirements. This approach has been adopted to allow for an "apples with apples" comparison of potential scheme yields, without having to consider the Reserve. Uncertainties relating to the eventual implementation of the Reserve are numerous. Within the scope of this screening exercise, the development of potential Reserve scenarios for each and every scheme was not possible.

Table 2.1 List of Potential Surface Water Schemes to be Screened

Olifants River Catchment		
Name of Potential Scheme	**Additional Storage (Mm^3)**	**Additional Yield (Mm^3/a) (1)**
Rosendaal Dam	26	14
Visgat Dam	unknown	unknown
Grootfontein Dam	138	90
Keerom Dam	153	100
Raise Clanwilliam Dam by 5m (2)	63	36
Raise Clanwilliam Dam by 10m (2)	143	66
Raise Clanwilliam Dam by 15m (2)	240	86
Farm Dams (Off Channel)	14	10

Doring River Catchment		
Name of Potential Scheme	**Additional Storage (Mm^3)**	**Additional Yield (Mm^3/a) (1)**
Leeu River Dam	35	6
Groot River Dam	159	64
Aspoort Dam	395	76
Reenen Dam	250	88
Melkbosrug Dam (4)	400	116
Melkboom Dam (4)	400	121
Brandewyn Dam	160	± 50 (3)
Farm Dams (Off Channel)	8	5

(1) The yields are gross yields before provision for the Reserve and before any compensation releases other than as indicated in Note (3)

(2) Over and above the existing Clanwilliam Dam storage of 122 million m^3 and yield of 149 million m^3/a.

(3) The Yield for Brandewyn Dam has already allowed for IFRs as determined in the WODRIS.

(4) These yields are based on the ODRB Study of 1998 and are for a 1 MAR dam with no allowance for EWRs or compensation releases. The subsequent WODRIS (2004) reports the following yields for Melbosrug or Melkboom Dams, including an allowance for EWRs :

1 MAR	(400 million m^3)	-	80,6 million m^3/a
1,5 MAR	(600 million m^3)	-	92,3 million m^3/a
2,0 MAR	(800 million m^3)	-	104,2 million m^3/a

The locations of the surface water development options are shown on Figure 2.1.

Figure 2.1 The Olifants/Doring River Basin

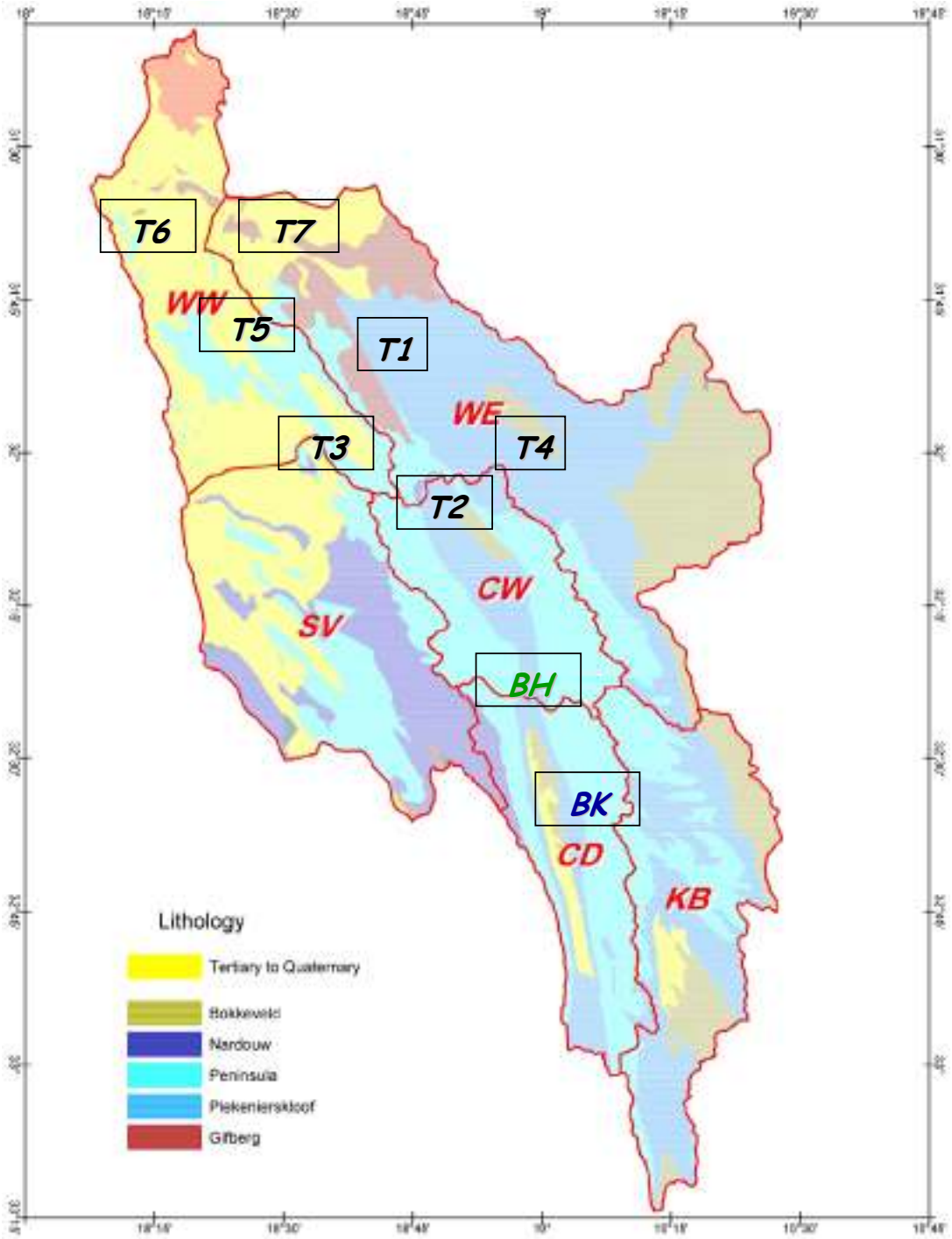
There is only one groundwater scheme that has been developed at conceptual level on the basis of data available at pre-feasibility level. This scheme was developed on the WODRIS and comprises a preliminary list of 5 wellfields in the TMG and 2 Aquifer Storage and Recovery (ASR) Schemes. One wellfield in the Citrsudal Trough Scheme Domain has been developed but between 12 – 20 more such wellfields are possible. The wellfields and estimated sustainable groundwater supply from the different groundwater scheme domains are summarised in Table 2.2. The groundwater target zones in relation to the groundwater scheme domains are shown on Figure 2.2.

Table 2.2 List of Potential Groundwater Schemes to be Screened

Scheme Domain	Wellfield Name and Location	Potential Yield
WODRIS West		
	T3 – Wellfield on the left bank of the Sandlaagte valley at Skurfkop Syncline. To abstract groundwater from the Peninsula Aquifer.	3 – 10 Mm^3/a
	T6 - Katmakoep area between Vredendal and Strandfontein. Wellfield in Katmakoep area to abstract groundwater from Peninsula Aquifer.	Capacity was not assessed
	T5 - Aquifer Storage Recovery Scheme Sandlaagte Valley Aquifer. Storage Recovery Scheme in unutilised Sandlaagte Aquifer.	Pump in and store water from Olifants River
WODRIS East		
	T1 - Two wellfields (T1a and T1b) at the confluence of the Doring and Olifants Rivers. Abstraction out of Peninsula Aquifer.	5 - 20 Mm^3/a, from each
	T2 – Wellfield on the right bank of the Olifants River, above the Bulshoek Weir. Wellfield to abstract groundwater from the Peninsula Aquifer.	3 – 10 Mm^3/a
	T4 – Brandewyn River valley above confluence with Doring River. Wellfield in river valley to abstract groundwater from both Skurweberg and Peninsula Aquifers.	Capacity was not assessed
	T7 - Aquifer Storage Recovery Scheme Aquifer. Storage Recovery Scheme in under-utilised Vanrhynsdorp dolomitic aquifer. Has water quality concerns associated with limestone aquifers.	Pump in and store water from Olifants River
Citrusdal Trough		
	Expansion of the Boschkloof Wellfield at Citrusdal, which presently supplements municipal bulk water supply for Citrusdal.	Not available
	CAGE - Peninsula Aquifer in E10 catchment. The CAGE Study (1998) estimated existing abstraction to be between 1,5 and 2,0 million m^3/a.	45 Mm^3/a
Clanwilliam Trough	No wellfield target zones identified as yet	50 – 100 Mm^3/a
Kouebokkeveld	No wellfield target zones identified as yet	40 – 80 Mm^3/a

The currently identified target zones for groundwater development are shown in Figure 2.2.

WODRIS reports a realistic total combined yield for T1a + T1b + T2 + T3 as 20 million m^3/a (5 million m^3/a each, with not more than 5 million m^3/a from T3). The maximum combined yield for T1a + T1b + T3 was estimated at 60 million m^3/a.



WW	*WODRIS West*	*SV*	*Sandveld*
WE	*WODRIS East*	*CD*	*Citrusdal Trough*
CW	*Clanwilliam Trough*	*KB*	*Kouebokkeveld*

Figure 2.2 Identified groundwater target zones in relation to groundwater scheme domains

In Sections 3.1 to 4.9 each of the schemes listed in Tables 2.1 and 2.2 are described in more detail, and the following information on each is provided.

SCHEME LOCATION
Description of the environment and a map

ENGINEERING AND FINANCIAL

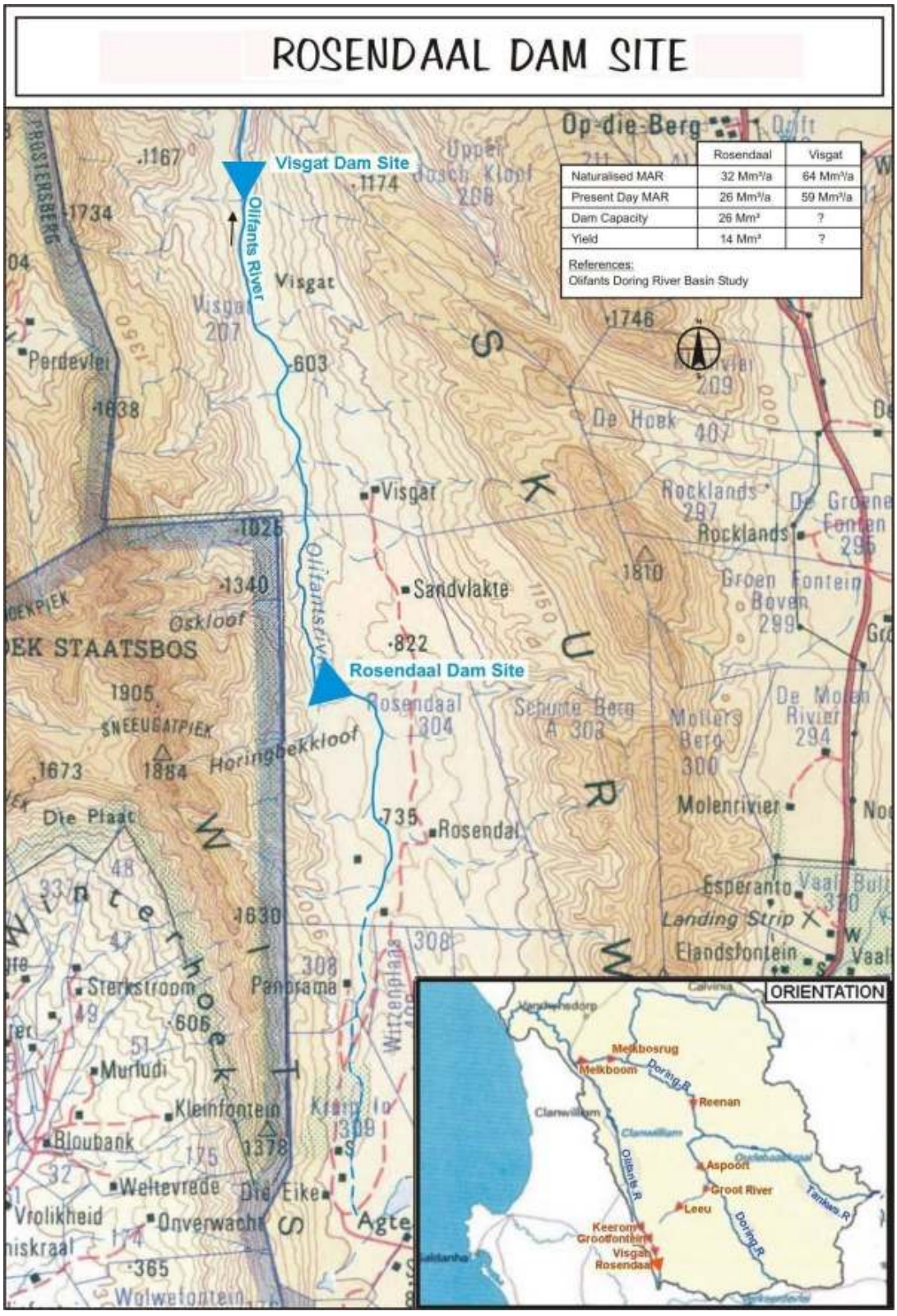
ENVIRONMENTAL OVERVIEW
- Barrier and Sedimentation Effects
- Inundation Effects
- Downstream Effects

BENEFICIARIES, INFRASTRUCTURE REQUIREMENTS AND ENVIRONMENTAL IMPACTS

RESOURCE POOR FARMERS

3. SURFACE WATER AND GROUNDWATER SCHEME OPTIONS : OLIFANTS RIVER CATCHMENT

Unless otherwise stated, the yields of the potential surface water schemes presented in Sections 3.1 to 3.6 do not include any allowance for EWRs nor any allowance for downstream compensation releases.



	Rosendaal	Visgat
Naturalised MAR	32 Mm³/a	64 Mm³/a
Present Day MAR	26 Mm³/a	59 Mm³/a
Dam Capacity	26 Mm³	?
Yield	14 Mm³	?

References:
Olifants Doring River Basin Study

Figure 3.1 Rosendaal Dam Site

3.1 ROSENDAAL DAM SITE

3.1.1 Location

The Rosendaal Dam site is the most upstream development option on the Olifants River. The dam site is situated approximately 27 km to the north of Ceres, in the headwaters of the Olifants River.

3.1.2 Engineering and Financial

The Rosendaal Dam was considered as a storage reservoir to supply water to the Citrusdal Water User Association (WUA). The geology on which the proposed earth embankment would be constructed consists primarily of quartzitic sandstone.

The most cost-effective dam has a capacity of 1 MAR. The earth embankment wall would be 42 m high, requiring 1,45 million m^3 of fill material. The dam would have a storage capacity of 26 million m^3 and a yield of 14 million m^3/a (before any compensation releases). The crest length would be 435 m.

The financial costs associated with the construction of the dam are :

Yield Mm^3/a	Construction Cost	Ref Date (Year)	2004 Equivalent Cost (escalation @ 8% p.a.)	Cost:Yield Ratio
14	R65 million	1998	R103 million	7,4

(Ref : Olifants Doring River Basin Study)

The Rosendaal Dam Scheme should be compared with the Additional Farm Dams option (Section 3.6).

3.1.3 Environmental Overview

Environmental issues associated with the proposed Rosendaal Dam include:

Barrier and Sediment Effects
As the dam site is located upstream of the Visgat canyon with its water falls, the dam would not have any barrier effect for the movement of fish and other aquatic organisms. Similarly, due to the low sediment load, the dam would not have a significant impact on the downstream sediment dynamics and associated aquatic habitat.

Inundation Effects
The site is disturbed and comprises mainly of cultivated lands and *Acacia mearnsii*. Fynbos in the remainder of the inundation area is dominated by *Elytropappus rhinocerotis*, *Protea laurifolia*, *P repens* and *Cliffortia ruscifolia* with many geophytes. This vegetation is not often found in the relatively undisturbed state found at this site. The dominant species observed are however widespread.

Downstream Effects

Water for irrigation would be released down the river resulting in an increase in summer base flows that could threaten indigenous fish species, especially in the nursery areas. Furthermore, the introduction and spread of alien fish into the dam could effect the survival of indigenous fish species. The dam site is located immediately upstream of the ecologically important and sensitive Visgat canyon and therefore the water quality and quantity downstream are likely to be of major concern for maintenance of the aquatic ecosystem.

3.1.4 Beneficiaries, Infrastructure Requirements and Environmental Impacts

Water would be released down the Olifants River during the summer months for extraction by irrigators served by the Citrusdal WUA. Citrus is the main crop grown by commercial farmers along this reach of river.

If these releases were to replace existing summer abstractions from the river by irrigators then additional water would flow into Clanwilliam Dam during the summer months, enhancing its yield. This additional water could be utilised by irrigators below the dam as discussed in Section 3.5 5 (Raising Clanwilliam Dam).

The existing infrastructure, comprising pumping installations on the river, pipelines and balancing dams, could be utilised by the existing irrigators of the Citrusdal WUA. Similar infrastructure would need to be provided by new irrigators.

The additional water supply would enable the area under irrigation to be extended by about 750ha, the development of which would probably not have any significant impact on existing natural vegetation as much of the area is highly degraded. The main impact would arise from the additional summer releases down the Olifants River, however these releases would also assist to reinstate the natural summer low flows in the river, which have been reduced by the summer irrigation abstractions in the upper reaches of the Olifants River.

3.1.5 Resource Poor Farmers

Resource poor farmers could either benefit from the additional water supply through joint ventures with existing commercial farmers or through the development of their own farms on land provided by Citrusdal Municipality, or on land purchased from commercial farmers. If export citrus farming is to be undertaken then joint venture farming is likely to be more successful on account of the high technology and complicated marketing requirements. The alternative of supplying resource poor farmer beneficiaries below Clanwilliam Dam is discussed in Section 3.5.6 below.

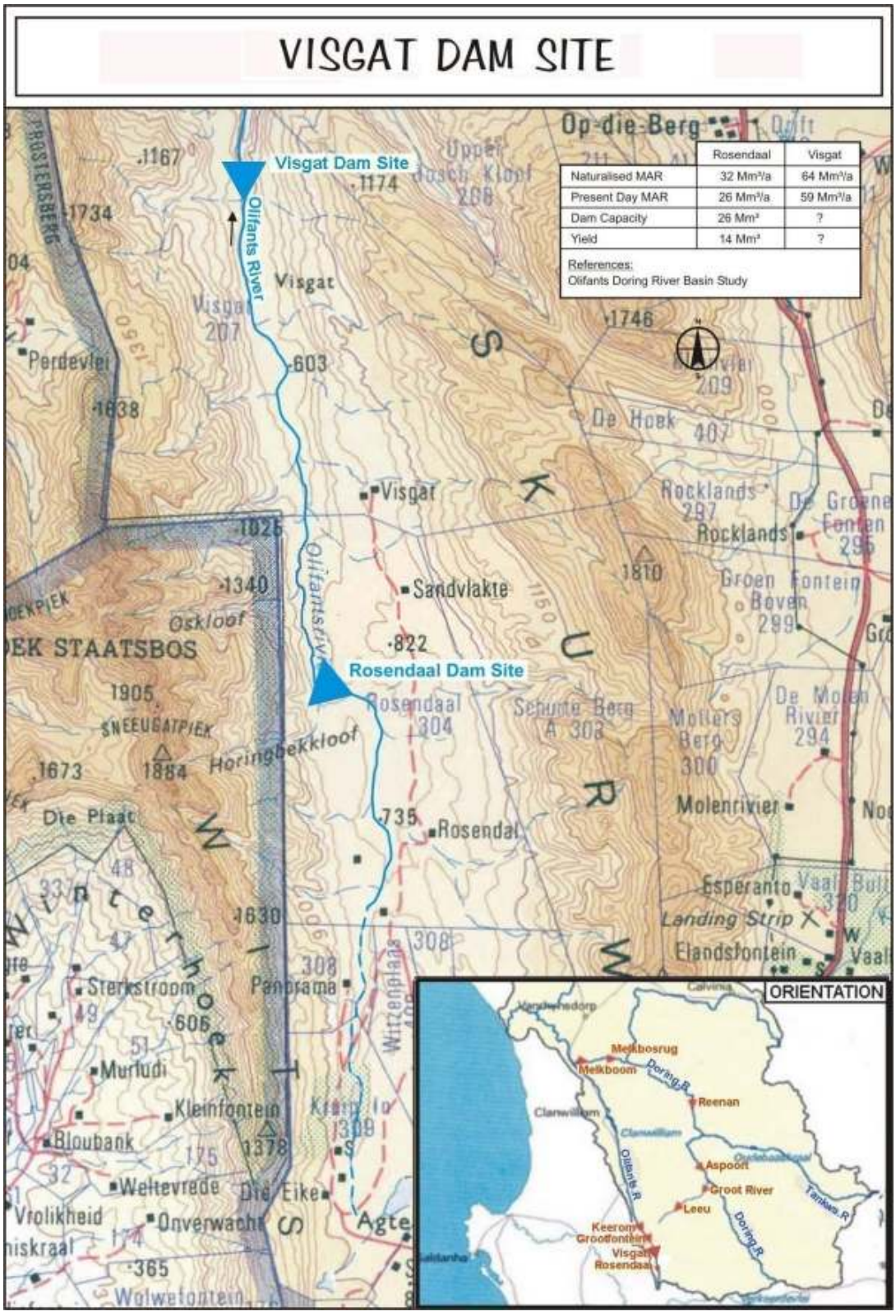


Figure 3.2 Visgat Dam Site

3.2 VISGAT DAM SITE

3.2.1 Location

The Visgat Dam site is located approximately 10 km downstream of the Rosendaal Dam site. Although listed as an option in the 1998 Olifants Doring River Basin Study, no detailed study of the site was undertaken, nor was any dam size evaluated.

3.2.2 Engineering and Financial

This option was not costed in the 1998 Olifants Doring River Basin Study.

3.2.3 Environmental Overview

Environmental issues associated with the proposed Visgat Dam include:

Barrier and Sediment Effects
As per Rosendaal.

Inundation Effects
The riverine and Mountain Fynbos vegetation found at the proposed dam site is in a good state. The two main types of Mountain Fynbos present include *Protea laurifolia* and *Heeria argentea*. The area is rich in rare species due to the diversity of habitats, the high rainfall, which is conducive to the speciation in Mountain Fynbos and its location near to the species rich Winterhoek and Koue Bokkeveld areas. The inundation impacts would be significantly greater than at Rosendaal due to the much larger area of natural vegetation that would be affected as well as the importance of the vegetation present.

Downstream Effects
As per Rosendaal.

3.2.4 Beneficiaries, Infrastructure Requirements and Environmental Impacts

The ODRB Study reports a present day MAR at the Rosendaal Dam site of 26 million m^3/a and 59 million m^3/a at the Visgat Dam site. Consequently, the yield of Visgat Dam should be significantly higher than that of Rosendaal Dam. The dam would serve the same areas and have the same infrastructure requirements and impacts as those for Rosendaal Dam as described in Section 3.1.4 above.

3.2.5 Resource Poor Farmers

The potential resource poor farmer beneficiaries would be similar to those for the Rosendaal Dam as described in Section 3.1.5 above.

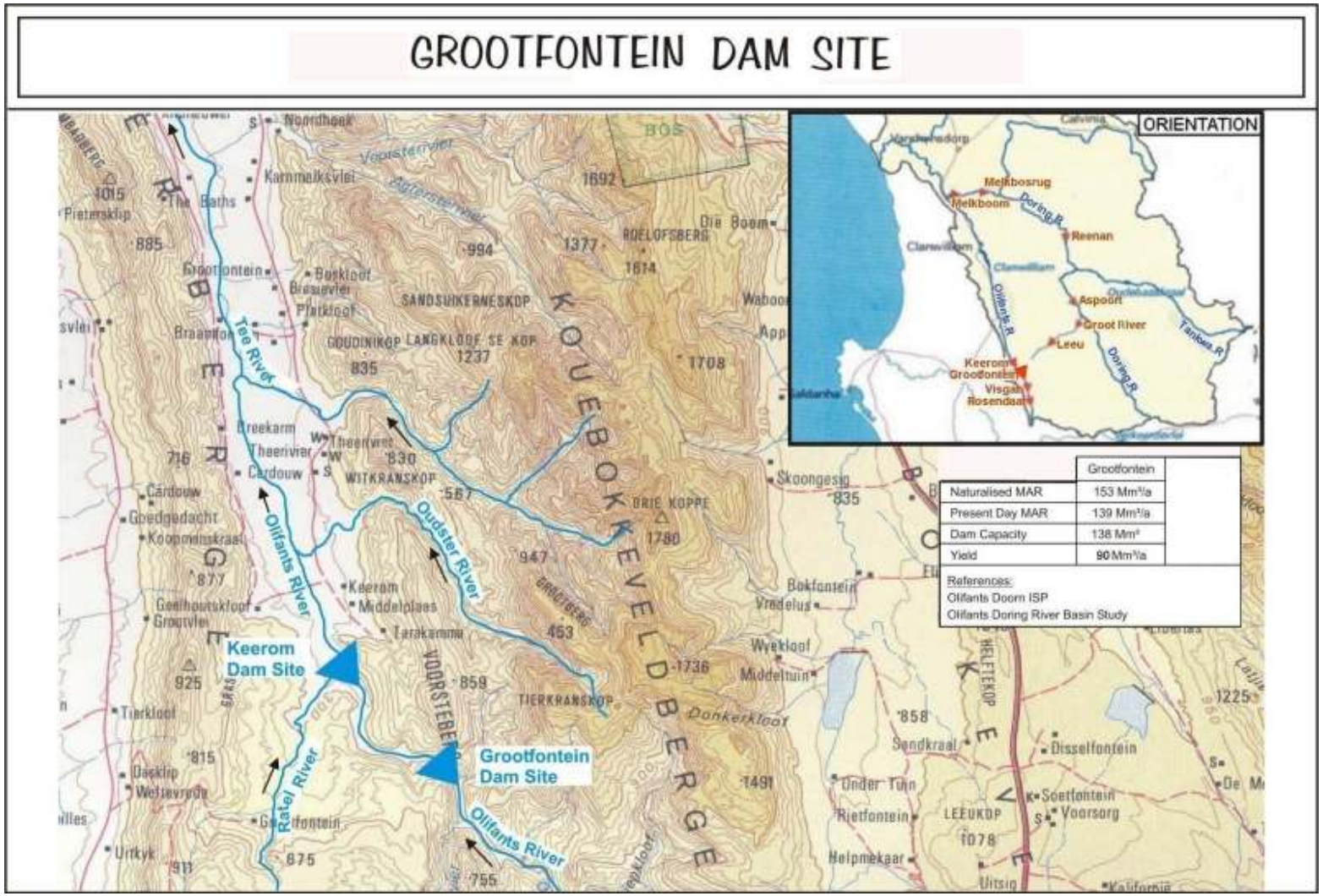


Figure 3.3 Grootfontein Dam Site

3.3 GROOTFONTEIN DAM SITE

3.3.1 Location

The Grootfontein Dam site is located approximately 6 km upstream of the confluence of the Olifants and Ratel Rivers. The site lies downstream of the Visgat gorge.

3.3.2 Engineering and Financial

The Grootfontein Dam was considered in the Olifants Doring River Basin Study (1998) as a possible storage dam to supply water to Cape Town, as well as to stabilise water supply for existing and expanded irrigation developments along the Olifants River, upstream of Clanwilliam Dam. The site is underlain by quartzitic sandstone, with shallow interbedded shale horizons.

A typical rollcrete gravity section with central spillway was considered. For a one MAR dam, a total dam height of 86 m is required, with a crest length of 330 m. The storage capacity of 138 million m^3 would yield about 90 million m^3/a (before any compensation releases). At present, farmers in the vicinity of Citrusdal are re-investigating this option. It is not presently considered to be financially viable as a source for augmenting Voëlvlei Dam, for benefit to Cape Town.

The financial costs associated with the dam are :

Yield Mm^3/a	Construction Cost	Ref Date (Year)	2004 Equivalent Cost (escalation @ 8% p.a.)	Cost:Yield Ratio
90	R257 million	1998	R408 million	4,5

(Ref : Olifants Doring River Basin Study)

3.3.3 Environmental Overview

At a workshop hosted by DWAF in 1991 to assess the impacts of proposed dams on the aquatic environment upstream of the Clanwilliam Dam, it was decided that the inundation of the Olifants River gorge was environmentally and socially unacceptable, due its geological and biological importance and its links to Gondwanaland. Further environmental issues relating to the proposed Grootfontein Dam include:

Barrier and Sediment Effects
Some barrier and sediment effects are anticipated.

Inundation Effects
The riverine vegetation is in good condition with relatively few infestations of *Acacia mearnsii* and *A. saligna*. There are a suite of interesting species occurring in the Mountain Fynbos adjoining the dam site, and on the Onderboschkloof property adjacent to or within the flood limits of the dam. These species include:

- *Agathosma insignus*, which is only know to this area;
- *Leucadendron diemontianum*, which is considered as being rare;

- *Macrostylis barbigera*, also considered rare;
- *Moraea barkerae*, considered rare, with Grootfontein farm identified as a locality for this species; and
- Serruria confragosa, considered rare, is found in a narrow band running north south in the upper Olifants River valley.

A further seven rare plant species have been recorded from the general area but without specific reference to the proposed dam site. The Grootfontein site would result in the inundation of much of the gorge. As mentioned above the inundation of the Olifants River gorge is considered environmentally and socially unacceptable.

Downstream Effects

The downstream effects would be similar to that of Rosendaal and Visgat (i.e. elevated summar flows and reduction of winter floods). The length of river immediately below the dam is in good ecological condition. However, the Olifants River deteriorates downstream of Keerom. The main effect would be the significant absorption and attenuation of floods probably necessitating the provision of large capacity outlet works to release at least the annual flood.

3.3.4 Beneficiaries, Infrastructure Requirements and Environmental Impacts

The beneficiaries would be the irrigators served by the Citrusdal WUA who mainly grow citrus as discussed in Section 3.1.4 above. However the yield of the Grootfontein Dam would be considerably greater than the yields of Rosendaal or Visgat Dam and approximately 4200 ha of additional citrus could be irrigated. Alternatively there could potentially be slightly more water available for use below Clanwilliam Dam as discussed in Section 3.5.5 below.

The existing infrastructure of the Citrusdal WUA users could probably be utilized but new irrigators would require additional infrastructure as discussed in Section 3.1.4 above.

The summer low flows in the Olifants River downstream of Grootfontein Dam would be considerably increased above natural levels, probably to the detriment of the riverine environment. The additional 4200 ha of irrigated land would impact on natural veld, but again much of this is relatively degraded.

3.3.5 Resource Poor Farmers

The resource poor farmers in the reach of the Olifants River served by the Citrusdal WUA could benefit as described in Section 3.1.5 above, and probably also those below Clanwilliam Dam as described in Section 3.5.6 below. However the number of beneficiaries would potentially be considerably greater as some 4200 ha could be irrigated.

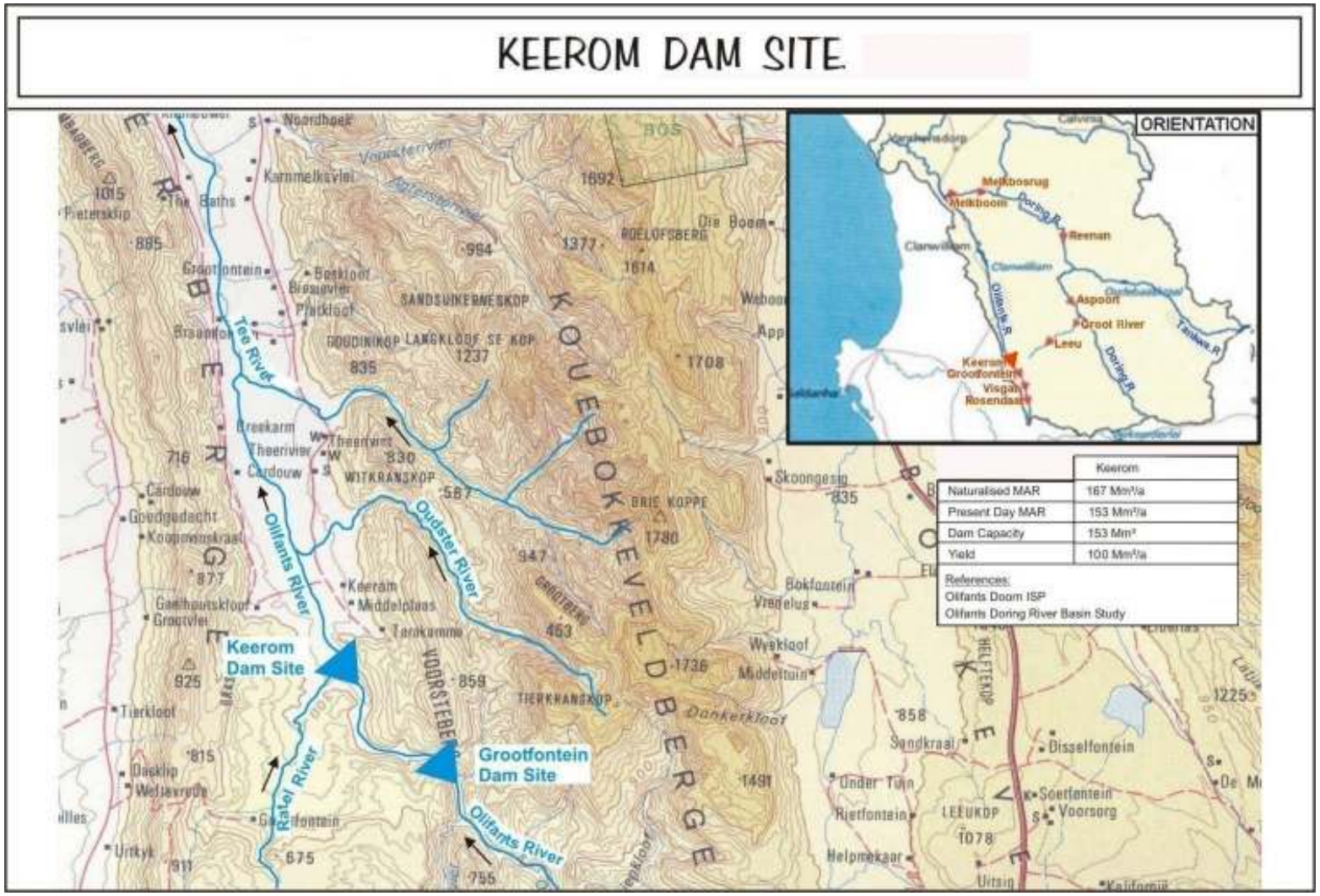


Figure 3.4 Keerom Dam Site

3.4 KEEROM DAM SITE

3.4.1 Location

This site is the most downstream new dam site option on the upper Olifants River. It was investigated in the Olifants Doring River Basin Study and based on cost, Grootfontein was considered the preferred option. The dam would be situated on the Olifants River, immediately upstream of the confluence with the Ratel River, and would span both rivers.

3.4.2 Engineering and Financial

The Keerom Dam would consist of a concrete gravity section. A one MAR dam would have a capacity of 153 million m^3 and yield 100 million m^3/a (before any compensation releases). The dam height would be 57 m for a one MAR dam with a crest length of 1 200 m. The site is located in an area underlain by quartzitic sandstone. Approximately 1,37 million m^3 of rollcrete would be required for the construction.

The financial costs associated with Keerom Dam are :

Yield Mm^3/a	Construction Cost	Ref Date (Year)	2004 Equivalent Cost (escalation @ 8% p.a.)	Cost:Yield Ratio
100	R466 million	1998	R740 million	7,4

(Ref : Olifants Doring River Basin Study)

3.4.3 Environmental Overview

The biophysical environment is similar to that of the Grootfontein Dam site. However, because the dam is not as high, the impacts on the sensitive gorge area would be reduced. Notwithstanding, at the 1991 DWAF Environmental Workshop the inundation of the Olifants River gorge was also deemed unacceptable.

Barrier and Sediment Effects
The dam would have similar effects to Grootfontein, but would also affect the Ratel River.

Inundation Effects
The riverine vegetation above the drift is in good condition. There has been some cultivation of the floodplain along the west bank while other parts are burnt periodically. The river bank supports a suite of individual plant species including yellowwood (*Podocarpus elongatus*), wild almond (*Brabejum stellatifolium*), rooiels (*Cunonia capensis*) and Cape willow (*Salix mucronata subsp. hursuta*). The area downstream of the site has been subjected to more disturbances with a concomitant infestation of alien plants.

Downstream Effects
See Grootfontein Dam (Section 3.3.3).

3.4.4 Beneficiaries, Infrastructure Requirements and Environmental Impacts

The yield of Keerom Dam would be slightly greater than that of Grootfontein Dam and could supply about 4700 ha of irrigation. The dam would serve the same areas and have the same infrastructure requirements and impacts as those of the Grootfontein Dam as described in Section 3.3.4 above.

3.4.5 Resource Poor Farmers

The number of potential resource poor farmer beneficiaries would be slightly greater than those for the Grootfontein Dam as described in Section 3.3.5 above.

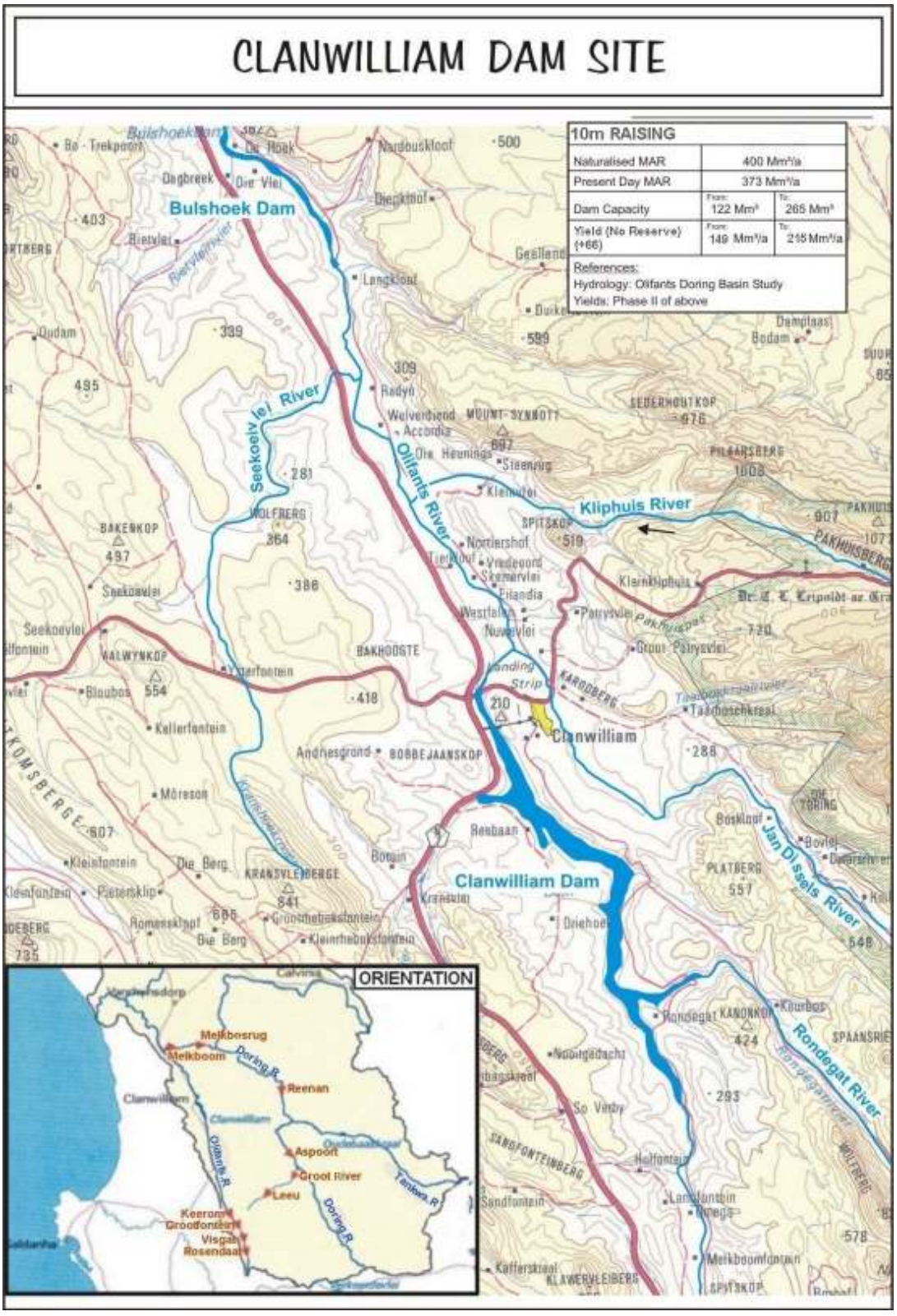


Figure 3.5 Clanwilliam Dam Site

3.5 RAISING CLANWILLIAM DAM

3.5.1 Location

The existing dam wall at Clanwilliam Dam could be raised by up to 15 m. This was investigated as part of Phase 2 of the Olifants/Doring River Basin Study (August 2003).

3.5.2 Engineering and Financial

DWAF is in the process of planning remedial work to the Clanwilliam Dam wall. This is necessary to ensure that the dam is able to comply with current dam safety standards. The option favoured to improve the stability of the structure is to add a rollcrete section to the downstream side of the wall. This offers an opportunity to simultaneously raise the dam wall and increase the yield at what appears to be a favourable incremental cost. The dam was last raised (by 6,1 m) in 1962 to provide its current storage capacity of 122 million m^3. The historical firm yield for three potential raisings with and without preliminary EFR (Reserve) scenarios are presented in Table 3.1.

Table 3.1 Historical Firm Yields for Clanwilliam Dam Raising

Raising	FSL (MRL)	Capacity (Mm^3)	Historical Firm Yield (Mm^3/a)			
			NO RESERVE		WITH PRELIMINARY RESERVE	
			Total Yield	Increase	Total Yield	Increase
0	104.41	122	149		131 (1)	
				36		15
5 m	109,41	185	185		146	
				66		**30**
10 m	114,41	265	215		161	
				86		40
15 m	119,41	362	235		171	

(Ref Possible Raising of Clanwilliam Dam Study, 2003)

(1) No releases for EWRs are currently made from Clanwilliam Dam. If the Preliminary Reserve Scenario used in Table 3.1 were to be applied to the existing dam, it would reduce the current yield by about 18 million m^3/a (from 149 to 131 million m^3/a)

From an engineering perspective, the costs associated with a raising of 5 m would not be economical. A 15 m raising on the other hand would have significant impacts in terms of land expropriation and re-alignment of existing main roads. Depending on the EFR, a 10 m raising would just meet the current demands. Any additional increase in yield could be taken up by the development of more irrigated areas. Furthermore, Water Conservation and Demand Management (WC/DM) in the agricultural sector must play its role in the provision of water to support further irrigation development.

Table 3.2 provides a comparison of the capital costs associated with each of the three raising options. These are based on the assumption of no Reserve.

Table 3.2 Comparative Capital Costs of Three Raising Options

Raising	Net Additional Yield (Mm^3/a) (1)	Construction Cost (2)	Ref Date (Year)	2004 Equivalent Cost (escalation @ 8% p.a.)	Cost:Yield Ratio (1)
5 m	36 (15)	R70 million	2003	R76 million	2,1 (5)
10 m	66 (30)	R106 million	2003	R115 million	1,7 (3,7)
15 m	86 (40)	R173 million	2003	R187 million	2,2 (4,7)

(1) Figures in brackets indicate the yields after Preliminary Reserve Estimates have been allowed for.
(2) Excludes cost of replacement of infrastructure and dam safety remediation costs.

3.5.3 Using Catchment Storage Draft Curves – Clanwilliam Example

As a cross check, the WR90 Catchment Storage Draft Curves were used to determine the incremental yield of a 10 m raising of Clanwilliam Dam, taking the existing catchment storage into account. The results were then compared to the raised Clanwilliam Dam yield reported in the ODRB Study, Phase 2 (2003).

For a 10m raising of Clanwilliam Dam, the incremental yield increase derived from the curves (98% assurance) is about 68 million m^3/a (see Figure 3.6 overleaf). This compares favourably with the figure of 66 million m^3/a reported in the Olifants Doring Phase 2 Study "*Possible Raising of Clanwilliam Dam*" (2003). Furthermore, that study indicated that the Preliminary Reserve has an impact on the net additional yield of between 42% and 46%, depending on the size of the raising (see Table 3.2 - Net Additional Yield).

To allow development options in this report to be compared on an equal basis, the EWRs have not been taken into account. This is due to the complexity associated with the many possible permutations, the uncertainties relating to river classification, the extent of available information and other factors. Where information is available on EWRs, this has been presented for completeness, and clearly indicated.

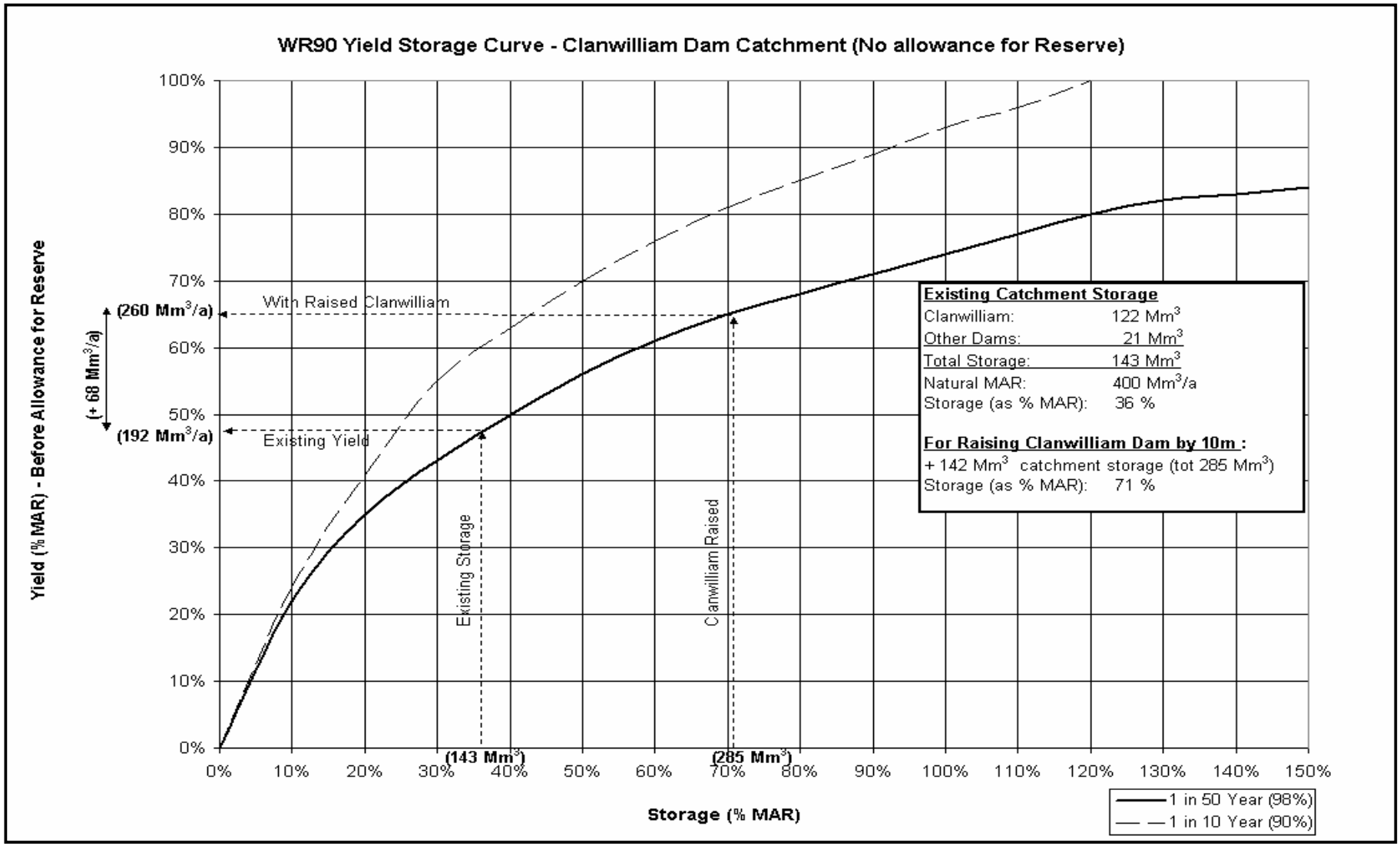


Figure 3.6 The WR90 Yield Storage Curve for the Clanwilliam Dam Catchment

3.5.4 Environmental Overview

Environmental issues associated with a raising of Clanwilliam Dam include:

Barrier and Sediment Effects
A small population of Clanwilliam yellowfish exists between the Clanwilliam Dam and Bulshoek Weir. The existing dam prevents migration of the fish to spawning grounds in the upper reaches of the Olifants River. Raising of the dam would not exacerbate this impact.

Although raising the dam would attenuate flood flows and reduce downstream flows, it would not have a significant effect on downstream sediment dynamics.

Inundation Effects
Depending on the height of the raising, limited areas of indigenous vegetation would be affected. However, irrigated lands, infrastructure (including the N7), and tourist facilities would be inundated.

The dam basin is rich in archaeological material. Many cultural heritage sites have already been lost when the original dam was constructed. Some rock art paintings would need to be removed or recorded, and certain deposits sampled if the dam was raised.

Downstream Effects
A raised dam would further absorb the small floods, which act as spawning cues for fish, unless specific releases were made as part of the Reserve requirements. Currently hypolimnetic water is released from the dam and is colder than the water entering the reservoir, retarding the onset of spawning behaviour in the Clanwilliam yellowfish. If the dam were to be raised, multilevel outlets could be installed which would reduce some of the existing impacts related to temperature and water quality.

The further attenuation of moderate and large floods is likely to have a detrimental effect on the ecologically important estuary and its associated salt marshes.

3.5.5 Beneficiaries, Infrastructure Requirements and Environmental Impacts

The enhanced yield that would be obtained by raising Clanwilliam Dam (or that might be provided by the potential Rosendaal, Visgat, Grootfontein or Keerom Dams) could be utilised to improve the reliability of the supply to the existing irrigation area served by the Lower Olifants River Water User Association (LORWUA). The main crops irrigated are wine grapes, but some table grapes and some vegetables are also irrigated. If additional water were available this could be utilised to:

- expand the irrigated area between Clanwilliam Dam and Bulshoek Weir, and/or
- expand the irrigated area of the LORWUA downstream of Bulshoek Weir, or
- abstract from the river downstream of Bulshoek Weir, or
- use upstream of Clanwilliam Dam.

Irrigation between Clanwilliam Dam and Bulshoek Weir is served by river pump stations and pipelines owned by the individual farmers. Expansion of irrigation in this area would probably

require the expansion of existing river pumping and pipeline schemes and/or the construction of additional schemes by individual farmers.

Irrigation below Bulshoek Weir is mainly via the LORWUA canal system, which extends for approximately 100km from Bulshoek Weir to Ebenhaeser, near the mouth of the Olifants River. This canal system is operated at full capacity during the summer months and there is limited spare capacity during the winter, taking maintenance downtime into account. The infrastructure options for distributing the additional yield are as follows:

- Increase canal usage during peak periods (i.e. operate for 168 hours/week).
- Utilise the limited spare canal capacity that is available in winter to convey and store water in existing dams or in additional dams for later utilization in summer.
- New canal option - not at all feasible due to associated high capital costs.
- Increase the capacity of the canal by raising the canal lining. This cost per meter length of canal would be high and therefore the infrastructure cost would be lower for developments near Bulshoek Weir and very high for a development in the vicinity of Ebenezer at the end of the canal system.
- Release water into the Olifants River below Bulshoek Weir for abstraction by pumping schemes or pipelines further down the river. This takes place currently to some extent but the supply would be more dependable if Clanwilliam Dam were raised. Summer and winter abstraction would be possible up to the confluence with the Doring River. However the poor water quality in the Olifants River below the Doring River confluence during the summer months may necessitate that releases are only made during the winter months when water quality is generally better, requiring more on-farm storage. Pump stations, pipelines would be required to distribute the water, and where water quality is problematic, also dams to store the additional winter water for release during the summer. In the latter case, some additional pumping and pipeline infrastructure is likely to be required to utilize the water in the summer.
- The WODRIS report on Bulk Water Conveyance Options for schemes in the lower reaches of the Doring River proposes that water is released down the Doring and Olifants Rivers for abstraction at a concrete weir at the Mieliepan site near Klawer. From there the water would be conveyed by a new pump station, pipeline and canals to potential available land for irrigation development at Klawer (2 226 ha), and in the Coastal 1 (4 262 ha) and Coastal 2 (4 683 ha) areas. Not all of this land is proposed to be developed and is subject to water availability. The WODRIS report on water quality modelling has not yet been finalised. However, the study assumes that water quality in the Olifants River will be acceptable during the summer as far downstream as the proposed Mieliepan Weir.

The release of additional water from Clanwilliam Dam into the Olifants River during the summer would marginally increase the already contra-seasonal flow pattern in the Olifants River between Clanwilliam Dam and Bulshoek Weir. This would probably aggravate the already adverse impact of the summer irrigation releases on this riverine environment. On the other hand, additional winter and summer releases below Bulshoek Weir would probably be advantageous for this riverine environment, which would naturally have experienced higher summer and winter flows.

If additional areas are to be irrigated then this will result in more of the natural vegetation of this arid area being removed, whereas merely improving the assurance of supply to existing irrigators would have no impact.

3.5.6 Resource Poor Farmers

The Terms of Reference of the Feasibility Study for the Raising of Clanwilliam Dam stress that the water made available by this scheme should be utilized for the benefit of resource poor farmers. Representatives of DWAF, the Department of Agriculture and the Department of Land Affairs comprise the Coordinating Committee for Agricultural Water (CCAW) charged with facilitating the needs of resource poor farmers and in particular access to land, water, finance and expertise.

A number of schemes have been investigated for assisting resource poor farmers, including the Aspoort Scheme and various options identified by the WODRIS. Other investigations have focussed on resource poor communities including facilitating access to municipal commonage for farming activities.

Resource poor farmers in the Olifants/Doring WMA have benefitted from a variety of schemes. The following are some of the possible ways that resource poor farmers could benefit from the additional water that would be made available by the raising of Clanwilliam Dam:

- Resource poor farmers could benefit from the additional water supply through joint ventures with existing commercial farmers. These joint ventures might have various forms such as:

  - The farmer would allocate a portion of his property to his farm workers. Finance for the water supply infrastructure and agricultural development might either be provided by the farmer or possibly from a state subsidy. The section of the farm allocated to the resource poor farmers would probably be farmed as a part of the main farm but separate accounts would be kept. The profits of that portion of the farm would be shared by the resource poor farmers.

  - The farmer might also allocate shares in his existing farm to his farm workers possibly in accordance with an agreement with DWAF that an additional water allocation would be made available to the farm.

- Resource poor farmers could be assisted to develop their own farms on land currently owned by them, or on land purchased from established commercial farmers. The WODRIS Social Assessment Report mentions that there are existing resource poor farming communities at Klawer, Vredendal and Ebenhaeser. Restitution claims have been lodged around Lutzville in the Knersvlakte and some Coastal Region farms. The cost of upgrading the canal system as far downstream as these areas would be very high. Therefore the option of pumping winter water from the river into on-farm storage dams for use in summer, is likely to be more economically viable for these communities.

If citrus, wine grape or export table grape farming is to be undertaken, then joint venture farming is likely to be more successful on account of the high technology and relatively complicated marketing requirements (unless existing cooperative cellars are utilised). Cash crop vegetable farming is likely to be more easily practiced by individual resource poor farmers, provided that adequate economic returns can be achieved.

3.6 ADDITIONAL FARM DAMS IN THE OLIFANTS RIVER CATCHMENT

The draft Olifants/Doorn ISP (2005) has identified that up to 14 million m^3 of additional farm dam storage could be developed in the Upper Olifants (i.e. upstream of Clanwilliam Dam). This could be expected to yield an additional 10 million m^3/a. The draft ISP recommends that in terms of developing farm dam storage, only off-channel storage be implemented and that only surplus winter water be abstracted for storage. This is attributed to the fact that based on the existing infrastructure in place, the upper Olifants catchment is in balance and no surplus yield is available.

The development of small farm dams in the upper Olifants River catchment could avoid many of the environmental impacts associated with large on-channel structures. However, releases for the Reserve from farm dams are more difficult to manage and control, resulting in impacts on tributary streams that are potentially as severe as those of large dams. These dams are likely to decrease river flow, retard winter flood flows, and transform the headwater tributaries, resulting in loss of habitat for the small fish species inhabiting these reaches. However the collective impacts of farm dams may be less than those of large dams, if Reserve releases from farm dams can be managed.

There may also be opportunity to develop additional farm dam storage in the catchment of the Doring as described in Section 4.8 of this document.

3.6.1 Beneficiaries, Infrastructure Requirements and Environmental Impacts

The Citrusdal WUA irrigators are currently allowed, in terms of their permit conditions, to construct off-channel farm dams with capacities equal to half their annual allocation to be filled by pumping during the winter months. Not all of the irrigators have provided such storage which has resulted in the summer flows being heavily impacted with the result that the expected Reserve requirements cannot be met. DWAF is supportive of efforts to reduce the need for summer pumping from the Olifants River, in order to pave the way for the eventual implementation of the Reserve. If the Clanwilliam Dam is raised, consideration could be given to increasing the allowable off-channel storage upstream to more than 50% of the annual allocation, in order to enable the summer Reserve requirement to be met, and possibly to increase the area under irrigation.

The main infrastructure would comprise the off-channel dams and possibly additional pipelines and pumping stations. The off-channel dams themselves would mostly impact on the local environment.

3.6.2 Resource Poor Farmers

In this predominantly high technology citrus farming region of the catchment, resource poor farmers would probably benefit most through joint ventures with existing commercial farmers although some individual resource poor farms have been established on Clanwilliam Municipality's commonage as discussed in Section 3.5.6 above.

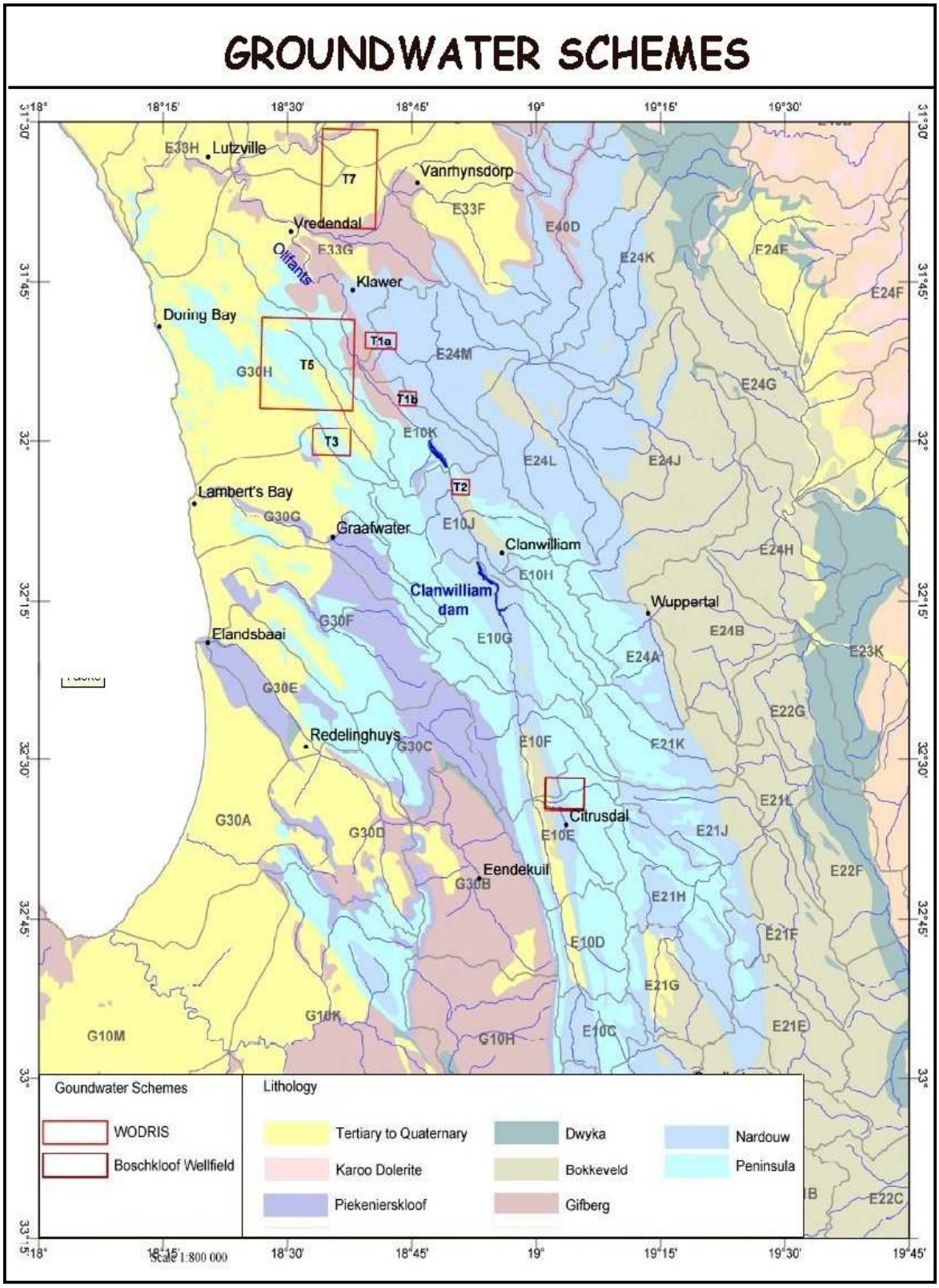


Figure 3.7 Groundwater Schemes

3.7 GROUNDWATER SCHEMES

3.7.1 The Bulshoek T2 Project - Conventional Wellfield

The target zone for wellfield T2 is situated close to the Bulshoek Barrage. It is conservatively estimated that this wellfield should yield 1,6 million m^3/a from five boreholes. In a realistic "safe" case, a yield of 2,1 to 3,2 million m^3/a, pumped over 8 months, is considered possible.

If the groundwater is to be piped into the Bulshoek Barrage, which has a capacity of 6 million m^3, it is preferable to pump only in the summer months (viz. November to April). However, distribution of this water may be limited by the capacity of the downstream canals at particular times.

Scheme Name	Yield (Mm^3/a)	Costs			Date and source of information
		Capital (R million)	Operation & Maintenance (R million/a)	Relative Cost or URV (R/m^3)	
T2	3,2 min	11,16	0,41	0,35 (1)	Umvoto, 2005

1. URV based on 6% discount rate over 50 years.

Environmental aspects

The Upper Peninsula Formation, in which this wellfield is located, is in an area where the Klawer Fault and the Clanwilliam Fault meet in a splay extending to the east of the Bulshoek Barrage. There are anecdotal reports of significant springs along the Bulshoek transfer zone that potentially could be impacted on by large-scale abstraction in this target zone. Production would be from the relatively unconfined Peninsula Aquifer, and a management factor to consider is that the springs currently discharge into the Bulshoek Barrage. Consequently, it is possible that high levels of abstraction could induce flow from the dam into the aquifer. If considered as a conjunctive supply scheme the purpose would be to take advantage of the additional underground storage facility and the high recharge in the Krakadouw Mountains along the fault strike to the south-east.

3.7.2 The Skurfkop Syncline T3 Project - Conventional Wellfield

The target zone for wellfield T3 is situated at approximately 270 masl. It is conservatively estimated that four boreholes would be required to yield 1,26 million m^3/a. In a realistic case a yield of 1,7 to 2,5 million m^3/a, pumped over 8 months, is considered possible.

It is proposed that groundwater be pumped at a minimum rate of 40 λ/s by booster pump to cross a low divide of 380 masl from where the water can gravitate into the left bank canal of the Olifants River Government Water Scheme (ORGWS). This would require a rising main of approximately 9 500 m and a gravity section of 4 500 m. The pipeline route would follow the existing road.

Because the required infrastructure is expensive relative to the proposed wellfields T1 and T2, it may be preferable to develop this wellfield only for local use. This alternative is considered in a composite project, including Projects T1 and T2, titled Project T5 below.

Scheme Name	Yield (Mm^3/a)	Costs			Date and source of information
		Capital (R million)	Operation & Maintenance (R million/a)	Relative Cost or URV (R/m^3)	
T3	2,5 min	14,19	0,33	0,49 (1)	Umvoto, 2005

1. URV based on 6% discount rate over 50 years

It should be noted that during a later stage of the WODRIS, it was indicated that T3 has been locally more exploited (confirmed during a hydrocensus) than previously considered.

Environmental aspects

The target zone lies along the Skurfkop Fault and this fault could allow sub-surface discharge from the TMG Aquifer into the sands of the G30H Quaternary catchment. This would effectively result in a natural inter-basin transfer from the E drainage basin into the G30H catchment. There could be hidden seep zones in this arid, poorly known and poorly documented area, although there is no apparent topographic expression of seep zones, other than the elongated upper valley of the Sandlaagte which is proposed as a storage facility in Project T5.

3.7.3 The Upper Sandlaagte Valley T5 Project - Aquifer Storage Recovery

This project is based on the storage potential in the palaeo valley of the Sandlaagte River. This storage capacity is viewed as three subsections (S1, S2, S3) of which S3 is currently being abstracted from. The three sections are assumed to be hydraulically connected but with zones of restricted transmissivity values dividing each section from the other. The total combined storage is estimated to be 80 to 90 million m^3 in S1 and S2.

All water supply from the proposed wellfields T1, T2 and T3 would be conveyed to a common point and then pumped over the water divide between the Olifants River and the Sandlaagte catchments so as to recharge the Sections 1 and 2 of this aquifer. If after a reasonable period of monitoring either the volumes pumped can be increased or the length of the pump cycle can be increased, it is anticipated that this yield could increase up to 20 million m^3/a.

The proposed point of abstraction from the Olifants River is south of Klawer and thus the volumes available for recharging the primary aquifer could include both water from the left bank canal of the ORGWS and the Olifants River as well as the Doring River during high flows. It is suggested that an off-channel pump sump delivering 1.3 m^3/s (i.e. 20 million m^3 over a 6 month pumping period) would pump water into a pipeline following an existing road over the low ridge northwest of Trawal (280 masl). From there it would gravitate to the recharge wellfield at approximately 220 masl.

Twenty six recharge boreholes could be situated 350 m apart, each injecting up to 50 λ/s. Abstraction of up to 50 λ/s would be via the same injection boreholes. The water would be reticulated using two rising mains to a level of 320 masl. This assumes that any future distribution canal would be constructed at this level in order to distribute to the arable land below.

In costing this project additional water from the surface supply options was not considered, although the storage capacity in S1 and S2 would allow for up to 90 million m^3 to be stored. This

storage volume could be accumulated over a number of years, as confidence in the scheme developed and initial teething problems are resolved.

The purpose of this project or scheme would be to abstract up to 20 million m^3 from the TMG Aquifer in the winter months between March and November (or from surface water) and to artificially recharge the primary aquifer (S1 and S2) from which it can be abstracted during the summer.

The position of the recharge and/or abstraction boreholes would be based on more detailed investigation and characterisation of the aquifer as well as the potential irrigation areas identified.

Scheme Name	Yield (Mm^3/a)	Costs			Date and source of information
		Capital (R million)	Operation & Maintenance (R million/a)	Relative Cost or URV (R/m^3)	
T5	20 min	422 (2)	20 (2)	0,82 (1)	Umvoto, 2005

1. URV based on a 6% discount rate over 50 years.
2. Costs include pumping of water from river and other wellfields into ASR Scheme.

Environmental aspects

Aside from "site footprint" (area of land impacted by the required wellfield infrastructure) considerations the primary environmental concern would be the impact of raising the water table in the unconfined to semi confined primary aquifer in the Sandlaagte Valley. It is not known if sensitive ecosystems or important biodiversity sites have been identified in the area. An ecological assessment of the area is required. It should be noted that significant changes in the natural habitat have already occurred as a result of dry land agriculture.

3.7.4 The Vanrhynsdorp T7 Project - Aquifer Storage Recovery

A storage capacity of 121 million m^3 in the fractured limestones was used for the calculation. An off-channel concrete pump sump on the Olifants River close to Vredendal is proposed with an abstraction rate of 7,7 m^3/s, i.e. 121 million m^3 pumped over six winter months using 8 pumps each delivering 1 m^3/s. The water would be pumped via a rising main to 154 injection wells spaced 500 m apart. Each well would inject water into the storage aquifer at a rate of 50 λ/s. The wellfield would be spread over a 5 km by a 7,5 km area. The same boreholes used for recharge would be used for abstraction.

The potential storage facility is the confined fractured limestones located beneath an older land surface covered by red aeolian sands. It is situated around the divide between the Vars and the Troe-Troe Rivers' channels west of Vanrhynsdorp in an extremely arid area. The rivers flow during flash floods and the aquifer is apparently no longer being actively recharged and as yet no farfield lateral recharge potential has been identified.

The primary cost component is the winter and summer pumping and the extensive pipe network for the distribution and collection of water.

Scheme Name	Yield (Mm^3/a)	Costs			Date and source of information
		Capital (R million)	Operation & Maintenance (R million/a)	Relative Cost or URV (R/m^3)	
T7	121 ave	150 (2)	4,42 (2)	0.12 (1)	Umvoto, 2005

1. URV based on 6% discount rate over 50 years.
2. Costs exclude pumping of water from river into ASR Scheme.

Environmental aspects

It is suggested that the greatest environmental impact would be the site footprint resulting from the development. This development would occur in an area of new agricultural development which is already undergoing complete change. The groundwater development scheme would likely be obscured within the agricultural development. There could be aquifer ecology impacts arising from the different chemistries (acidic and unbuffered) and possibly microbiologies and microfauna of the waters (surface and TMG) being pumped into the alkaline and buffered waters of the limestone aquifer.

The T7 Scheme was not considered during WODRIS due to the problems associated with the water quality within the limestone aquifer.

3.7.5 Conjunctive Use

During the CAGE project the Water Resources Yield Model (WRYM) for the catchment area above Clanwilliam Dam was run using different operating rules. In one extreme, groundwater from the Peninsula Aquifer of the TMG was always pumped to the Clanwilliam Dam and, in the other extreme, only when the dam was empty. The effective exploitable storage for these reservoirs, *viz*. east, central and west are 200, 750 and 80 million m^3, respectively. The eastern and western reservoirs are unconfined and the central is confined.

The study concluded that conservatively 45 million m^3/a would be available to the four Water Users Associations without negative environmental impact if conjunctive use was implemented, which would give an increase in the historic firm yield of the Clanwilliam Dam of 20%.

Scheme Name	Yield (Mm^3/a)	Costs			Date and source of information
		Capital (R million)	Operation & Maintenance (R million/a)	Relative Cost or URV (R/m^3)	
CAGE	45 min	-	-	-	Umvoto, 2000

Environmental aspects

Over wide areas in the middle part of the E10 catchment, the potentiometric surface may be hundreds of metres above the buried top of the Peninsula aquifer. Locally, drawdowns very much larger than 10 m are theoretically possible (at least up to a maximum economic pumping depth of ~100 m) without in any way impacting on the aquifer's saturated thickness. Furthermore, with sufficient knowledge of other aquifer properties such as hydraulic conductivity, well field sites can be strategically selected to ensure that, during the summer pumping season, the surrounding cones of depression rarely, if ever, impact on exposed aquifer boundaries where base flow at springs can be affected. In the event that this occurred, it would be appropriate to supplement surface flows accordingly or evaluate the cost benefit and most water efficient approach to storage.

3.7.6 Citrusdal-Boschkloof Wellfield in confined Peninsula Aquifer

This wellfield has been partially developed to supply Citrusdal. It could be expanded to supply other users. The CAGE Study (1998) estimated that the existing abstraction from this wellfield was 1,5 to 2,0 million m^3/a.

Regrettably this study has not been able to obtain actual URV costs for this wellfield nor current information on usage and management of the wellfield. Current costs based on hard data for the Hermanus wellfield result in a URV of 70 c/m^3. Even if the costs of undertaking development of a regional monitoring infrastructure and monitoring protocols (for which the costs should not strictly be assigned to a particular scheme), and costs for development further away from existing infrastructure are added, the URV will not be more than 100 c/m^3.

Scheme Name	Yield (Mm^3/a)	Costs			Date and source of information
		Capital (R million)	Operation & Maintenance (R million/a)	Relative Cost or URV (R/m^3)	
Citrusdal-Boschkloof	1,48 (Umvoto Report)	J.Conradie will look for	Not available	Not available	Deon Wasserman of Municipality 027-4828000 Johan Conradie (KweziV3) 022-7132288

4. SURFACE WATER AND GROUNDWATER SCHEME OPTIONS : DORING RIVER CATCHMENT

Unless otherwise stated, the yields of the potential surface water schemes presented in 4.1 to 4.8 do not include any allowance for EWRs nor any allowance for downstream compensation releases.

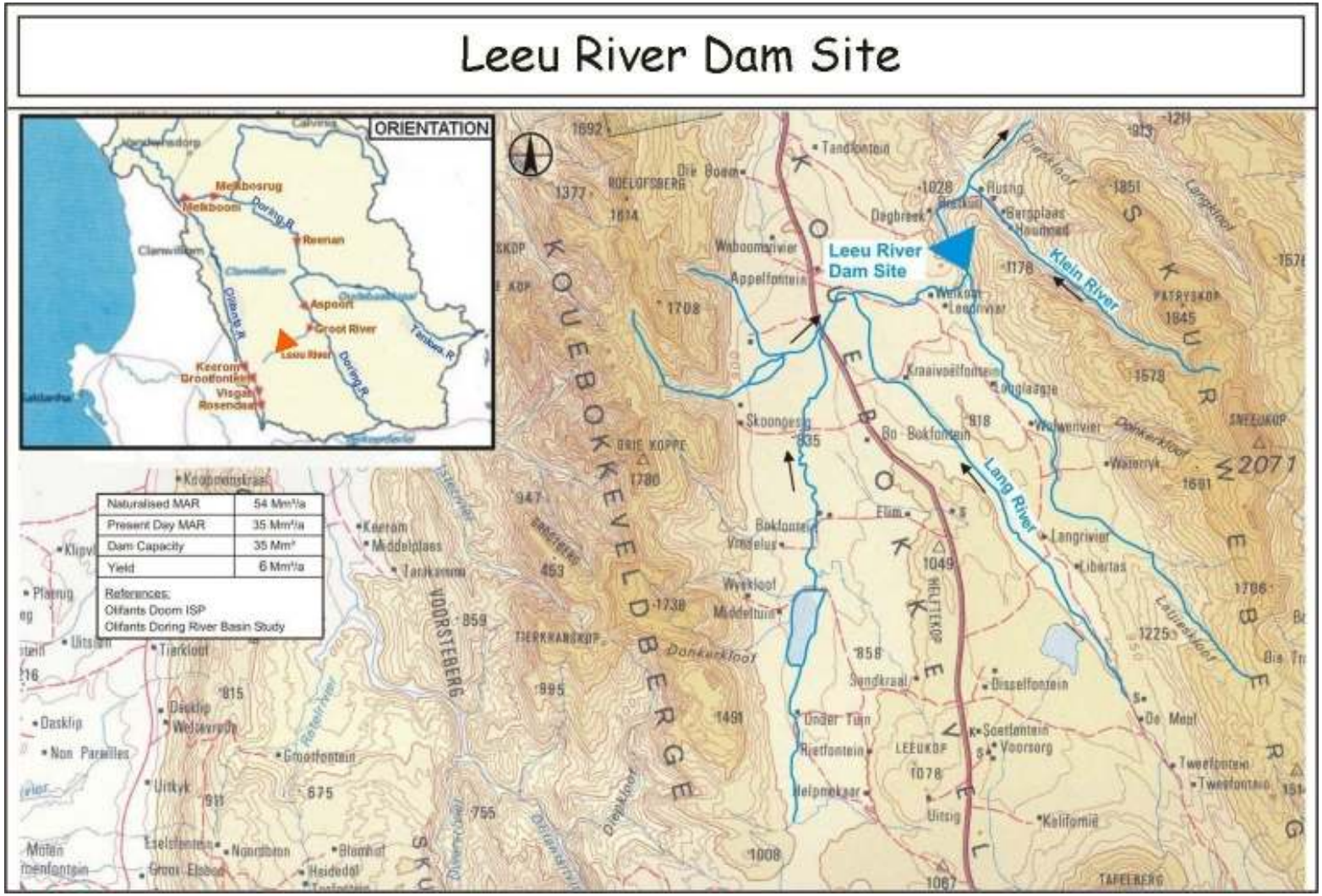


Figure 4.1 Leeu River Dam Site

4.1 LEEU RIVER DAM SITE

4.1.1 Location

A potential dam site had been previously identified in the Kouebokkeveld, on the Leeu River tributary of the Groot River. The Groot River is a major tributary of the Doring River. This is the uppermost dam site identified within the Doring River catchment. The site is located just upstream of the confluence of the Leeu and Klein Rivers.

4.1.2 Engineering and Financial

Mention is made of this site in the Olifants/Doring River Basin Study (1998), but no financial information is provided. A 1 MAR dam would have a capacity of 35 million m^3 and would yield only 6 million m^3/a (before any compensation releases). The low net yield being attributed to evaporation losses of 12 million m^3/a. Consequently, this is not considered to be a very favourable site.

4.1.3 Environmental Overview

There does not appear to be any previous screening of this development option.

4.1.4 Beneficiaries, Infrastructure Requirements and Environmental Impacts

The Leeu River dam site is situated far downstream in the Kouebokkeveld. Water could probably be pumped back upstream into the Kouebokkeveld, but at the high cost of pumping this is likely to make this option economically not viable. Alternatively, water could be released for abstraction a considerable distance downstream in a remote area where there is currently little development and the potential for development is very uncertain. Therefore the potential benefits of developing this scheme are also very uncertain.

The main impacts of the scheme would be the inundation and barrier effects and the effect on the riverine environment including the impacts on floods. The increased summer releases would probably replace some of the summer flows lost on account of the construction of dams in the Kouebokkeveld, however the irrigation releases would result in some reversal of seasonality.

4.1.5 Resource Poor Farmers

The establishment of resource poor farmers in joint venture with commercial farmers or as independent farmers is more likely to be viable in the Kouebokkeveld, where there are well established farms and farming practices, than further downstream where there is little or no development.

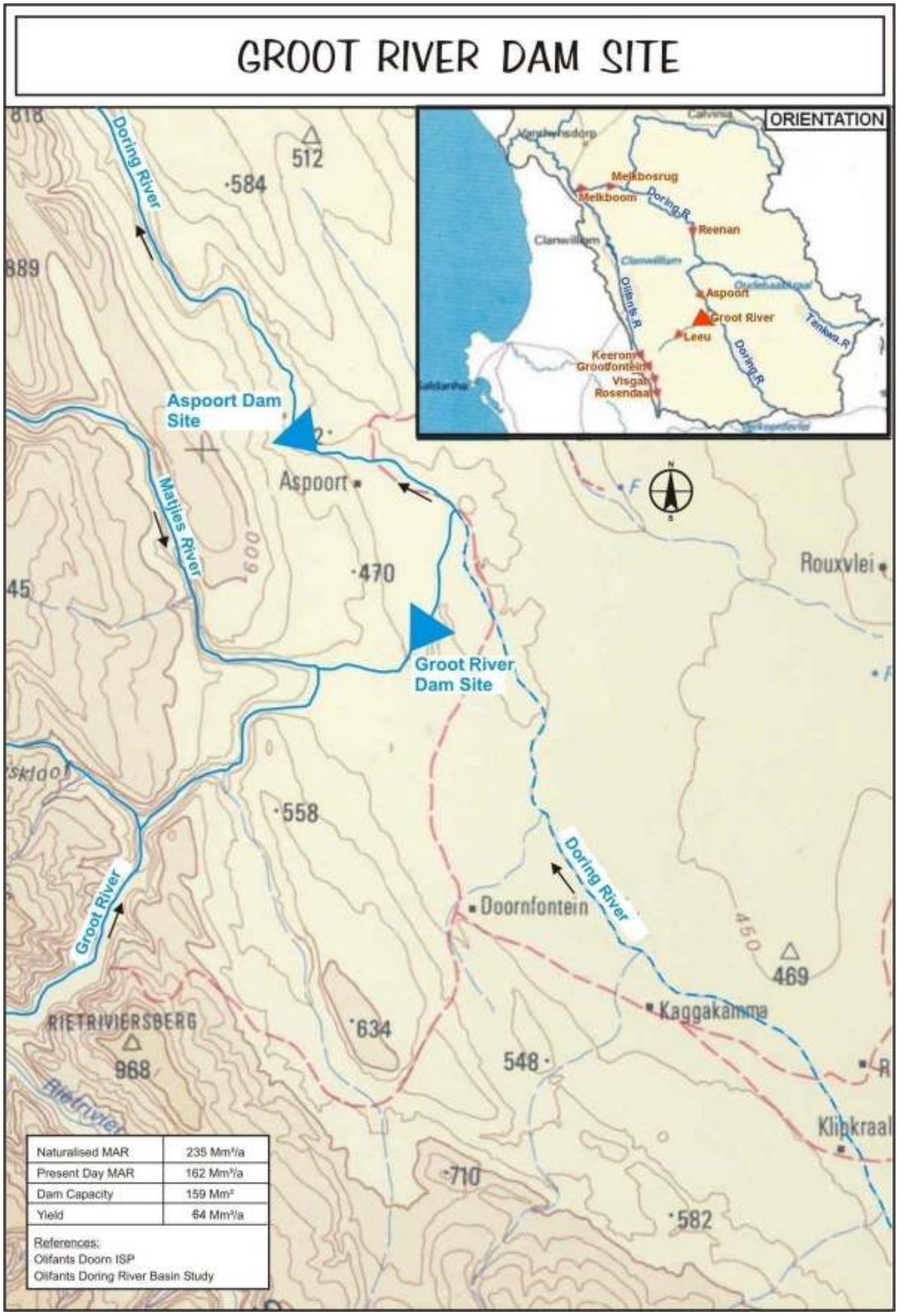


Figure 4.2 Groot River Dam Site

4.2 GROOT RIVER DAM SITE

4.2.1 Location

The Groot River Dam site is situated on the Groot River, the major tributary of the Doring River. The site lies downstream of the confluence with the Matjies River on the farm Elandsdrift.

4.2.2 Engineering and Financial

The potential dam was investigated during the Olifants/Doring River Basin Study as an alternative to Aspoort Dam. It would supply water to the proposed Aspoort Scheme along the Doring River or to the Tanqua Scheme in the Tanqua River valley.

A concrete gravity section and central spillway were considered. A 1 MAR dam would be 75 m high and have a storage capacity of 159 million m^3 and yield about 64 million m^3/a (before any compensation releases). The dam would have a total crest length of 2 900 m. Approximately 348 000 m^3 of rollcrete would be required for the construction and about 65 000 m^3 of excavation.

The financial costs associated with the dam are :

Yield Mm^3/a	Construction Cost	Ref Date (Year)	2004 Equivalent Cost (escalation @ 8% p.a.)	Cost:Yield Ratio
64	R129 million	1998	R205 million	3,2

(Ref : Olifants Doring River Basin Study)

4.2.3 Environmental Overview

The Groot River provides the major freshwater input into the Doring River system. Almost half of the annual flow in the Doring River, at its confluence with the Olifants River, is generated within the catchment of the Groot River.

Environmental issues associated with the potential Grootrivier Dam include:

Barrier and Sediment Effects
The height of the proposed dam wall would preclude the passage of fish between the Doring and Groot Rivers. The migration in the Doring River of the three large cyprinid fish species endemic to the Olifants-Doring system would be halted. The spawning areas upstream of the dam would be unavailable to these fish. Fish trapped upstream of the dam would not be able to migrate downstream to their over-wintering areas in the lower Doring and Olifants Rivers. The dam would therefore constitute a significant barrier. Sedimentation effects are not likely to be severe due to the relatively low sediment loads.

Inundation Effects
The Groot River Dam would inundate areas of indigenous terrestrial and riparian vegetation. The dam would inundate some cultural heritage sites and may affect unique and highly important archaeological sites downstream.

Downstream Effects

The Groot River provides almost half of MAR of the Doring River. A dam on the Groot River would result in winter floods being delayed, attenuated or completely removed. Less water entering the middle Doring would reduce the dilution effect of the saline water from the upper Doring, Tankwa and other rivers draining the Tankwa Karoo. The increased salinity could have a negative effect on flora and fauna sensitive to salinity changes.

4.2.4 Beneficiaries, Infrastructure Requirements and Environmental Impacts

The Groot River Dam site is situated in a remote area where there is little or no existing development. The construction of a dam at this site would probably preclude the construction of further dams on the Doring River or off-channel dams to be filled from the Doring River, such as the Brandewyn Dam, which is described in Section 4.7 below. As mentioned above, the Groot River Dam would be an alternative to the Aspoort Dam for serving the proposed Aspoort scheme where suitable soils are available. Water would be released down the Doring River and abstracted at a weir downstream of Elandsvlei from where it would be pumped to a balancing dam and also directly to the land to be irrigated. About 2800 ha of table grapes, wine grapes and citrus could be irrigated from this dam.

The water released down the river for abstraction might reinstate some of the lost summer flows over the reach of river between the dam and the diversion weir, but might also result in elevated summer flows that are detrimental to the riverine environment. The irrigated areas at Aspoort as well as pumping, pipeline and possibly also canal infrastructure would impact directly on certain natural areas.

4.2.5 Resource Poor Farmers

The Northern Cape Provincial Government was interested in establishing a substantial irrigation development for resource poor farmers at the proposed Aspoort Irrigation Scheme. The Groot River Dam would serve this proposed farming development, however the Aspoort Dam was found to be economically more favourable if zero value was placed on the much higher evaporation losses of the Aspoort Dam. That dam was investigated in some detail as described in Section 4.3.5 below.

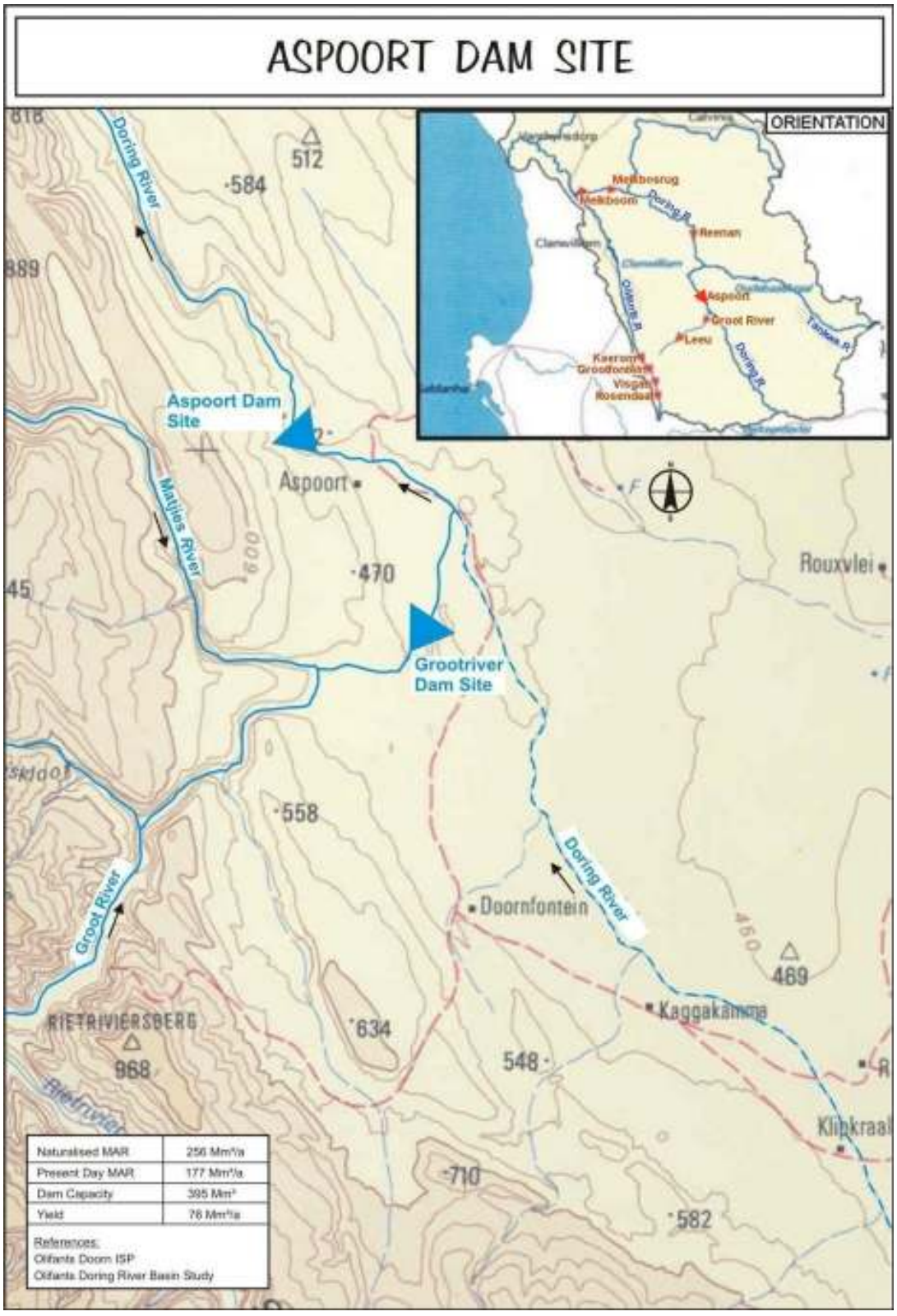


Figure 4.3 Aspoort Dam Site

4.3 ASPOORT DAM SITE

4.3.1 Location

The potential Aspoort Dam would supply water to the proposed Aspoort Irrigation Scheme. The dam site is located at the head of a canyon, downstream of the confluence of the Groot River and the usually dry Upper Doring River.

4.3.2 Engineering and Financial

The proposed Aspoort Dam would consist of a rollcrete gravity section, a main spillway and an emergency spillway embankment on the right flank. A dam of 395 million m^3 capacity would yield approximately 76 million m^3/a (before any compensation releases), assuming no further upstream development. This is equivalent to a 2,2 present day MAR dam, which would be approximately 44 m high. Depending on the height of the dam, any dam with a storage level above 401 masl would require one or more saddle embankments on the right bank, from about 2 km to 8 km upstream of the dam.

The financial costs associated with the dam are :

Yield Mm^3/a (1)	Construction Cost	Ref Date (Year)	2004 Equivalent Cost (escalation @ 8% p.a.)	Cost:Yield Ratio
76	R63 million	1998	R100 million	1,3

(Ref : Olifants/Doring River Basin Study)
1. For a 2,2 MAR dam.

The most cost effective dam at Aspoort would be one with a capacity of about 200 million m^3/a. This would have a yield of 58 million m^3/a assuming no further upstream development.

4.3.3 Environmental Overview

Environmental issues associated with the potential Aspoort Dam include:

Barrier and Sediment Effects
The proposed dam wall would preclude fish passage. The migration in the Doring River of the three large cyprinid fish species endemic to the Olifants-Doring River system would be halted as the spawning areas upstream of the dam would be unavailable to these fish. Fish trapped upstream of the dam would not be able to migrate downstream to their over-wintering areas in the lower Doring and Olifants Rivers.

The water of the Doring River is rich in sediment. The dam would trap large amounts of sediment that would be detrimental to the river course downstream of the dam.

Inundation Effects

The flat floodplain of the proposed dam site is currently utilised for dry-land agriculture and grazing. Succulent and low karroid shrubs are prevalent in the area. This vegetation is widespread upstream of the proposed dam basin.

Areas of unique rock paintings and stone-age sites are located within the proposed dam basin, which should be seen as cohesive units rather than many sites. The cultural impacts associated with the dam are considered to be significant

Downstream Effects

The Aspoort Dam impoundment would be wide and shallow, leading to higher rates of evaporation thus requiring more water from the system to achieve the same yield as Groot River Dam. High rates of evaporation would also lead to increased salinity in the dam water. Furthermore, abstraction of the low salinity water would have major implications for downstream salinities with concomitant impacts on aquatic fauna and vegetation as well as other agricultural and other users. Although the proposed dam is far from the estuary, a reduction in freshwater and flood inflows is expected to have a negative impact.

4.3.4 Beneficiaries, Infrastructure Requirements and Environmental Impacts

In 1996, the Northern Cape Government investigated six options for the development of a large area of irrigation in the Ceres Karoo area. The proposed development would extend over the farms Morêster, Gemsbokkloof, Zandfontein and Draaikraal, on the right hand bank of the Doring River, downstream of the confluence with the Tanqua River. The scheme would also supply an existing 350 ha irrigation development at Elandsvlei. With no further allocation of water for expansion of existing irrigation development in the Koue Bokkeveld, the maximum size of the Aspoort Scheme would be 3 650 ha with this value decreasing to 3 050 ha should limited development take place in the Koue Bokkeveld. However, if the maximum expansion of the Koue Bokkeveld took place, irrigation at Aspoort would be precluded.

The potential irrigation area is characterised by sparse Succulent Karoo vegetation mainly consisting of low succulents and typical karroid shrubs. The species diversity is considered to be low in comparison to other areas evaluated, and some of the vegetation may be conserved in the Tanqua National Park. The irrigation area may be a barrier to animal migration routes between the Eastern Cederberg and Tanqua.

Water would be released down the Doring River and abstracted at a weir downstream of Elandsvlei from where it would be pumped to a balancing dam and also directly to the land to be irrigated. Apart from the impact of the dam itself on the riverine environment and on the inundated area as described above, the releases from the dam into the reach of river between the dam and the diversion weir would be counter-seasonal and would probably significantly exceed the summer flows lost on account of farm dam development in the Kouebokkeveld. The other main impacts would arise from the development of the proposed Aspoort irrigation area of nearly 4000 ha.

If the Doring River is used as a conduit for irrigation water, then the usual aquatic impacts associated with large changes in seasonality would occur.

A scheme at Aspoort would likely have different effects on the estuary to a scheme lower down the Doring River, as irrigation return flows are unlikely to increase the summer base flows at the estuary, as the return flows will either be abstracted downstream or evaporate.

4.3.5 Resource Poor Farmers

The Northern Cape Provincial Government was interested in establishing a substantial irrigation development for resource poor farmers at Aspoort. The Aspoort Dam was considered to be the most favourable of the options for serving the 4000 ha of table grapes, wine grapes and citrus, which would be irrigated. The remoteness of the area and the lack of similar farming enterprises and infrastructure in the vicinity makes the development of this scheme more uncertain. The Northern Cape Provincial Government in 1998 stated its intention to undertake a pilot study in the area proposed for the major irrigation development. There has been no progress on this to date.

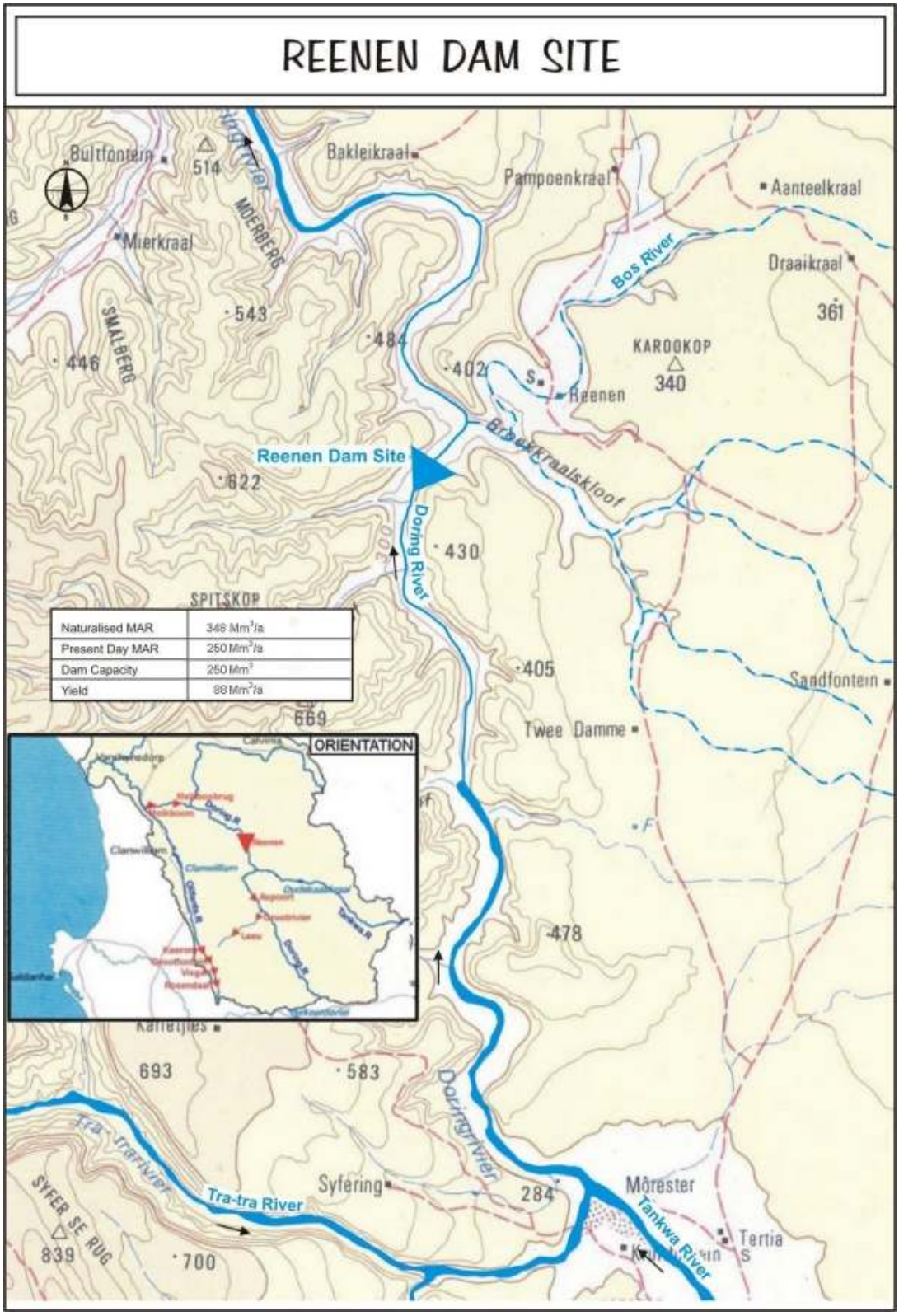


Figure 4.4 Reenen Dam Site

4.4 REENEN DAM SITE

4.4.1 Location

The potential Reenen dam site was previously identified on the Doring River, approximately 2 km upstream of the confluence of the Doring and Bos Rivers.

4.4.2 Engineering and Financial

Originally, this option had been proposed to supply water to the Aspoort Irrigation Scheme. A dam of 1 MAR would have a capacity of 250 million m^3/a and a yield of 88 million m^3/a (before any compensation releases). It was rejected after a brief investigation in the Olifants Doring River Basin Study (1998) because of the relatively high costs associated with the dam, the conveyance infrastructure and associated energy costs.

Figure 4.5 Melkbosrug Dam Site

4.5 MELKBOSRUG DAM SITE

This site was investigated in the 1998 Olifants/Doring River Basin Study and re-assessed in the 2004 Western Cape Olifants/Doring River Irrigation Study (WODRIS).

4.5.1 Location

The potential Melkbosrug Dam site is located on the Lower Doring River, approximately 34 km upstream of its confluence with the Olifants River. The Olifants/Doring Basin Study proposed that the dam should supply water to the Urionskraal Irrigation Scheme. However, WODRIS proposed that the dam, possibly together with a wellfield, supply water to a number of areas along the Lower Olifants River, as described in Section 4.5.4 below.

4.5.2 Engineering and Financial

The WODRIS provides cost estimates for potential dam sizes of 1, 1,5 and 2 MAR. For the purpose of this document, a 1 MAR (400 million m^3/a) dam is assumed. For costing purposes, rollcrete options were costed.

The Olifants/Doring River Basin Study (1998) reported a yield of 116 million m^3/a for a dam of 400 million m^3 capacity. Subsequent information (presented in Table 4.1) from the WODRIS indicates the following yields for two possible ecological classes for the Doring River. The yields are considered in terms of potential upstream development.

Table 4.1 Comparison of Yield Scenarios - Melkbosrug Dam Site (400 million m^3 dam)

Reserve Scenario	Yield (Mm^3/a)		
	No development upstream	1 900 ha development in Kouebokkeveld (KBV) *	Aspoort development plus 1 900 ha in KBV *
No Reserve	116 **	Not available	Not available
Class B Doring River	98 *	80,6	45,3
Class A Doring River	69,5 *	52	17

(Ref : * WODRIS, 2004
** ODRB Study , 1998)

The WODRIS concludes that any development at Aspoort is unlikely. The impact is, however, indicated in Table 4.1 for completeness.

The construction costs associated with a 1 MAR dam (400 million m^3 storage) and yield of 116 million m^3/a (no Reserve) are:

Yield Mm^3/a	Construction Cost (excl. VAT)	Cost: Yield Ratio
116 **	R659 million *	5,7

(Ref : * WODRIS 2004
** ODRB Study, 1998)

4.5.3 Environmental Overview

Environmental issues associated with the potential Melkbosrug Dam include:

Barrier and Sediment Effects
The high dam wall would act as a barrier to fish, preventing migration of the three large cyprinid fish species endemic to the Olifants-Doring River system. This is regarded as a significant ecological impact. Furthermore, the dam is likely to trap large volumes of sediment, which is likely to result in increased erosion of the riverbed and banks downstream of the dam. The river is used for river rafting in the winter. The dam would impact on this activity.

Inundation Effects
The riparian vegetation along the Doring River from below the confluence with the Groot River to the confluence with the Olifants River is unusual in the that it has a mixture of saline or drought tolerant karoid together with fynbos related riparian plants generally found under sweet to acid water conditions. Flooding of the dam basin (1 MAR dam) will lead to a loss of over 45 km of riverine and riparian habitat from the proposed Gifberg Biosphere Reserve and a loss of continuity between the proposed Gifberg and Cederberg Biosphere Reserves. Furthermore the area is rich in cultural heritage sites, including burial sites, which will require additional permits for disturbance. There is a concern that the context of the rock paintings will be lost if the area is inundated.

Downstream Effects
The dam will result in a loss of perennial flow in this section of the river. Spillage from the dam would be infrequent during winter, other than the possible environmental releases. The loss of winter flushing floods is likely to increase the salinity levels of the lower Olifants River. During summer, sub-surface flow below the river bed takes place and intermittent pools are found. Releases from the dam in summer would lead to a reversal of seasonality in that continuous surface flow would occur.

4.5.4 Beneficiaries, Infrastructure Requirements and Environmental Impacts

The Melkbosrug Dam was identified by the Olifants/Doorn River Basin Study as a suitable source of water for the Urionskraal Irrigation Scheme where suitable soils were identified in the Upper Troe-Troe valley. During the WODRIS, the Melkbosrug Dam was identified as being able to supply existing irrigation areas as well as new schemes, namely, the Melkboom irrigation area, the Klawer irrigation area and the two Coastal Region irrigation areas. WODRIS did not consider the environmentally sensitive Atties Karoo irrigation area as a potential area for further irrigation development. The proposed Melkboom irrigation area of 514 ha is located between the Olifants/Doring River confluence in the west and the Gifberg and Nardouwsberg Mountains in the east. The Klawer irrigation area of 2 226 ha is located just north-west of Klawer between the N7

National Road, the R362 Regional Road between Klawer and Vredendal, and south of the Wiedouw River. The proposed Coastal 1 and Coastal 2 areas would comprise up to 4 262 ha and 4 683 ha of irrigable areas respectively.

The preferred development scenarios described in the WODRIS reports comprise combinations of wellfields operated conjunctively with the proposed Melkbosrug Dam or other dams (Melkboom or Brandewyn River), and a large number of distribution options. These proposed bulk distribution infrastructure options include extensive combinations of canals, pump stations and pipelines and a diversion weir on the Olifants River at Mieliepan near Klawer.

The summer releases into the Doring and Olifants Rivers would be contra-seasonal particularly in the case of the Doring River which is currently relatively pristine, and in the case of the Olifants River would probably be in excess of the natural low flow which has been cut off by the Bulshoek Weir and which will reduce as a result of recent repairs to that dam.

The canal infrastructure would impact on the environment mainly on account of the barrier effect, however the greatest impact would arise from the development of natural veld as agricultural land. WODRIS indicates that subject to water availability and irrigable land potential, Melkbosrug Dam could supply about 7 500 ha.

4.5.5 Resource Poor Farmers

The Lower Olifants River is in a unique position in that there is a mix of well-established commercial farmers who have sound technical farming knowledge and aspirant farmers without the commercial expertise, but the desire to start irrigation farming. Various farming models could be applied in this region including joint ventures between emerging farmers and private enterprise to expand existing farms, joint ventures on new developments, the rehabilitation and expansion of existing irrigation schemes or conventional new irrigation schemes. It was recommended in the WODRIS that the crops that are selected for expanded irrigation agriculture be those that have already undergone commercialisation and are therefore based on an established industry. These include wine grape, table grape, vegetable and limited lucerne production.

Figure 4.6 Melkboom Dam Site

4.6 MELKBOOM DAM SITE

As is the case for the Melkbosrug Dam site, the Melkboom Dam site was also investigated in both the Olifants Doring River Basin Study (1998) and the WODRIS (2004).

4.6.1 Location

The potential Melkboom Dam site is located on the Lower Doring River, approximately 11 km upstream of the confluence with the Olifants River. The dam is intended to supply new irrigation developments at Melkboom, Klawer, the Coastal Region, or some combination of these developments. WODRIS has not considered further irrigation development in the environmentally sensitive Atties Karoo Region.

4.6.2 Engineering and Financial

As for the Melkbosrug site, the WODRIS also provides cost estimates for various sizes of a potential Melkboom Dam. A 1 MAR dam (400 million m^3) would provide a yield of 121 million m^3/a before any allowance for the Reserve. Based on the WODRIS, estimates of yield for two Reserve scenarios are shown in Table 4.2.

Table 4.2 Comparison of Yield Scenarios - Melkboom Dam Site (400 million m^3 dam)

Reserve Scenario	Yield (Mm^3/a)		
	No development upstream	1 900 ha development in Kouebokkeveld (KBV) *	Aspoort development plus 1 900 ha in KBV *
No Reserve	121 **	Not available	Not available
Class B Doring River	98 *	80,6	45,3
Class A Doring River	69,5 *	52	17

(Ref : * WODRIS, 2004
** ODRB Study , 1998)

The financial costs associated with a 1 MAR dam (400 million m^3 storage) and a yield of 121 million m^3/a (no Reserve) are :

Yield Mm^3/a	Construction Cost (excl. VAT)	Cost: Yield Ratio
121 **	R667 million *	5,5

(Ref : * WODRIS, 2004
** ODRB Study , 1998)

4.6.3 Environmental Overview

By virtue of the fact that there are currently no impoundments along the Doring River, the river system is a unique one in the area. Environmental issues associated with the potential Melkboom Dam include:

Barrier and Sediment Effects
Similar to Melkbosrug Dam. Refer to Section 4.5.3.

Inundation Effects
Similar to Melkbosrug Dam. Refer to Section 4.5.3. A notable exception being that the inundation length will be less (39 km) with less infrastructure to be inundated than for Melkbosrug Dam.

Downstream Effects
Similar to Melkbosrug Dam. Refer to Section 4.5.3.

4.6.4 Beneficiaries, Infrastructure Requirements and Environmental Impacts

The Olifants/Doring River Basin Study proposed that the Melkboom Dam be developed to supply a new 4 000 ha irrigation scheme at either Klawer or the Coastal Region. The WODRIS investigated this dam and also the Melkbosrug and Brandewyn River Dams as options to be operated conjunctively with wellfields for supplying up to about 7 500 ha of new irrigated areas. The beneficiaries, distribution infrastructure requirements and environmental impacts would be the similar to those described in Section 4.5.4 above.

The environmental effects of the various development options on the Olifants River estuary is dependent on where in the catchment dams are built and where the additional yield is utilised. The water from the proposed Meklboom Scheme would likely be utilised downstream of the confluence between the Olifants and Doring Rivers, and irrigated in relatively close proximity to the river channel. Summer base flows in the estuary would therefore increase due to irrigation return flows. The increased base flows could result in lower salinities in the estuary during the summer, and saline water would not penetrate as far upstream as presently. The Melkboom Dam would likely attenuate the magnitude and frequency of major floods, and trap sediment. This is likely to result in increased scour and a deepening of the estuary.

4.6.5 Resource Poor Farmers

This scheme would serve resource poor farmers as described for Melkbosrug Dam, see Section 4.5.5.

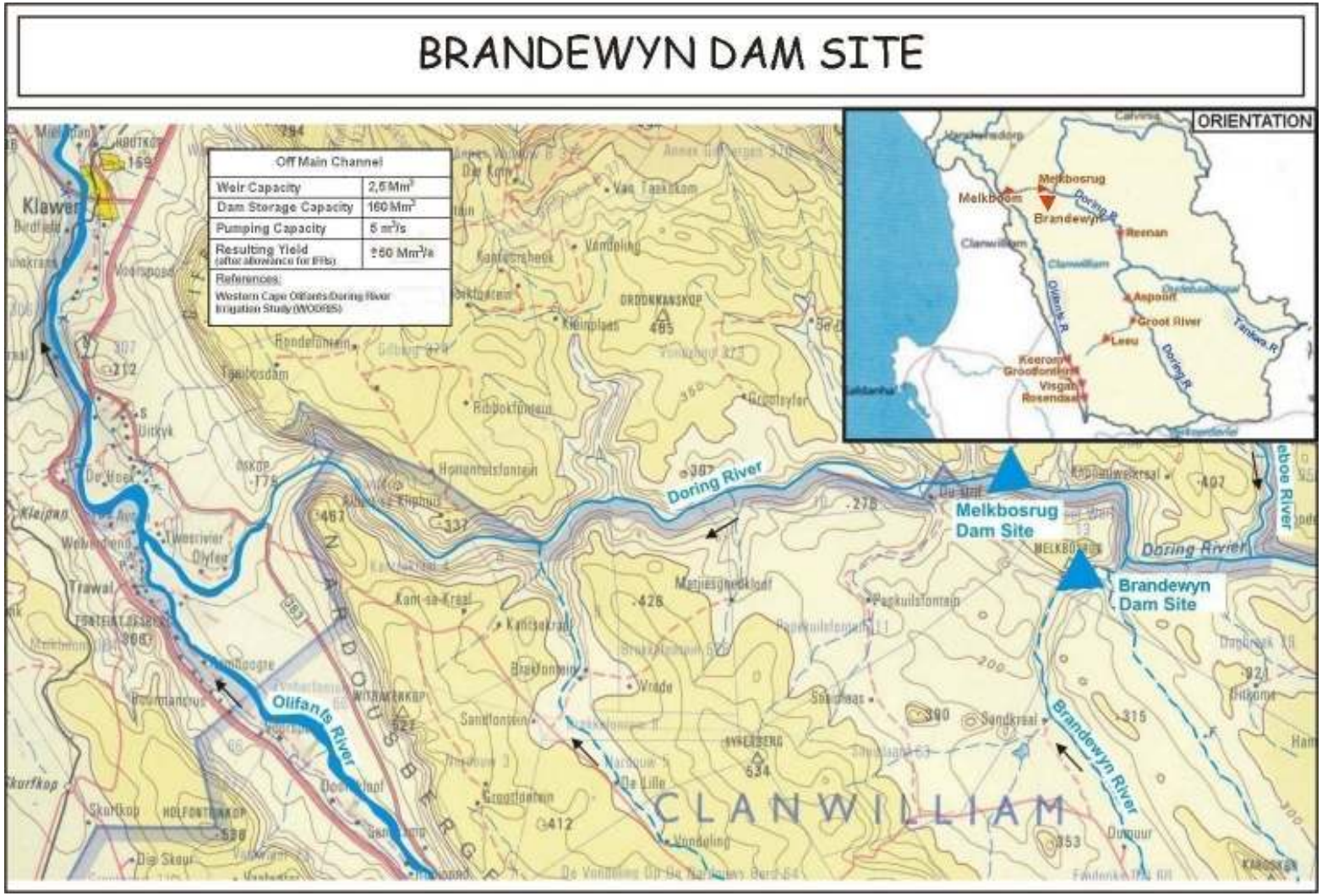


Figure 4.7 Brandewyn Dam Site

4.7 BRANDEWYN DAM SITE

This site was investigated in the WODRIS (2004). The information available on yield calculations *includes* an allowance for instream flow requirements.

4.7.1 Location

The potential Brandewyn Dam is located on the Brandewyn River, approximately 1,9 km upstream of the confluence of the Doring and Brandewyn Rivers. The dam would serve as an alternative to either the Melkbosrug or Melkboom Dams, both of which are on the main stem Doring River. A small diversion weir on the Doring River would be required, from which water will be pumped into the potential Brandewyn Dam.

4.7.2 Engineering and Financial

The engineering assessment is based on the assumption that the Doring River is an Environmental Management Class B and that the EFR associated with that class is met via control of the pumping operation. In so doing, no releases are required from Brandewyn Dam as the EFR is accounted for at the point of abstraction. Table 4.3 indicates the range of potential yields available from the dam for

- various diversion weir capacities
- various pumping capacities
- various storage capacities

Table 4.3 Historical Firm Yields for Proposed Brandewyn Dam

Diversion Weir Capacity (Mm^3)	Pump Capacity (m^3/s)	Brandewyn Dam Storage (Mm^3)	Historical Firm Yield (Mm^3/a) (1)
0	0,5 to 5,0	120 to 220	19 to 52
2	5,0	160	± 50
10	0,5 to 5,0	25 to 250	25 to 68
20	0,5 to 5,0	25 to 280	25 to 78

(1) After Allowance for IFRs as per WODRIS.

The WODRIS concluded that to limit the vertical obstruction of the weir as well as the inundation impact of a 280 million m^3 storage dam, the following limitations were proposed :

- a weir capacity of 2,5 million m^3, allowing for 0,5 of dead storage, and a weir height of approximately 12 m.
- a gross capacity of the Brandewyn Dam of 160 million m^3 (FSL at 181,3 masl).
- a 5 m^3/s pump station.

The resulting firm yields for the above limitations are shown in Table 4.4.

Table 4.4 Firm Yields for Proposed Brandewyn Dam (2,5 million m^3 diversion weir capacity, 5 m^3/s pump station)

Gross Capacity (Mm^3)	Firm Yield (Mm^3/a)
6	7
15	18
26	26
55	41
78	44
112	48
160	52

(Ref : WODRIS, 2004)

The WODRIS proposed that if the Brandewyn Dam option were to be considered, a diversion weir of 2,5 million m^3 storage and a dam of 160 million m^3 would be suitable. This would yield about 50 million m^3/a at an assurance of supply of about 1:120 years.

Earthfill and/or rockfill of sufficient quality is unlikely to be available within the dam basin to construct an embankment dam. Considering that the diversion weir will be concrete and would fall under the same contract as the dam, the concrete option is used for the purpose of cost estimates.

For a rollcrete gravity dam (160 million m^3) and a 2 million m^3 weir on the Doring River, the following construction costs are estimated :

Yield (1) Mm^3/a	Construction Cost (excl. VAT)	Cost: Yield Ratio (2)
50	R351 million	7,0

(1) After allowance for IFRs determined in WODRIS.
(2) Annual pumping costs are likely to be significant, increasing the cost : yield ratio.

4.7.3 Environmental Overview

The Brandewyn Dam was proposed as an alternative to either the Melkboom or Melkbosrug Dams. The effects of constructing the Brandewyn Dam would be similar to constructing the Melkboom or Melkbosrug Dams, however the significance for the system as a whole would be reduced, due to the much smaller scale of the structure and smaller area of inundation. In the WODRIS, the Brandewyn Dam was considered to have less of an overall impact on the environment than either the Melkboom or Melkbosrug Dams. This is achieved by the reduced effect on the flora and archaeological aspects. Specific environmental issues include:

Barrier and Sediment Effects

A pumping weir located on the Doring River would be a relatively low structure, and its barrier effect could therefore be mitigated through the construction of a fish ladder. Sediment effects are likely to be problematic for the downstream reaches.

Inundation Effects

The river vegetation along the lower rocky reaches of the dam basin is typical of that found along footslope mountain streams in. the Fynbos Biome. Construction of the Brandewyn Dam would result in the loss of riparian and valley vegetation of the Brandewyn River and part of the poorly researched Karoid shale vegetation intrusion into the mountain area of the proposed Cederberg Biosphere Reserve complex. These communities do however occur elsewhere in the region. However, the loss of individuals of three rare and endangered plant species is likely.

The extent of the inundation would be 16 km along the Brandewyn River and 5 km along the Doring River. Some 38 cultural heritage sites were located within or near the proposed dam site. Construction of the dam would require the disturbance of two sites containing graves and human remains.

Downstream Effects

The construction of the pumping weir will result in the transformation of the flow regime downstream of the dam and weir, in the Doring River. Medium to large floods would, however, pass through largely unattenuated. Furthermore, the dam is likely to facilitate the invasion of alien fish species.

4.7.4 Beneficiaries, Infrastructure Requirements and Environmental Impacts

The WODRIS investigated this dam as an option operating conjunctively with wellfields for supplying up to about 5 000 ha of new irrigated areas. The beneficiaries, distribution infrastructure requirements and impacts would be similar to those described for the Melkbosrug Dam, in Section 4.5.4

4.7.5 Resource Poor Farmers

This scheme would serve resource poor farmers as described for the Melkbosrug Dam, in Section 4.5.5.

4.8 ADDITIONAL FARM DAMS IN THE KOUEBOKKEVELD

The Olifants/Doorn ISP identified that up to 8 million m^3 of additional farm dam storage could be developed in the Kouebokkeveld. This could be expected to yield an additional 5 million m^3/a. In the ODRB Study, such development was determined to be the most cost effective of all the development options considered. The ISP recommends that in terms of developing additional farm dam storage, releases should be provided for the Reserve at each dam. Nevertheless, these dams are likely to decrease river flow, retard winter flood flows, and further transform the headwater tributaries, resulting in loss of habitat for the small fish species inhabiting these reaches. The combined effect of farm dams is of concern in that it is difficult to manage/ensure Reserve releases. For a single large dam the environmental Reserve releases are more readily enforced.

4.8.1 Beneficiaries, Infrastructure Requirements and Environmental Impacts

The beneficiaries would be the existing commercial farmers, which mainly irrigate deciduous fruit and potatoes. Opportunities could be provided for resource poor farmers.

4.8.2 Resource Poor Farmers

In this predominantly high technology farming region of the catchment, resource poor farmers would probably benefit most through joint ventures with existing commercial farmers rather than purchasing farms for individual or groups of resource poor farmers (although in the Olifants River catchment some individual resource poor farms have been established on Clanwilliam Municipality's commonage as discussed in 4.1.5 above).

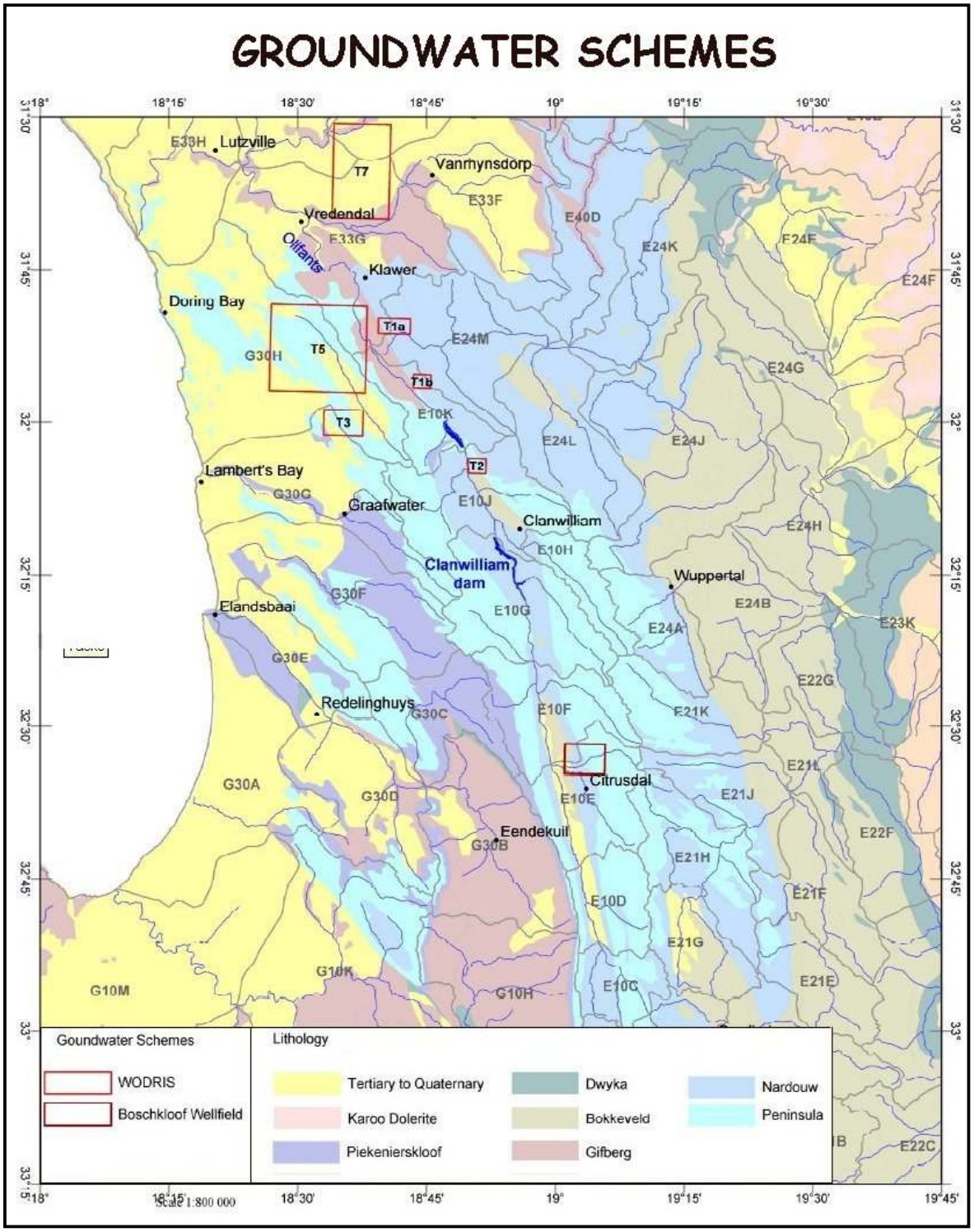


Figure 4.8 Groundwater schemes

4.9 GROUNDWATER SCHEMES

4.9.1 The Klawer Fault T1 Project - Conventional Wellfield

This project comprises two proposed wellfields (T1a and T1b) positioned on the Klawer Fault to abstract groundwater from the Peninsula Formation. It is very conservatively estimated that the combined yield should be over 2,5 million m^3/a from eight boreholes, four in each wellfield. The realistic case is considered to be 2 to 3 times this yield (namely 3,4 to 5,0 million m^3/a over an 8 month pump cycle).

Wellfield T1a is located adjacent to the Doring River and close to the right bank canal of the Olifants River Government Water Scheme (ORGWS) along the Olifants River and so any groundwater abstracted can be pumped directly into the river or the canal with minimal pipework required.

Wellfield T1b is located between the Bulshoek Barrage and the confluence of the Doring River with the Olifants River. It is situated close to the left bank canal of the OGWSS and thus a short length of pipe work would be required to discharge directly into the canal.

For both of these proposed wellfields it was proposed that the water should be pumped and conveyed during the time of the year when there is spare capacity in the canal (March – November). This would require the provision of balancing storage. The alternative being to enlarge the canal.

Scheme Name	Yield (Mm^3/a)	Costs			Date and source of information
		Capital (R million)	Operation & Maintenance (R million/a)	Relative Cost or URV (R/m^3)	
T1a	5 min	12	0,49	0,25 (1)	Umvoto, 2005
T1b	5 min	10,5	0,49	0,23 (1)	Umvoto, 2005

1. URV based on 6% discount rate over 50 years.

Environmental aspects

The production shall be from the confined Peninsula Aquifer. There is no indication in the current data set that this sector of the aquifer contributes to the base flow either via springs or via sub-surface flow. Consequently, it is not expected that abstraction in this area would result in unacceptable impact for either the terrestrial or the aquatic ecology. To enable a more detailed understanding of the surface groundwater interaction in the study area, a detailed and focussed study would be required. It is recommended that datum measurement and monitoring and detailed field inspection of sensitive eco-systems and important biodiversity sites should be undertaken before groundwater production commences.

APPENDIX B

Summary of Groundwater Screening Inputs

CLANWILLIAM DAM RAISING STUDY

SPECIALIST SCREENING WORKSHOP

23 NOVEMBER 2004

Summary of Groundwater Screening Input

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1. INTRODUCTION

This report aims to contextualise existing groundwater resource data and to qualitatively summarise the cost/benefit of documented and possible groundwater schemes in the light of the feasibility study to raise the Clanwilliam Dam wall. The report also provides Integrated Water Resource Development and Management recommendations for the greater Clanwilliam Dam area.

The report has drawn on previous investigations, resource estimates and identified groundwater schemes in the greater Clanwilliam Dam area.

Clanwilliam Dam, which is the major dam in the Olifants/Doring River Basin, is situated on the Olifants River upstream of Bulshoek Barrage. This dam is used to provide water for the Olifants River Government Water Scheme (ORGWS). Water is released from the Clanwilliam Dam to Bulshoek Barrage, from where it is abstracted into an extensive canal system providing water to downstream irrigators and towns such as Clanwilliam, Klawer, Vanrhynsdorp and Vredendal.

About 85% of the total river flow volume occurs during the winter months. In contrast, over 60% of the annual urban demand and 90% of the irrigation demand occurs in summer. This pattern necessitates high levels of assurance in water resource development and management. Consequently, considerable storage capacity is required to store the winter surplus for use in summer.

2. GEOLOGY AND HYDROGEOLOGY

The Clanwilliam Dam is located within a roughly N-S trending syncline in the Table Mountain Group (TMG) known as the Orange River Syncline (ORS). NW-SE-striking faults crossing the area form sub-parallel, continuous, interconnected systems, extending over distances of more than 100 km. Together these systems constitute "megafault" zones (Umvoto, 2000).

The reader is referred to the Citrusdal Artesian Groundwater Exploration (CAGE) study report for a comprehensive description and illustration of the geology and the hydrogeological patterns, particularly the hydrotects or megafaults that dominate regional movement of groundwater in the area as well as the surface groundwater interactions.

The main hydrostratigraphic units represented in the study area belong to the Table Mountain Group (**Table 1**). The Table Mountain Group (TMG) exerts the main lithological control on the groundwater flow regime throughout the length and breadth of the Olifants River valley as well as in the hinterland and the coastal plain.

The **Peninsula Formation** constitutes the middle aquifer in the TMG, and is a topographically dominant unit, building most of the high mountain ranges. It is ***hydrogeologically most important*** because of its:

- ***wide areal extent*** in the areas of maximum precipitation and recharge potential; and
- ***high sub-surface volume*** of permeable fractured rock.

The Peninsula Formation is approximately 550 m thick in the Cape Peninsula area but reaches approximately 1 300 m in the Citrusdal region.

Table 1 Coincident hydrostratigraphic units of western TMG

Super-units	Units	Sub-units
Bokkeveld	Gydo Mega-aquitard	
Table Mountain Super-aquifer	Nardouw Aquifer	Rietvlei Sub-aquifer
		Verlorenvallei Mini-aquitard
		Skurweberg Sub-aquifer
	Winterhoek Mega-aquitard	Goudini Meso-aquitard
		Cedarberg Meso-aquitard
		Pakhuis Mini-aquitard
	Peninsula Aquifer	Platteklip Sub-aquifer
		Leeukop Sub-aquifer
	Graafwater Meso-aquitard	(30-180 m thickness)
	Piekenierskloof Aquifer	(not yet identified)
Saldanian	Basement aquifuge	

The Peninsula Formation is overlain by the **Pakhuis Formation**, which is a thin (generally less than 50 m), poorly sorted, compact and impermeable unit. The argillaceous **Cedarberg Formation** succeeds it conformably. Hydrogeologically, the Pakhuis-Cedarberg sequence is an effective aquitard, grading upwards into intercalated siltstones and fine-grained sandstones.

The overlying **Nardouw Sub-group** consists of three sandstone-dominated formations. The Clanwilliam Dam wall is situated within the Nardouw Sub-group.

The lower **Goudini Formation** is characterised by repeated sandstone-siltstone cyclicity, and reddish-brown weathering due to iron-oxide content. The new mapping of the TMG in the Western Cape Olifants/Doring River Irrigation Study (WODRIS) area shows the Goudini Formation to wedge out in a northerly direction.

The middle Nardouw unit, the **Skurweberg Formation**, consists of thick, cross-bedded quartzitic sandstones and is a potentially important fractured-rock aquifer. It is approximately 330 m thick near latitude 32°S, and decreases to approximately 150 m on the Matzikama Mountains, to the north of the study area.

Thinner bedding, subdued weathering pattern, closely spaced jointing and denser vegetation distinguish the **Rietvlei Formation,** and result in distinctive tones on aerial photographs. It is about 200m thick in the Clanwilliam area.

Both the Peninsula and the Skurweberg Aquifers are currently little exploited although they constitute the largest natural storage facility in the area. The reason for this pattern has been limited scientific or professional input to the development of groundwater resources by local farmers who are the primary users.

The Cage study estimated that approximately 12 million m^3/a were abstracted from the Nardouw Aquifers by local farmers. At that time (1998) there was limited abstraction from the Peninsula Aquifer viz. 1,5 – 2,0 million m^3/a from the Boschkloof Wellfield. Abstraction from the primary aquifers along the coast are excluded from further consideration in this report other than in association with development of the TMG aquifers and surface water in Aquifer Storage Recovery Schemes (ASR).

The CAGE study (Umvoto, 2000) concluded that from a hydrogeological perspective, the major structural features of the area include the following:

- There is a close kinematic relationship between folding along slightly N-S axial trends on the dominant NW-SE faulting.
- The structural geometry of major folds, such as the Olifants River Syncline (ORS) is such that large volumes of aquifer formations are located at depths up to 3 km below sea-level in box-like configurations.
- Four major “megafault” systems cross the study area along roughly NW-SE directions, and are linked to each other by numerous connecting splay-and cross-faults (two of these “megafault” systems occur in the vicinity of the Clanwilliam Dam).

- Fracture-trace analysis on Landsat and SPOT imagery reveals five principal joint sets, covering the exposed areas of the TMG and other formations between the (generally eroded and superficially covered) major fault traces.

The fractures in the quartzitic Peninsula Formation and the similarly quartzitic Nardouw Sub-group are of primary interest for long-term groundwater supply, because they impart to the otherwise relatively impermeable rock a so-called “secondary” permeability.

There are three major sets of fracture structures, along north-west/south-east, west/east and north-east/south-west directions. In general, the fracturing is similarly orientated in both the Peninsula and the Nardouw Formations, but there is variability in fracture spacing, depending on bedding thickness differences and proximity to major fault zones.

In parts of the study area, the more thinly bedded Nardouw Sub-group is intensely fractured by closely-spaced but relatively discontinuous structures. Large-scale, continuous, widely-spaced master joints are characteristic of parts of the more massively bedded Peninsula Formation. Sub-horizontal or dipping bedding planes and formational contacts can contribute to the secondary permeability and can, in combination with local structures and topography, control the occurrence and flow rate of springs.

Two formations viz. the Rietvlei and the Skurweberg are preferred aquifer targets and are drilled by the farming sector. The farmers use the groundwater to augment surface water supplies or for use as an emergency supply during summer, largely for the irrigation of citrus in the area upstream and downstream of the dam. The Clanwilliam Dam wall is situated on the Skurweberg Formation.

The textbook value of 0-10% recharge for fractured crystalline rocks is not applicable in the TMG terrain. A range of 5-50% infiltration given for vesicular basalt is more realistic, given the pseudokarstic character and endoreic drainage systems of the TMG at high altitude where most of the rain falls. The CAGE study indicates an average of 23% in a range of 8 to 52%. All recharge calculations suggest that the TMG super-aquifer delivers a substantial and sustainable yield.

3. INTEGRATED WATER RESOURCE MANAGEMENT DOMAINS

As a component of the National Water Resources Strategy (NWRS), the Minister of Water Affairs and Forestry established the boundaries of the Olifants/Doorn WMA, which is comprised of 88 quaternary sub-catchments.

These have been sub-divided into key ***surface***-water sub-areas "in order to improve management" (ISP, 2004).

From a groundwater perspective (Vegter, 2001), the Olifants/Doorn WMA straddles six "groundwater regions" (numbers and names below after Vegter, 2001, Figure 2 and associated tables), namely:

- Northern part of No 57 – Swartland
- No 48 – North-western Cape Ranges
- No. 56 – Knersvlakte
- Southern part of No. 27 – Namaqualand
- No. 36 – Hantam
- No. 37 – Tanqua Karoo

A relatively simple refinement of the six groundwater regions in the Olifants/Doorn WMA (Umvoto, 2004a), linked to quaternary catchment boundaries and better reflecting patterns of groundwater storage/flow and surface-groundwater interaction, recognizes two main hydrogeological provinces (Adamastor and Western Karoo, respectively), each sub-divided into two sub-provinces that facilitate integrated ground and surface water quantification objectives (**Table 2**). These are described as Integrated Water Resource Management (IWRM) Domains.

The distribution of the TMG Peninsula Aquifer is the main determinant of the eastern boundary between the Cederberg and Tankwa sub-provinces, which is here made to coincide approximately with the TMG-Bokkeveld contact while respecting quaternary boundaries (except in the E24K instance). This proposed modification of the "groundwater regions" concept represents a development towards a hierarchy of aquifer-related spatial domains relevant and useful to Integrated Water Resources Management (IWRM) purposes.

IWRM domains facilitate the integration of surface and groundwater resource allocation, regulation, conjunctive use and management at WMA, CMA and Departmental level. It is proposed that an IWRM strategy that would underpin resource development (Screening) and management decisions, requires a comprehensive understanding of the available natural and man-made storage options available as well as the time and space scale of surface and groundwater interaction.

Table 2 The Relationship between IWRM Domains and WMA Subareas

Province	Sub-province	Situational Assessment sub-areas
Adamastor	Cederberg	Sandveld (G30 A – H) Upper Olifants (E10 A – K) W Kouebokkeveld (E21G, H, J, K) W Lower Doring (E24A, J, L, M, lower part of E24K) Lower Oorlogskloof (E40D)
	Knersvlakte	Lower Olifants/Sout, Goerap
Western Karoo	Tankwa Karoo	Upper Doring E Kouebokkeveld (E21A-F, L) Tankwa E Lower Doring (E24B-H, upper part of E24K)
	Hantam	Upper Oorlogskloof (E40A-C) Hantams Kromme

Within these domains it would be a reasonable first step to develop conjunctive water resource development and management schemes that optimise natural storage and existing/potential surface facilities and their yield with patterns of rainfall (short to long term) and demand (time and space). This planning is critical given the current and the modelled impact of climate change.

4. PREVIOUS STUDIES

In general the studies that have been undertaken are regional studies. Other than in the CAGE Study and WODRIS, they do not contain aquifer specific, nor scheme specific information. Groundwater cannot be developed and schemes cannot be conceptualised without this information.

The data that has generally been used is that available in the WRC 90 records, the 1:250 000 geology map series of the Council of Geoscience (CGS) and the available DWAF hydrogeological map series (1:1M to 1:500 000). Thus the groundwater potential contained in the reports is largely generalised. It is useful for input in principle at a policy level. It is not meant to be a significant input to resource development and management decisions that would have any medium to long-term impact on water resource allocation and management in the WMA or within a Water User Association (WUA) area.

To evaluate the data available is beyond the scope and budget of this study but would be required if groundwater schemes were to be conceptualised, costed and evaluated on a par with identified surface water schemes.

However, the results of the different studies are summarized and compared in **Table 3** below. It is eminent that differences in resource evaluation are due to different approaches, methodologies and study areas. The aquifer recharge estimations vary between 22 million m^3/a for a portion of the Peninsula Aquifer alone and 138 million m^3/a for the TMG within the WODRIS area. The available groundwater for abstraction varies between 25 million m^3/a and 457 million m^3/a (as harvest potential). Only two studies yielded estimates for the effective storage.

The decision at this stage is :

- whether the natural storage of water that has proven to be accessible and from which reliable yields are cost effective over periods of time warrants investment; and
- whether IWRM in the area can be achieved without this investment.

The impact of climate change that is apparent in this area must be considered in the evaluation of storage of water or so-called scheme options (dams in the case of surface water and aquifer development in the case of groundwater or both) in both resource development and management decisions.

Table 3 Summary of groundwater resource estimates in existing reports

Study	GW Reservoir (Domain)	Effective storage (Mm^3)	Recharge (Mm^3/a)	Available groundwater (Mm^3/a)
CAGE, 2000	East (unconfined) Central (confined) West (unconfined) Peninsula Aquifer only	200 750 80	22	45
ISP, 2004	Upper Olifants (E10A-G) Aquifer specific	Not used	120 (73 Peninsula 39 Nardouw)	36
WODRIS, 2003	Peninsula Aquifer in E10G-E10J, E24A, E24L, E24M	Storage capacity 80 –200	80 Peninsula 58 Nardouw (Includes more Quats)	The yield was estimated for specific target areas
GEOSS Consortium (DANIDA), 2003	Upper Olifants (Entire E10D, E10E, E10F as well as portions of E10C and –G),	Not used	Mean Annual Effective Recharge (MAER) – 32.87	25.18
Water Resources Situation Assessment, 2002 DWAF	Upper Olifants (E) TMG Aquifer not included	Not used		79.8
Seymour and Seward, 1996*****	Upper Olifants	Not available		Harvest Potential 457 (for E10A-G).
WSM, 2000*****	Upper Olifants (E10A-G)			Exploitation Potential 308

Note: * It is not possible to understand or evaluate the discrepancies in earlier estimates because of the scale differences in the data available and insufficient published information on the assumptions governing the data at the quaternary catchment and aquifer specific scale.

5. IDENTIFIED SCHEMES

There has been significant investment in the study area to identify all surface water supply schemes. This effort has not been applied to the significant groundwater potential in the area. The locations of groundwater resource development schemes identified to date are shown in **Figure 1**. The potential yields, and estimated capital, operational and relative costs of these schemes are shown in **Table 4**. The setting as well as engineering and environmental aspects of each of these schemes is described as the information was available.

The identification of all potential groundwater schemes in the area is beyond the scope and budget of this study.

A number of schemes were identified in the course of the WODRIS. The target zones/schemes were defined by the geological settings and the potential of abstracting and or storing groundwater of good quality and of sufficient amount in a sustainable manner. The target zones/schemes for abstraction and storage are situated outside proposed irrigation schemes and are summarised below. The reader is referred to the reports of the WODRIS for further details and graphic illustration. It must be noted that a groundwater scheme ***per se*** comprises a number of different wellfield or ASR projects.

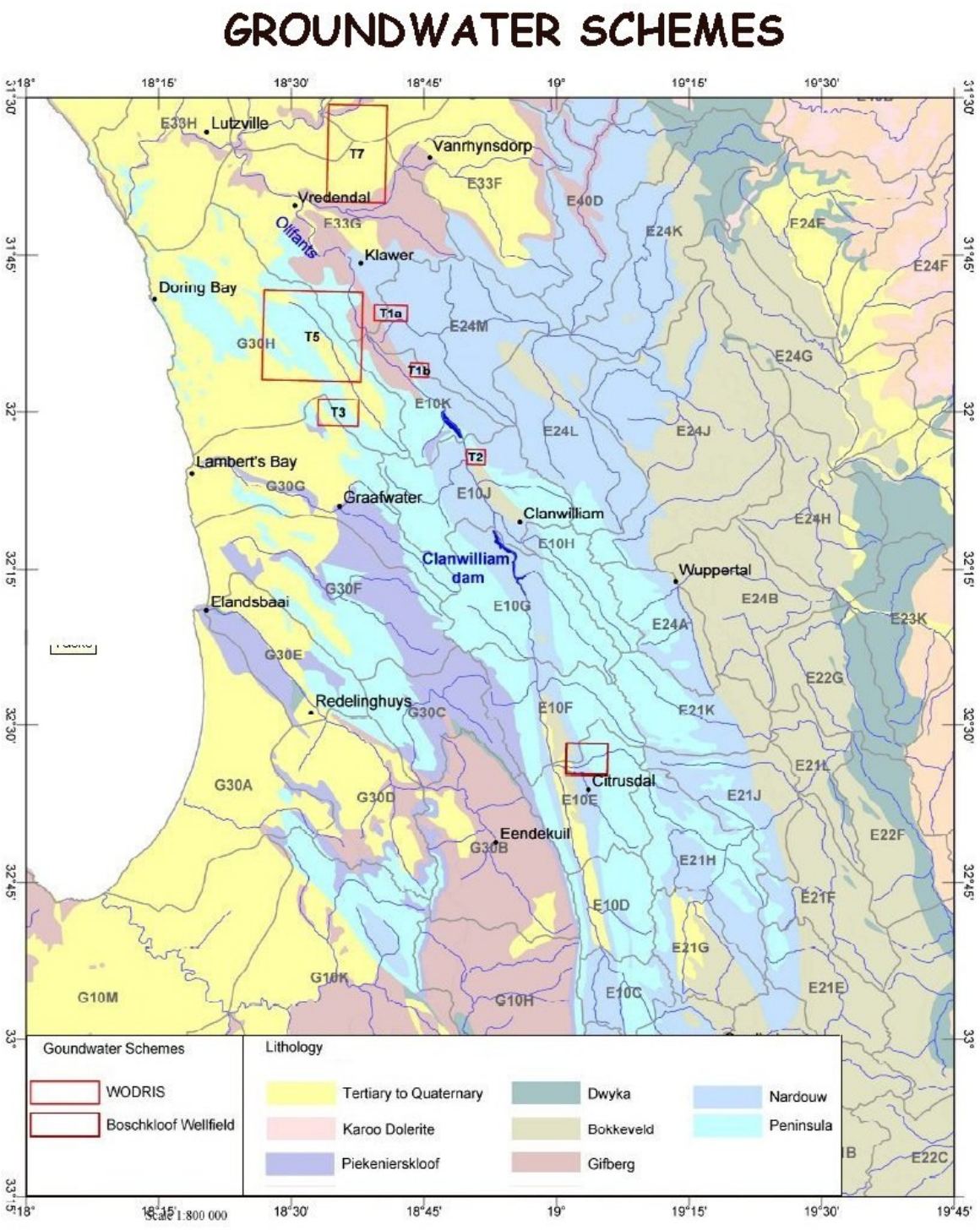

Figure 1 The location of groundwater resource schemes identified to date

5.1 PROJECT T1 CONVENTIONAL WELLFIELD

This project comprises two proposed wellfields (T1a and T1b) positioned on the Klawer Fault to abstract groundwater from the Peninsula Formation. It is very conservatively estimated that the combined yield should be over 2,5 million m^3/a from eight boreholes, four in each wellfield). The realistic case is considered to be 2 to 3 times this yield (namely 3,4 to 5,0 million m^3/a over an 8 month pump cycle).

Wellfield T1a is located adjacent to the Doring River and close to the right bank canal of the ORGWS along the Olifants River. Consequently, any groundwater abstracted can be pumped directly into the river or the canal with minimal pipework required.

Wellfield T1b is located between the Bulshoek Barrage and the confluence of the Doring and Olifants Rivers. It is situated close to the left bank canal of the ORGWS and thus a short length of pipe work would be required to discharge directly into the canal.

For both of these proposed wellfields it was proposed that the water should be pumped and conveyed during the time of the year when there is spare capacity in the canal (March – November).

Environmental aspects

- The production shall be from the confined Peninsula Aquifer.
- There is no indication in the current data set that this sector of the aquifer contributes to the base flow, either via springs or via sub-surface flow.
- It is not expected that abstraction in this area would result in unacceptable impact for either the terrestrial or the aquatic ecology.
- More detailed understanding of the surface groundwater interaction in the study area would require a detailed and focused study.
- It is recommended that datum measurement and monitoring and detailed field inspection of sensitive eco-systems and important biodiversity sites should be undertaken before groundwater production commences.

5.2 PROJECT T2 CONVENTIONAL WELLFIELD

The target zone for wellfield T2 is situated close to the Bulshoek Barrage. It is conservatively estimated that this wellfield should yield 1.6 million m^3/a from five boreholes. In a realistic case a yield of 2,1 to 3,2 million m^3/a, pumped over 8 months, is considered possible.

If the groundwater is to be piped into the Bulshoek Barrage, which has a capacity of 6 million m^3, it is preferable to pump only in the summer months (viz. November to April), however, distribution of this water may be limited by the capacity of the downstream canals at particular times.

Environmental aspects

- The Upper Peninsula Formation is in an area where the Klawer Fault and the Clanwilliam Fault meet in a splay extending to the east of the Bulshoek Barrage.
- There are anecdotal reports of significant springs along the Bulshoek transfer zone that potentially could be impacted by large-scale abstraction in this target zone.
- Production would be from the relatively unconfined Peninsula Aquifer.

- A management factor to consider is that the springs discharge into the Bulshoek Barrage.
- It is possible that high levels of abstraction could induce flow from the dam into the aquifer.
- Taken as a conjunctive supply scheme the purpose would be to minimise evaporation from the Bulshoek Barrage (shallow dam in a hot windy area) by taking advantage of the additional underground storage facility and the high recharge in the Krakadouw Mountains along the fault strike to the south-east.

5.3 PROJECT T3 CONVENTIONAL WELLFIELD

The target zone for wellfield T3 is situated at approximately 270 masl. It is conservatively estimated that four boreholes would be required to yield 1,26 million m^3/a. In a realistic case a yield of 1,7 to 2,5 million m^3/a, pumped over 8 months, is considered possible.

It is proposed that groundwater be pumped at a minimum rate of 40 ℓ/s by booster pump to cross a low divide of 380 masl from where the water can gravitate into the left bank canal of the ORGWS. This would require a rising main of approximately 9 500 m and a gravity section of 4 500 m. The pipeline route would follow the existing road.

Because the required infrastructure is expensive relative to the proposed wellfields T1 and T2, it may be preferable to develop this wellfield only for local use. This alternative is considered in a composite project, including T1 and T2, titled T5 below.

Environmental aspects

- The target zone lies along the Skurfkop Fault.
- This fault could allow subsurface discharge zone from the TMG Aquifer into the Quaternary sands.This would result in a natural interbasin transfer from the E drainage basin into the G30H catchments.
- There could be hidden seep zones in this arid, poorly known and poorly documented area, although there is no apparent topographic expression of such other than the elongated upper valley of the Sandlaagte which is proposed as a storage facility in Project T5.

5.4 PROJECT T5 AQUIFER STORAGE RECOVERY

This project is based on the storage potential in the palaeo valley of the Sandlaagte River. This storage capacity is viewed as three subsections (S1, S2, S3) of which S3 is currently being abstracted from. The three sections are assumed to be hydraulically connected but with zones of restricted transmissivity (T) values dividing each section from the other. The total storage is estimated to be 80 to 90 million m^3 in S1 and S2.

All water supply from the proposed wellfields T1, T2 and T3 would be conveyed to a common point and then pumped over the water divide between the Olifants River and the Sandlaagte catchments so as to recharge the Sections 1 and 2 of this aquifer. If after a reasonable period of monitoring either the volumes pumped can be increased, or the length of the pump cycle can be increased, it is anticipated that this yield could increase up to 20 million m^3/a.

The proposed point of abstraction from the Olifants River is south of Klawer and thus the volumes available for recharging the primary aquifer could include both water from the left bank canal of the ORGWS and the Olifants River as well as the Doring River during high flows. It is suggested

that an off-channel pump sump delivering 1,3 m^3/s (i.e. 20 million m^3 over a 6 month pumping period) would pump water into a pipeline following an existing road over the low ridge north-west of Trawal (280 masl). From there it would gravitate to the recharge wellfield at approximately 220 masl.

Twenty six recharge boreholes could be situated 350 m apart, each injecting up to 50 ℓ/s. Abstraction would be via the same boreholes and at the same rate as injection. The water would be reticulated using two rising mains to a level of 320 masl. This assumes that any future distribution canal would be constructed at this level in order to distribute to the arable land below.

In costing this project, additional water from the surface supply options was not considered, although the storage capacity in S1 and S2 would allow for up to 90 million m^3 to be stored. This storage volume could be accumulated over a number of years, as confidence in the scheme developed and initial teething problems are resolved. There are international and national projects from which knowledge and expertise could be drawn.

The purpose of this project or scheme would be to abstract up to 20 million m^3 from the TMG Aquifer in the winter months between March and November (or from surface water) and to artificially recharge the primary aquifer (S1 and S2) from which it can be abstracted during the summer.

The position of the recharge and/or abstraction boreholes would be based on more detailed investigation and characterisation of the aquifer as well as the potential irrigation areas identified.

Environmental aspects

- Aside from site footprint considerations the primary environmental concern would be the impact of raising the water table in the unconfined to semi confined primary aquifer in the Sandlaagte Valley.
- It is not known if sensitive ecosystems or important Biodiversity sites have been identified in the area. An ecological assessment of the area is required.
- Significant changes in the natural habitat have already occurred as a result of dry land agriculture.

5.5 PROJECT T7 AQUIFER STORAGE RECOVERY

A storage capacity of 121 million m^3 in the fractured limestones was used for the calculation. This is equivalent to the yield of the potential Melkboom Dam.

An off-channel concrete pumping sump on the Olifants River close to Vredendal is proposed with an abstraction rate of 7,7 m^3/s, i.e. 121 million m^3 pumped over six winter months using 8 pumps each delivering 1 m^3/s. The water would be pumped via a rising main to 154 injection wells spaced 500 m apart. Each well would inject water into the storage aquifer at a rate of 50 ℓ/s. The wellfield would be spread over a 5 km by a 7,5 km area. The same boreholes used for recharge would be used for abstraction.

The primary cost component is the winter and summer pumping and the extensive pipe network for the distribution and collection of water.

Environmental aspects

- The potential storage facility is the confined fractured limestones located beneath an older land surface covered by red aeolian sands.
- It is situated around the divide between the Vars and the Troe-Troe Rivers' channels, west of Vanrhynsdorp in an extremely arid area.
- The rivers flow during flash floods and the aquifer is apparently no longer being actively recharged and as yet no farfield lateral recharge potential has been identified. It is suggested that the greatest environmental impact would be the site footprint resulting from the development.
- These would occur in an area of new agriculture development and thus already undergoing complete change.
- The groundwater development scheme would be obscured within the agriculture development.
- There could be aquifer ecology impacts arising from the different chemistries (acidic and unbuffered) and possibly microbiologies and microfauna of the waters (surface and TMG) being pumped into the alkaline and buffered waters of the limestone aquifer.

5.6 CONJUNCTIVE USE

During the CAGE project the Water Resources Yield Model (WRYM) for the catchment area above Clanwilliam Dam was run using different operating rules. In one extreme, groundwater from the Peninsula Aquifer of the TMG was always pumped to the Clanwilliam Dam and, in the other extreme, only when the dam was empty. A number of intermediate scenarios were also considered.

The Peninsula Aquifer was modelled as three interconnected rectangular reservoirs represented as three separate nodes in the WRYM. The effective exploitable storage for these reservoirs viz. east, central and west are 200, 750 and 80 million m^3, respectively. The eastern and western reservoirs are unconfined and the central is confined. Recharge to only the unconfined eastern and western reservoirs was conservatively calculated as 332 and 22 million m^3/a, respectively. Combined fountain flow from both unconfined reservoirs was estimated as 3 million m^3/a. Interflow relationships between the groundwater reservoirs are critical and confidence in initial estimates needs to be improved. Similarly, the relationship between spring flow and drawdown in the individual model reservoirs was presented by a relationship, which requires verification.

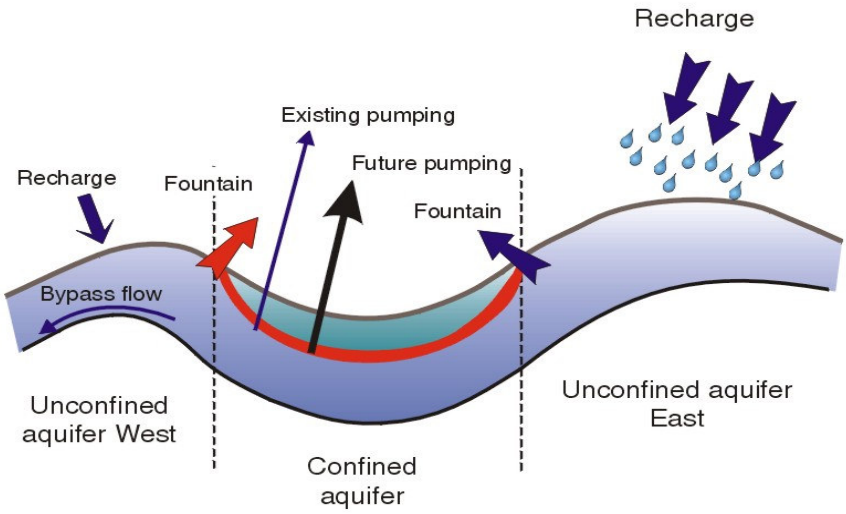

Figure 2 Simplified diagrammatic sketch illustrating the hydrogeological setting of the three modelled aquifer reservoirs in the Olifants River Basin

The study concluded that **conservatively** 45 million m^3/a would be available to the Olifants River WUA without negative environmental impact if conjunctive use was implemented without impact on the environment, which would give an increase in the historic firm yield of the Clanwilliam Dam of 20%.

Environmental aspects

Over wide areas in the middle part of the E10 catchment, the potentiometric surface may be hundreds of metres above the buried top of the Peninsula aquifer. Locally, drawdowns very much larger than 10 m are theoretically possible (at least up to a maximum economic pumping depth of ~100 m) without in any way impacting on the aquifer's saturated thickness. Furthermore, with sufficient knowledge of other aquifer properties such as hydraulic conductivity K, wellfield sites can be strategically selected to ensure that, during the summer pumping season, the surrounding cones of depression rarely, if ever, diffuse to exposed aquifer boundaries where base flow at springs can be affected. In the event of this occurring it would be appropriate to supplement surface flows accordingly or evaluate the cost benefit and most water efficient approach to storage.

5.7 CITRUSDAL-BOSCHKLOOF WELLFIELD IN CONFINED PENINSULA AQUIFER

Regrettably, this study has not been able to obtain actual URV costs for this wellfield nor current information on usage and management of the wellfield. Current costs based on hard data for the Hermanus wellfield result in a URV of 70 c/m^3. Even if the costs of undertaking development of a regional monitoring infrastructure and monitoring protocols (which such costs should not strictly be assigned to a particular scheme), and costs for development further away from existing infrastructure are added, the URV will not be more than 100 c/m^3.

Table 4 Summary of identified groundwater development schemes

Scheme Name	Yield (Mm^3/a)	Costs			Date and source of information
		Capital (R million)	Operation & Maintenance (R million/a)	Relative Cost or URV (R/m^3)	
Citrusdal-Boschkloof	1.48 (Umvoto Report) 1,5-2,0 (Table 2.4 from NS)	Not available	Not available	Not available	Deon Wasserman of Municipality 027-4828000 Johan Conradie (KweziV3) 022-7132288
WODRIS T1a	5 min	12.0	0.49	0.25	Umvoto, 2005
WODRIS T1b	5 min	10.5	0.49	0.23	Umvoto, 2005
WODRIS T2	3.2 min	11.16	0.41	0.35	Umvoto, 2005
WODRIS T3	2.5 min	14.19	0.33	0.49	Umvoto, 2005
WODRIS T5 (1)	20 min	422	20	0.82	Umvoto, 2005
WODRIS T7 (2)	121 ave	150	4.42	0.12	Umvoto, 2005
CAGE	45 min	-	-	-	Umvoto, 2000

(1) Costs include pumping of water from the river and other wellfields into the ASR Scheme
(2) Costs exclude pumping of water from the river into the ASR Scheme.

6. CONCLUSIONS

The reader is further referred to the CAGE study (Umvoto, 2000) as many of the conclusions are relevant to this report.

1. Substantial potential (100 – 190 million m^3/a) exists for the sustainable abstraction of relatively large quantities of water from the TMG aquifers. This could be possible without having significant negative impacts on the environment or on users of surface and of groundwater but such would require further study.

2. The rural nature of the population suggests that groundwater could contribute to widespread provision of the basic human need, as well as an allocation for irrigation and empowerment via conjunctive use schemes, with or without the raising of the Clanwilliam Dam.

3. The water quality in the TMG is good to excellent for domestic use. The TMG aquifer is currently neither vulnerable to pollution nor over-abstraction[1].

4. Conjunctive use of surface and groundwater holds the possibility that the variability of flow in the rivers could be increased with a consequent upgrade in environmental management of the river systems.

5. Aquifer extents and the surface boundaries of recharge domains ("groundwater catchments") locally and regionally exhibit marked departures from the surface-water catchment divides. The combined surface/groundwater system is an open system; i.e. what is abstracted from the groundwater storage within a particular catchment is not necessarily "lost" to the surface water system in the same catchment, neither is it necessarily discharged within the same catchment if it remains unabstracted. There are most likely significant losses of TMG water to the sea via the hydrotects.

6. An evaluation of storage potential and thereafter the reliability of the sustainable yield that is achievable from surface and groundwater is needed. This requires a conjunctive approach to the management of storage that necessitates a new platform and approach.

7. Preliminary storage models were prepared in the CAGE Study and WODRIS for sectors of the TMG aquifers. These illustrate that in the area up gradient of the Clanwilliam Dam,

[1] The Peninsula and Skurweberg Aquifers are recharged in the high mountain areas that are uninhabited and not used for agriculture. The pattern of land use in the area means that there is no to very limited source of pollution into these aquifers. In the event that the aquifers are developed, aquifer protection is an essential component of any management scheme.

The Skurweburg is a confined subartesian aquifer and is at present unexploited. Given the difference between the demand and potential supply it is currently under no threat of over abstraction. The Peninsula aquifer is saturated and the volume of water in storage is significantly greater than the current predicted demand.

approximately 100 million m^3/a is available from the Peninsula Aquifer alone, if used independently as well as in conjunction with Clanwilliam Dam and other dams. In the area below Clanwilliam Dam approximately 50 - 100 million m^3/a is available from the Peninsula Aquifer. Similar models for the Skurweberg Aquifer are not available.

8. At present potential schemes above the Clanwilliam Dam have not been identified. Since the TMG dominates the terrain and the hydrotects transect the terrain in a general NW trend there are no significant limitations on access to the water.

9. The aquifer management strategy proposed for the TMG aquifers is that of summer pumping and winter recharge, ***viz***. drawdown of the groundwater table in summer in order to enhance recharge in the winter and make optimum use of the evaporation free storage. This is another approach to water banking because winter floods can be stored in an aquifer. This opportunity is borne out by isotopic results that indicate that up to 90% of floods consist of rejected groundwater recharge in these areas.

10. When normal winter recharge and aquifer recovery does not occur fully during exceptional drought periods, and surface water reservoirs are seriously depleted or empty, the deep wellfields should in principle also be capable of “mining” the TMG groundwater resource over several summer-winter cycles. Such mining of the deep strategic groundwater reserve should be effected with minimal or no impact on the surface environment, until the drought is broken and full recovery is assured.

11. In order to accomplish this form of water resource management, the time lag between the onset of pumping and the radial expansion of the induced depression in the potentiometric surface to the borders of the recharge area should be in the order of months or years. Such extended time lags in (spring or well) discharge responses to recharge from distant precipitation are indeed possible where deep regional flow systems exist (Domenico and Schwartz, 1990, p. 262).

12. In view of the evident potential for adverse global climate change in the 21st Century, there is a long-term strategic importance in developing the deep groundwater reserve. It is an added insurance against losses consequent on prolonged drought cycles, which could trigger disastrous economic downturns. In the longer run, such episodic losses could potentially dwarf the cumulative recurrent costs of operation (e.g., pumping) and maintenance.

13. The general consensus is that surface water is more vulnerable to climate change and variability than groundwater. Thus the integration of the TMG resource becomes a matter of strategic planning and importance for the area.

14. Aquifer Storage and Recovery (ASR) or Artificial Recharge and Recovery (ARR) technology has advanced in recent years and is currently implemented in a number of developed and developing countries. It has gained acceptance worldwide as an effective method of conserving water for future use, for enhancing water quality and for averting saline water intrusion. The primary aim of ASR as a water supply resource is to replenish aquifers with surplus water, water that would otherwise be lost through natural processes or through evaporation in dams.

15. In order for the full spectrum of IWRM options to be evaluated and considered, it is essential that the knowledge base for all water resource options is sufficiently developed to allow for meaningful quantitative modelling and comparisons of sustainable water yields and cost benefits.

16. Conjunctive water resource development and management schemes will optimise natural (aquifers) and existing surface storage facilities and their yield with patterns of rainfall (short to long-term) and demand (time and space).

7. RECOMMENDATIONS

1. Artesian basin(s) such as the Peninsula and Skurweberg Aquifers must be developed in a planned coherent manner. This may mean that different sub areas can be developed before others, but that the whole is strategically understood, planned and undertaken from a resource evaluation, monitoring, data base development, technology and management approach. Where to start is dictated by demand, existing infrastructure, available information and relative cost/benefit. Such incremental development mitigates real and perceived risks associated with groundwater and has the advantage that the downstream developments benefit from experience and insight arising from the monitoring of such schemes.

2. The storage capacity of any aquifer (be it a wellfield or ASR development) is a crucial parameter for the long-term management of groundwater usage. Field reconnaissance, and site-specific study as well as storage models and exploration drilling would be required for any of the schemes identified in order to move from a desk top pre-feasibility stage to a feasibility level.

3. The recharge estimation used to evaluate sustainability of the fractured rock schemes indicates that it is pertinent to calibrate the recharge model by means of other methods, such as SVF / CRD and chloride and isotope analysis.

4. Integrated Water Balances should be developed for the Integrated Water Resource Management Domains to establish the potential for groundwater development within the constraints of natural variation and existing surface water developments and dependence.

5. The development and implementation of a comprehensive monitoring programme is strongly suggested. To do so would be to the benefit of both surface and groundwater development and management.

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APPENDIX C

Minutes of the Key Stakeholder Workshop (10 February 2005)

NINHAM SHAND CONSULTING SERVICES

Item	Notes of Meeting	Action
	Feasibility Study for the Raising of the Clanwilliam Dam **Reference Group Meeting on the Screening of Options Report** **held on 10 February 2005** **at the Clanwilliam Bowling Club, Clanwilliam** **STUDY TEAM ATTENDENCE** Dr M Shand — Ninham Shand (MJS) Mr E van der Berg — Ninham Shand (EvdB) Mr M Luger — Ninham Shand (MKL) Mr G English — Ninham Shand (GE) Mr A West — Ninham Shand (AW) Mr D Wilson — ASCH Consulting (DW) Mr E Jakoet — Jakoet and Associates (EJ) Ms D Februarie — Nosipho Consultancy (DF) Mr W Enright — DWAF (WE) Mr A Parker — DWAF (AP) Mr F van Heerden — DWAF (FvH)	
1	**WELCOME AND SETTING CONTEXT – PLENARY SESSION** DF welcomed the members of the study team and introduced them to the Reference Group. MJS provided an overview of the purpose of the Screening Phase and anticipated outcomes, and provided participants with a brief overview of the Olifants/ Doring Catchment. EvdB provided participants with an overview of the Feasibility Study for the Raising of Clanwilliam Dam, and an overview of the Screening Phase and key outcomes of the Screening Workshop. He then explained that there would be two breakaway sessions after lunch, in order to facilitate further debate of the findings of the Screening Workshop and the associated Screening of Options report. A participant wanted to know if the total costs for the dam raising took into account the cost of the remedial work? EvdB responded that the costs associated with the raising of the dam were incremental, that is, the costs over and above the cost of undertaking the requisite remedial work. Mr du Toit raised a query regarding the rating of the screening of the Leeu River Dam, stating that there are existing dams on the Leeu River, and there was potential for further dam development. MKL responded that the screening of options was based on the suite of previous work undertaken. The Olifants Doring Basin Study Phase 1 had assessed the Leeu River option and rated it poorly. However, the assessment may have been based on a worst-case scenario, as it was not possible as part of the Screening Phase to optimise all of the options from a technical and environmental perspective. Mr Joubert asked if water from the Clanwilliam Dam was supplied to either Lamberts Bay or Doring Bay? The study team responded that Doring Bay gets water from Clanwilliam Dam, but that Lamberts Bay was supplied from groundwater. Clarity was sought on the difference between storage (capacity) and yield of a dam.	

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	EvdB explained that storage was the total volume of water that the dam could hold, while yield was the average volume of useable water that a dam could supply. The bigger a dam, the less the chance of the dam being filled every year, and therefore the yield of a large dam is less than the storage. A question was raised regarding the investigation of impacts at the mouth of the Olifants River and impacts on fishermen. The study team responded that the Reserve determination study was investigating the estuary, and looking at fish and the quantity of water required to maintain the fish life as well as social impacts. The results of the Reserve determination study would be incorporated into the Clanwilliam Dam Raising Feasibility Study. Participants wanted to know by when the dam had to be stabilised. The study team responded that the Department wanted to complete the work within the next five years. The feasibility study would determine if the dam should be raised and by how much.	
2	**NOTES OF THE OLIFANTS RIVER BREAKAWAY SESSION** Erik van der Berg and Mike Shand chaired the Olifants River breakaway discussion session. EvdB reiterated that the purpose of the breakaway discussion group was to further debate the recommendations of the Screening Phase and for participants to provide further inputs. The floor was then opened for general discussion and questions.	
3	**QUESTIONS AND GENERAL DISCUSSION FROM THE OLIFANTS RIVER BREAKAWAY SESSION**	
3.1	The first question raised was clarification on how the benefits of irrigation were rated in the Screening of Options report. The facilitators responded that a four-point scale was used, where one equated to neutral or positive, and four was very negative. If many people could benefit from a scheme, then the scheme was given a positive rating.	
3.2	It was questioned whether further farm dams could also be developed, should the Clanwilliam Dam be raised. The project team responded that off-channel dams upstream of the Clanwilliam dam remained a favourable option for expansion of water capacity. The practice does not necessarily conflict with the raising of Clanwilliam Dam, and in fact both options could be utilized conjunctively to achieve the greatest benefit.	
3.3	Mr Basson wanted to know what effect farm dams in the upper catchments were having on the ability to fill Clanwilliam Dam, as the dam has not filled in the last two years. The project team responded that there appears to be a relationship between the two issues. However, DWAF has already given rights to the upstream farmers to store up to 60% of their allocation in farm dams.	
3.4	Ms Graaf wanted to know what the likelihood was of the Grootfontein Dam being developed, if Clanwilliam Dam was raised and further farm dams were constructed in the upper Olifants River catchment. The project team responded that the Reserve determination process would dictate the volume of water required from the Olifants and the Doring Rivers, to maintain the ecological functioning of the river and estuary. This will ultimately dictate whether further dams in the catchment could be accommodated.	
3.5	Mr Geyer raised a concern that dams upstream of Citrusdal would supply water to Cape Town. MJS responded that the Western Cape Systems Analysis had investigated this option. This was regarded as highly unlikely due to the high transfer costs involved. Cape Town had a suite of options available and it was much more likely that water from more favourable schemes in other areas would be utilized to supply Cape Town.	
3.6	Mr van der Westhuizen questioned the likelihood of the T7 aquifer being further developed. MJS reported that there was insufficient capacity in the well field for much	

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	utilization. The most likely scenario would be the pumping of water from another scheme for temporary storage in the aquifer. The advantages of low evaporative losses would have to be weighted against the pumping costs. *Umvoto Africa provided input subsequently, and their inputs are reflected in italics - To clarify, the T7 is an Aquifer Storage and Recovery scheme in the Van Rhynsdorp Aquifer, which is a limestone or karstic aquifer. The purpose was to store excess winter water from the Olifants River in the evaporation free aquifer which has significant storage capacity. There are considerations about the mixing of different waters that require further investigation since concerns have been expressed about relative alkalinity between the surface water and the host aquifer water chemistry. The water from the Olifants River however is not known to be singularly acidic or corrosive. Given the land use potential in this area as well as the water shortage, it is considered a viable scheme.*	
3.7	It was questioned whether or not the raising of Clanwilliam Dam would have an effect on groundwater in the Sandveld? MJS responded that there was currently a study underway investigating groundwater in the Sandveld. As part of the Feasibility Study, the team is investigating the impacts of the emergence of springs due to the dam raising. If it were determined to be a problem, then a further investigation would be undertaken. However, there did not appear to be a link to or impact on the Sandveld. *It has been postulated that the groundwater in the TMG aquifers underlying the dam are hydraulically connected to subsurface TMG that underlies the Sandveld in places. Any dam overlying fractured rock must induce enhanced recharge within the dam area. Changing the local groundwater table will impact down-gradient. Current knowledge suggests that the groundwater gradient is in a northwesterly direction parallel to the primary structural trends. The main regional fault underlying the dam is the so-called Twee Riviere-Liepoldtville Megafault Zone that extends underneath parts of the Sandveld. There are a number of current studies supported by DWAF whose purpose is to establish the groundwater reserve in the Sandveld as well as whether the hydraulic connection along the regional hydrotects is continuous between the Kouebokkeveld and the Sandveld.*	
3.8	Mr Basson queried the effect of drilling new boreholes on the existing springs, aquifer and other borehole users. EvdB responded that the effects were dependent on a range of parameters including the depth of the borehole, rate of pumping etc. A new borehole could have a negative impact on other users. *To clarify, it is the abstraction of water from boreholes that has an impact on other users, but not necessarily an unacceptably negative impact. How it impacts is a function of aquifer and well field management. A borehole drilled into one aquifer cannot generally impact on a borehole drilled into a different aquifer. In the study area different aquifers overly each other and lie alongside each other. This is a function of both topography and geology. The current challenge is for users to coordinate and cooperate on aquifer monitoring and management much the same as they do for monitoring and management of surface water stored in a dam. In as much as surface water must be fairly and reasonably allocated so too with groundwater.*	
3.9	He further wanted to know how much water could be pumped from a borehole on average. The project team responded that each borehole had a yield specifically related to it, which was dependent on the geological formation in which the borehole was located, movement of water etc. In order to determine the yield a modelling exercise would be undertaken. The groundwater specialists may be able to provide further inputs. *The yields from boreholes differ depending upon where they are sited and generally the*	

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	insight of the person who sited the borehole. The relevant number is not what can be pumped from a borehole but what can be pumped from the aquifer. We consider that with good and informed borehole siting, wellfield planning and aquifer management in place that the aquifer can yield 20 – 50 Mm^3/a with wellfield yields of 2 – 5 Mm^3/a, this number being based on an average borehole yield of 20 l/s.	
3.10	A member of the Reference Group asked whether the capital / yield ratio for Clanwilliam Dam had been calculated based on the cost including or excluding the remedial work costs? The project team responded that the capital / yield ratio was calculated excluding the remedial work costs.	
3.11	The project team was asked their opinion on the likelihood of the Clanwilliam Dam being raised. DWAF and the project team responded that the possibility of raising the dam under one of the three raising options within the next five years (time within which Clanwilliam Dam has to satisfy its safety requirements) was very high due to the concurrent need to satisfy its safety requirements and the consequent cost saving. The particular raising option which would eventually be chosen was highly dependant upon the availability of users willing to fund and the utilize the additional water from the raising.	
3.12	What is the assurance of supply on the raising (for example 15m raising, 66 Mm^3 yield) and why? EvdB responded that the additional yield was calculated at 98% level of assurance of supply. More water could be made available but at a lower assurance. It should be borne in mind that the requirements of the Reserve still have to be taken into account, i.e. the actual yield would likely be reduced.	
3.13	Mr September asked how many more farm dams upstream of Citrusdal could be constructed in the next 5 years? WE reiterated that upstream users have an existing right to store up to 60% of their allocation. MJS added that farmers could stored winter water and undertake no pumping in the summer. The Feasibility Study would investigate the effect of increased winter storage on the Clanwilliam Dam. EvdB mentioned that the Feasibility Study would investigate the impact that farm dams would have on the yield of Clanwilliam Dam. This would take place through the verification of actual off-channel dam storage upstream of Citrusdal, in a modelling exercise.	
3.14	A participant noted that it appears that a large proportion of the water generated from the dam raising would go towards meeting the Reserve requirements. He wanted to know who would pay for this? The project team responded that if the Reserve were to be implemented and the dam not raised, the users would lose access to some 30% of the flow. However, the raised dam allows the Reserve requirement to be offset by the increased yield, and the users would share the cost.	
3.15	A question was raised regarding sedimentation of the Clanwilliam Dam. The team responded that sedimentation was not a problem in the catchment, and would not be further investigated.	
3.16	One of the delegates stated that in the areas upstream of Citrusdal, irrigation areas were expanded as more water was stored. This ultimately leads to increased pressure on the system. Mr Bredenkamp responded that the upstream users did not have a dam to rely on and therefore had to build farm dams in order to farm in the area. Mr Geyer added that he felt that control should be exercised over storage and the	

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	expansion of farming.	
3.17	Francois van Heerden raised the issue of groundwater and its effect on stream flow, and the uncertainties regarding the impacts on river flow through groundwater abstraction. He suggested that the issue might require further investigation.	
3.18	A question was raised regarding the utilisation of the T5 or T7 groundwater schemes for storage, and the extent of losses. The project team responded that there would be losses through an artificial recharge programme, but that the losses were likely to be less than evaporative losses. However, due to the geology of those aquifers, there would a reduction in water quality. The advantages of aquifer recharge included a reduction in evaporative loss, storage in close proximity to the end-users, and reduced environmental impacts. *The Aquifer Storage and Recovery schemes are proposed to reduce losses due to evaporation. While the main losses in surface water schemes are evaporative losses, underground storage is evaporation free. Potential losses due to change in hydraulic gradient or mixing waters of different quality are far less than evaporative losses and can be managed.* In Atlantis, for example, storm water is used to artificially recharge the aquifer, from which the water is later abstracted at different boreholes for use.	
3.19	Ms Graaf raised the issue of the mandate of the Reference Group in the process. What if the Reference Group supported an alternative option to the ones presented? The project team responded that the purpose of the screening phase was to determine whether any other options could complete with Clanwilliam raising and therefore whether the raising of Clanwilliam Dam should be studied any further. WE added that DWAF might look at other options in the future.	
3.20	Ms Graaf asked whether or not there would be sufficient water to raise Clanwilliam Dam and build the Grootfontein Dam. The project team responded it was unlikely that Grootfontein Dam would be economical, if Clanwilliam Dam was raised. Rosendaal Dam was a more viable option.	
3.21	Mr Basson enquired about water demand management measures in the catchment. EvdB responded that water demand management formed a small component of the Feasibility Study, and would therefore get some attention.	
3.22	A question was raised regarding how the Reserve determination results would fit into the Feasibility Study? EvdB responded that the Reserve determination results would feed into the Yield Analysis task and hence into the financial viability.	
3.23	The feasibility of providing water from the raised Clanwilliam Dam to Bitterfontein for potable use was raised. The project team responded that it would depend on the economics or affordability, as the users would have to pay. WE added that a study for investigating water supply for Bitterfontein was underway. The provision of desalinated water is likely the most feasible option.	
4	**NOTES OF THE DORING RIVER BREAKAWAY SESSION** MKL explained that in the breakaway session, the objective was to discuss the potential scheme options and how they could compete with the Raising of the Clanwilliam Dam, and if the raising would preclude any further water resource development on the Doring River from being pursued. The schemes discussed and ranked at the November 2004 Specialist Workshop were	

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	presented and the results of their ranking explained. Participants of the breakaway group were asked to indicate: • Whether or not they supported a Feasibility Study to assess the economic viability, social acceptability and environmental acceptability of raising the Clanwilliam Dam; and. • Whether or not they support the findings with respect to the development of further off-channel farm dams and groundwater. MKL handed out the "Comment Sheets" and asked that these be completed and returned by post or fax to Ninham Shand. MKL emphasized that the Screening Process was based on existing reports and that stakeholder input from those most familiar with the catchment was essential.	
5	**QUESTIONS AND GENERAL DISCUSSION FROM THE DORING RIVER BREAKAWAY SESSION**	
5.1	A participant asked if the proposal to raise Oudebaaskraal Dam and the construction of another dam in the same area had been taken into account? Judge Burger was the client and Charl Pienaar of BKS would have information on this. MKL mentioned that irrigation expansion in that area (Aspoort) had been identified as not being an economically viable option for the region.	
5.2	Mr Nel asked what had become of the interest expressed by the Northern Cape Provincial Administration to establish resource poor farmers at Aspoort. GE responded that the Northern Cape Provincial Administration had indicated (in 1998) an interest in undertaking a pilot study for major irrigation development in that area. There had however been no progress to date.	
5.3	Mr Love asked how Aquifer Storage Recovery at the potential T7 site would work.GE explained the concept of utilizing available storage underground and injecting surplus water into that storage. The purpose was to store excess winter water from the Olifants River in the evaporation-free aquifer, which has significant storage capacity. The same boreholes that would be used for injecting excess water could be used for abstracting water. There are considerations about the mixing of different waters that require further investigation, since concerns have been expressed about relative alkalinity between the surface water and the host aquifer water chemistry. The water from the Olifants River however is not known to be singularly acidic or corrosive. Given the land use potential in this area as well as the water shortage it is considered a viable scheme.	
5.4	Mr du Toit expressed concern that groundwater schemes located near to or in the Kouebokkeveld (KTSV) would impact on springs and lower the water table, impacting on farmer's groundwater sources. MKL agreed that knowledge on the groundwater/surface water interaction was limited in some areas but that the necessary preliminary planning studies and monitoring would take place prior to incremental development. Monitoring data and model development would precede any groundwater development that could then be planned in a more informed manner.	
5.5	A participant stated the importance of implementing Water Conservation and Demand Management (WC/DM). It was stressed that this should not be considered as an alternative but implemented regardless of the other planned development options. This was agreed by all.	
5.6	A participant stated that LORWUA estimated that canal losses accounted for 28 % of their requirement. MKL stated that canal rehabilitation and alternative operation and management of the canals would form part of the Feasibility Study. GE reminded all that other interventions would also be considered, ***inter alia*** invasive alien plant removal, water trading, conjunctive use of groundwater.	

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5.7	Mr du Toit from Witzenberg, expressed concern that the raising of Clanwilliam Dam would benefit farmers lower down in the catchment, but that the canal infrastructure supporting these farmers contributed to high percentage losses. He asked if the study had looked at a pumping scheme out of the Twee Rivieren River. MKL stated that the study had not but had focused on a dam on the Groot River, which had appeared less favourable due to environmental concerns.	
5.8	Mr Love asked if the study would identify where resource poor farmers (RPFs) could be most economically established? He further stated that it was unlikely that RPFs would be able to afford the cost of water from large schemes. MKL acknowledged the importance of this issue and that RPFs would require subsidies. Groundwater and off-channel farm dams also appeared favourable options for supplying water to RPFs. MKL described the potential scheme options, namely Leeu River Dam, Groot River Dam, Aspoort Dam, Reenen Dam, Melkbosrug Dam, Melkboom Dam, Brandewyn Dam, farm dams and groundwater. It was agreed that with further development of farm dams and responsible development of groundwater, the raising of Clanwilliam Dam seemed favourable and that a Feasibility Study to investigate this option was supported. MKL emphasized that whilst the Feasibility Study would only address the raising of the Clanwilliam Dam, other options for development remain on the table but are less favourable than the raising.	
5.9	Mr du Toit stated that irrigation practices in the region were not as efficient as they should be. There was scope for the irrigation sector to make better use of the available water resources.	
5.10	Mr Nel asked whether the desperate water supply situation in Calvinia and surrounding areas would be addressed? GE explained that Calvinia was not supplied from Clanwilliam Dam and the responsibility for potable water supply to towns was that of the Municipality. MKL indicated that municipal funding mechanisms were in place to address such issues. *Mr Love requested a copy of the WODRIS Study. GE explained that the final report was not available from Ninham Shand but from Arcus Gibb. GE agreed to send the latest draft that he had to Mr Love. The final report would have to be acquired from Arcus Gibb.* Mr Love's address is PO Box 26, Ebenhaezer, 8149.	GE
6 6.1	**CONCLUSIONS** EvdB reiterated that the purpose of the workshop was to determine whether or not Clanwilliam Dam raising was a reasonable enough option, both financially as well as socially, to allow for the continuation of the study as well as the eventual raising. WE stated that it appeared that the general feeling was that the Clanwilliam Dam raising should take place, but that this would not preclude other options such as farm dams or groundwater, which could be implemented conjunctively. The meeting was concluded at 16:00	

APPENDIX D

Summary of issues and concerns submitted by members of the Reference Group in writing

	CLANWILLIAM DAM - SCREENING OF OPTIONS KEY STAKEHOLDER ENGAGEMENT			
No.	Individual	Organisation	Options Supported	Concern or comment
1	Nik Wullschelger	Swartruggens Conservancy	Supports the raising of Clanwilliam Dam, further groundwater development, but not further off-channel farm dams.	Would like to see water demand management further investigated in the Feasibility Study, specifically the 30% canal losses.
2	Jan Hendriks	Suid Namakwaland GMA Forum	Supports the raising of Clanwilliam Dam and further groundwater development.	He is supportive of the proposed raising of Clanwilliam Dam, because his area is reliant on groundwater at the moment.
3	Monica Graaff	Tierkranz Trust	Supports the raising of Clanwilliam Dam, further groundwater development and the construction of off-channel dams.	Concerned about the possibility of Grootontein Dam being chosen as a dam site. Concerns regarding the cultural heritage and natural beauty of the site. Furthermore, they planning on building a property on the farm, which would be inundated should the dam be built.
4	Mercia Kearns	Nama Karoo Forum	Supports the raising of Clanwilliam Dam, further groundwater development and the construction of off-channel dams.	No comment
5	Andreas Jantjies	Nama Karoo Forum	Supports the raising of Clanwilliam Dam, further groundwater development and the construction of off-channel dams.	No comment
6	Francisco Fewskey	Suid Namakwaland GMA Forum	Supports the raising of Clanwilliam Dam, further groundwater development and the construction of off-channel dams.	Wants to know if the people of his area can abstract water from the Olifants River? Since there is a pipeline to Namakwa Sands, why couldn't this pipeline be extended to his area, which is poor in water resources.
7	Gerard Stone	Bokwater Boerdery	Supports the raising of Clanwilliam Dam, but does not support the further development of groundwater or the construction of off-channel farm dams.	Concerns relating to the volume of water available from groundwater, the influence that further groundwater development may have on existing boreholes, and the effects that off-channel dams will have on the availability of water in the Olifants River.
8	Joanne Joubert	Lutzville Landbouvereniging	Supports the raising of Clanwilliam Dam, further groundwater development and the construction of off-channel dams.	The Olifants River valley is an important area from a fruit production and employment perspective. It makes sense to raise the dam, when the essential maintenance work is being undertaken.
9	PJ Cloete	DWAF Clanwilliam Dam	Supports the raising of Clanwilliam Dam, further groundwater development and the construction of off-channel dams.	We shouldn't let the last two dry seasons influence our decision of whether or not to raise the dam. The region needs an injection, and this will be brought about through job creation and tourism.
10	H Noemdoe	Sandveld Investment and Development Company	Supports the raising of Clanwilliam Dam and further groundwater development.	No comment
11	Sakkie du Toit	Koue Bokkeveld Water Forum	Supports the raising of Clanwilliam Dam and further off-channel dam development, but doesn't support the further development of groundwater.	Concerned regarding the increased farming activity and associated increased requirement for water. The constant abstraction of groundwater will have an effect on the acquifer in the long run.

No.	Individual	Organisation	Options Supported		Concern or comment
12	Jannie Basson	Zandrug Ltd	Supports the raising of Clanwilliam Dam, further groundwater development and the construction of off-channel dams.		Doesn't think that the downstream impact of the Clanwilliam Dam raising should be rated as high. Supply of water to the downstream reaches will be supplied by the Reserve allocation.
13	JJ Claase	Rainbow Farmers Gewasse Projek	Supports the raising of Clanwilliam Dam, further groundwater development and the construction of off-channel dams.		Leakage and unlawful abstraction from the canal are issues for concern.
14	Gerrit Kalemeyer	Witzenberg Kleinboer Vereniging	Supports the development of groundwater and the further development of off-channel dams, but doesn't support the raising of Clanwilliam Dam.		If the wall is raised, farmers in the Witenberg valley will have to let more water pass down the river, which may land them in difficulties.

FEASIBILITY STUDY FOR THE RAISING OF CLANWILLIAM DAM

Study Reports

No	Report name	DWAF Report numbers	NS Report numbers
1	Inception	No report number	4414
2	Screening of Options	P WMA 17/E10/00/0405	4415
3	Water Quality	P WMA 17/E10/00/0506	4416
4	System Analysis	P WMA 17/E10/00/0607	4417
5	Groundwater Resources	P WMA 17/E10/00/0707	4418
6	Environmental Scoping	P WMA 17/E10/00/0805	4419
7	Environmental Impact	P WMA 17/E10/00/0907	4420
8	Soils, Water Requirements and Crops	P WMA 17/E10/00/1106	4422
9	Water Management Plan for the Olifants-Doorn Catchment Management Area	P WMA 17/E10/00/1207	4423
10	Opportunities for the Supply of Water to Resource-poor Farmers	P WMA 17/E10/00/1307	4424
11	Irrigation Development and Water Distribution Options	P WMA 17/E10/00/1407	4425
12	Impacts on Roads and other Infrastructure	P WMA 17/E10/00/1507	4426
13	Financial Viability of Irrigation Farming	P WMA 17/E10/00/1607	4427
14	Socio-economic Impact Assessment	P WMA 17/E10/00/1707	4428
15	Financial Evaluation	P WMA 17/E10/00/1807	4455
16	Main	P WMA 17/E10/00/1907	4429

No	Reports by DWAF	DWAF Report numbers	NS Report numbers
17	Feasibility Design of Raising (Engineering Design) and Design Report Addendum	-	4430
18	First Engineering Geological Materials Report (Course Aggregate) For Proposed Raising (Council for Geoscience)	-	4431
19	Farm Dams (Options Analysis): include under Report 4 as Appendix	-	4432

APPENDIX F

List of Registered I&APs

WATER FORUM/ ORGANISATION	NAME	ADDRESS	TOWN	CODE	TEL	CELL	FAX	EMAIL
Sandveld	Mr Hjalmar Enderstein	Kooperasiestraat 26	Lambertsbaai	8130	027 432 1285	082 406 3377	027 432 1285	
Sandveld	Mr Theunis Engelbrecht	P.O. Box 123	Lambertsbaai	8130	027 432 1244		027 432 1244	
Sandveld	Mr Theo Kitching	P.O. Box 199	Lambertsbaai	8130				
Upper Olifants	Mr JJS Kellerman	Private Bag X5	Citrusdal	7340	022 921		022 921 2186	
Upper Olifants	Mr JGF Bredenkamp	P.O. Box 43	Citrusdal	7340	022 921 2543	082 925 6691	022 921 2623	
Ceder Doorn	Mr Bill Mitchell	P.O. Box 409	Clanwilliam	8135	027 482 2397		027 482 2397	
Ceder Doorn	Ms Moshall Mouton	Die Werf	Wupperthal	8138	027 492 3001		027 492 3113	info@wupperthal.co.za
Hantam	Mr ABJ Brand	P.O. Box 146	Niewoudtville	8180	027 218 1013			
Hantam	Mr WJ van Rensburg	Private Bag X5912	Upington	8800	054 334 0889		054 334 0896	vrensbw@dwaf.gov.za
Hantam	Mr Chris Williams	P.O. Box 228	Calvinia	8190	027 341 1753		027 341 2459	charles@calvinia.spp.org.za
Koue Bokkeveld	Mr Gys du Toit	P.O. Box 236	Ceres	6835	023 317 0830		023 316 1229	
Koue Bokkeveld	Mr Sakkie du Toit	P.O. Box 70	Koue Bokkeveld	6836	023 317 0004	083 2299 131	023 317 0507	
Koue Bokkeveld	Mr Gys du Toit	P.O. Box 878	Koue Bokkeveld	6835	023 317 0831		023 317 0984	onions@dekeur.co.za
Koue Bokkeveld	Mr N. Wullschleger	P.O. Box 62	Koue Bokkeveld	6838	023 317 0784		023 317 0625	
Koue Bokkeveld	Mr G. Gallant	P.O. Box 255	Koue Bokkeveld	6836	023 317 0310		023 317 0231	ggworldfocus@yahoo.com
Koue Bokkeveld	Mr H. Mars	P.O. Box 151	Koue Bokkeveld	6838	023 317 0310		023 317 0625	hannes@wethu.com
Lower Olifants	Mr Jan Thom	173 Ultra Singel	Vredendal	8160	027 213 1858			
Lower Olifants	Mr Edward Mostert	4 Sophia Englebrecht	Vredendal	8160	027 213 1948		027 213 2945	edwardmoster@labour.gov.za
Lower Olifants	Mr J. Claase	116 Bloekom Street	Lutzville	8165	027 217 1519	084 739 6340	027 217 1746	
Lower Olifants	Mr William Fortuin	P.O. Box 37	Ebenhaeser	8149	027 217 1239	076 228 4479	027 213 3238	verd18@matzikamamun.co.za
Lower Olifants	Mr Johan Matthee	Private Bag x1	Vredendal	8160	027 213 2043		027 213 3519	
Lower Olifants	Mr GS van Wyk	P. O.Box 429	Vredendal	8160	027 216 1446			
Middle Olifants	Mr Daniel Ludick	35 Kersboslaan	Clanwilliam	8135	027 482 1931	073 605 6296		
Middle Olifants	Ms Shirley-Ann Mouton	34 Gousblom Ave	Clanwilliam	8135	027 482 8000		027 482 1933	
Middle Olifants	Mr Jannie Nieuwoudt	P.O. Box 233	Koue Bokkeveld	6836	027 482 2814		027 482 2814	cederwater@wam.co.za
Middle Olifants	Mr H P Geyer	P.O. Box 8	Clanwilliam	8135	027 482 2573		027 482 2573	westfalen@telkomsa.net
Middle Olifants	Mr C G Snyman	P.O. Box 197	Clanwilliam	8135	027 482 1421		027 482 2520	cardyn@telkom.co.za
Witzenberg	Mr P. Graaff	P.O. Box 92	Ceres	6835	023 313 1915	082 447 4375	023 313 3348	pgraaff@cybertrade.co.za
Matzikama Munisipaliteit	Melt van der Spuy	P.O. Box 123	Vredendal	8160	027 213 2495	082 878 0553	027 213 2495	
Matzikama Munisipaliteit	Ruben Saul	P.O. Box 631	Lutzville	8165	027 216 1158	082 321 8328	027 216 1180	depmayor@matzikamamun.co.za
Matzikama Munisipaliteit	P. Love	P.O. Box 26	Ebenhaeser	8160	027 217 1930	082 610 2431		
CAD Operateur	T.Mouton	P.O. Box 70	Citrusdal	7340	022 921 3903	082 896 2100		
Rondegat Plaas no. 269	PS Raad	P.O. Box 248	Clanwilliam	8135				
Rondegat Plaas no.269/6	Tolbos Beleggings- JW Ferreira	P.O. Box 400	Clanwilliam	8135	027 482 2862		027 482 1640	tolbos@kingsley.co.za
Koue Bokkeveld Forum	Sakkie Du Toit	P.O.Box 70	Koue Bokkeveld	6836	023 317 0004		023 317 0004	
Department of Agriculture Western Cape	Peter Keuck	Private Bag X1	Elsenburg	7607	021 808 5357		021 808 5370	PeterK@elsenburg.com
DWAF	Letitia Mattheus	Private Bag X5	Clanwilliam	8135	027 482 2233		027 482 2232	matthel@dwaf.gov.za
Clanwilliam Besproeiingsraad	DJ Mouton	P.O. Box 251	Clanwilliam	8135	027 482 1202		027 482 1202	devlei@lando.co.za
DWAF Wes-Kaap/ Western Cape	Francois Van Heerden	Private Bag X5	Clanwilliam	8135	027 482 2233	082 807 3539	027 482 2232	vheerdf@dwaf.gov.za
Clanwilliam Irrigation Board- Large Centre Pivot	Jannie Basson	P.O.Box 161	Clanwilliam	8135	027 482 2517	082 555 1282	027 482 2519	zandrug@iafrica.com
CEO LORWUA	Johan Matthee	Private BagX1	Vredendal	8160	027 213 2043	082 807 2455	027 213 3519	johan-lorwua@kingsley.co.za
Director: Element Consulting - Consulants to LORWUA	James Turner	P.O.Box 1142	Durbanville	7551	021 975 1718	083 261 9411	021 976 9694	turnerj@eceng.co.za
Associate:Element Consulting	Johan Bester	P.O.Box 1142	Durbanville	7551	021 975 1718	082 889 1220	021 976 9694	besterj@eceng.co.za
Chairperson: LORWUA	John Roux	P.O.Box 214	Vredendal	8160	027 213 2430	082 800 6981	027 213 3743	john@makelaars.co.za
	AT Lutz	P.O. Box 233	Lutzville	8165	027 217 1144	083 637 4747	027 217 2165	atlutz@kingsley.co.za
	L Sieberhagen	P.O. Box 122	Vredendal	8160				
	J Louw	P.O. Box 241	Vredendal	8160		082 889 9033	027 213 2426	jlouws@kingsley.co.za
Rooirand Boerdery (edms) Bpk.	HPC Stephan	P.O. Box 35	Klawer	8145	027 216 1416	082 801 1888	027 216 1450	cstephan@kingsley.co.za
Caleta Cove Home Owners Association	Keith Prentice	P.O.Box 37806	Valyland	7978		083 302 8058	021 785 1694	pren@webmail.co.za
Caleta Cove Home Owners Association	Craig Mc Iver					082 459 1109		
SA Migration International	David Dorfman	P.O.Box 3733	Cape Town	8001	021 465 0333	082 658 0900	021 465 8857	davi@sami.co.za
Hantam Streek Opkomende Boerevereniging	A. Nel	P.O. Box 12	Loeriesfontein	8185	027 662 1108	073 383 4226	027 662 1108	
Dept.of Envirnomental Affairs and Dev. Planning W.C	Roger Diamond	1 Dorp Street,	Cape Town	8001	021 483 2901		021 483 2979	Rdiamond@pgwc.gov.za
Department of Land Affairs	Jacques Pheiffer	Private Bag X9187	Cape Town	8000	021 423 4566		021 426 4598	jmhpheiffer@dla.gov.za
Clanwilliam Afrikaanse Sakekamer	SP Tredoux	P.O. Box 157	Clanwilliam	8135	027 482 2155	082 881 2456	027 482 2456	sp@rooibosltd.co.za
Cape Orchard Company	EL Hugo	P.O. Box 386	Clanwilliam Arcadia	8136	027 482 2640	086 653 0272		arcadia@isales.co.za
Clanwilliam Toerisme	Melina Constance	P.O. Box 5	Clanwilliam	8135	027 482 2024		027 482 2361	cederberg@lando.co.za
Oewereienaar	Gerrit Du Plessis	P.O. Box 106	Holfontein, Clanwilliam	8135	027 482 2756			dupie5@telkomsa.net

WATER FORUM/ ORGANISATION	NAME	ADDRESS	TOWN	CODE	TEL	CELL	FAX	EMAIL
Dept. Of Water Affairs and forestry	Zanele Maphumulo	Private Bag X 5912	Upington	8800	054 334 0201		054 334 0205	maphumz@dwaf.gov.za
Vredeoord Plase	Patrik Steens	P.O.Box 276	Clanwilliam	8135	027 482 1333		027 482 2551	vredeoord@kingsley.co.za
Driehoek Farm	J.H.Mouton	P.O. Box 48	Clanwilliam	8135	027 482 2608			driehoek@telkomsa.net
Sederview Farm CC	AT Wolman	P.O. Box 402	Paarden Eiland	7420	021 511 8626	082 827 8888		
Bulshoekdam Riparian Owners Union-Secretary	Mrs. Amanda Roux				021 872 4186	083 632 9393		sz_roux@mweb.co.za
Bulshoekdam Riparian Owners Union- Chairperson	Nick Snyman				021 461 9215	082 466 4948		snick@xsinet.co.za
Homeowners	Low & Allison Wrench	18 Le Sueur Avenue	Constantia	7806	021 794 7967		021 794 5857	lwrench@telkomsa.net/ alibums@telkomsa.net
Heritage Western Cape- HWC	Calvin Van Wijk	Private Bag X9067	Cape Town	8000	021 483 9692			
Sederview Farm CC	Pieter Van Rhyn	4 Ananome avenue, Welgedaght	Bellville	7530	021 913 6616	082 490 0752		vanrhyng@iafrica.com
	Mr. Stewart Beattie	P.O.Box 554	Howard centre	7450		082 411 7363		
	Mrs. J. Kleynhans	P.O.Box 65	Clanwilliam	8135		082 837 7353		
Namakwaland Sitrus (Edms.) Bpk.	Tobias Basson	P.O. Box 44	Clanwilliam	8135	027 482 2503		027 482 1562	namakwa@yebo.co.za
Small Business Association	Jan Thom	Unltrasingel 173	Vredendal-Noord	8160		082 221 5871		
Small Business Association	Melvin Stuurman	Panorama Singel 38	Vredendal-Noord	8160	027 213 2831			
	Andre Petersen	Hoogstraat 302	Vredendal - Noord	8160	027 213 4228			
Small Business Association	Hein Kordom	Hoerskoolweg 13	Vredendal - Noord	8160		083 696 4122		
Twee Riviere Boerdery	T.I.N. Basson Snr.	P.O. Box 94	Clanwilliam	8135	027 482 2502		027 482 2505	
EVK		P.O. Box 100	Ebenhaeser	8149	027 217 1930		027 217 1616	
Weskus Distriksmunisipaliteit	I van der Westhuizen	P.O. Box 242	Morreesburg	7310	022 433 8400		022 433 8484	inbvanderwesthuizen@wcdm.co.za
DWAF	A. Belcher	Private Bag X16	Sanlamhof	7532	021 950 7140		021 950 7140	belchea@dwaf.gov.za
	Leslie Bergstedt	Luckhoff Street 19	Idasvalley	7600	021 886 5510			
	Nicola Bezuidenhout	P.O.Box 243	Clanwilliam	8135	027 482 2788	072 212 8181		
Fekjoh 12 eiendomme Bpk.	Johann Ferreira	P.O. Box 618	Bellville	7535		082 225 0305	021 386 4455	johann@intercape.co.za
Marg Will Farm	WG Van Rooyen	PO Box 156	Clanwilliam	8135	027 482 2537		027 482 2537	margwill@telkomsa.net
Driehoek Farm	Braam Mouton	P.O. Box 48	Clanwilliam	8135	027 482 2608	082 575 1111		
Brakwater & Cederberg Inn	Gerald Stone	P.O.box 286	Clanwiliam	8135	027 482 2186			gjstotal@telkomsa.net
Clanwilliam Aquatic Club								
Caleta Cove Home Owners Association	Johan van Meulen							
	Chantelle van Tonder				021 930 4444			chantell@strawberry.co.za
Ons Kontrei	Mariam Smuts	P.O. Box 140	Vredendal	8160	027 482 1104	082 926 9934	027 482 2661	maaitjie@isales.co.za
Landbou Boerevereniging	Katrina Stuurman	Wandelstraat 316	Klawer	8145		072 959 4658		
	Carol Hougaard	P.O. Box 380	Malmesbury	7299	027 222 4822		027 222 4822	
Agri Wes-Kaap	JG van Zyl	P.O. box 93	Vredendal	8160	027 213 2312		027 213 2212	janponk@kingsley.co.za
	Frans van Heerden	P.O.box 403	Clanwilliam	8135		082 807 5882		
	Kobus Joubert	P.O.Box 5610	Helderberg	7135	021 855 3672	082 564 5899		joubertin@absamail.co.za
	Mark Kilbribe	20 Recreation Road	Fish Hoek	7975		083 4555001		markk@meihuizen.co.za
Homeowners	james Douglas	P.O.box 14	Claremont	7700	021 659 4825	082 802 0008		james.douglas@za.didata.com
	Johan SD Vermeulen	P.O. Box 121	Clanwilliam	8135	027 482 1226		027 482 1546	seder@cybertrade.co.za
Clanwilliam Aquatic Club	Jannie Swart	P.O. Box 116	Clanwiliam	8135	027 482 2130		027 482 1816	spar@cybertrade.co.za
Suid Namakwaland Water Forum	Jan Hendriks	P.O. Box 52	Molsvlei	8202	027 632 5193			
Suid Namakwaland Water Forum	Gertruida Fortuin	P.O. Box 107	Molsvlei	8202	027 642 1002			
Suid Namakwaland Water Forum	Cecilia Otto	P.O. Box 60	Rietpoort, Molsvlei	8202	027 632 5620			
Suid Namakwaland Water Forum	Klaas Andrews	P.O. Box 108	Rietpoort, Stofkraal	8202	027 632 5193			
Rondegat Citrus	Charl van der Merwe	P.O. Box 35	Clanwilliam	8135	027 482 2527			rondegat@lando.co.za
Clanwilliam Riviera	Stuart Brattle	2 Victoria Road	Clifton, Cape Town	8000		082 411 7363	027 438 3469	prestige@iafrica.com
Clanwilliam Hills Development	Andre van Zyl	P.O. Box 295	Clanwilliam	8135		082 877 0422	027 482 1295	coleen@cedarberg.co.za
Beordery Belange	EH Smit	P.O. Box 190	Clanwilliam	8135	027 482 2546		027 482 2546	
Vredendal Boerdery	Elizabeth Afrika	154 Skuilstraat	Klawer	8145	027 216 1462			
Die Poort	CJ Smit	P.O. Box 20	Citrusdal	7340	022 921 3902		022921 3902	desense-christo@kingsley.co.za
Landbou Vroue verenigings	Dorina Witbooi	Barker Street 88	Lambertsbaai	8130	027 432 1705			
Kleinboere	Sophia Van Wyk	P.O. Box 166	Vredendal	8160		073 240 6193		
Kleinboere	John Scorag	P.O. Box 166	Vredendal	8160				
WEKUFU - Weskaap Ubuntu Partners Union	Carol Ehrhardt	P.O.Box 795	Malnmesbury	7299	022 482 2380		022 482 2381	wekufu@wcaccess.co.za
Weltevrede	Helgard Smit	P.O.box 74	Clanwilliam	8135	027 482 2549		027 482 1075	weltevrede@xsinet.co.za

WATER FORUM/ ORGANISATION	NAME	ADDRESS	TOWN	CODE	TEL	CELL	FAX	EMAIL
Klawervlei	JP Smit	Klawervlei Sitrus Posbus 129	Citrusdal	7340	027 482 2200		027 482 2200	klawervlei@kingsley.co.za
Bullshoekdam Owereienaars Vereniging	Nick Snyman	11 Chesterfield rd	Oranjezight, Cape Town	8001		072 829 3674	021 461 9215	snick@xsinet.co.za
	Anna Faroa	Langstraat 205	Lambertsbaai	8130	027 432 1785			
	NG Pienaar	P.O. Box 59	Vredendal	8160	027 213 2509		027 213 5190	gpienaar@mweb.co.za
Cederberg Munisipaliteit	Jacob Klaase	Private Bag X2	Clanwilliam	8135	027 482 8000		027 482 1933	jacobk@cederbergraad.co.za
Weskus Distriksmunisipaliteit	Andries de Kock	P.O. Box 14	Clanwilliam	8135	027 482 2108		027 482 1065	clanogp@telkomsa.net
Lutzville Small Farmers	Joseph J Claase	Bloekomstraat 116	Lutzville	8165		084 7396340	027 217 1746	
O/H Project	A Booysen	Eikenhoutstraat E10	Lutzville	8165	027 217 1426			
Vredendal Kleinboere Vereniging	Cornelius Swarts	Ultrasingel 190	Vredendal	8161		072 142 5167		
O.V.V en Ebenhaeser Gemeenskap Verenigings	Pieter Cloete	Erf 250 Olifantsdrift	Ebenhaeser	8149		073 385 5272		
Champion	SA Mouton	Gousblom 34	Clanwilliam	8135	027 482 1908		027 482 1933	ShirleyAnn@Cederberg.co.za
Environmental Monitoring Group	Liane Greeff	P.O.Box 13378	Mowbray, Cape Town	7705	021 448 2922		021 448 2922	Rivers@kingsley.co.za
Du Toit Group	AJ Venter	P.O. Box 25	Koue Bokkeveld	6836	023 317 0780		023 317 0786	kft@dutoit.com
	HK Gibbons	50 Avery Road	Bellville	7530	021 913 5757	083 275 5014	021 913 7574	
Vredendal Ontwikkelende Boere	Willem Afrika	154 Skuilstraat	Klawer	8145	027 216 1462			
Klawer Landbou	T Filand	Volstruissingel 81	Klawer	8145	027 216 1315			
Noord Weste Varkboer Vereniging	Johanna Coetzee	Uitkykstraat 61	Lutzville	8165		073 121 1939		
	Joanita Smit	Kransvlei Posbus 39	Clanwilliam	8135	027 482 2607		027 482 2607	
Loeriesfontein EFA	AE Nel	P.O. Box 12	Loeriesfontein	8185	027 662 1108		027 662 1108	
Namakwa Sands	Teresa Steele	PO Box 223	Lutzville	8165	027 217 3164		027 217 3085	tsteele@namakwa.co.za
Clanwilliam Dierehospitaal	Joan Kleynhans	P.O. Box 65	Clanwilliam	8135		082 837 7353		jkleinhans@telkomsa.net
Cape Mango's Edms Bpk	Bernie van der Heever	P.O. Box 403	Clanwilliam	8135		082 807 5882		capemango@telkomsa.net
Lutzville Landbouvereniging	Albie	P.O. Box 141	Lutzville	8165	027 217 1420		027 217 1420	larochelle@kingsley.co.za
Boer	Johan Coetzee	P.O. Box 2	Lutzville	8165	027 217 1009		027 217 1009	sewester@telkomsa.net
Lambertsbaai Vrouevereniging	Salome Horn	St Peters Straat 5	Lambertsbaai	8130		084 273 8984		
Hantam Water Forum	Patrick Steenkamp	Hoofweg 1	Loeriesfontein	8185	027 662 1116		027 662 1108	
	Nico Nolte	P.O. Box 275	Clanwilliam	8135	027 482 1847			nicknolte@lando.co.za
Omsien kleinboere	Richard Kampies	Volstruissingel 139	Klawer	8145	027 216 1308		027 216 1597	
Doringbaai Veeboere	James Williams	P.O.Box127	Doringbaai	8151		084 404 8509		
Van Rhynsdorp Kleinboere Vereniging		Weltevrede Singel 582	Van Rhynsdorp	8170		073 333 3884		
Lutzville Kleinboere Verenigings		Bloekomstraat 116	Lutzville	8165		084 739 6340		
Caleta Cove Home Owners Association	Dennis van der Westhuizen	P.O.Box 864	Milnerton	7435	021 551 0575	082 490 2872		dennis@mre.co.za
Van Rhynsdorp Kleinboere Vereniging	G Jantjies	Weltevrede Singel 532	Van Rhynsdorp	8170	027 219 1529	073 333 2884	027 219 1014	
Sandveld Investments Co. Ltd	H. Noemdoe	P.O.box 116	Graafwater	8120	027 422 1017		027 422 1017	
Environmental Monitoring Group	Noel Oettle	P.O.Box 350	Nieuwoudtville	8180	027 218 1117		027 218 1117	dryland@global.co.za
Robin Charlwood & Associates	Robin Charlwood	PLLC,1001 Maple Street	Edmonds, WA 98020 USA		1+425-712-7-1750		1+425-478-1642	robin@charlwood.us/www.charlwood.us
Landowner	Shannon Pluke	5 Shamrock Street	Upper Fernwood Estate, Newlands	7700	021 674 1872		021 683 0642	leepluke@netactive.co.za
	Richard Sack	237 Beach Road, Sea Point	Cape Town	8005	021 465 2835	021 461 9436		richard@traderswarehouse.co.za
Kleinboere Vereniging	Pieter Abrahams	31 Wandelstraat	Vredendal Noord	8145		072 954 6121		
Klawer Landbou Vereniging	Maria Isaacs	319 Wandelstraat	Klawer	8145		073 598 3311		
	Thomas Isaacs	SAS Sirkel	Klawer	8145		083 484 0934		
	Charles Bones	Langstraat	Klawer	8145				
Vredendal Landbou Vereniging	Francois Pienaar	P.O.Box 789	Vredendal	8160	027 213 4555		027 213 4555	fpienaar@new.co.za
Crystal Waters Property Owners Association	Hans Matter	P.O.Box 15126	Panorama	7506		086 4511373	021 945 3694	hans@inds-ct.co.za
	Robert Consani	8 Buren Crescent	Stellenberg	7550	021 919 1714	021 945 4261	021 948 1929	consani@inds-ct.co.za
Caleta Cove Home Owners Association	Ross Petersen				021 905 2517	082 568 8770		
Landowner	John Magner	P.O.Box 12, Bergvliet	Cape Town	7864	021 932 7941	021 794 4733		jmagner@metlite.co.za
Caleta Cove Home Owners Association	Rod Maxwell					083 658 6010		
	Frans Engelbrecht							soilkraf@iafrica.com
	Steve Smit					082 777 2080		
Nooitgedaght Homeowners Association	Bradley Family Trust	24 Egret Lane, Steenberg Estate	Tokai	7945	021 670 7800	083 269 9392		Andrew.Bradley@acsis.co.za
Homeowners	Cheryl Spilsbury	18 Hawthorne Close	Tokai	7945	021 715 2455		021 715 2063	cheryl.anne@mweb.co.za
Homeowners	Andre Zandberg	P.O. Box 1074, Kuilsrivier	Cape Town	7579				
Homeowners	Robin Fergus	Cul-nai-cain, Skaife Street	Hout Bay		021 790 1917	083 309 6092		culnacn@iafrica.com
Homeowners	Mr. G. Correvon	P.O.Box 100512, Ysterplaat	Cape Town	7425	021 976 5578	082 894 1572	021 511 8009	hsp@iafrica.com

WATER FORUM/ ORGANISATION	NAME	ADDRESS	TOWN	CODE	TEL	CELL	FAX	EMAIL
Homeowners	Mr. Andre v/d Merwe	P.O. Box 348	Malmesbury	7299		082 565 1000	022 772 1000	
Homeowners	Mr. Erica & Julia Rust	P.O. Box 200	Malmesbury	7299	022 482 2878	082 452 1591	022 482 2878	vkf@cybertrade.co.za
Homeowners	Mr. Pieter & Irina Scholtz	P.O. Box 650	Malmesbury	7299	022 482 2396			
Homeowners	Mr. F. Lindique	P.O. Box 222	Melkbosstrand	7437	021 552 4722	082 703 6318	021 553 2121	
Homeowners	Johan & Almari	P.O. Box 1074, Kuilsrivier	Cape town	7579	021 913 7177		021 386 4455	johann@intercape.co.za
Homeowners	Louise & Reg	P.O.Box 235	Table View	7439	021 557 4569	083 275 0611		

APPENDIX G

Notification of I&APs

- List of notification to I&APs
- Letter to Landowners
- Advertisements
- BID

NOSIPHO CONSULTANCY PTY (LTD)

REGISTRATION NO: 2004 / 009483 / 07

P O Box 174
KUILSRIVER
7579

(t) (021) 903-5911
(f) (021) 903-8376
nosiphocc@telkomsa.net

9 June 2005

Attention: Stakeholder

Dear Sir/ Madam

EIA PROCESS FOR THE RAISING OF CLANWILLIAM DAM AND ASSOCIATED REALIGNMENT OF AFFECTED ROADS – BACKGROUND INFORMATION DOCUMENT

The Department of Water Affairs and Forestry (DWAF) will undertake remedial measures at the Clanwilliam Dam in near future. This presents an opportunity to simultaneously raise the dam wall, should it be desirable from an economic, social and environmental perspective. DWAF consequently appointed the Clanwilliam Dam Raising Association, comprising Ninham Shand Consulting Services, Asch and Jakoet & Associates, to undertake the Feasibility Study for the Raising of Clanwilliam Dam in the Western Cape. As an integral part of the Feasibility Study, an Environmental Impact Assessment (EIA) is being undertaken.

You have been identified as an interested and/or affected party (I&AP) due to your possible interest in the project, as a landowner or through your involvement in previous water resource studies. Please find attached a Background Information Document (BID), which outlines the purpose of the Feasibility Study and the EIA process, and provides you with an opportunity to participate in this EIA process.

You are invited to attend the first EIA process public meeting, which will be held on **Wednesday 20 July 2005** between **10h00** and **12h00** at the **Clanwilliam Bowling Club, Clanwilliam,** to provide background to the project and gather any issues or concerns you may have.

Please register by completing and returning the attached Response Form by 25 July 2005, or by contacting Ms Doreen Februarie at (021) 903 5911. You can raise any issues by filling in the Response Form, providing us with your written comment or by attending the public meeting. **PLEASE NOTE: FUTURE INFORMATION WILL ONLY BE SENT TO REGISTERED I&APS.**

Yours sincerely

DOREEN FEBRUARIE
Public Participation Co-ordinator

KAREN SHIPPEY
EIA Co-ordinator
(Certified Environmental Assessment Practitioner)

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(f) (021) 903-8376
nosiphocc@telkomsa.net

9 Junie 2005

Vir aandag: Rolspeler

Geagte Heer / Dame

OMGEWINGSINVLOEDBEPALING VAN DIE VERHOGING VAN DIE CLANWILLIAMDAM EN DIE GEPAARDGAANDE HERBELYNING VAN PAAIE WAT HIERDEUR GERAAK WORD: INLIGTINGSDOKUMENT

Die Departement van Waterwese en Bosbou (DWAF) moet binnekort noodsaaklike herstelwerk aan die Clanwilliamdam aanbring. Dit skep die geleentheid om die damwal terselfdertyd te verhoog, indien dit vanuit 'n ekonomiese, maatskaplike en omgewingsperspektief aanvaarbaar is. Om hierdie rede het DWAF die Vereniging vir die Verhoging van die Clanwilliamdam, wat bestaan uit Ninham Shand Raadgewende Dienste, Asch en Jakoet & Vennote, aangestel om 'n uitvoerbaarheidstudie oor die verhoging van die Clanwilliamdam in die Wes-Kaap uit te voer. Die omgewingsinvloedbepaling vorm 'n integrale deel van hierdie uitvoerbaarheidstudie.

U is as 'n belanghebbende en/of geaffekteerde party geïdentifiseer as gevolg van u moontlike belangstelling in die projek, omdat u 'n grondeienaar is of as gevolg van u betokkenheid by vorige waterhulpbronstudies. Vir u inligting word in agtergronddokument hierby aangehg. Dit omskryf die doel van die uitvoerbaarheidstudie en die proses wat met die omgewingsinvloedbepaling gevolg sal word. Dit bied u verder die geleentheid om aan omgewingsinvloedbepaling deel te neem.

U word uitgenooi om die eerste openbare vergadering, wat deel van die Omgewingsinvloedbeplaing vorm, by te woon. Dit vind plaas op **Woensdag 20 Julie 2005** vanaf **10:00** tot **12:00** by die **Clanwilliam Rolbalklub, Clanwilliam**. Die doel van die vergadering is om u agtergrondinligting oor die projek te gee en om 'n opname te maak van alle geskilpunte en kwessies wat u mag hê.

Registreer asb as 'n belanghebbende en/of geaffekteerde party deur die aangehegte Antwoordblad teen 25 Julie aan ons terug te stuur, of tree in verbinding met Me Doreen Februarie by (021) 903-5911. U kan u kommentaar op die Antwoordblad aanbring, skriftelik aan ons stuur of tydens die openbare vergadering opper. **LET WEL: SLEGS GEREGISTREERDE DEELNEMERS SAL IN DIE TOEKOMS VERDERE KORRESPONDENSIE ONTVANG.**

Die uwe

DOREEN FEBRUARIE
Koördineerder: Openbare Deelname

KAREN SHIPPEY
Koördineerder: Omgewingsinvloedbepaling
(Geregistreerde Omgewingstakseringspraktisyn)

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(f) (021) 903-8376
nosiphocc@telkomsa.net

July 2005

Attention: Stakeholder

Dear Sir/ Madam

EIA PROCESS FOR THE RAISING OF CLANWILLIAM DAM AND ASSOCIATED RE-ALIGNMENT OF AFFECTED ROADS

The Department of Water Affairs and Forestry (DWAF) will undertake remedial measures at the Clanwilliam Dam in near future. This presents an opportunity to simultaneously raise the dam wall, should it be desirable from an economic, social and environmental perspective. DWAF consequently appointed the Clanwilliam Dam Raising Association, comprising Ninham Shand Consulting Services, Asch and Jakoet & Associates, to undertake the Feasibility Study for the Raising of Clanwilliam Dam in the Western Cape. As an integral part of the Feasibility Study, an Environmental Impact Assessment (EIA) is being undertaken.

You are invited to attend the first EIA process public meeting, which will be held on **Wednesday 20 July 2005** between **10h00** and **12h00** at the **Clanwilliam Bowling Club, Clanwilliam,** to provide background to the project and gather any issues or concerns you may have.

Please register with the study as an interested or affected party (I&AP) by contacting Ms Doreen Februarie at (021) 903 5911. A Background Information Document (BID), which outlines the purpose of the Feasibility Study and the EIA process can be obtained on request.

PLEASE NOTE: FUTURE INFORMATION WILL ONLY BE SENT TO REGISTERED I&APS.

Yours sincerely

DOREEN FEBRUARIE
Public Participation Co-ordinator

KAREN SHIPPEY Pr. Nat. Sci.
EIA Co-ordinator
(Certified Environmental Assessment Practitioner)

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REGISTRATION NO: 2004 / 009483 / 07

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KUILSRIVER
7579

(t) (021) 903-5911
(f) (021) 903-8376
nosiphoco@telkomsa.net

Julie 2005

Vir aandag: Rolspeler

Geagte Heer / Dame

OMGEWINGSINVLOEDBEPALING VAN DIE VERHOGING VAN DIE CLANWILLIAMDAM EN DIE GEPAARDGAANDE HERBELYNING VAN PAAIE WAT HIERDEUR GERAAK WORD

Die Departement van Waterwese en Bosbou (DWAF) moet binnekort noodsaaklike herstelwerk aan die Clanwilliamdam aanbring. Dit skep die geleentheid om die damwal terselfdertyd te verhoog, indien dit vanuit 'n ekonomiese, maatskaplike en omgewingsperspektief aanvaarbaar is. Om hierdie rede het DWAF die Vereniging vir die Verhoging van die Clanwilliamdam, wat bestaan uit Ninham Shand Raadgewende Dienste, Asch en Jakoet & Vennote, aangestel om 'n uitvoerbaarheidstudie oor die verhoging van die Clanwilliamdam in die Wes-Kaap uit te voer. Die omgewingsinvloedbepaling vorm 'n integrale deel van hierdie uitvoerbaarheidstudie.

U word uitgenooi om die eerste openbare vergadering, wat deel van die Omgewingsinvloedbeplaing vorm, by te woon. Dit vind plaas op **Woensdag 20 Julie 2005** vanaf **10:00** tot **12:00** by die **Clanwilliam Rolbalklub, Clanwilliam**. Die doel van die vergadering is om u agtergrondinligting oor die projek te gee en om 'n opname te maak van alle geskilpunte en kwessies wat u mag hê.

Registreer asb as 'n belanghebbende en/of geaffekteerde party. Bel Me Doreen Februarie by (021) 903-5911 om te registreer. Vir u inligting is 'n agtergronddokument ook beskikbaar. Dit omskryf die doel van die uitvoerbaarheidstudie en die proses wat met die omgewingsinvloedbepaling gevolg sal word.

LET WEL: SLEGS GEREGISTREERDE DEELNEMERS SAL IN DIE TOEKOMS VERDERE KORRESPONDENSIE ONTVANG.

Die uwe

DOREEN FEBRUARIE
Koördineerder: Openbare Deelname

KAREN SHIPPEY
Koördineerder: Omgewingsinvloedbepaling
(Geregistreerde Omgewingstakseringspraktisyn)

Cape Times (A3)

ENVIRONMENTAL IMPACT ASSESSMENT (EIA)

EIA PROCESS: RAISING OF CLANWILLIAM DAM AND ASSOCIATED REALIGNMENT OF AFFECTED ROADS

Notice is given in terms of Regulation (4) 6 of the regulations published in Government Notice No. R1183 under Section 26 of the Environment Conservation Act 73 of 1989 of the intent to carry out the following activities:

- The raising of Clanwilliam Dam wall, by either 5, 10 or 15 metres, through the addition of rollcrete on the downstream face of the dam wall; and
- The realignment of sections of the N7 National road, and consideration of the impacts of inundation on other roads.
- The proponent for the project is the Department of Water Affairs and Forestry in conjuction with the Provincial Government of the Western Cape.
- Ninham Shand Consulting Services has been appointed to undertake the requisite Environmental Impact Assessment process. Contact the Public Facilitator, Ms Doreen Februarie, Tel: (021) 903 5911, Fax (021) 903 8376 or Email: nosiphocc@telkomsa.net

A Public Meeting will be held from 10h00 to 12h00 on Wednesday 20 July 2005 at the Clanwilliam Bowling Club, Clanwilliam.

In order to ensure that you are identified as an interested and/or affected party, please submit your name, contact information and interest in the matter to the contact person given above within 30 days of publication of this advertisement. **PLEASE NOTE THAT THE FUTURE CORRESPONDENCE WILL ONLY BE SENT TO REGISTERED PARTICIPANTS.**

Die Burger (A2)

OMGEWINGSINVLOEDBEPALING (OIB)

PROSES VIR DIE OIB: VERHOGING VAN DIE CLANWILLIAMDAM EN GEPAARDGAANDE VAN HERBELYNING VAN PAAIE WAT HIERDEUR GERAAK WORD

In terme van Regulasie (4) 6 van artikel 26 van die Wet op Omgewingsbewaring, Wet 73 van 1989, word hiermee kennis gegee van die voorneme om die volgende aktiwiteite uit te voer:

- Die verhoging van die Clanwilliam damwal met 5, 10 of 15 meter deur die aanbring van rolbeton op die stroomaf aansig van die damwal; en
- Die herbelyning van sekere gedeeltes van die N7 Nasionale Pad, en die moontlike gevolge van die oorstroming van ander paaie.
- Die voorsteller van hierdie projek is die Departement van Waterwese en Bosbou, in samewerking met die Wes-Kaapse Provinsiale Regering.
- Ninham Shand Raadgewende Dienste is aangestel om die vereiste Omgewingsinvloedbepaling uit te voer. Tree asb in verbinding met die Openbare Fasilliteerder, Me Doreen Februarie, by Tel: (021) 903-5911; Faks (021) 903-6376 of E-pos: noelphocc@telkomsa.net

'n Openbare vergadering sal op Woensdag 20 Julie 2005 van 10:00 -12:00 in die saal van die Clanwilliam Rolbalklub gehou word.

Indien u as 'n belanghebbende en/of geaffekteerde party wil registreer, moet u binne 30 dae na publikasie van hierdie advertensie u naam, kontakbesonderhede en u belang in hierdie aangeleentheid aan die openbare fasilliteerder voorsien.
NEEM ASB KENNIS DAT VERDERE KORRESPONDENSIE SLEGS AAN GEREGISTREERDE DEELNEMERS GESTUUR SAL WORD.

Noelphe-200605

Ons Kontrei (A1)

OMGEWINGSIMPAKBEPALING (OIB)

PROSES VIR DIE OIB: VERHOGING VAN DIE CLANWILLIAMDAM EN GEPAARDGAANDE VAN HERBELYNING VAN PAAIE WAT HIERDEUR GERAAK WORD

In terme van Regulasie (4) 6 van artikel 26 van die Wet op Omgewingsbewaring, Wet 73 van 1989, word hiermee kennis gegee van die voorneme om die volgende aktiwiteite uit te voer:

- Die verhoging van die Clanwilliam damwal met 5, 10 of 15 meter deur die aanbring van rolbeton op die stroomaf aansig van die damwal; en
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- Die voorsteller van hierdie projek is die Departement van Waterwese en Bosbou, in samewerking met die Wes-Kaapse Provinsiale Regering.
- Ninham Shand Raadgewende Dienste is aangestel om die vereiste Omgewingsimpakbepaling uit te voer. Tree asb in verbinding met die Openbare Fasiliteerder, Me Doreen Februarie, by Tel: (021) 903-5611; Faks (021) 903-6376 of E-pos: [illegible]@telkomsa.net

'n Openbare vergadering sal op Woensdag 20 Julie 2005 van 10:00 - 12:00 in die saal van die Clanwilliam Rolbalklub gehou word.

Indien u as 'n belanghebbende en/of geaffekteerde party wil registreer, moet u binne 30 dae na publikasie van hierdie advertensie u naam, kontakbesonderhede en u belang in hierdie aangeleentheid aan die openbare fasiliteerder voorsien. **NEEM ASB KENNIS DAT VERDERE KORRESPONDENSIE SLEGS AAN GEREGISTREERDE DEELNEMERS GESTUUR SAL WORD.**

Weskus Media (A4)

OMGEWINGSINVLOEDBEPALING (OIB)

PROSES VIR DIE OIB: VERHOGING VAN DIE CLANWILLIAMDAM EN GEPAARDGAANDE HERBELYNING VAN PAAIE WAT HIERDEUR GERAAK WORD

In terme van Regulasies (4) 5 van artikel 26 van die Wet op Omgewingsbewaring, Wet 73 van 1989, word hiermee kennis gegee van die voorneme om die volgende aktiwiteite uit te voer:

- Die verhoging van die Clanwilliam-damwal met 5, 10 of 15 meter deur die aanbring van rolbeton op die stroomaf-aansig van die damwal; en
- Die herbelyning van sekere gedeeltes van die N7 Nasionale Pad, en die moontlike gevolge van die oorstroming van ander paaie.
- Die voorsteller van hierdie projek is die Departement van Waterwese en Bosbou, in samewerking met die Wes-Kaap Provinsiale Regering.
- Ninham Shand Raadgewende Dienste is aangestel om die vereiste Omgewingsinvloed-bepaling uit te voer. Tree asb. in verbinding met die Openbare Fasiliteerder, Ms.Doreen Februarie, by tel: (021) 903 5911, faks (021) 903 8376 of e-pos: nosiphocc@telkomsa.net.

'n Openbare vergadering sal op Woensdag, 20 Julie 2005 van 10:00 - 12:00 in die saal van die Clanwilliam Rolbalklub gehou word.

Indien u as 'n belanghebbende en/of geaffekteerde party wil registreer, moet u binne 30 dae na publikasie van hierdie advertensie u naam, kontakbesonderhede en u belang in hierdie aangeleentheid aan die openbare fasiliteerder voorsien. **NEEM ASB. KENNIS DAT VERDERE KORRESPONDENSIE SLEGS AAN GEREGISTREERDE DEELNEMERS GESTUUR SAL WORD.**

VERHOGING VAN DIE CLANWILLIAMDAM EN GEPAARDGAANDE HERBELYNING VAN PAAIE WAT HIERDEUR GERAAK WORD

AGTERGROND INLIGTINGSDOKUMENT

JUNIE 2005

AGTERGROND

Die Clanwilliamdam, wat in die Olifantsrivier geleë is, is oorspronklik in 1935 gebou en is in die 1970s verhoog deur die aanbring van sluise en die gebruik van voorspanningskabels. (Verwys na **Figuur 1**). Die dam voldoen egter nie aan die huidige damveiligheidsvereistes wat van toepassing is op uiterste omstandighede nie en die Departement van Waterwese en Bosbou (DWAF) is van mening dat stappe binnekort geneem moet word om hierdie saak reg te stel. Hierdie situasie skep die geleentheid om die volvoorraadvlak (vvv) van die dam terselfdertyd te verhoog, maar slegs indien die marginale koste van die verhoging, bo en behalwe die koste verbonde aan die versterking van die damwal, ekonomies lewensvatbaar, maatskaplik wenslik en ekologies aanvaarbaar is.

Die Verkenningstudie (DWAF, 2003), wat deel was van Fase II van die Olifants/Doringrivier Opvanggebiedstudie, het tot die slotsom gekom dat die verhoging van die damwal die lewering vanuit die dam op 'n koste-doeltreffende wyse kan verhoog en dat hierdie moontlikheid deur middel van 'n uitvoerbaarheidstudie verder ondersoek moet word.

In Januarie 2004 is die "Vereniging vir die Verhoging van die Clanwilliamdam", wat bestaan uit Ninham Shand, Asch Raadgewende Ingenieurs en Jakoet & Vennote, deur DWAF aangestel om 'n uitvoerbaarheidstudie oor die moontlike verhoging van die Clanwilliam damwal te onderneem.

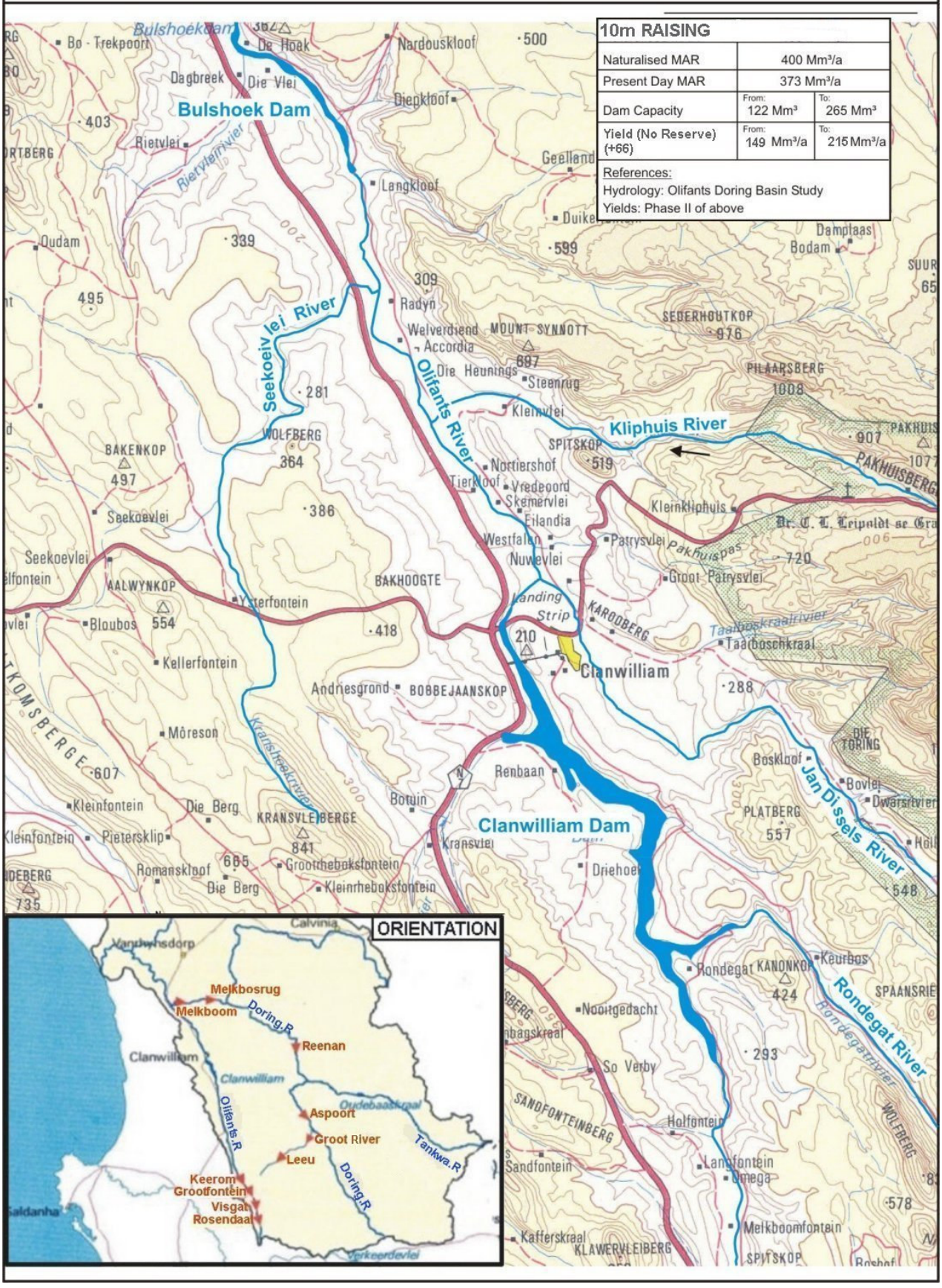
Indien die damwal verhoog word, sal dit die N7 Nasionale Pad op sekere plekke oorstroom en is die herbelyning daarvan noodsaaklik. Ander paaie mag ook oorstroom word. DWAF, in samewerking met die Wes-Kaapse Provinsiale Regering, hanteer die ondersoek en die ontwerpwerk wat met die herbelyning gepaard gaan.

As deel van die uitvoerbaarheidstudie word 'n omgewingsinvloedbepaling van die verhoging van die Clanwilliamdam en die herbelyning van die N7 Nasionale Pad gemaak. Die invloed op ander paaie wat oorstroom kan word, word ook in oorweging geneem.

Die doel van hierdie agtergrond inligtingsdokument is om:

- Agtergrond te verskaf en die voorgestelde projek uiteen te sit;
- Die studieproses te omskryf, veral in terme van die geleenthede vir openbare deelname; en
- Belanghebbende en Geaffekteerde Partye (B&GP) uit te nooi om as deelnemers tot die proses te registreer en enige geskilpunte of kwessies oor die projek openbaar te maak.

CLANWILLIAM DAMTERREIN



Figuur 1: Kaart van die Clanwilliamdam

DIE UITVOERBAARHEIDSTUDIE VIR DIE VERHOGING VAN DIE CLANWILLIAM DAMWAL

DWAF beoog om die damwal te versterk deur rolbeton aan die stroomaf aansig van die damwal aan te bring. Hierdie remediërende werk bied die geleentheid om die damwal terselfdertyd koste-doeltreffend te verhoog,, bykomende lewering te verskaf en die versekering van lewering te verbeter.

Die oorkoepelende doel van die uitvoerbaarheidstudie is dus om te bepaal of die verhoging van die Clanwilliamdam ekonomies lewensvatbaar, maatskaplik wenslik en ekologies aanvaarbaar is.

Indien die verhoging lewensvatbaar blyk te wees, sal daar verdere ondersoek ingestel word na die hoogte waarmee die damwal verhoog moet word.

DIE VOORGESTELDE PROJEK

Die omgewingsinvloedbepaling vorm 'n integrale deel van die uitvoerbaarheidstudie vir die voorgestelde verhoging van die damwal en die herbelyning van paaie.

Die volgende aktiwiteite is deel van die projek:

- Die verhoging van die Clanwilliam damwal met 5, 10 of 15 meter;
- Die herbelyning van sekere gedeeltes van die N7 Nasionale Pad; en
- Die invloed van die oorstroming op ander paaie in die omgewing van Clanwilliam.

Die omgewingsinvloedbepaling dien 'n dubbele doel deurdat dit inligting sal verskaf oor die ekologiese wenslikheid van DWAF se voorgestelde verhoging van die damwal, asook die betrokke omgewingsowerheid (die Departement van Omgewingsake en Toerisme, oftewel DEAT), in sal lig oor die gevolge van die verhoging.

WETLIKE VEREISTES

Verordening 1182, afgekondig in terme van die Wet op Omgewingsbewaring (Wet No. 73 van 1989), identifiseer sekere aktiwiteite wat 'n '*wesenlike nadelige gevolg op die omgewing*' mag hê. Hierdie geskeduleerde aktiwiteite vereis dat die Departement van Omgewingsake en Toerisme (DEAT) 'n omgewingsmagtiging na afloop van 'n omgewingsinvloedbepaling moet uitreik.

Die primêre geskeduleerde aktiwiteit in hierdie projek wat die omgewingsinvloedbepaling noodsaak, is die "*konstruksie, bou of opgradering van:*

- *damme, oewerwalle en stuwalle wat die vloei van 'n rivier beïnvloed*; en
- *paaie, spoorlyne, vliegvelde en verwante strukture*"

Die ontginning van material uit steelgate en klipgroewe vir die konstruksie van die damwal en paaie, vereis ook 'n magtiging vanaf die Departement van Mineraal- en Energiesake in terme van die verordeninge wat in die *Mineral and Petroleum Resources Development Act*, (Wet No. 28 van 2002) vervat is. Permitte moet ook aangevra word in terme van die Wet op Nasionale Erfenishulpbronne (Wet No. 25 van 1999) en die Nasionale Waterwet (Wet No. 36 van 1998).

DIE OMGEWINGSINVLOEDBEPALING (OIB)

Die OIB-proses bestaan uit twee fases, nl. die verslag oor die Omvangsbepaling en die Omgewingsinvloedbepalingsverslag. Die doel van die Omvangsbepalingsverslag is om daardie aspekte te identifiseer wat tydens die OIB-fase verder ondersoek moet word sodat eenstemmigheid verkry kan word oor die alternatiewe wat ondersoek moet word.

Die verslag oor die omgewingsinvloedbepaling sal bestaan uit 'n evaluering van al die aspekte wat tydens die omvangsbepaling geïdentifiseer is. Tot op datum is die volgende spesialis-studies as van belang geïdentifiseer:

- Botaniese opname;
- Opname van varswatervisse;
- Evaluering van invloed op erfenisgebiede;
- Hirdogeologiese ondersoek; en
- Evaluering van maatskaplike gevolge.

Openbare deelname vorm 'n integrale deel van beide die Omvangsbepaling- en die OIB-fases. Die geleentheid wat u kry om aan hierdie fases deel te neem, word op 'n latere stadium bespreek.

MOONTLIKE ALTERNATIEWE

Die voorgestelde verhoging van die Clanwilliamdam is voorafgegaan deur heelwat studies oor die onderskeie opsies vir die ontwikkeling van waterhulpbronne in die Olifants-Doorn Waterbestuursgebied (WBG). Die studiespan het ook die ontwikkelingsopsies wat voorheen vir beide oppervlak- en grondwaterbronne in die WBG voorgestel is, deur middel van 'n "Evaluering van Opsies"-proses ondersoek.

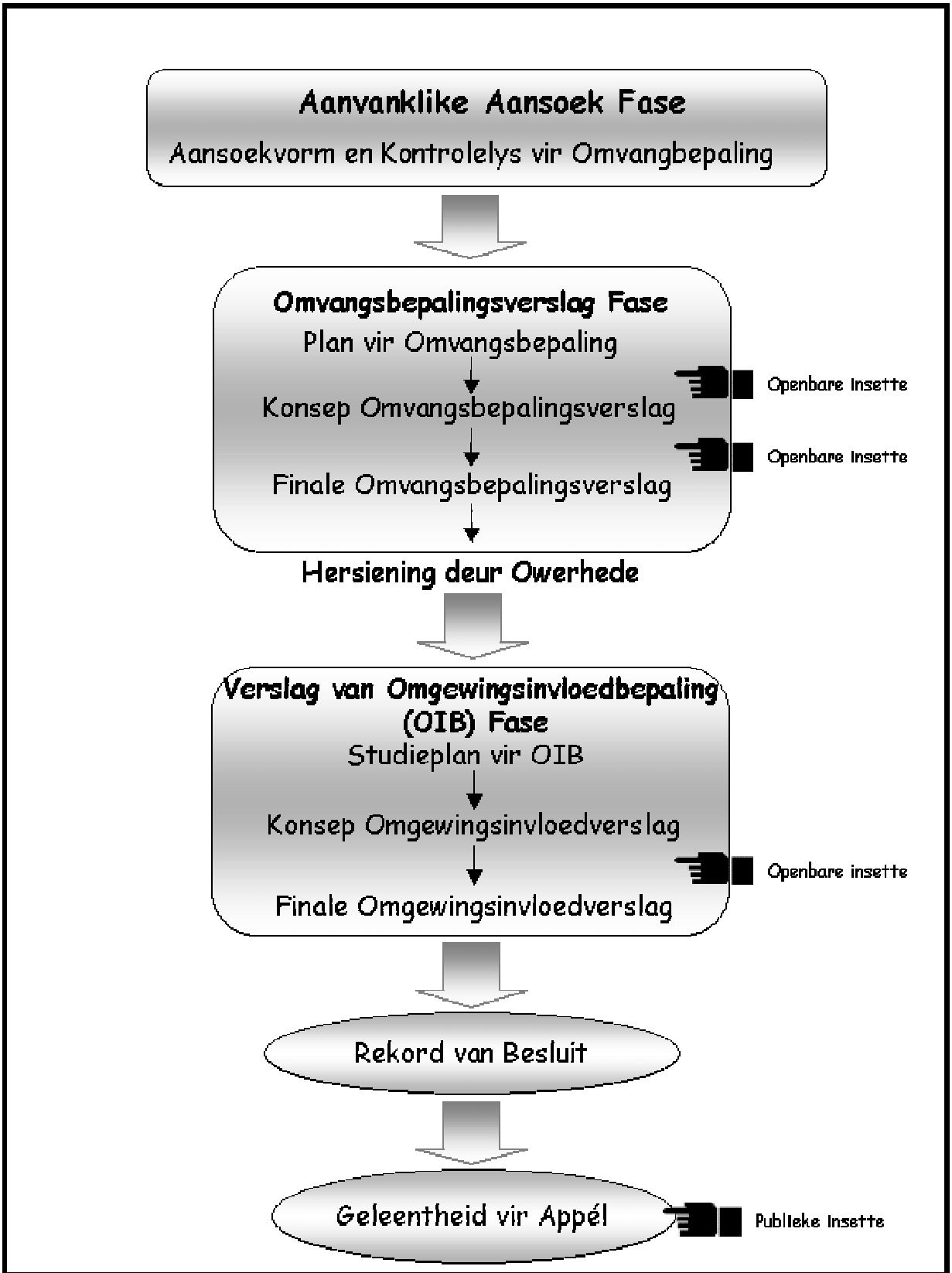
Die Verslag oor die Evaluering van Opsies is saamgestel deur spesialiste en die Verwysingsgroep van die WBG. Dit kyk na die aanvaarbaarheid van die onderskeie oppervlak- en grondwateropsies in vergelyking met die verhoging van die Clanwilliamdam. Daar is tot die slotsom gekom dat die bou van buitebedding plaasdamme, die ontwikkeling van grondwaterbronne en die verhoging van die Clanwilliam damwal die mees geskikte opsies is. Die Verslag oor die Evaluering van Opsies is aan die lede van die WBG Verwysingsgroep voorgelê, en hulle kommentaar is in aanmerking geneem.

Diegene wat verdere inligting verlang kan die Verslag oor die Evaluering van Opsies naslaan in die Clanwilliam openbare biblioteek, die munisipale kantore en op Ninham Shand se webwerf by www.shands.co.za.

Hierdie strategiese dokument dien as vertrekpunt vir die omgewingsinvloedbepaling. Geen van die alternatiewe ontwikkelingsopsies sal ondersoek word nie, aangesien hulle reeds in die Verslag oor die Evaluering van Opsies aangespreek is.

Die enigste alternatiewe wat wel ondersoek sal word, is daardie wat direk met die projek verband hou, soos:

- Die verhoging van die Clanwilliam damwal met 5, 10 of 15 meter;
- Alternatiewe vir die herbelyning van die N7 Nasionale Pad. Dit sluit die konstruksie van 'n viaduk tot 'n totale verlegging van die pad (afhangende



Figuur 2: Proses vir Omgewingsinvloedbepaling

van die hoogte waarmee die wal verhoog sal word) in; en
- Die gevolge van ander paaie in die omgewing van Clanwilliam wat oorstroom mag word.

HOE U BETROKKE KAN RAAK

Openbare deelname is 'n sleutelkomponent van die omgewingsinvloedbepaling en sal gereeld deur die loop van die projek plaasvind. Soos in **Figuur 2** hierbo uiteengesit, sal daar drie geleenthede wees waartydens die publiek by die proses betrek sal word. Die eerste geleentheid is met die aanvang van die projek, die tweede nadat die konsepverslag van die omvangsbepaling voltooi is en die derde geleentheid sal plaasvind nadat die konsep OIB-verslag saamgestel is.

Tydens elkeen van hierdie geleenthede sal geregistreerde G&BPs tersaaklike dokumentasie ontvang, soos bv. die Uitvoerende Opsomming van die Konsep Omvangsbepalingsverslag. Hulle sal dan uitgenooi word om 'n openbare vergadering, waartydens hulle geleentheid sal kry om enige kwessies aan te spreek, by te woon. Kommentaar kan ook binne 30 dae skriftelik ingedien word.

Sleutelrolspelers wat tot op datum geïdentifiseer is, sluit die volgende in:

- Grondeienaars wat direk geraak word;
- Lede van die WGB Verwysingsgroep;
- Watergebruikersverenigings en Forums;
- B&GPe van die WODRIS-studie;
- Amptenare van die betrokke Distriks- en Plaaslike munisipaliteite;
- Amptenare van die betrokke provinsiale en nasionale staatsdepartemente;
- Plaaslike raadslede.

Hierdie lys is geensins omvattend nie en u word aangemoedig om ons in kennis te stel van enige persoon wat graag deel van die proses wil wees.

Indien u enige kommentaar wil lewer of kwessies oor die proses wil opper, of indien u as 'n G&BP wil registreer, moet u asb die aangehegte Antwoordblad invul en dit aan Nosipho Consultancy faks of pos deur van die ingeslote gratis besigheidsantwoordkoevert gebruik te maak.

LET WEL: U SAL GEEN VERDERE KORRESPONDENSIE ONTVANG INDIEN U NIE AS 'N B&GP GEREGISTREER IS NIE.

KONTAKPERSOON

Doreen Februarie
Tel: (021) 903-5911 Faks: (021) 903-8376
nosiphocc@telkomsa.net

Nosipho Consultancy
Posbus 174
Kuilsrivier
7579

MOENIE VERGEET OM U ANTWOORDBLAD IN TE VUL EN AS 'N B&GP TE REGISTREER NIE!

RAISING OF CLANWILLIAM DAM AND ASSOCIATED REALIGNMENT OF AFFECTED ROADS

BACKGROUND INFORMATION DOCUMENT

JUNE 2005

BACKGROUND

The Clanwilliam Dam, located on the Olifants River, was originally built in 1935, and was raised in the 1970s by adding gates and the use of pre-stressed cables (Refer to **Figure 1**). In order to comply with current dam safety standards applicable during extreme events, the Department of Water Affairs and Forestry (DWAF) envisages that remedial measures will be required at the dam in the near future. This presents an opportunity to raise the full supply level (FSL), if the marginal cost of raising, over and above the cost of strengthening the dam wall, is economically viable, socially desirable and environmentally acceptable.

The Reconnaissance Study (DWAF, 2003), which formed part of the Olifants/Doring River Basin Study Phase II, concluded that raising the dam could cost-effectively result in the provision of increased yield and recommended that it be investigated further at a feasibility level of study.

In January 2004, the Clanwilliam Dam Raising Association, comprising Ninham Shand, Asch Consulting Engineers and Jakoet & Associates was appointed by DWAF to undertake a Feasibility Study for the possible raising of the Clanwilliam Dam.

Should the dam be raised, the N7 National Road would be inundated, and would therefore require realignment. Other roads may also be affected by the inundation. DWAF, in consultation with the Provincial Government of the Western Cape, has agreed to undertake the investigation and design work associated with the potential road realignment.

As part of the Feasibility Study, an Environmental Impact Assessment (EIA) process is being undertaken for the raising of the Clanwilliam Dam, the realignment of the N7 National road. Implications of the inundation of other roads will also be considered.

The purpose of this Background Information Document is to:

- Provide a background to and description of the proposed project;
- Describe the study process, particularly in terms of the opportunities for public participation; and
- Invite Interested and Affected Parties (I&APs) to register as participants in the process and to raise any issues or concerns they may have regarding the project.

THE FEASIBILITY STUDY FOR THE RAISING OF CLANWILLIAM DAM

DWAF envisages strengthening the dam wall by adding a rollcrete section to the downstream side of the dam. The proposed remedial work presents an opportunity for DWAF to simultaneously raise the dam wall, thereby achieving cost savings and providing additional yield and increased assurance of supply.

Figure 1: Map of Clanwilliam Dam

The overall objective of the Feasibility Study is thus to determine whether the raising of Clanwilliam Dam is economically viable, socially desirable and environmentally acceptable.

If the raising is viable, the optimal height by which the dam wall should be raised would be determined.

THE PROPOSED PROJECT

An integral part of the Feasibility Study is the Environmental Impact Assessment process for the proposed dam raising and road realignment.

The project comprises the following activities:

- The raising of Clanwilliam Dam wall, by either 5, 10 or 15 metres;
- The realignment of sections of the N7 National road; and
- Considering the implications of inundating other roads in the Clanwilliam area.

The EIA would fulfil a dual role of informing DWAF's decision on the environmental desirability of the proposed dam raising and informing the competent environmental authority, the Department of Environmental Affairs and Tourism (DEAT), of the implications of raising the dam.

LEGAL REQUIREMENTS

Regulation 1182, promulgated in terms of the Environment Conservation Act (ECA) (No. 73 of 1989), identifies certain activities, which '*could have a substantial detrimental effect on the environment*'. These scheduled activities require environmental authorisation from the Department of Environmental Affairs and Tourism (DEAT) through an EIA process.

The primary scheduled activities which trigger the requirement for an EIA process in this project are the "c*onstruction, erection or upgrading of:*

- *dams, levees and weirs affecting the flow of a river* and;
- *roads, railways, airfields and associated structures"*

Furthermore, the sourcing of material from borrow pits and quarries for the construction of the dam wall and the roads, triggers the regulations in terms of the Mineral and Petroleum Resources Development Act (No. 28 of 2002), and will require authorisation from the Department of Minerals and Energy. Permits in terms of the National Heritage Resource Act (No. 25 of 1999) and the National Water Act (No. 36 of 1998) will also be required.

THE EIA PROCESS

The EIA process consists of a Scoping Report Phase and an Environmental Impact Report (EIR) Phase. The purpose of the Scoping Report Phase is to identify those aspects that will require specialist investigation and assessment during the EIR Phase and to obtain agreement on alternatives to be assessed.

The Environmental Impact Report will contain an assessment of the aspects identified during the Scoping Phase. To date, the following specialist

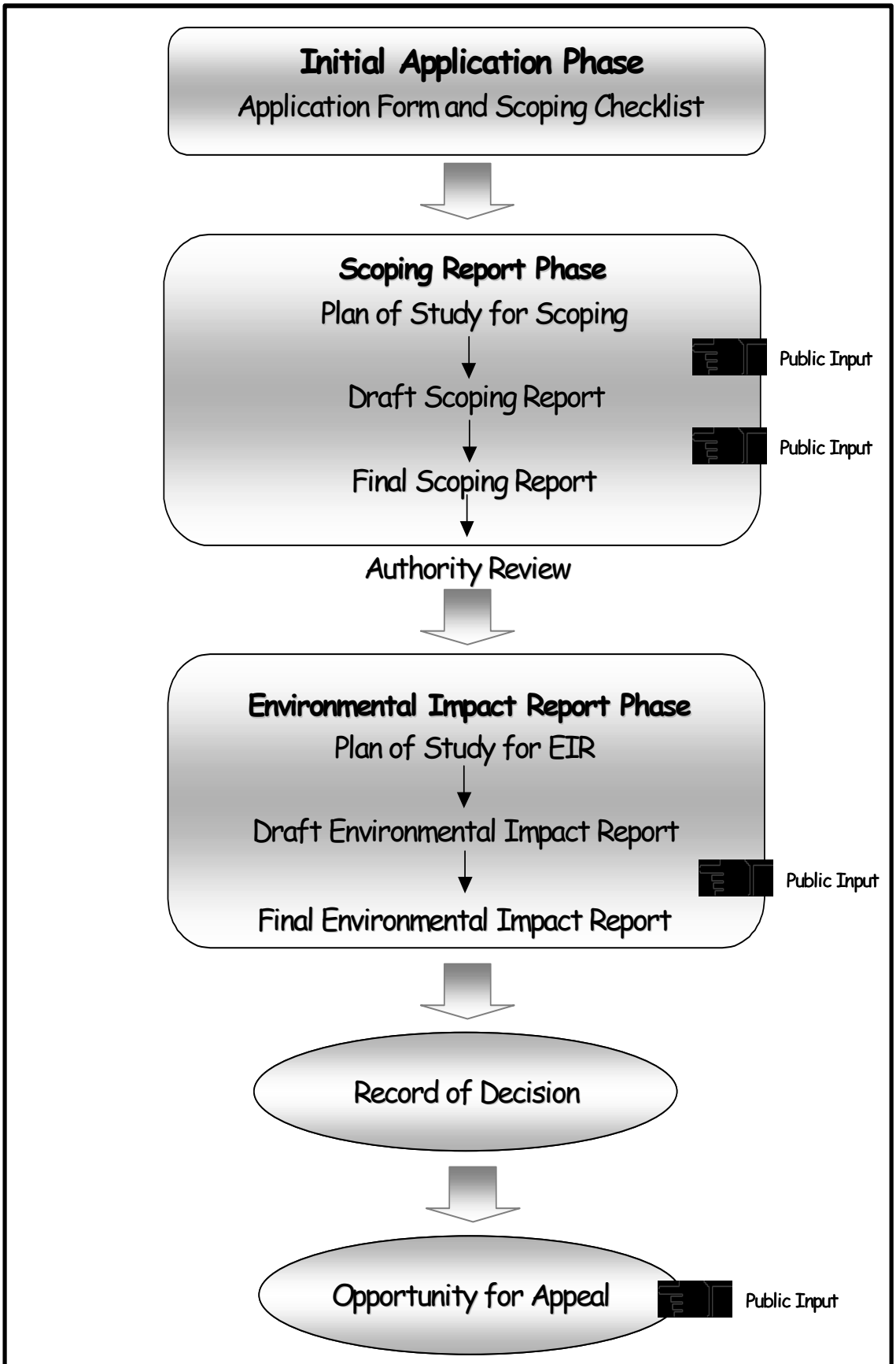


Figure 2: Environmental Impact Assessment process

studies have been identified as being required:

- Botanical assessment;
- Freshwater fish survey;
- Heritage impact assessment;
- Hydrogeological investigation; and
- Social impact assessment.

Public participation forms an integral component of both the Scoping and EIR Phases and your opportunity to participate in the EIA process is discussed below.

CONSIDERATION OF ALTERNATIVES

The proposed raising of Clanwilliam Dam was preceded by many studies that investigated water resource development options in the Olifants-Doorn Water Management Area (WMA). The Feasibility Study team undertook a "Screening of Options" review to compare the previously identified water resource development options (surface water and groundwater) in the WMA.

The Screening of Options Report was informed by specialists, and the WMA Reference Group. It considers the acceptability of the various surface water and groundwater development options in comparison to the raising of Clanwilliam Dam. It concluded that the most favourable development options for the WMA include the development of off-channel farm dams, the development of groundwater and the Raising of Clanwilliam Dam. The Screening of Options Report was presented to the WMA Reference Group members, who provided their comments to the team.

The Screening of Options Report has been made available at the Clanwilliam public library and municipal offices and on the Ninham Shand website at www.shands.co.za should you be interested in finding out more.

This strategic report serves as the starting point for the EIA process. It is intended that other water resource development alternatives not be revisited during the EIA process, as they have been addressed in the Screening of Options Report.

Therefore, only project level specific alternatives will be further investigated, including:

- Raising the Clanwilliam Dam by 5, 10 and 15 metres;
- Road realignment alternatives for the N7 National road ranging from the construction of a viaduct to a complete rerouting of the road, dependent on the level of raising; and
- The implications of inundating other roads in the Clanwilliam area.

HOW YOU CAN GET INVOLVED

Public participation is a key component of this EIA process and will take place at various stages throughout the project. As outlined in **Figure 2** above, there will be three opportunities for public engagement during this EIA process. The first opportunity is at the initiation of the project, the second opportunity after the Draft Scoping Report has been compiled, and the third opportunity after the Draft EIR has been compiled.

At each stage, registered I&APs will receive relevant information, such as the

Executive Summary of the Draft Scoping Report, and will be invited to attend a public meeting, where they will have the opportunity to raise any concerns. You will also be able to submit your comments in writing and will have 30 days within which to do this.

Key stakeholders identified to date include:

- Directly affected landowners;
- WMA Reference Group members;
- Water User Associations and Forums;
- I&APs from the WODRIS study;
- Relevant District and Local Municipality officials;
- Relevant National and Provincial government officials; and
- Local Councillors.

This list does is by no means comprehensive, and you are encouraged to notify us if there is anyone who would be interested in participating in this project.

Should you wish to raise any issues of concern regarding the proposed project, or if you wish to register as an I&AP, please complete the attached Response Form and return it to Nosipho Consultancy by fax or by using the free business reply envelope provided.

PLEASE NOTE: WE WILL NOT SEND YOU ANY FUTURE CORRESPONDENCE IF YOU DO NOT REGISTER AS AN I&AP.

CONTACT PERSON

Doreen Februarie
Tel: (021) 903 5911 Fax: (021) 903 8376
nosiphocc@telkomsa.net

Nosipho Consultancy
PO Box 174
Kuils River
7579

DON'T FORGET TO COMPLETE AND SUBMIT YOUR REPSONSE FORM, TO REGISTER AS AN I&AP!

RAISING OF CLANWILLIAM DAM AND ASSOCIATED REALIGNMENT OF AFFECTED ROADS ~ EIA PROCESS

Response Form for comment by Interested and Affected Parties

Please return this page to the Public Facilitator via fax or by using the envelope provided:

Attention: Ms Doreen Februarie

Tel No: (021) 903 5911 Fax No: (021) 903 8376

Postal Address: P.O. Box 174, Kuils River, 7579

YOUR NAME: .....

ORGANISATION (If applicable): .....

POSTAL ADDRESS: .....

.....CODE:.....

PHONE NUMBER: ....FAX NUMBER: .....

EMAIL: .....

1) I would like to register/ remain registered as an Interested and Affected Party and receive future correspondence (tick relevant block):

Yes	No

2) List any other Interested and Affected Parties that should be contacted (with contact details if available):

Name/ Organisation	Postal Address	Tel No.	Fax No.

PLEASE LIST ANY COMMENTS, ISSUES OR CONCERNS WHICH YOU MAY HAVE:

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Thank you for your time!

VERHOGING VAN DIE CLANWILLIAMDAM EN DIE GEPAARDGAANDE HERBELYNING VAN PAAIE WAT HIERDEUR GERAAK WORD ~ OMGEWINGSIMPAKSTUDIE

Antwoordblad vir kommentaar deur Belanghebbende en Geaffekteerde Partye (B&GP)

Stuur hierdie bladsy asb terug aan die Openbare Fasiliteerder deur dit in die ingeslote koevert terug te stuur of te faks aan:

Aandag: Me Doreen Februarie Tel: (021) 903-5911 Faks: (021) 903-8376
Posadres: Posbus 174, Kuilsrivier 7579

U NAAM: .....

ORGANISASIE (Indien van toepassing): .....

POSADRES: .....

.....KODE:.....

TELEFOONNR: ....FAKSNR:.....

EPOS: .....

1) Ek wil graag as 'n B&GP registreer / geregistreer bly en toekomstige korrespondensie ontvang (merk betrokke blokkie):

Ya	Nee

2) Lys enige ander G&BPs wat genader moet word (met kontakbesonderhede indien beskikbaar):

Naam/ Organisasie	Posadres	Telnr.	Faksnr.

SKRYF ASB ENIGE KOMMENTAAR, GESKILPUNTE OF KWESSIES WAT U MAG HÊ HIERONDER NEER:

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Dankie vir u tyd!

APPENDIX H

Issues raised through Public Process

- Issues trail
- Original comments submitted by I&APs

RAISING OF CLANWILLIAM DAM AND ASSOCIATED REALIGNMENT OF AFFECTED ROADS, COMMENTS FROM I&APS				
	Individual	**Organisation**	**Issue or Concern**	**Action/ Response**
1	J Mountain	John Mountain Property	Raised concern regarding the height of dam wall in relation to the increased FSL area.	Noted.
2	R Charlwood		Interested in the condition, rehabilitation and future life span of the ageing concrete dam and related structures	A Dam Safety Inspection report has been compiled for the Clanwilliam Dam. Rehabilitation work is required to bring the dam in line with current dam safety guidelines applicable during extreme events.
3	N Oettle	Environmental Monitoring Group	For the past 3 summers the ecological reserve in the Olifants River has been inadequate and raising the wall will not address the inadequacy if :	Ecological Water Requirements (EWR) are currently not released from the dam. However a Reserve Determination process is currently underway to determine the quantity and quality of water required for ecological maintenance. Once the Reserve has been satisfied, the remaining water would be available for use.
			-The additional water is all allocated for agriculture (especially in drought years).	
			- Farmers continue to extract water downstream of the dam	
			Increased water supply should not be equated to increased water availability for Resource Poor Farmers	The Department of Water Affairs and Forestry is committed to facilitating the establishment of Resource Poor Farmers in the Olifants/Doring River catchment. As part of the Feasibility Study for the Raising of Clanwilliam Dam, equitable utilisation of water and opportunities for Resource Poor Farmers is being investigated.
4	H Noemdoe	Sandveld Investments Co Ltd	Supports the development on the basis that more water is made available for small farmers	Noted.
5	S Breamme	Clanwilliam Riveira	What effect will the raising of the Clanwilliam Dam have on the level of the Bulshoek Dam during and after the raising of the wall?	During the construction phase, less water would be released from the dam, which may cause Bulshoek to be drawn down further than in a normal year.
6	M Kilbride		Concerned about the loss of available habitat for fauna in the area.	The additional area that would be inundated if the dam were raised is largely agricultural, with limited natural vegetation and consequently limited habitat for fauna. There is unlikely to be a large diversity of fauna in the area of inundation. There are some protected areas in the vicinity of the dam, such as the Cedarberg Wilderness Area, which would act as a refuge and recruitment area for fauna.
			Increasing the dam wall by 15m would result in a very little buffer between the dam and houses in Crystal Waters.	Noted.
7	C Ehrhardt	Wekufu-Weskaap Ubuntu Farmers Union	Would like information about or on decisions taken regarding the changes Clanwilliam Dam may have on emerging farmers.	One of the tasks of the Feasibility Study for the Raising of Clanwilliam Dam specifically investigates opportunities for Resource Poor Farmers as a result of raising Clanwilliam Dam.

RAISING OF CLANWILLIAM DAM AND ASSOCIATED REALIGNMENT OF AFFECTED ROADS, COMMENTS FROM I&APS				
	Individual	**Organisation**	**Issue or Concern**	**Action/ Response**
			The process should include emerging farmers from the start, so that they are fully capacitated and in their own language.	Noted. As part of the EIA process, emerging farmers have been identified and were invited to attend the first public meeting. Furthermore, transportation was provided to facilitate their attendance at the meeting. Emerging farmers will be invited to subsequent public meetings as part of the EIA process, and transportation will be provided. The public process is being run in English and Afrikaans, with Xhosa available on request.
			Resource Poor farmers must be represented in negotiations about the land	Noted. Land negotiations do not fall within the scope of the EIA process or the Feasibility Study.
8	T Steele	Namakwa Sands	Concerned about the impact that the project may have on water quality.	Sediment loads may increase during the construction phase of the project. This would however be for a limited duration. Water quality during the operational phase of the project is likely to improve, since the EWR will be set for the river and released from the Clanwilliam Dam. The EWR encompasses water quantity as well as quality requirements.
			Wanted to know if the current water allocations could be increased as a result of anticipated increased assurance of water supply?	This will be established by the modelling to be undertaken in the Feasibility study; however it is currently anticipated that there will be allowance for some water allocations to be increased.
			Would water supply during the construction period be disrupted and if so, what are the proposed actions to ensure continued supply to downstream users?	DWAF would endeavour to continue supplying water to downstream users during the construction of the project. However, if water could not be provided for periods of time, adequate notice would be provided.
			What would be the alternative road route between Klawer and Cape Town during the realignment of the N7?	During the road realignment process, traffic would continue to utilise the N7. The current alignment would be utilised while the new alignment was being constructed. On the sections of road that would be raised, traffic flow would be maintained by working on one lane at a time, and keeping the other lane open to traffic with control measures in place.
			Since construction activities will result in the disturbance of larger areas that may in the end not be part of the actual dam, what are the plans to limit this impact and to remediate/ rehabilitate after construction?	A Framework Environmental Management Plan would be developed to address construction phase impacts and post construction rehabilitation. DWAF also implements a construction EMP on all their contracts.
			What will water cost after the project has been implemented?	This is currently not known. The actual costs are needed for the DWAF to calculate such tariffs.
			Questioned whether or not a rehabilitation and closure plans for the quarries would be developed?	Required authorisations from the Dept of Minerals and Energy will be obtained to undertake quarrying activities. A requirement of these authorities is to develop an EMPR for the mining activity, which would include a rehabilitation plan. This will be detailed in the EIR.

RAISING OF CLANWILLIAM DAM AND ASSOCIATED REALIGNMENT OF AFFECTED ROADS, COMMENTS FROM I&APS				
	Individual	**Organisation**	**Issue or Concern**	**Action/ Response**
9	H K Gibbons		At what level would Cedarberg Parks be affected?	The Cedarberg Wilderness Area would not be affected by the raising of Clanwilliam Dam.
10	L Greeff	Environmental Monitoring Group	The Clanwilliam Dam raising should ensure that Doring River is kept pristine i.e. it should ensure optimal river functioning of the Doring River.	Noted.
			There is concern that a raised dam may not fill up during drought years.	This is normal. The dam would be designed to just not empty over the evaluation period for the agreed risk at which it is being designed.
			The study should increase focus on non-raising options of meeting the reserve, reducing current allocations and water demand management.	The various water resource options for the Water Management Area were considered in the Screening of Options Report. Please see **Annexure E** of the Scoping Report. The remainder of the Feasibility Study also addresses non-raising options as well, also for meeting the Reserve with current infrastructure, and water demand management options.
			- Concerned that the scoping meeting did not facilitate the participation of potential emerging farmers, especially women.	Emerging farmers were invited to the first public meeting, and many attended. Furthermore, DWAF provided transportation to the meeting, to facilitate their attendance and participation.
			- The project should consider all the construction impacts labour and HIV into the area.	Noted.
11	S Horn	Lambertsbaai Vroue vereeniging	Supports a dam raising of up to 5m to increase the water supply	Noted.
12	I Kruger		He feels that the option of making the dam deeper has not been investigated fully. While the dam was virtually empty in 2005, the capacity could have been doubled by clearing the silt and removing more sand.	Noted. The opportunity to raise Clanwilliam Dam has arisen out of the need to perform remedial work to the dam wall, which has to be undertaken.
			As a speedboat owner, he's concerned about potentially hazardous objects (trees), that will be submerged and not returned.	DWAF is likely to remove infrastructure within the inundation area, and would include large trees.
13	P Keuck	Department of Agriculture, Western Cape	The 5, 10 or 15m raising with associated total accounted cost and benefit relationships gives or points to an optimum height for raising the dam and the optimum height might prove to be 11.45m.	Noted. One of the purposes of the Feasibility Study is to assist DWAF in determining the optimal level to raise the dam by.
14	D Dorfman	Clanwilliam Hills	Support the project as they believe that more water is needed. They are willing to assist where ever necessary	Noted.
15	RE Vachaudez Louise		Supports the raising of the dam to ensure the survival and expansion of activities taking place downstream of the dam.	Noted.

RAISING OF CLANWILLIAM DAM AND ASSOCIATED REALIGNMENT OF AFFECTED ROADS, COMMENTS FROM I&APS				
	Individual	**Organisation**	**Issue or Concern**	**Action/ Response**
			Suggests raising the wall to its maximum height now, so that raising in the future is not precluded by further development or expropriation costs in the future.	Noted. The optimal level of raising would be determined using the technical, environmental and financial constraints as informants.
16	P Beukes	Weskus Jof	Water must be conserved and users must pay for water consumed.	Noted.
17	L & A Wrench		Would like a clear idea of the proposal and implications thereof before commenting on the project.	Project information is provided in the Background Information Document and Scoping Report both of which are publically available.
18	Anonymous		Concern is raised regarding disruption to N7 during the construction period and the Citrusdal Road (gravel road) as these are used to transport produce.	Noted. Please refer to section 5.4 of the Scoping Report. The impact on roads is going to be investigated in more detail in the EIR.
			The concern is raised that spring under the Clanwilliam hospital may flow stronger, when the dam is raised.	Noted. A groundwater specialist has been appointed to investigate the impact of raising Clanwilliam Dam on groundwater resources in the area. The results of this assessment will be presented in the EIR.
			The property owners of Caleta Cove are in opposition to the raising of the dam.	Noted. Directly affected landowners are invited to bring their issues and concerns to the process, so that these can be detailed and addressed during the study.
19	T Lutz	Up to date farms	Water tax or levy associated with the raising of the dam must not exceed the inflation rate.	Noted as input to the financial analyses, which will be undertaken towards the end of the Feasibility Study.
20	PS Raad		The farmer would like to know the exact level of dam raising, as this will greatly affect his farming, and he needs to undertake forward planning.	The decision as to the level that the dam would raised, if at all, is likely to be taken by June 2006. The decision would be informed by the Feasibility Study which includes the EIA process, and consequently, a decision would not be made until the study has been completed.
			He is also concerned that raising the dam will result in the flooding of the gravel road from Citrusdal to his property, cutting him off from the N7.	This impact is noted and must be investigated further, in order to determine its significance.
21	AA Erasmus	Clanwilliam Bewarea	Would like the study team to investigate accommodating an artificial fish ladder to allow upstream migration of the yellow fish	Noted. There is currently no intention to include a fish ladder as part of the dam wall design. Conditions in the dam are likely to be unsuitable for the Clanwilliam Yellowfish, and more suitable to exotic bass, which would outcompete the Yellowfish before it reached the upper reaches of the river. Please refer to **Section 5.2.3.**

RAISING OF CLANWILLIAM DAM AND ASSOCIATED REALIGNMENT OF AFFECTED ROADS, COMMENTS FROM I&APS				
	Individual	**Organisation**	**Issue or Concern**	**Action/ Response**
			If another borrow pit/quarry is developed, the possibility of converting it into a landfill site should be investigated, since the Clanwilliam landfill site has reached its design capacity.	Noted.
22	TJN Basson		Believes that there is more than enough water available, but that it is wasted because it flows out to sea. Storage could also be provided on the Doring River and the Jan Dyssels River.	Water that flows to the sea is not wasted. Different parts of the river, including the estuary require different volumes of water for ecological maintenance purposes. Furthermore, the National Water Act stipulates that the ecological functioning of a river must be maintained or improved through the provision of the requisite quantity and quality of water.
			For many years, there have been investigations into other storage options in the upper reaches of the Olifants River and the Doring River. Why have these options not been pursued?	Many storage options have been investigated on the Olifants and Doring Rivers. Many of these potential schemes are unfavourable, for different reasons. The Screening of Options Report contained in **Annexure E** of the Scoping Report assessed the various augmentation options previously identified according to capital-to-yield ratio, environmental impacts and potential beneficiaries.
			Would like further information on the number of people that rely on the dam for potable water, the value of farming activities that the additional water could realise, the additional tax that could be generated by the additional farming, the number of people that could be employed on the farms.	We do not have the exact number of people that currently rely on the dam for potable water, but it comprises the majority of the urban populations of the upper Olifants and lower Olifants River. The further requested information will only become available later in the Feasibility Study.
			Raising of Clanwilliam Dam to the maximum and construction of further dams on the Olifants and Doring rivers is critical for expansion of agriculture and development of Resource Poor Farmers	Noted. Please refer to The Screening of Options Report contained in **Annexure E** of the Scoping Report for further information on alternative resource options.
			Believes that the state should fund the entire cost of raising the dam, since it is better investment than building low cost housing, or making loans to neighbouring African states.	The State would pay for the rehabilitation work that would take place irrespective, but the users would be required to pay for the cost difference between the rehabilitation and dam raising costs. This cost is typically recouped through water tariffs.
23	LB Bergstedt		A concern is raised regarding the impact of the dam raising on the Olifants River mouth, and the deeper penetration of saline water.	As mentioned above, a Reserve Determination process for the Olifants/Doring river catchment is currently underway, which would stipulate the quantity and quality of water required by the river and estuary. Releases would need to be made from the Clanwilliam Dam to meet the Reserve requirements irrespective of the potential raising. Consequently, the Clanwilliam Dam should have no impact on the ecological functioning of the Olifants River estuary.

RAISING OF CLANWILLIAM DAM AND ASSOCIATED REALIGNMENT OF AFFECTED ROADS, COMMENTS FROM I&APS				
	Individual	**Organisation**	**Issue or Concern**	**Action/ Response**
24	S van Wyk	Kleinboere	Feels that meetings must be conducted in Afrikaans.	Noted. The approach for the first public meeting was to have presentations in English and Afrikaans, allow questions in both languages, and allowance for Xhosa translation was also made.
25	D Witbooi	Landbou Vroue Vereniging	Wants to know how the coastal towns and resource poor farmers will benefit from the raising of Clanwilliam Dam?	It is anticipated that some towns would receive additional water from a possible future raised dam, which would be determined by affordability of the water. Various options are being evaluated for benefitting resource-poor farmers, and it is expected that a range of possible options for resource-poor farmers to benefit will be proposed, which will likely include joint-venture options with established commercial farmers.The focus will be on establishing ownership of water rights and land.
26	CJ Smit	Die Poort (Farm)	The Reserve is not met in the upper reaches of the Olifants River during later summer. Perhaps a dam on the upper Olifants should be considered, utilising part of the money allocated for the Clanwilliam Dam.	This is beyond the scope of this study. A Reserve Determination Study is being undertaken for the Olifants and Doring Rivers. Alternative water resource options are considered in the Screening of Options Report contained in **Annexure E** of the Scoping Report.
			The Doring River provides a large volume of the water to the system. Explore using the Doring River water to satisfy the Reserve, and maybe some irrigation requirements too.	Noted. Please refer to the Screening of Options Report contained in **Annexure E** of the Scoping Report.
27	C van der Merwe	Rondegat Sitrus	Concern regarding inundation of the gravel road between Clanwilliam and Citrusdal, as he transports his produce on this road to Citrusdal.	Noted. The socio-economic impacts of a loss of access will be assessed during the EIR phase of the study.
			Parts of his farm and orchards will be inundated, depending on the height of the raising.	Noted. If DWAF takes the decision to raise the dam, a comprehensive process related to the acquisition of land would be undertaken. This will include a survey of the dam basin to accurately determine the extent of land lost, and negotiations regarding compensation with affected land owners.
28	PJ Hahn	Lower Olifants River area	Concern regarding the impact that the dam raising will have on existing fisherman in the Ebenhaeser and Papendorp areas.	The impact on fish in the river system is considered to be important. If the dam is raised, this is unlikely to have an effect on the fish in lower reaches of the Olifants River. Once the dam is raised, the EWR releases would be made from the dam, which would maintain the system in its current state, and in this case, improve the ecological functioning of the system.
			The canals only make provision for the existing established farmers. It is suggested that the whole scheme is upgraded so that Resource Poor Farmers can also benefit from the scheme.	This is beyond the scope of this study. A study of the canal system was undertaken by the LORWUA who own and operate the canals. Opportunities for resource Poor Farmers are being investigated as part of the Feasibility Study.

RAISING OF CLANWILLIAM DAM AND ASSOCIATED REALIGNMENT OF AFFECTED ROADS, COMMENTS FROM I&APS				
	Individual	**Organisation**	**Issue or Concern**	**Action/ Response**
29	PB Black	OVV & Ebenhaeser gemeenskap vereeniging	Concern regarding the impact that the dam raising will have on existing fisherman in the Ebenhaser and Papendorp areas.	Refer to the response to No. 28 above.
			How are the Resource Poor Farmers in the area accommodated in the proposed raising?	The Department of Water Affairs and Forestry is committed to facilitating the establishment of Resource Poor Farmers in the Olifants/Doring River catchment. As part of the Feasibility Study for the Raising of Clanwilliam Dam, equitable utilisation of water and opportunities for Resource Poor Farmers is being investigated. This is likely to include discussions with emerging farmers and other role players involved in supporting emerging farmers in the area.
30	JJ Claase	Lutzville Small Farmers	Suggests that livelihoods must be protected as a priority.	Noted.
31	NG Pienaar		Believes that the raised dam must first satisfy the existing allocations before making water available for'new' users.	Noted. Investigation of the equitable distribution of additional water will take place in the Feasibility Study. The National water Act requires water for basic human needs and the ecological water requirements to be provided first and then any additional water may be allocated to users. Additional water from the raising will be used for the establishment of resource poor farmers and to increase assurance of supply for existing irrigators.
			The catchment is not large enough to fill the raised dam on a yearly basis.	The modelling will show how often the dam will fill but it will likely not fill every year.
			The Resource Poor Farmers will not be able to afford to pay for the costs of the dam raising.	This will be addressed as part of the Feasibility Study by identifying and recommending the appropriate mechanisms of subsidies and grants.
32	A Faroa		Supports a 5m dam raising	Noted.
33	JP Smit	Klawervlei	Suggests that a dam is built in the upper reaches of the Olifants River, south of Citrusdal. This is proposed because the river often dries up between Citrusdal and Clanwilliam, and the dam could release water for the Reserve, thereby restoring river health, improving the water level in Clanwilliam Dam.	Potential dams upstream of Citrusdal that have been identified in the past were the Keerom and Grootfontein dams. Based on our assessment during the Screening of Options process, it was agreed that both these dams would result in the inundation of the Visgat gorge, which was deemed to be unacceptable from an environmental perspective. Refer to the Screening of Options Report, **Annexure E** of the Scoping Report
34	S du Toit	Koue Bokkeveld Water Forum	Concerned about the pressure that will be placed on the catchment to fill the raised Clanwilliam Dam.	The increased yield of the dam can mainly be ascribed to the trapping of more floods. If adequate releases are made, this should not place any further pressure on the catchment.

RAISING OF CLANWILLIAM DAM AND ASSOCIATED REALIGNMENT OF AFFECTED ROADS, COMMENTS FROM I&APS				
	Individual	**Organisation**	**Issue or Concern**	**Action/ Response**
			Concerned that downstream irrigation farmers will develop more, because they have the water, while there will be demand for water upstream of the dam.	Part of the Feasibility Study's tasks is to evaluate where demand for water exists, along with favourable conditions, and to make recommendations on where additional water, if any, can be allocated. If illegal use is being referred to, that will be for the DWAF to control.
35	J Saorag	Kleinboere	Hopes that the study and raising of Clanwilliam Dam will result in a reliable source of water to users downstream of the dam.	Noted.
36	R Kampies	Omsien Kleinboere	Concern is raised regarding the inundation of infrastructure such as houses and roads, as well as the safety of the dam.	Noted. If DWAF takes the decision to raise the dam, a comprehensive process related to the acquisition of land would be undertaken. This will include a survey of the dam basin to accurately determine the extent of land lost, and negotiations regarding compensation with affected land owners.
37	B van der Heever	Cape Mangos (Pty) Ltd	Landowner in the area (Rondegat 269, portion 7), has concerns regarding the inundation of infrastructure such as boreholes, roads etc.	Refer to the response to No. 36 above.
38	J Kleynhans Jordaan	Clanwilliam Vet	Owns property in Caleta Cove, and wants to undertake renovations, but in concerned that the property will be affected by the proposed dam.	DWAF states that until an official notice to acquire land has been issued to affected landowners, said landowners should continue with their activities as if the dam were not being raised. DWAF could make a decision regarding the dam raising as early as June 2006, once the results of the Feasibility Study and EIA process have been reviewed.
39	K Stuurman	Landbou Boere Vereniging	Supports the dam raising, provided that water is also provided to Resource Poor Farmers.	Refer to the response to No. 3 above. The Feasibility Study is investigating mechanisms for equitable water sharing and the inclusion of Resource Poor Farmers in new developments.
40	J Ferreira		Supports the dam raising, but if the dam is raised more than 5m, the Nooitgedacht Development will be inundated.	Noted. DWAF will liaise with affected landowners with regard to the acquisition of land, if a decision is made to raise the dam and appropriate compensation would be paid to those affected.
41	JPS Louw	LORWUA	States that farmers in the area do not necessarily require more water, but rather an improved assurance of supply. Long-term crops cannot be developed without water assured at a high level.	Noted. One of the possible options for the additional water would be to improve assurance of supply for the existing farmers. Equitable distribution of water is being investigated in the Feasibility Study.
42	ABJ Brand		DWAF has been dragging its feet with the raising of Clanwilliam Dam.	Noted.
43	PW Love	Ebenhaeser Transformation Committee	Would like to see transformation in the development area, with the emergence of new Resource Poor Farmers to take up the water.	Noted. Refer to the response to No. 3 above.
44	TIN Basson	TweeRiviere Boerdery	Providing more water to the area must get more attention as well as providing good quality water.	Noted.

RAISING OF CLANWILLIAM DAM AND ASSOCIATED REALIGNMENT OF AFFECTED ROADS, COMMENTS FROM I&APS				
	Individual	**Organisation**	**Issue or Concern**	**Action/ Response**
45	E Mostert	Olifants River Black Economic Empowerment Forum	Would like to see the awarding of tenders for contracts associated with the project to include black economic empowerment.	Noted. DWAF is likely to undertake 75% of the dam raising work itself, with 25% being subcontracted out. However, the road realignment contract is likely to be completely outsourced. DWAF has a procurement policy, which would be applied to this project.
46	A Petersen		Believes that there is no transparency in the process that is being undertaken.	We disagree. The Feasibility Study has included representatives of the Olifants Doorn Reference Group to assist in the determination of Screening of Options. Further to this, the Feasibility Study is engaging with emerging farmers, commercial farmers and Water User Associations in its investigations. The EIA process is open to all members of the public to ensure that all issues and concerns are addressed. Specific meetings have also been held with directly affected landowners to ensure extensive opportunities for information dissemination and collection. DWAF will be informed by all these processes when it determines whether or not to raise the dam and if so, to what level.
47	MM Mouton	Wupperthal Bewarea	Supports the project, provided that the requisite studies and processes are followed.	Noted.
48	IB du Toit	Koue Bokkeveld Water Forum	Has concerns regarding the increasing of irrigated land in the area, and wants to know why a dam is not built in the upper reaches of the Olifants River.	Refer to the response to No. 33 above. Dams in the upper reaches of the Olifants have been investigated in the past. Those investigated include Rosendal, Visgat, Grootfontein and Keerom dams. One or more of these may be developed in the future. However, the Screening of Options process confirmed that the Raising of Clanwilliam Dam was the best option to pursue currently.
49	HKH Enderstein	Sandveld Water Forum	Lamberts Bay is supplied with groundwater, the quality of which is diminishing. The town will need to be provided with water from Clanwilliam Dam in the future. Have the requirements of Lamberts Bay, Graafwater and Elandsbaai been taken into account in the study?	Since these towns are remote, it would be too costly to supply them with water from Clanwilliam Dam.
50	H Mars	Koue Bokkeveld Community Forum	Would like to see black businesses benefiting from the process.	Refer to the response to No. 45 above.
51	G Gallant	World Focus Training	Is interested in the training of workers.	Noted.
52	DJ Mouton		Wants to know how important the achieving of a higher assurance of supply for the existing users is to DWAF.	The equitable allocation of the additional water is being considered in the Feasibility Study. Water is likely to be used to increase assurance of supply as well as for the establishment of Resource Poor Farmers.

RAISING OF CLANWILLIAM DAM AND ASSOCIATED REALIGNMENT OF AFFECTED ROADS, COMMENTS FROM I&APS				
	Individual	**Organisation**	**Issue or Concern**	**Action/ Response**
			The opportunities for new farmers are good downstream of the dam, provided that more water can be secured.	Noted.
53	E Rust	Nooitgedacht Homeowners Association	The Nooitgedacht housing development would be inundated at a 10m and 15m raising. A rough compensation estimate of R8.2million and R10.9 million for the 10m and 15m raisings was provided.	Noted. DWAF would liaise with affected landowners with regards to the acquisition of land and appropriate compensation. The DWAF policy on the acquisition of land for water works would be applied.
54	P Cloete	Olifants Vissers Vereniging (OVV)	The OVV represents the Olifants River community in the vicinity of Ebenhaeser and Papendorp. The fishing community has concerns regarding the potential impacts of the construction phase on the fish in the lower reaches of Olifants River, and the potential impact on livelihoods.	The raising of Clanwilliam Dam is not anticipated to have any impact on the ecological functioning of the river downstream of the dam. This assumes that the EWR is released as required. However, during the construction phase, less water will be released from the dam, than is currently the case. This reduction is water may have an impact on the ecological functioning of the river, especially in the lower reaches of the river and the estuary. DWAF would however endeavour to supply the required water to downstream users, which may mitigate the impact on fish in the lower river reaches.
55	JM Kindinger	Kindinger International Transport Consultants	His father was involved in early work at the Clanwilliam Dam and canals. Previously received authorisation to erect a memorial wall at the dam site, which was later changed to a tombstone type wall just off the N7 at the dam wall.	Noted.
			Given the high number of tourists visiting the area, he wants the study to identify a suitable location for a 3.5m high memorial wall.	The identification of a suitable location for a memorial wall is beyond the scope of the Feasibility Study and the EIA process. DWAF should be approached in this regard.
56	PJ Cloete	DWAF, Clanwilliam	States that even though the project is expensive, there could be benefits for all.	Noted.
57	EH Smit	Boerdery Belange	Has farming interests upstream and downstream of the Clanwilliam Dam.	Noted.
58	Willem	Vredendal ontwikelde boerdery	Would like to benefit from the additional water in the future, should the dam be raised.	Noted.
59	JJ Williams	Doringbaai Vee Boere	They have a borehole but do not have the money to operate it, and would like assistance.	Noted. This is outside of the scope of the EIA, but this will be brought to the attention of DWAF.
60	JJ Claase	Lower Olifants Water Forum	Believes that the Feasibility Study and EIA process is a step in right direction to raising the Clanwilliam Dam wall.	Noted.

APPENDIX I

Minutes of Meetings

CLANWILLIAM DAM FEASIBILITY STUDY

PUBLIC MEETING

NAME OF FORUM / GROUP	**Clanwilliam Dam Feasibility Study**
VENUE	**Clanwilliam Bowling Club, Clanwilliam**
DATE	**20 July 2005**
TIME	**10h00**
MEETING	**First (1st)**

Item	Notes of Meeting	Action
1.	**Welcome and Introduction:** Mr Alan Brown, Department of Water Affairs and Forestry (DWAF) (Study Manager) and Mr Willie Enright (DWAF Regional Office) welcomed the stakeholders present and encouraged them to ask questions and participate in the proceedings of the day. Mr Brown gave a brief overview with regards to how the study came about. There were safety aspects surrounding the current dam wall which required that the wall be strengthened. There were possible economic benefits if this work was combined with a dam raising.The possible raising of the dam wall to higher levels up to a maximum of 15m was therefore being considered.	Willie Enright Alan Brown- Study Manager
2.	**Meeting rules and Agenda** Ms Doreen Februarie emphasised the importance for individuals and organisations to register on the available response form. She also mentioned that only registered interest groups and individuals will be invited to future meetings**.** The presentation given is attached as **Appendix A** The project team was introduced as follows: **DWAF:** Alan Brown – Study Manager Willie Enright – DWAF Regional Office , Bellville Abdulla Parker– DWAF Regional Office, Bellville (absent – apologies) Francois van Heerden – DWAF Regional Office, Clanwilliam **The Association for the Raising of the Clanwilliam Dam**: Erik van der Berg – Study Leader Karen Shippey - EIA Task Leader Ashwin West – Team Member Doreen Februarie – Task Leader: Public Participation Process Niclaas Mouton – Team Member	Doreen Februarie
3.	**The purpose of the meeting :** Ms Karen Shippey indicated that the purposes of the meetings was : • To provide background information • To start the communication process with stakeholders and provide notification of the start of the Environmental Impact Assessment	Karen Shippey

	To identify initial questions and concerns	
4.	**Background to the Feasibility Study** Mr Erik van der Berg presented an overview of the following aspects (Refer to **Appendix A**): - The need for a Feasibility Study - Objectives - Key Issues – Important Questions - Scope of the Study and Study tasks	Erik van der Berg
5.	**Question Session with regards to Presentation by Erik van der Berg:**	Doreen Februarie – facilitator
	Question: Who will pay for the raising? How will it work and who will benefit? **Answer**: No analysis has yet been done. The purpose of the Feasibility Study is to investigate these aspects. Whoever benefits from the water will pay for the additional benefit. The cost for securing the dam wall is the responsibility of the government. **Question:** What effect will the raising of the dam wall have on the level of the Bulshoek dam, during construction? **Answer:** It is anticipated that there will not be a significant impact on Bulshoek as the existing Clanwilliam dam wall will remain in place. The water level may however fluctuate at times.	Mr TJN Basson –Clanwilliam resident Erik van der Berg Mr Lou Wrench - landowner Erik van der Berg Willie Enright
	Question: What is the timeframe for construction? **Answer:** The study on the possible Raising must first be completed which will be during 2006. Thereafter there is an approval process done by DWAF. The dam safety work however must be undertaken by 2010.	Mr. Nick Snyman (Bulshoekdam riparian owner). Alan Brown
	Question: How long will the construction take? Will it affect boating on the dam? **Answer:** Construction is likely to take 2-3 years. It is unlikely that boating will be affected but there may be safety issues to be taken into account at times.	Mr David Dorfmann - landowner Erik van der Berg
	Question: Is water currently being released to Bulshoek dam? **Answer:** Yes.	David Dorfmann Willie Enright
	Question: Will dam level fluctuate as much as now? **Answer**: If the raising is considered feasible there is likely to be less fluctuation than with the existing dam.	David Dorfmann Erik van der Berg
	Question: What impact will the project have on subsistence fishermen with licences, downstream of the dam? Will subsistence fishermen be compensated if negatively impacted upon? How many Emerging Farmers can be settled in this area and what impact will this have on the canal system? **Answer:** A freshwater fish specialist has been appointed to consider the impact on fish. Further to this, the Feasibility Study is investigating the needs of local Resource Poor Farmers and where additional farmers could be established. There are concerns about	Mr Petie Hahn – Emerging farmer, Ebenhaeser Erik van der

	the canal limitations but first it needs to be established who requires access to the canal.	Berg
	Question: When will the Reserve requirements be determined? To what extent must the dam be raised in order to meet the ecological requirements? **Answer:** The Ecological Reserve study is underway and is expected to be complete in early 2006 and an interim Reserve provided. There will be public participation process before the Reserve is finalised Our current information indicates that a 5m raising of the dam will be sufficient to meet the Reserve and provide for existing water allocations.	Lou Wrench Erik van der Berg
	Question: If the dam is raised, does land have to be bought? Will land be purchased for establishing Emerging Farmers? **Answer:** If the Dam Raising is approved, **l**and which is going to be inundated will be expropriated. From our initial findings it seems that land for resource Poor Farmers is not in short supply but rather water allocations to go with land. is more of a concern. **Answer**: Mr Enright said that land will also have to be made available. He referred to the recent "Land Summit" and to the Land Reform Process and the Land Distribution Programme. He also mentioned that DWAF makes funds available for infrastructure for Emerging Farmers. However, water cannot be allocated if no land is available.	Coral Ehrhardt – W Cape Ubuntu Farm Workers Union Erik van der Berg Willie Enright
	Question: Which raising would be most economical – 5, 10 or 15m? If the dam is not raised and the demand for water doubles, does that mean that existing quotas must be divided? Must farmers forego of their rights? **Answer**: Based on a previous study it was shown that a 10m raising would be the most economical. Water is required for the Ecological Reserve by law and if the requirement could not be met, compulsory licensing could be introduced. Compulsory licensing means realigning water allocations with available water, ensuring that the Reserve requirements are met and that water is made available for historically disadvantaged groups.	TJN Basson Erik van der Berg Willie Enright
	Question: Concern regarding the use of Clanwilliam Canal System and impact of the dam on users of the canal. **Answer**: It is unlikely that the Clanwilliam Canal will be affected by raising of the dam.	Mr B. Geyer – Councillor, Cederberg Municipality Erik van der Berg
	Question: Is it legal for DWAF to take water rights away without compensation? **Answer:** Previous water allocations did not take into account water for the ecology nor did it provide for Historically Disadvantaged Communities that could not own land. Allocations must now be adjusted to accommodate these requirements through compulsory licensing if they can't be accommodated in other ways. The existing water use rights can lawfully be reduced without compensation provided that it will not cause severe economic prejudice.	T J N Basson Willie Enright
6.	**Environmental Impact Assessment (EIA) for the raising of the Clanwilliam Dam.**	

	Ms Karen Shippey presented an overview of the required environmental process: (Refer to **Appendix A**)	Karen Shippey
	Question: Are the contact details of the specialists available on Ninham Shand's website as well as maps? **Answer:** Ms Shippey explained that the maps were too large to put onto the website but said they would be available at the municipality's office as well as at the Clanwilliam Library. She said that the specialists were as follows: • Botanical aspects (Dr Charlie Boucher) • Freshwater Fish aspects (Mr Dean Impson - CapeNature) • Groundwater aspects (Umvoto Africa) • Archaeological aspects (Archaeological Contracts Office-UCT) • Economic aspects (Urban Econ) • Social aspects (Tony Barbour & UCT Enviro Evaluation Unit) • Roads (Ninham Shand and ASCH Consulting) Information concerning the Project is also available on Ninham Shand's website. Website: www.ninhamshand.co.za	Coral Ebrhardt – W Cape Ubuntu Farm Workers Union Karen Shippey
	Question: Request that a meeting of landowners along the dam be held as soon as possible. He said there was a strong feeling about this matter. **Answer:** Ms Shippey agreed and said that a meeting with landowners would be convened within the next few weeks. Mr Enright requested that farmers to undertake their future planning with regards to the implications that the raising of the dam wall will have on their properties. He said that the inundation lines mapped would assist this planning.	Mr Braam Mouton & Mr Paul Raadt – landowners Karen Shippey Willie Enright
	Question: When will land negotiations take place? **Answer:** Ms Shippey answered that the EIA team has the task of determining the impact of the project so an informed decision can be taken. If it is decided to raise the Dam the State will negotiate with landowners directly. She said it was very important for the EIA Team to understand how the Raising would affect landowners.	Mr Mouton Karen Shippey
	Question: Will there be an influence on water provision downstream, below Bulshoek dam? **Answer:** He does not believe that there will be any influence on water provision downstream due to the raising of the dam.	Teresa Steele - Namakwa Sands Willie Enright
	Question: Are dam users affected during construction? **Answer:** DWAF will try not to affect dam users during construction.	Teresa Steele Willie Enright
7.	**The Way Forward:** Ms Shippey said that the way forward was that a draft Scoping Report would be written and made available to the public at all municipality offices and the Clanwilliam Public Library. A second public meeting will take place in October 2006. The finalisation of Scoping Report and submission to the	Doreen Februarie/ Karen Shippey

	Department of Environmental Affairs and Tourism (DEAT) would occur after the meeting and further environmental requirements guided by DEAT.	
8.	**Closure of meeting:** Mr Enright thanked the stakeholders for their interest and attendance at the meeting. The stakeholders were also encouraged to attend the Olifants-Doorn Catchment Management Agency Reference Group Meetings should they want to find out more about Water Resource Management in the Olifants-Doorn Water Management Area.	Willie Enright
	LUNCH	

NAAM VAN VERGADERING	Clanwilliamdam Uitvoerbaarheidstudie
LOKAAL	Clanwilliam Rolbal Klub, Clanwilliam
DATUM	20 Julie 2005
TYD	10h00
NOMMER VAN VERGADERING	Eerste (1ste)

Item	Notule	Aksie
1.	**Verwelkoming en Inleiding:** Mnr Alan Brown, Departement van Waterwese en Bosbou (DWAF- Projek Bestuurder) en Willie Enright (Streekkantoor DWAF), verwelkom die rolspelers teenwoordig en rig `n versoek om vrae te stel en deel te neem aan die dag se verrigtinge. Allan Brown verduidelik die rede vir hierdie studie. Daar is veiligheidaspekte wat aandag moet geniet en noem dat die damwal versterk sal moet word. Dit maak egter ekonomies sin om die damwal terselfdertyd te verhoog. Daar word dus ondersoek ingestel na die verhoging tot 'n maksimum van 15 m.	Willie Enright – Streekkantoor DWAF Allan Brown – Projekbestuurder
2.	**Vergaderingreëls en Agenda** Me Doreen Februarie beklemtoon dat dit belangrik is dat individue en organisasies die antwoordblad moet invul aangesien slegs geregistreerde individue en organisasies in die vervolg na die vergaderings uitgenooi sal word. Die aanbieding word as **Bylae A** aangeheg. Daarna word die projekspan voorgestel: **Departement van Waterwese en Bosbou:** Allan Brown – Projekbestuurder Willie Enright – DWAF Streekkantoor, Bellville Abdulla Parker – DWAF Streekkantoor, Bellville (afwesig – verskoning) Francois van Heerden – DWAF, Plaaslike kantoor, Clanwilliam **Die Vereniging vir die Verhoging van die Clanwilliamdam**: Erik van der Berg – Studieleier Karen Shippey –- OIS Taakleier Ashwin West – Spanlid Doreen Februarie – Taakleier: Proses van Openbare Deelname Niclaas Mouton – Spanlid	Doreen Februarie
3.	**Die doel van die vergadering:** • Om die kommunikasieproses met rolspelers te begin en kennis te gee oor die aanvang van die Omgewingsimpakstudie • Om agtergrondinligting te verskaf • Om kwessies en knelpunte te identifiseer.	Karen Shippey
4.	**Agtergrond oor Uitvoerbaarheidstudie:** Mnr Erik van der Berg gee 'n oorsig oor die volgende aspekte (verwys na **Bylae A**):	Erik van der

	(verwys na **Bylae A**): - Die rede vir die Uitvoerbaarheidstudie - Doelwitte - Sleutelkwessies – Belangrike Vrae - Oorsig en Take van die studie	Berg
5.	**VRAESESSIE RAKENDE ERIK VAN DER BERG SE AANBIEDING:**	Doreen Februarie - fasiliteerder
	Vraag: Wie gaan betaal, hoe gaan dit werk, en wat is die voordele? **Antwoord**: Geen ontleding is nog gedoen nie – dit is juis die doel van die Uitvoerbaarheidstudie om hierdie aspekte te ondersoek. Wie ookal die voordeel van die water kry, sal vir hierdie voordeel betaal. Die koste verbonde aan die beveiliging van die damwal is die regering se verantwoordelikheid. **Vraag:** Watter invloed sal die verhoging van die damwal tydens die konstruksiefase op die vlak van die Bulshoekdam hê? **Antwoord:** Na verwagting sal dit nie 'n groot invloed hê nie omdat die Clanwilliamdamwal in plek bly. Die watervlak mag egter by tye fluktueer.	Mnr T.J.N. Basson – Clanwilliam inwoner Erik van der Berg Mnr. Lou Wrench - grondeienaar Erik van der Berg & Willie Enright
	Vraag: Wat gaan die tydskaal wees van die werk wat gedoen gaan word. **Antwoord:** Die studie oor die moontlike verhoging moet eers voltooi word, en dit sal eers teen 2006 wees. Daarna moet moet dit nog eers by DWAF deur 'n proses van goedkeuring gaan. Die damveiligheidswerk moet egter voor 2010 gedoen word.	Mnr. Nick Snyman (Bulshoekdam oewereienaar). Allan Brown
	Vraag: Wat gaan die tydsduur van die konstruksie wees en sal dit 'n invloed op die gebruik van bote op die dam hê? **Antwoord**: Konstruksie sal ongeveer 2 jaar duur. Dit sal nie bootaktiwiteite beperk nie, maar veiligheidsaspekte sal ten alle tye in oorweging geneem moet word.	Mnr. David Dorfmann - grondeienaar Erik van der Berg
	Vraag: Word water huidiglik na Bulshoekdam losgelaat? **Antwoord:** Ja.	David Dorfmann - grondeienaar Willie Enright
	Vraag: Sal die damvlak net so dikwels as nou fluktueer? **Answer:** Indien daar besluit word om die damvlak te verhoog sal daar minder fluktuasies voorkom.	David Dorfmann Erik van der Berg
	Vraag: Watter impak gaan die projek op die bestaansvissers stroomaf van die damwal hê? Sal daar kompensasie wees vir die bestaanvissers indien dit wel 'n negatiewe impak het? Hoeveel kleinboere kan gevestig word in hierdie area en watter impak sal dit op die kanaalstelsel hê? **Antwoord:** 'n Spesialis in varswatervisse is aangestel om 'n	Mnr. Pietie Hahn – Kleinboer, Ebenhaeser

	impakstudie te doen. Die uitvoerbaarheidstudie ondersoek ook die behoeftes van plaaslike kleinboere en kyk na gebiede waar hulle gevestig kan word. Die kanaalstelsel mag 'n beperkende faktor wees, maar daar moet eers vasgestel word wie toegang tot die kanaal verlang.	Erik van der Berg
	Vraag: Wanneer sal die Reserwebepaling gedoen word? Tot watter mate moet die damwal verhoog word om aan hierdie behoefte te voldoen? **Antwoord:** Die Ekologiese Reserwe word nog bepaal en hierdie ondersoek sal in 2006 voltooi wees, waarna 'n tussentydse Reserwe vasgestel sal word. Daar sal 'n proses van openbare deelname wees voordat die Reserwe gefinaliseer word. Volgens die huidige inligting sal 'n verhoging van 5m genoeg wees om die behoeftes van die Reserwe en die bestaande watertoedelings te bevredig.	Lou Wrench - grondeienaar Erik van der berg
	Vraag: Sal grond uitgekoop word indien die verhoging van die damwal plaasvind? Sal grond ook vir die vestiging van opkomende boere aangekoop word? **Antwoord:** Indien die damwal verhoog word, sal die grond wat oorstroom word, onteien word. Volgens huidige bevindings is daar genoeg grond beskikbaar vir die vestiging van kleinboere. Daar is eerder probleme met die watertoedelings aan beskikbare grond. **Antwoord**: Mnr Enright sê dat grond ook beskikbaar gestel sal moet word. Hy verwys na die onlangse "Spitsberaad oor Grondsake", asook die Grondhervormingsproses en die Grondverdelingsprogram. Hy noem verder dat DWAF fondse vir infrastruktuur aan opkomende boere beskikbaar stel. Water kan egter nie toegedeel word indien daar geen grond is nie.	Coral Ehrhardt - Wes Kaap Ubuntu Plaaswerkersunie Erik van der Berg Willie Enright
	Vraag: Wat is die ekonomiese impak van die voorgestelde 5-, 10- en 15-meter verhoging van die damwal? Sal bestaande kwotas verdeel moet word indien die damwal nie verhoog word nie en die aanvraag na water verdubbel? Sal boere van hul regte afstand moet doen? **Antwoord**: Na aanleiding van 'n vorige studie blyk 'n 10-meter verhoging die mees ekonomiese te wees. Die Wet maak dit verpligtend dat water vir die Ekologiese Reserwe beskikbaar gestel moet word. Indien daar nie aan hierdie behoefte voldoen kan word nie, sal verpligte lisensiëring ingestel word. Verpligte lisensiëring beteken dat watertoedelings in lyn gebring word met die water wat beskikbaar is nadat die Ekologiese Reserwe in ag geneem is en water vir histories agtergeblewe groepe beskikbaar gestel is.	T.J.N Basson – Clanwilliam inwoner Erik van der Berg Willie Enright
	Vraag: Kommer word uitgespreek oor die Clanwilliam kanaalstelsel en die invloed van die dam op kanaalgebruikers. **Antwoord**: Dit is hoogs onwaarskynlik dat die verhoging van die damwal 'n invloed op die kanaal sal hê.	B. Geyer – Raadslid, Cederberg Munisipaliteit Erik van der Berg
	Vraag: Mag DWAF volgens wet regte sonder enige vergoeding wegneem? **Antwoord**: Vorige watertoedelings het nie die ekologie in ag geneem nie, asook nie voorsiening gemaak vir histories	T J N Basson Willie Enright

	agtergeblewe gemeenskappe wat nie grond besit het nie. Toekennings moet nou aangepas word, en dit sal deur middel van verpligte lisensiëring plaasvind indien dit nie op enige ander wyse gedoen kan word nie. Bestaande watertoedelings kan sonder enige vergoeding verminder word, op voorwaarde dat dit nie ernstige ekonomiese gevolge inhou nie.	
6.	**<u>OMGEWINGSIMPAKSTUDIE (OIS) VIR DIE VERHOGING VAN DIE CLANWILLIAM DAM.</u>** Me Karen Shippey gee ‘n oorsig oor die verpligte omgewingsproses: (Verwys na **Bylae A**)	Karen Shippey
	Vraag: Is die projekspan se kontakbesonderhede, sowel as kaarte, op Ninham Shand se webtuiste beskikbaar? **Antwoord:** Me Shippy antwoord dat die kaarte te groot is om op die webwerf te plaas, maar dat dit by die munisipaliteit se kantoor, asook die Clanwilliam Biblioteek beskikbaar sal wees Die volgende spesialiste is by die projek betrokke: • Botaniese aspekte (Dr Charlie Boucher) • Varswatervisse (Mnr Dean Impson - CapeNature) • Grondwater (Umvoto Africa) • Argeologiese aspekte (Argeologiese Kontrakkantoor Univ Kaapstad) • Ekonomiese aspekte (Urban Econ) • Sosiale aspekte (Tony Barbour & UK Enviro Evalueringseenheid) • Paaie (Ninham Shand en ASCH Consulting) Inligting oor die projek is ook beskikbaar op Ninham Shand se webtuiste: www.ninhamshand.co.za	Coral Ehrhardt – Wes Kaap Ubuntu Plaaswerkerunie Karen Shippey
	Vraag: Daar word versoek dat daar so gou as moontlik `n vergadering met grondeienaars langs die Olifantsrivier gehou moet word. Hulle noem ook dat daar ‘n sterk gevoel daaroor is. **Antwoord:** Me Shippey stem saam en sê dat `n vergadering met grondeienaars binne die volgende paar weke gehou sal word. Mnr Willie Enright versoek dat boere reeds vooruit moet beplan vir die impak wat die verhoging van die damwal op hul eiendom sal hê. Hy sê dat die aangeduide vloedlyne hulle met hul beplanning sal help.	Braam Mouton & Paul Raadt - grondeienaars Karen Shippey Willie Enright
	Vraag: Sal daar ‘n invloed wees op watervoorsiening stroomaf van die Bulshoekdam? **Antwoord:** Hy glo nie dat die verhoging van die damwal enige invloed op voorsiening stroomaf sal hê nie.	Teresa Steele - Namakwa Sands Willie Enright
	Vraag: Wanneer sal daar begin word met onderhandelings oor grondonteiening? **Antwoord:** Me Shippey antwoord dat die span vir die omgewings-impakstudie die impak van die projek moet bepaal sodat ‘n ingeligte besluit geneem kan word. Indien daar besluit word om die damwal te verhoog, sal die staat direk met grondeienaars onderhandel. Sy noem dat dit uiters belangrik is dat die span verstaan hoe die verhoging die grondeienaars sal beïnvloed.	Mnr Mouton Karen Shippey
	Vraag: Sal gebruikers van die dam tydens die konstruksiefase nadeling beïnvloed word? **Antwoord:** DWAF sal poog om damgebruikers nie tydens	Teresa Steele

	konstruksie te benadeel nie	Willie Enright
7.	**Die Pad Voorentoe:** Me Shippey sê dat die Konsep Evalueringsverslag tans geskryf word en by alle munisipale kantore en die Clanwilliam Openbare Biblioteek vir die publiek beskikbaar gestel sal word. 'n Tweede openbare vergadering sal in Oktober 2006 gehou word. Na afloop van hierdie vergadering sal die Evalueringsverslag gefinaliseer word vir voorlegging aan die Departement van Omgewingsake en Toerisme. Hierdie departement sal bepaal watter verdere omgewingsaspekte aandag moet geniet.	Doreen Februarie/ Karen Shippey
8.	**Afsluiting van vergadering:** Mnr Enright bedank die rolspelers vir hul belangstelling en bywoning van die vergadering. Die rolspelers word ook aangemoedig om die vergaderings van die Verwysingsgroep vir die Olifants-Doorn OBA by te woon indien hulle meer van geïntegreerde waterhulpbronbestuur te wete wil kom.	Willie Enright
	MIDDAGETE	

Item	Notes of Meeting		Action
	EIA Process for the Raising of the Clanwilliam Dam **Landowners Meeting** **held on 16 August 2005** **at the Clanwilliam Town Hall, Clanwilliam**		
1.	**ATTENDANCE**		
	Ms. Joanita Smit	Kransvlei familietrust	
	Mr. Gerrit Du Plessis	Holfontein Boerdery	
	Mr. Johan Fereirra	Nooitgedaght Tolbosbeleggings	
	Mr. Gerard Stone	Bokwater & Cedar inn	
	Mr. Bernie van der Heever	Cape Mango's Pty Ltd.	
	Mr. Erich Rust	Nooitgedaght Nature Reserve	
	Mr. Johan Vermeulen	Sederkem Rooikrans	
	Mr. John Edge	Clanwilliam Leisure Homes Pty	
	Mr. Dirkie Mouton	De Vlei	
	Mr. Theys Mouton	Kriedouwskrans	
	Ms. Rika Du Plessis	Cape Nature	
	Ms. Collette van Deventer	Cape Nature	
	Mr. JEJ Swart	Clanwilliam Spar	
	Mr. Ricardo Herbst	Spec Corrosion Protection	
	Mr. Willie Van Rooyen	Fish Eagles Estate: Marg-Will Farm	
	Mrs. Margaret Van Rooyen	Fish Eagles Estate: Marg –Will Farm	
	Mr. Frans Engelbrecht		
	Mr. Steve Smit		
	Mr. Lee Pluke		
	Mr. Abdulla Parker	DWAF Regional Office	
	Ms. Solomzi Beyi	DWAF Regional Office	
	Mr. Matthew Matiea	DWAF Regional Office	
	Mr. Francois van Heerden	DWAF Clanwilliam Office	
	Mr. Vuyisile Zenani	Environmental Evaluation Unit	
	Ms. Mariam January	Environmenmtal Evaluation Unit	
	Mr. Tony Barbour	Independent Consultant	
	Mr Ashwin West	Ninham Shand	AW
	Mr Erik van der Berg	Ninham Shand	EvdB
	Ms Doreen Februarie	Nosipho Consultancy	DF
2.	**WELCOME** DF welcomed the landowners to the meeting and encouraged them to ask questions and to raise their concerns. Furthermore, she mentioned that the meetings with landowners arose from a request at the first Public Meeting for the EIA process on 20 July 2005 in Clanwilliam. She also introduced the project team members present. DF stated the meeting rules and asked that people state their name before asking questions.		
3.	**DISPLAY OF MAPPING** DF noted that the series of maps depicting the purchase lines at 5, 10 and 15m intervals were available for meeting attendees to review. The maps were also available at the Clanwilliam Library and Municipal Office. Furthermore, enlargements of sections of the maps were also		AW

Item	Notes of Meeting	Action
	available. The project team agreed to make relevant enlargements available on request.	
4	**RECAP OF BACKGROUND AND THE EIA PROCESS FOR THE RAISING OF CLANWILLIAM DAM** AW provided a brief presentation on the background to the study and the EIA process for the raising of Clanwilliam Dam. Ninham Shand in association with Asch Professional Services and Jakoet and Associates was appointed by the Department of Water Affairs and Forestry (DWAF) to undertake a Feasibility Study for the raising of Clanwilliam Dam. The environmental impact assessment (EIA) process formed part of the Feasibility Study. It was further stated that the role of the EIA team was to assess the environmental impacts associated with raising the dam, and report on these to both DWAF and the environmental authorities. Reasons for investigating a raising of Clanwilliam Dam include ***inter alia*** that remedial work is required to bring the dam in line with current dam safety requirements and this provides an opportunity to cost effectively raise the dam; to provide water for the ecological reserve, which is currently being determined; to improve the assurance of supply for the current users, and to provide water to Resource Poor Farmers. Tasks being undertaken as part of the Feasibility Study include water quality, yield analysis, groundwater, irrigation, environmental authorisation, financial and economic analysis, resource poor farmers, public participation. The preliminary design and cost estimate of the dam is being undertaken by DWAF directly. AW explained that the EIA process was being undertaken to satisfy a suite of statutory requirements, to identify potential environmental impacts (social and biophysical) and determine their likely significance, to inform DWAF's decision to raise the dam and to provide an opportunity for interested and affected parties to raise their issues and concerns. The study would be focused on the direct inundation impacts, the impacts of realigning the N7 National road, the impacts associated with borrow pits or a quarry site and broadly describe the implications of inundating secondary roads. A heritage impact assessment would form part of the EIA. The EIA process was described, with emphasis on the public's opportunity for involvement. The first opportunity was at the start of the Scoping Phase, which was already underway. The next public meeting would be held once the draft Scoping Report has been compiled. The third opportunity for public input would be during the Environmental Impact Report (EIR) Phase, when the draft EIR would be made available for public comment and public meeting would be held. The last opportunity for public involvement is during the appeal period, when there is an opportunity to lodge an appeal against the Record of Decision issued by the environmental authority. It was noted that the public participation process as part of the EIA process served to provide the public with an opportunity to raise their issues and concerns regarding the environmental acceptability of the proposed project. It was however not an opportunity to resolve issues regarding the acquisition of land by DWAF. There would be a separate	

Item	Notes of Meeting	Action
	process around land acquisition at a later stage, undertaken by DWAF. It was agreed that meeting attendees would be provided with a copy of the DWAF Compensation Policy on the Acquisition of Land for Government Water Works with the minutes of this meeting. It was explained that the policy was based on the "willing buyer willing seller" principle and that compensation would be based on market value at the time. It was added that provision was made to contest the quantum of money determined to be market value	
5	**QUESTIONS** Mr Eric Rust of Nooitgedacht Nature Reserve enquired whether property purchase lines fell within the Olifants River flood line. EvdB provided an explanation of how the river flood lines and levels were determined. Mr Johan Ferreira of Nooitgedacht wanted to know how land on a contour line would be sold. EvdB explained that the contour lines only served as a guideline, and that purchasing of property would not necessarily follow the contour lines. . Mr Rust enquired where the maps of the purchase lines were available for viewing. AW replied that the maps were at the Cederberg Municipal Library, but that maps could also be made available to landowners on request. With regard to the map extracts, AW requested landowners to indicate which maps they wanted and these would be sent to them after the meeting. Mr John Edge wanted to know what would happen if a house on a property was not being inundated, but the land was still being purchased, and how much the owner would get for the property. EvdB responded that it would depend on how close to the flood line the house was. He said the owner could negotiate a price but that the risk aspect would be the determining factor Mr Dirkie Mouton wanted to know whether or not the study included calculations of the cost of land sales. EvdB replied that no cost estimates had been determined as yet. Mr Gerhard Stone asked when the aerial photographs with the purchase line overlays had been taken. EvdB responded that the photography being used was from 1977 but that aerial photos, taken in 2003, were also available. He also asked whether or not an site investigation of farms had been planned. EvdB responded that for the Feasibility Study such an investigation was not necessary. An attendee asked how much additional hectares could be irrigated with the additional water made available through a 15 m raising. EvdB responded that a 15 m raising could provide potentially provide water for additional 4000ha while a 5 m raising would only be sufficient to meet the Ecological Reserve. Mr Parker mentioned that participants would again be given the opportunity to discuss the raising of the wall at the next Olifants - Doorn Reference Group Meeting. Mr Stone mentioned that many landowners near the dam made use of underground drainage and wanted to know how this would be taken into	

Item	Notes of Meeting	Action
	consideration. Mr van Heerden responded that this would depend on the soil type and geological composition of the area. Mr Rust wanted to know what would happen to grave and graveyards that may be affected through inundation. EvdB replied that the state would need to take this into consideration. Mr Johan Ferreira wanted to know who would be responsible for the cost of raising the dam, as he had heard that those benefiting from the raising would be responsible for the costs. E vdB responded that this would indeed be the case. Mr Gerrit du Plesiss queried who would get the additional water. EvdB responded that the scheme would not proceed without the inclusion of emerging farmers. He mentioned that various options for their inclusion needed to be looked at, including joint projects between commercial and emerging farmers Ms Joanita Smit asked whether the price of water would increase. EvdB replied that the scheme might have an impact on water costs, but that one should rather focus on a workable model Mr Mouton stated that there must be a degree of certainty about the facts and figures before negotiations could start. Mr Parker stated that negotiations should take place in good faith for the benefit of the region as a whole. Mr Tony Barbour wanted to know how important the gravel road was to farmers. Ms Kleynhans responded that most farmers would have problems if the road was flooded. Mr Mouton mentioned that the Algeria causeway was too low and that it might have to be raised. Mr Thys Mouton suggested that the old Cape road also be looked at Mr Stone wanted too know the time scale for the raised dam to be filled, in order to plan and avoid impacts on infrastructure such as borehole pumps etc. EvdB responded that he did not know precisely when the dam would be raised and filled. Mr Rust enquired about the possibility of building a road across the river. EvdB replied that this should be considered.	
6	**WAY FORWARD AND CLOSURE** AW reported that a draft Scoping Report would be compiled, and registered interested and affected parties would be invited to comment on the draft report and attend a public meeting. DF thanked everyone for their attendance and participation and the meeting was closed at 19:00 with many people remaining until 19:30 to engage in further discussion over the aforementioned maps.	

Item	Aantekeninge van vergadering		Aksie
	EIA-proses om die wal van die Clanwilliamdam te lig Vergadering van grondeienaars gehou op 16 Augustus 2005 in die Clanwilliam-stadsaal, Clanwilliam		
1.	**BYWONING**		
	Me. Joanita Smit	Kransvlei-familietrust	
	Mnr. Gerrit Du Plessis	Holfontein-boerdery	
	Mnr. Johan Fereirra	Nooitgedaght-Tolbosbeleggings	
	Mnr. Gerard Stone	Bokwater & Cedar inn	
	Mnr. Bernie van der Heever	Cape Mango's Pty Ltd.	
	Mnr. Erich Rust	Nooitgedaght-natuurreservaat	
	Mnr. Johan Vermeulen	Sederkem-Rooikrans	
	Mnr. John Edge	Clanwilliam Leisure Homes Pty	
	Mnr. Dirkie Mouton	De Vlei	
	Mnr. Theys Mouton	Kriedouwskrans	
	Me. Rika Du Plessis	Kaapse Natuurbewaring	
	Me. Collette van Deventer	Kaapse Natuurbewaring	
	Mnr. JEJ Swart	Clanwilliam Spar	
	Mnr. Ricardo Herbst	Spec Corrosion Protection	
	Mnr. Willie Van Rooyen	Fish Eagles Estate: Marg-Will Farm	
	Mev. Margaret Van Rooyen	Fish Eagles Estate: Marg –Will Farm	
	Mnr. Frans Engelbrecht		
	Mnr. Steve Smit		
	Mnr. Lee Pluke		
	Mnr. Abdulla Parker	DWAF-streekskantoor	
	Me. Solomzi Beyi	DWAF-streekskantoor	
	Mnr. Matthew Matiea	DWAF-streekskantoor	
	Mnr. Francois van Heerden	DWAF Clanwilliam-kantoor	
	Mnr. Vuyisile Zenani	Omgewingsevalueringseenheid	
	Me. Mariam January	Omgewingsevalueringseenheid	
	Mnr. Tony Barbour	Onafhanklike konsultant	
	Mnr Ashwin West	Ninham Shand	AW
	Mnr Erik van der Berg	Ninham Shand	EvdB
	Me Doreen Februarie	Nosipho Consultancy	DF
2.	**VERWELKOMING** DF verwelkom die grondeienaars by die vergadering en moedig hulle aan om vrae te vra en hulle besware te opper. Sy het verder genoem dat die vergaderings met grondeienaars spruit uit 'n versoek by die eerste openbare vergadering oor die EIA-proses op 20 Julie 2005 op Clanwilliam. Sy stel ook die projek se spanlede wat teenwoordig is, bekend. DF meld die reëls van die vergadering en vra dat persone hulle name noem voordat hulle vrae stel.		
3.	**UITSTALLING VAN KAARTE** DF noem dat die reeks kaarte waarop die kooplyne by tussenposes van 5, 10 en 15m verskyn, beskikbaar is sodat diegene wat teenwoordig is dit kan besigtig. Die kaarte is ook by die biblioteek en die munisipale kantoor op Clanwilliam beskikbaar. Verder is vergrotings van gedeeltes		AW

Item	Aantekeninge van vergadering	Aksie
	van die kaarte ook beskikbaar. Die projekspan stem in om betrokke vergrotings op versoek beskikbaar te stel.	
4	**HERSIENING VAN AGTERGROND EN DIE EIA-PROSES OM DIE WAL VAN DIE CLANWILLIAMDAM TE LIG** AW bied ‘n kort oorsig oor die agtergrond van die studie en die EIA-proses om die wal van die Clanwilliamdam te lig. Ninham Shand in samewerking met Asch Professional Services en Jakoet and Associates is deur die Departement van Waterwese en Bosbou (DWAF) aangestel om ‘n uitvoerbaarheidstudie oor die lig van die Clanwilliam-damwal te onderneem. Die proses van die omgewingsimpakbepaling (EIA) maak deel uit van hierdie uitvoerbaarheidstudie. Verder is verklaar dat die rol van die EIA-span is om die omgewingsimpakte in verband met die lig van die damwal te bepaal en om verslag oor hierdie bepalings aan DWAF en die omgewingsowerhede te doen. Redes om ‘n ondersoek na die lig van die Clanwilliam-damwal sluit onder andere in dat herstelwerk nodig is om die dam in lyn te bring met huidige damveiligheidsvereistes en dit bied die geleentheid om die damwal koste-effektief te lig; om water aan die ekologiese reservaat te lewer, wat teenswoordig bepaal word; om versekering van toevoer vir huidige verbruikers te verbeter, en om water aan hulpbehoewende boere te verskaf. Take wat as deel van die Uitvoerbaarheidstudie aangepak word, sluit in gehalte van water, toevoerontleding, grondwater, besproeiing, omgewingsmagtiging, finansiële en ekonomiese analises, opkomende boere en openbare deelname. Die voorlopige ontwerp en kosteberekening van die dam word regstreeks deur DWAF onderneem. AW verduidelik dat die EIA-proses onderneem word om te voldoen aan ‘n reeks statutêre vereistes, om moontlike omgewingsimpakte (maatskaplik en biofisies) te identifiseer en hulle waarskynlike belang te bepaal, om DWAF in kennis te stel sodat hulle kan besluit oor die lig van die damwal en om belanghebbende en geaffekteerde partye die geleentheid te bied om hulle kwessies en besware te opper. Die studie sal fokus op die regstreekse oorstromingsimpakte, die impakte op verlegging van die N7 nasionale pad, die impakte verwant aan leenputte of ‘n steengroefplek en breë beskrywing oor die implikasies van oorstroming van sekondêre paaie. ‘n Erfenisimpakbepaling sal deel uitmaak van die EIA. Die EIA-proses is beskrywe met nadruk op die publiek se geleentheid om betrokke te raak. Die eerste geleetheid was met die aanvang van die omvangsbepalingsfase wat reeds op dreef is. Die volgende openbare vergadering word gehou sodra die konsep-omvangsbepalingsverslag opgestel is. Die derde geleentheid vir openbare insette vind plaas gedurende die fase van die Omgewingsimpakverslag (EIR) wanneer die konsep-EIR vir openbare kommentaar beskikbaar gestel word en ‘n openbare vergadering word dan belê. Die laaste geleentheid vir publieke betrokkenheid is gedurende die appèltydperk wanneer daar die geleentheid bestaan om appèl aan te teken teen die Rekord van Besluitneming wat deur die omgewingsowerheid uitgereik word. Daar is opgelet dat die proses van openbare deelname as deel van die EIA-proses dien om die publiek die geleentheid te gee om hulle	

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	kwessies en besware te opper in verband met die omgewingsaanvaarding van die voorgestelde projek. Dit was egter nie ‘n geleentheid om kwessies oor DWAF se aanskaffing van grond op te los nie. Daar sal ‘n aparte proses in verband met die aanskaffing van grond in ‘n latere stadium deur DWAF onderneem word. Daar is ingestem om diegene wat die vergadering bywoon, saam met die notule van hierdie vergadering, te voorsien van ‘n afskrif van DWAF se vergoedingsbeleid oor die aanskaffing van grond vir Staatswaterwerke. Daar is verduidelik dat die beleid gebaseer is op die beginsel van “gewillige koper gewillige verkoper” en dat vergoeding gebaseer word op die markwaarde in daardie stadium. Verder is bygevoeg dat voorsiening gemaak is om die bedrag geld wat as markwaarde vasgestel word te betwis.	
5	**VRAE** Mnr Eric Rust van Nooitgedacht-natuurreservaat vra of eiendomme se kooplyne binne die Olifantsrivier se vloedlyn val. EvdB verduidelik hoe die rivier se vloedlyne en –vlakke bepaal is. Mnr Johan Ferreira van Nooitgedacht wou weet hoe grond op ‘n kontoerlyn verkoop word. EvdB verduidelik dat die kontoerlyne slegs as gids gebruik word en dat aankope van eiendom nie noodwendig die kontoerlyne sou volg nie. . Mnr Rust vra waar die kaarte met die kooplyne vir besigtiging beskikbaar is. AW antwoord dat die kaarte by die Cederbergse munisipale biblioteek ter insae lê, maar dat kaarte ook op versoek aan grondeienaars beskikbaar gestel sal word. In verband met uittreksels uit die kaarte het AW grondeienaars versoek om aan te dui watter kaarte hulle wou hê en hierdie kaarte sal dan na die vergadering aan hulle gestuur word. Mnr John Edge wou weet wat gebeur as ‘n huis op ‘n eiendom nie oorstroom word nie, maar die grond steeds aangekoop word en hoeveel die eienaar vir die eiendom sou kry. EvdB antwoord dat dit afhang van hoe na die huis aan die vloedlyn sou wees. Hy sê die eienaar kan ‘n prys onderhandel, maar die risiko-aspek sou die bepalende faktor wees. Mnr Dirkie Mouton wou weet of die studie berekenings van die koste van grondverkope insluit al dan nie. EvdB antwoord dat geen kosteberamings tot dusver gedoen is nie. Mnr Gerhard Stone vra wanneer die lugfoto’s met die kooplynbeleg geneem is. EvdB antwoord dat die fotografie wat gebruik is uit 1977 dateer, maar dat lugfoto’s wat in 2003 geneem is ook beskikbaar is. Hy wou verder weet of ‘n terreininspeksie van plase beplan word. EvdB antwoord dat vir die uitvoerbaarheidstudie sodanige ondersoek nie nodig is nie. ‘n Persoon in die vergadering wou weet hoeveel bykomende hektaar besproei kon word met die addisionele water beskikbaar as die damwal met 15m gelig word. EvdB verklaar dat ‘n bykomende 15m waarskynlik water vir nog 4000 ha sal voorsien terwyl ‘n bykomende 5m slegs voldoende sal wees om die ekologiese reservaat te voorsien. Mnr Parker noem dat deelnemers weer die geleentheid gebied word om	

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	die lig van die damwal op die volgende verwysingsgroepsvergadering van Olifants – Doorn te bespreek. Mnr Stone noem dat baie grondeienaars naby die dam gebruik maak van ondergrondse dreinering en wou weet hoe dit in aanmerking sou kom. Mnr van Heerden antwoord dat dit afhang van die tipe grond en die geologiese samestelling van die gebied. Mnr Rust wou weet wat sou met grafte en begraafplase gebeur wat deur oorstroming bedreig word. EvdB antwoord dat die staat dit in aanmerking moet neem. Mnr Johan Ferreira wou weet wie verantwoordelik sou wees vir die koste om die damwal te lig, aangesien hy gehoor het dat diegene wat by die ligting van die damwal sou baat vir die koste verantwoordelik sou wees. EvdB antwoord dat dit inderdaad die geval is. Mnr Gerrit du Plesiss vra wie die addisionele water sou kry. EvdB antwoord dat die skema nie sal voortgaan sonder om opkomende boere in te sluit nie. Hy noem dat verskeie opsies vir hulle insluiting onder oë geneem moet word, insluitende gesamentlike projekte tussen kommersiële en opkomende boere. Me Joanita Smit vra of die prys van water verhoog sal word. EvdB antwoord dat die skema 'n impak op die koste van water mag hê, maar dat daar eerder op 'n werkbare model gefokus moet word. Mnr Mouton verklaar dat daar 'n mate van sekerheid oor die feite en bedrae moet wees voordat met onderhandelinge begin kan word. Mnr Parker sê dat onderhandelings te goeder trou tot voordeel van die streek as geheel moet plaasvind. Mnr Tony Barbour wou weet hoe belangrik die gruispad vir boere sou wees. Me Kleynhans antwoord dat die meeste boere dit moeilik sou vind as die pad oorstroom is. Mnr Mouton noem dat die Algeria-laagwaterbrug te laag is en dat dit moontlik gelig moet word. Mnr Thys Mouton stel voor dat na die ou Kaapse weg ook omgesien word. Mnr Stone wou weet hoe lank dit sou neem om die dam met die hoër wal te vul sodat impakte op infrastruktuur soos boorgatpompe ens beplan en voorkom kan word. EvdB antwoord dat hy nie presies weet wanneer die damwal gelig en die dam gevul sal word nie. Mnr Rust vra na die moontlikheid om 'n pad oor die rivier te bou. EvdB antwoord dat dit oorweeg kan word.	
6	**PAD VORENTOE EN AFSLUITING** AW meld dat 'n konsep-omvangsbepalingsverslag opgestel sal word en geregistreerde belanghebbende en geaffekteerde partye genooi sal word om kommentaar oor die konsep-verslag te lewer en 'n openbare vergadering by te woon. DF bedank almal wat die vergadering bygewoon het vir hulle deelname en die vergadering sluit af om 19:00 terwyl heelwat mense agterbly tot 19:30 om voorgenoemde kaarte te bespreek..	

Item	Notes of Meeting		Action
	EIA Process for the Raising of the Clanwilliam Dam **Landowners Meeting** **held on 18 August 2005** **at Ninham Shand, Cape Town**		
1.	**ATTENDANCE**		
	Mr Lou Wrench	Uitsig (Small holding)	
	Ms Alison Wrench	Uitsig (Small holding)	
	Mr Carl Edmeades	Caleta Cove	
	Mr Johann Ferreira	Nooitgedacht Homeowners Assoc.	
	Mr Reg Vachaudez	Nooitgedacht Homeowners Assoc.	
	Ms Louise Vachaudez	Nooitgedacht Homeowners Assoc.	
	Mr Craig McIver	Caleta Cove	
	Ms Jane Magner	Caleta Cove	
	Mr John Magner	Caleta Cove	
	Mr James Douglas	Caleta Cove	
	Mr David Forbes	Caleta Cove	
	Mr Paul Raad	Lebanon Citrus	
	Ms Sue Raad	Lebanon Citrus	
	Mr Derek Morillion	Caleta Cove	
	Mr David Dorfman	Clanwilliam Hills	
	Mr Gareth Dorfman	Clanwilliam Hills	
	Mr Rod Maxwell	Clanwilliam Hills	
	Mr Nik Matthews	Caleta Cove	
	Mr Keith Prentice	Caleta Cove	
	Mr Ross Petersen	Caleta Cove	
	Mr G Boting	Caleta Cove	
	Mr Mark Marais	Asch Consulting Services	MM
	Mr Ashwin West	Ninham Shand	AW
	Ms Doreen Februarie	Nosipho Consultancy	DF
	Mr Faldee Abrahams	Private Consultant	FA
2.	**WELCOME** DF welcomed the landowners to the meeting and encouraged them to ask questions and to raise their concerns. Furthermore, she mentioned that the meetings with landowners arose from a request at the first Public Meeting for the EIA process on 20 July 2005 in Clanwilliam. She also introduced the project team members present. DF stated the meeting rules and asked that people state their name before asking questions.		
3.	**DISPLAY OF MAPPING** DF noted that the series of maps depicting the purchase lines at 5, 10 and 15m intervals were available for meeting attendees to review. The maps were also available at the Clanwilliam Library and Municipal Office. Furthermore, enlargements of sections of the maps were also available. The project team agreed to make relevant enlargements available on request.		AW
4	**RECAP OF BACKGROUND AND THE EIA PROCESS FOR THE RAISING OF CLANWILLIAM DAM**		

Item	Notes of Meeting	Action
	AW provided a brief presentation of the background to the study and the EIA process for the raising of Clanwilliam Dam. Ninham Shand in association with Asch Professional Services and Jakoet and Associates by the Department of Water Affairs and Forestry (DWAF) to undertake a Feasibility Study for the raising of Clanwilliam Dam. The environmental impact assessment (EIA) process formed part of the Feasibility Study. It was further stated that the role of the EIA team was to assess the environmental impacts associated with raising the dam, and report on these to both DWAF and the environmental authorities. Reasons for investigating a raising of Clanwilliam Dam include *inter alia* remedial work is required to bring the dam in line with current dam safety requirements and this provides an opportunity to cost effectively raise the dam; to provide water for the ecological reserve, which is currently being determined; to improve the assurance of supply for the current users, and to provide water to Resource Poor Farmers. Tasks being undertaken as part of the Feasibility Study include water quality, yield analysis, groundwater, irrigation, environmental authorisation, financial and economic analysis, resource poor farmers, public participation. The preliminary design and cost estimate of the dam is being undertaken by DWAF directly. AW explained that the EIA process was being undertaken to satisfy a suite of statutory requirements, to identify potential environmental impacts (social and biophysical) and determine their likely significance, to inform DWAFs decision to raise the dam and to provide an opportunity for interested and affected parties to raise their issues and concerns. The study would be focused on the direct inundation impacts, the impacts of realigning the N7 National road, the impacts associated with borrow pits or a quarry site and broadly describe the implications of inundating secondary roads. A heritage impact assessment would form part of the EIA. The EIA process was described, with emphasis on the public's opportunity for involvement. The first opportunity was at the start of the Scoping Phase, which has already taken place. The next public meeting would be held once the draft Scoping Report has been compiled. The third opportunity for public input would be during the Environmental Impact Report (EIR) Phase, when the draft EIR would be made available for public comment and public meeting would be held. The last opportunity for public involvement is the during the appeal period, when there is an opportunity to lodge an appeal against the Record of Decision issued by the environmental authority. It was noted that the public participation process as part of the EIA process served to provide the public with an opportunity to raise their issues and concerns regarding the environmental acceptability of the proposed project. It was however not an opportunity to resolve issues regarding the acquisition of land by DWAF. There would be a separate process around land acquisition at a later stage, undertaken by DWAF. Meeting attendees were provided with a copy of the DWAF Compensation Policy on the Acquisition of Land for Government Water Works. It was explained that the policy was based on the "willing buyer	

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	willing seller" principle and that compensation would be based on market value at the time. It was added that provision was made to contest the quantum of money determined to be market value.	
5	**QUESTIONS** Mr Raad and others raised concern over inundation of the gravel road on the eastern shore of the dam, as it provides access to farms, and lack of the access would have a serious economic impacts in terms of haulage costs for produce. MM and AW responded that the study team was currently investigating which roads would be affected, and which portions could be realigned. It was also noted that the Provincial Roads Authority are being liaised with regarding options for the gravel road, continuity of the road and access by farmers. The Provincial Authority has stated that landowners will have to be consulted with regarding the acceptability of changes in access to their properties. Mr Douglas asked if the Ninham Shand consortium would be involved in the construction of the dam, or was the contract limited to the Feasibility Study. AW confirmed that the current appointment was for the Feasibility Study. Furthermore, it was noted that DWAF is undertaking the design work for the dam and was likely to undertake the construction for the dam raising itself. Mr Dorfman enquired how serious DWAF was about raising Clanwilliam Dam? In the absence of a representative from the client body, AW responded that DWAF was investing substantial money into the initial investigation and design, that the raising of Clanwilliam Dam must be taken as a serious option. MM added that many previous studies in the Olifants/Doring River valley had studied water augmentation options for the area, and indicated that the raising of Clanwilliam Dam was one of the best solutions. Mr Edmeades wanted to know when the wall would be raised. MM responded that one could not categorically state when the project would happen, but that the Feasibility Study would assist in determining the costs etc. associated with raising the dam wall. Mr Wrench wanted to know about the ecological reserve and what a 5m raising would have for users. MM and AW responded that presently no reserve releases are made. If releases were to be made, this would likely have an effect on the existing allocations of farmers, who would have to give some up, for the ecological reserve. Initial calculations of the reserve requirement suggest that a 5m raising would yield enough water to satisfy the requirements of the Reserve. Mr Morillion questioned how critical the dam wall repairs were. MM responded that DWAF needed to undertake the repairs within a reasonable period of time. But there was however pressure for something to be done soon. Mr Raad wanted to know how DWAF would determine the cost that the raised dam would have on the agricultural sector in the area. MM and AW explained that as part of the Feasibility Study, an agricultural team would determine indicative costs associated with different land uses. This was being done through an aerial photography inspection and	

Item	Notes of Meeting	Action
	quantification exercise, as well as through discussions with farmers on the ground. It was noted that at a feasibility level, each farmer would not be individually approached and the value of his land determined. Mr Matthews wanted to know what the likely dam raising would be. MM responded that 10 to 15m looked likely, but depended on a suite of things such as the economic feasibility. Mr Ferreira representing the Nooitgedacht Homeowners Association asked what he should tell people who wish to develop their properties, that fall below the purchase lines for 5,10 or 15m raising. MM responded that it would be advisable to wait until a decision has been taken by DWAF. ***It must however be noted that DWAFs official policy is that property owners should continue developing their properties, as if the dam would not be raised, until such time that an official notice to acquire land has been received.*** Ms Wrench asked if land downstream of the dam would be affected by the dam raising? MM responded that there would not be any influence on property below the dam other than higher flows in the river were likely to be experienced for longer periods of the year.	
6	**WAY FORWARD AND CLOSURE** AW reported that a draft Scoping Report would be compiled, and registered interested and affected parties would be invited to comment on the draft report and attend a public meeting. DF thanked everyone for their attendance and participation and the meeting was closed at 18:00 with many people remaining until 18:30 to engage in further discussion over the aforementioned maps.	

Item	Notule van Vergadering		Aksie
	Proses vir Omgewingsimpakbepaling (OIB) van die Verhoging van die Clanwilliamdam **Vergadering met Grondeienaars** **gehou op 18 Augustus 2005** **by Ninham Shand, Kaapstad**		
1.	**BYWONING**		
	Mnr Lou Wrench	Uitsig (Kleinhoewe)	
	Me Alison Wrench	Uitsig (Kleinhoewe)	
	Mnr Carl Edmeades	Caleta Cove	
	Mnr Johann Ferreira Huiseienaarsvereniging	Nooitgedacht	
	Mnr Reg Vachaudez Huiseienaarsvereniging.	Nooitgedacht	
	Me Louise Vachaudez Huiseienaarsvereniging	Nooitgedacht	
	Mnr Craig McIver	Caleta Cove	
	Me Jane Magner	Caleta Cove	
	Mnr John Magner	Caleta Cove	
	Mnr James Douglas	Caleta Cove	
	Mnr David Forbes	Caleta Cove	
	Mnr Paul Raad	Lebanon Citrus	
	Me Sue Raad	Lebanon Citrus	
	Mnr Derek Morillion	Caleta Cove	
	Mnr David Dorfman	Clanwilliam Hills	
	Mnr Gareth Dorfman	Clanwilliam Hills	
	Mnr Rod Maxwell	Clanwilliam Hills	
	Mnr Nik Matthews	Caleta Cove	
	Mnr Keith Prentice	Caleta Cove	MM
	Mnr Ross Petersen	Caleta Cove	AW
	Mnr G Boting	Caleta Cove	DF
	Mnr Mark Marais	Asch Konsultantdienste	FA
	Mnr Ashwin West	Ninham Shand	
	Me Doreen Februarie	Nosipho Consultancy	
	Mnr Faldee Abrahams	Private Konsultant	
2.	**VERWELKOMING** DF verwelkom die grondeienaars en moedig hulle aan om vrae te vra en hulle bekommernisse te lug. Sy lig hulle in dat hierdie vergadering aangevra is tydens die eerste openbare vergadering van die OIB-proses wat op 20 Julie in Clanwilliam gehou is. Sy stel ook die projekspan bekend. DF verduidelik die reëls van die vergadering en vra dat mense hulself identifiseer voordat hulle vrae vra.		
3.	**VERTONING VAN KAARTE** DF noem dat die persone teenwoordig ‘n reeks kaarte waarop die 5-, 10- en 15-meter oorstromingslyne aangebring is, tydens die vergadering kan besigtig. Die kaarte is ook te besigtig by die Clanwilliam Biblioteek en		AW

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	die Munisipale Kantore. Vergrotings van sekere seksies van die kaarte is ook beskikbaar. Die projekspan stem in om vergrotings van sekere seksies beskikbaar te stel.	
4	**OPSOMMING VAN DIE AGTERGROND EN REDE VIR DIE OIB-PROSES VIR DIE VERHOGING VAN DIE CLANWILLIAMDAM** AW gee 'n kort oorsig oor die agtergrond tot die studie en die OIB-proses vir die verhoging van die Clanwilliamdam. Ninham Shand, in samewerking met Asch Professionele Dienste en Jakoet en Genote, is deur die Departement van Waterwese en Bosbou (DWAF) aangestel om 'n Uitvoerbaarheidstudie na die verhoging van die Clanwilliamdam te onderneem. Die omgewingsinvloedbepaling (OIB) vorm deel van die Uitvoerbaarheidstudie. Daar is genoem dat die OIB-proses ten doel het om die omgewingsaspekte wat met die verhoging van die damwal gepaard gaan, te ondersoek en hulle bevindinge aan beide DWAF en die omgewingsowerhede bekend te maak. Die redes waarom daar ondersoek ingestel word na die moontlike verhoging van die Clanwilliamdam sluit onder andere die volgende in, naamlik dat verbeteringswerke aangebring moet word om die dam in lyn te bring met huidige damveiligheidsvereistes en dat hierdie werke die geleentheid bied om terselfdertyd die damwal te verhoog; dat water vir die ekologiese reserwe, wat tans bepaal word, beskikbaar gestel moet word; dat die versekering van lewering aan bestaande gebruikers verbeter moet word en dat water vir opkomende boere beskikbaar gestel moet word. Take wat as deel van die Uitvoerbaarheidstudie aangepak word, sluit in gehalte van water, toevoerontleding, grondwater, besproeiing, omgewingsmagtiging, finansiële en ekonomiese analises, opkomende boere en openbare deelname. Die voorlopige ontwerp en konsep kostebereking van die dam word tans deur DWAF self gedoen. AW verduidelik dat die OIB-proses uitgevoer word om 'n aantal statutêre vereistes aan te spreek, om potensiële omgewingsinvloede (maatskaplik en biofisies) te identifiseer, om DWAF se besluit om die damwal te verhoog bekend te maak en om belangstellende en geaffekteerde partye die geleentheid te bied om hulle kwessies en knelpunte te lug. Die studie sal spesifiek aandag gee aan daardie aspekte wat direk op die oorstroming betrekking het, aan die verlegging van die N7 Nasionale Pad, aan die invloed van leengroewe of 'n steengroef. Dit sal ook kortliks die implikasies van die oorstroming van sekere sekondêre paaie aanspreek. 'n Erfenisinvloedsbepaling sal ook deel van die OIB vorm. Hierna is die OIB-proses verder omskryf, en daar is veral klem gelê op die geleenthede wat geskep word om die publiek by die proses te betrek. Die eerste geleentheid het reeds met die aanvang van die Evalueringsfase plaasgevind. Die volgende openbare vergadering sal gehou word sodra die konsep Evalueringsverslag voltooi is. Die derde geleentheid vir openbare deelname sal plaasvind wanneer die konsepverslag oor die OIB voltooi is en 'n openbare vergadering gehou sal word om die publiek se kommentaar daarop te verkry. Die laaste geleentheid vir deelname is tydens die tydperk van appél, wanneer daar geleentheid is om appél aan te teken teen die Rekord van Besluite wat	

Item	Notule van Vergadering	Aksie
	deur die omgewingsgesag uitgereik word. Daar is genoem dat die proses van openbare deelname deel van die OIB-proses vorm sodat die publiek sy mening oor die kwessies en knelpunte rondom die aanvaarbaarheid van die projek vanuit 'n omgewingsoogpunt kan lug. Dit is egter nie die regte forum om sake oor die aankoop van grond deur DWAF aan te spreek nie. Hierdie is 'n aparte proses en sal op 'n latere stadium deur DWAF gedoen word. 'n Afskrif van DWAF se Vergoedingsbeleid is aan diegene wat die vergadering bygewoon het, beskikbaar gestel. Daar is verduidelik dat dit berus op die beginsel van "gewillige koper / gewillige verkoper" en dat vergoeding op markverwante pryse gegrond sal wees. Daar is bygevoeg dat voorsiening gemaak word vir besware teen die wyse waarop die markverwante pryse bepaal word.	
5	**VRAE** Mnr Raad en ander maak bekend dat hulle bekommerd is oor die oorstroming van die grondpad op die oostelike oewer van die dam, aangesien dit toegang tot plase bied. 'n Gebrek aan toegang sal ernstige ekonomiese nadele in terme van produkvervoerkoste inhou. MM en AW antwoord dat die projekspan ondersoek instel na die paaie wat geraak sal word en watter gedeeltes herbelyn moet word. Daar is genoem dat daar tans met die Provinsiale Paaie-owerheid samesprekings gevoer word oor moontlike opsies vir die grondpad, deurlopendheid van die pad en toegang vir boere na hul plase. Die Provinsiale Owerheid het genoem dat grondeienaars geken sal word in enige besluite wat 'n verandering in toegang na hul grond veroorsaak. Mnr Douglas vra of die Ninham Shand konsortium betrokke sal wees by die bou van die dam, of dat hul kontrak net tot die Uitvoerbaarheidstudie beperk is. AW bevestig dat die huidige aanstelling net vir die Uitvoerbaarheidstudie is. Daar is verder genoem dat DWAF self die ontwerp van die verhoging behartig en heel moontlik die konstruksie intern sal behartig. Mnr Dorfman vra hoe ernstig DWAF is met die verhoging van die Clanwilliamdam? Aangesien die kliënt nie teenwoordig was nie, het AW geantwoord dat DWAF heelwat geld aan die aanvanklike ondersoek en ontwerp spandeer, en dat die verhoging ernstige oorweging geniet. MM voeg by dat verskeie opsies vir die aanvulling van water aan die die Olifants-/Doringriviervallei deur vorige studies ondersoek is en dat die verhoging van die Clanwilliamdam een van die beste oplossings is. Mnr Edmeades wil weet wanneer die damwal verhoog sal word. MM antwoord dat niemand kategories kan stel wanneer die projek sal begin nie. Die Uitvoerbaarheidstudie sal egter help om die kostes wat op die verhoging van die damwal betrekking het, te bepaal. Mnr Wrench vra vir meer inligting oor die ekologiese reserwe en wil weet watter voordeel verbruikers uit die 5m verhoging sal trek. MM en AW antwoord dat daar tans geen loslatings vir die reserwe gemaak word nie. Indien hierdie loslatings gemaak word, sal dit beteken dat bestaande toedelings aan boere verminder sal moet word om aan die behoeftes van die ekologiese reserwe te voldoen. Aanvanklike	

Item	Notule van Vergadering	Aksie
	berekeninge dui aan dat die 5m verhoging genoeg water sal lewer om die behoefte van die ekologiese reserwe aan te spreek. Mnr Morillion vra hoe krities noodsaaklik die verbeteringswerke aan die damwal is. MM antwoord dat DWAF binne 'n redelike tydperk herstelwerk moet aanbring, maar dat hulle onder groot druk verkeer om so gou as moontlik daaraan aandag te gee. Mnr Raad wil weet hoe DWAF die koste vir die verhoging van die damwal gaan bepaal, asook die invloed wat dit op die landbousektor in die gebied sal hê. MM en AW verduidelik dat 'n span landbouspesialiste die koste (indikators) verbonde aan die verskillende landboupraktyke as deel van die Uitvoerbaarheidstudie sal bepaal. Dit word deur middel van lugfoto's en 'n kwantifiseringsoefening gedoen, sowel as d.m.v. gesprekke met boere op die grond. Tydens die Uitvoerbaarheidstudie sal elke boer egter nie individueel genader, om die waarde van sy plaas vas te stel nie. Mnr Matthews wil weet met hoeveel meter die damwal heel waarskynlik verhoog sal word. MM antwoord dat dit heel moontlik 10m of 15m sal wees, maar dat dit afhang van 'n reeks faktore, waaronder die ekonomiese lewensvatbaarheid. Mnr Ferreira, wat die Nooitgedacht Huiseienaarsvereniging verteenwoordig, vra wat hy moet sê aan eienaars wat hul grond wil ontwikkel, maar wat binne die 5m, 10m en 15m oorstromingslyn geleë is? MM antwoord dat dit wys sal wees om te wag totdat DWAF 'n besluit geneem het. ***Daar moet egter kennis geneem word van DWAF se amptelike beleid wat sê dat grondeienaars met ontwikkeling moet voortgaan (m.a.w. asof die damwal nie verhoog sal word nie) tot en met die stadium wanneer hulle 'n amptelike kennisgewing vir die aankoop van hul grond ontvang.*** Me Wrench vra of grond stroomaf van die wal deur die verhoging geraak sal word? MM antwoord dat die verhoging geen invloed op eiendom sal hê nie, behalwe dat hoër riviervloeie vir langer periodes kan voorkom.	
6	**PAD VORENTOE EN AFSLUITING** AW noem dat die konsep Evalueringsverslag saamgestel word, en dat geregistreerde belanghebbende en geaffekteerde partye uitgenooi sal word om op die konsepverslag kommentaar te lewer, asook na 'n openbare vergadering uitgenooi sal word. DF bedank almal vir hulle teenwoordigheid en deelname. Die vergadering word om 18:00 afgesluit, alhoewel heelwat persone tot 18:30 gebly het om die kaarte te besigtig en te bespreek.	

APPENDIX J

Plan of Study for EIA

NINHAM SHAND
CONSULTING SERVICES

81 Church Street
P.O. Box 1347
CAPE TOWN 8000

Tel: (021) 481 2400
Fax: (021) 424 5588
Email: enviro@shands.co.za

PROPOSED RAISING OF CLANWILLIAM DAM AND ASSOCIATED REALIGNMENT OF AFFECTED ROADS

Plan of Study for Environmental Impact Assessment

October 2005

Directorate: Options Analyses
Department of Water Affairs and Forestry
Private Bag X313
Pretoria
South Africa

Tel: (012) 336 8321
Fax: (012) 338 8295
E-mail: icb@dwaf.gov.za

CONTENTS

PROPOSED RAISING OF CLANWILLIAM DAM AND THE ASSOCIATED REALIGNMENT OF AFFECTED ROADS~ *Draft Plan of Study for EIA*

1 BACKGROUND TO THE STUDY[1]

The Clanwilliam Dam was originally built in 1935, and was raised to a height of 43m in the 1970s by adding gates and through the use of pre-stressed cables. In order to comply with current dam safety standards applicable during extreme events, the Department of Water Affairs and Forestry (DWAF) envisages that remedial measures will be required at the dam in the near future. The required remedial work presents an opportunity to raise the dam by up to 15m, if the marginal cost of raising, over and above the cost of the strengthening, is such that the raising is economically viable and socially and ecologically acceptable.

In January 2004, Ninham Shand in association with the Asch Consulting Engineers and Jakoet & Associates was appointed by DWAF to undertake a Feasibility Study for the possible raising of the Clanwilliam Dam (hereinafter referred to as the Feasibility Study). Furthermore, DWAF in consultation with the Provincial Government of the Western Cape and the South African National Roads Agency has agreed to undertake the investigation and design work associated with the potential realignment of the N7 National Road, should the dam be raised. An Environmental Impact Assessment (EIA) process forms a component of the aforementioned Feasibility Study.

The EIA process commenced in June 2005 with the submission of an Application Form and Scoping Checklist and Plan of Study for Scoping, which was subsequently approved in August 2005. The subsequent Scoping process has culminated in the production of a Draft Scoping Report which has identified various potential environmental impacts and project alternatives which require more detailed investigation. Accordingly, this "***Plan of Study for EIA***" has been compiled and will be submitted to the provincial Department of Environmental Affairs and Development Planning (DEA&DP) for their consideration.

2 PURPOSE OF THIS PLAN OF STUDY FOR EIA

This Plan of Study for EIA has been compiled in terms of the DEAT "***Guideline Document for the Implementation of Sections 21, 22 and 26 of the Environment Conservation Act***" (April 1998) and its purpose is to ensure that the EIR phase of this EIA process satisfies the requirements of DEA&DP.

[1] Detailed background information is provided in the Scoping Report, and accordingly only the essential elements are reiterated here.

Accordingly, this Plan of Study for EIA outlines the anticipated process and products for the EIR phase.

3 DESCRIPTION OF THE ACTIVITY

The nature of the activity is described in detail in the Scoping Report, but in brief includes the following:

- The raising of the Clanwilliam Dam wall by either 5, 10 or 15 m;
- The realignment of two portions of the N7 National road, totalling up to 3 200 m in length; and
- The raising of approximately 100 m length of DR 1487 in the vicinity of the Olifants River crossing.

It is important to note that the realignment of portions of the N7 would only be undertaken if the Clanwilliam Dam were raised.

4 DESCRIPTION OF TASKS TO BE PERFORMED

4.1.1 Potential Environmental Impacts Identified during Scoping

The Scoping investigation has reviewed the range potential environmental impacts associated with the proposed dam raising and road realignment. Pursuant to this assessment, which was based on literature, input from the authorities, interested and affected parties (I&APs) and various professionals, a shortlist of potentially significant environmental impacts were identified for further, more detailed investigation during the EIR phase. Specifically the following potential environmental impacts have been identified:

- Operational phase impacts on the biophysical environment:
    - Impact on flora;
    - Impact on fauna;
    - Impact on the aquatic environment;
    - Impact on groundwater resources;
    - Impact of sourcing construction material; and
    - Impact of inundation on the roads.
- Operational phase impacts on the social environment:
    - Visual impacts;
    - Impact on heritage resources;
    - Impact of inundation of existing infrastructure (other than roads) adjacent to the dam
    - Impact on recreational facilities;
    - Impact on livelihood security;

- Impact on the local economy; and
- Macro-economic impacts.

- Construction phase impacts on the biophysical and social environments:

  - Disturbance of flora and fauna;
  - Sedimentation and erosion;
  - Deterioration of water quality;
  - Increase in traffic volumes;
  - Interruption of road services;
  - Interruption of water services;
  - Storage and utilisation of hazardous substances on site;
  - Risk of fire;
  - Disturbance to sense of place, visual aesthetics;
  - Security risks;
  - Health issues;
  - Windblown dust;
  - Litter/waste pollution;
  - Noise pollution; and
  - Light pollution.

4.1.2 Method for Assessing the Significance of Potential Environmental Impacts

This section outlines the proposed method for assessing the significance of the potential environmental impacts outlined above. As indicated, these include both operational and construction phase impacts.

For each impact, the EXTENT (spatial scale), MAGNITUDE and DURATION (time scale) would be described. These criteria would be used to ascertain the SIGNIFICANCE of the impact, firstly in the case of no mitigation and then with the most effective mitigation measure(s) in place. The mitigation described in the EIR would represent the full range of plausible and pragmatic measures but does not necessarily imply that they would be implemented.[2]

The tables on the following pages show the scale used to assess these variables, and defines each of the rating categories.

[2] The applicant will be requested to indicate at the Draft EIR stage which alternative and mitigation measures they are prepared to implement.

Table 1: Assessment criteria for the evaluation of impacts

CRITERIA	CATEGORY	DESCRIPTION
Extent or spatial influence of impact	**Regional**	Beyond a 20 km radius of the dam wall
	Local	Within a 20 km radius of the dam wall
	Site specific	On site or within 100 m of the construction area
Magnitude of impact (at the indicated spatial scale)	**High**	Natural and/ or social functions and/ or processes are ***severely*** altered
	Medium	Natural and/ or social functions and/ or processes are ***notably*** altered
	Low	Natural and/ or social functions and/ or processes are ***slightly*** altered
	Very Low	Natural and/ or social functions and/ or processes are ***negligibly*** altered
	Zero	Natural and/ or social functions and/ or processes remain ***unaltered***
Duration of impact	**Construction period**	Up to 3 years
	Medium Term	Up to 10 years after construction
	Long Term	More than 10 years after construction

The SIGNIFICANCE of an impact is derived by taking into account the temporal and spatial scales and magnitude. The means of arriving at the different significance ratings is explained in Table 2.

Table 2: Definition of significance ratings

SIGNIFICANCE RATINGS	LEVEL OF CRITERIA REQUIRED
High	• High magnitude with a regional extent and long term duration • High magnitude with either a regional extent and medium term duration or a local extent and long term duration • Medium magnitude with a regional extent and long term duration
Medium	• High magnitude with a local extent and medium term duration • High magnitude with a regional extent and construction period or a site specific extent and long term duration • High magnitude with either a local extent and construction period duration or a site specific extent and medium term duration • Medium magnitude with any combination of extent and duration except site specific and construction period or regional and long term • Low magnitude with a regional extent and long term duration
Low	• High magnitude with a site specific extent and construction period duration • Medium magnitude with a site specific extent and construction period duration • Low magnitude with any combination of extent and duration except site specific and construction period or regional and long term • Very low magnitude with a regional extent and long term duration
Very low	• Low magnitude with a site specific extent and construction period duration • Very low magnitude with any combination of extent and duration except regional and long term
Neutral	• Zero magnitude with any combination of extent and duration

Once the significance of an impact has been determined, the PROBABILITY of this impact occurring as well as the CONFIDENCE in the assessment of the impact, would be determined using the rating systems outlined in Tables 3 and 4 respectively. It is important to note that the significance of an impact should always be considered in concert with the probability of that impact occurring. Lastly, the REVERSIBILITY of the impact is estimated using the rating system outlined in Table 5.

Table 3: Definition of probability ratings

PROBABILITY RATINGS	CRITERIA
Definite	Estimated greater than 95 % chance of the impact occurring.
Probable	Estimated 5 to 95 % chance of the impact occurring.
Unlikely	Estimated less than 5 % chance of the impact occurring.

Table 4: Definition of confidence ratings

CONFIDENCE RATINGS	CRITERIA
Certain	Wealth of information on and sound understanding of the environmental factors potentially influencing the impact.
Sure	Reasonable amount of useful information on and relatively sound understanding of the environmental factors potentially influencing the impact.
Unsure	Limited useful information on and understanding of the environmental factors potentially influencing this impact.

Table 5: Definition of reversibility ratings

REVERSIBILITY RATINGS	CRITERIA
Irreversible	The activity will lead to an impact that is in all practical terms permanent.
Reversible	The impact is reversible within 2 years after the cause or stress is removed.

5 NEED FOR ADDITIONAL INFORMATION: SPECIALIST STUDIES

In reviewing the potential environmental impacts, the following impacts have been identified as being of particular concern:

- Impact on flora;
- Impact on freshwater fish;
- Groundwater impact;
- Impact on heritage resources; and
- Impacts on the social environment.

Accordingly, in undertaking the assessment of these impacts, it is proposed that specialist studies be undertaken.

The terms of reference for these investigations as well as the identified specialists are outlined in more detail below.

5.1 SPECIALIST BOTANICAL INVESTIGATION

The raising of the dam and concomitant inundation of land surrounding the dam is likely to impact on natural vegetation. However, the area of natural vegetation is limited as the land surrounding the dam is mostly cultivated (refer to section 3.2.3). The realignment of portions of the N7 could have a negative impact on the flora within the proposed alternative road alignments

The broader area is however known to support areas of high conservation importance. It is therefore recommended that a specialist botanical assessment be undertaken, focussed on the proposed area of inundation and the area affected by the N7 road realignment alternatives to determine the impact on the floral communities. The proposed Terms of Reference for this specialist botanical assessment are as follows:

- Collate and review all available existing vegetation documentation;
- Obtain and collate information about rare and endangered plants in the area;
- Consult with relevant botanists and institutions to obtain information not in the public domain;
- Undertake a survey and analysis of the vegetation in the potential inundation area and in the alternative road alignments; and
- Produce a report and vegetation map describing and assessing the implications of raising the dam and the alternative road alignments.

Dr C Boucher, formerly of the University of Stellenbosch, currently consulting in his private capacity, has been appointed to undertake the botanical investigation since he has previously worked in this area and has an extensive knowledge of the Cape Floristic Kingdom. Dr Boucher's CV is included in **Annexure K** of the Scoping Report.

5.2 FRESHWATER FISH INVESTIGATION

In light of the potential impact that the raised dam could have on the aquatic environment and more specifically the fish indigenous fish population, it is suggested that a specialist freshwater fish assessment be undertaken, in order to determine the impact of a raised dam on the habitat requirements of indigenous fish and the impact that the dam would have on the Rondegat River, a tributary of the Olifants River. The Terms of Reference for the specialist freshwater fish assessment are as follows:

- Undertake a desktop review of existing information on the area to be inundated by the raised dam in the Olifants and Rondegat rivers;

- Comment on the proposed release mechanisms; and
- Comment on the area immediately downstream of the Clanwilliam Dam, which acts as a sanctuary for the Clanwilliam yellowfish.

It is suggested that Mr. Dean Impson undertake this specialist fish assessment. He is recognised expert in this field with extensive experience in the Olifants River valley. It must be noted that although Mr. Impson is employed by CapeNature, he would undertake this work in his private capacity. Mr Impson's CV is attached as **Annexure K** of the Scoping Report.

5.3 GROUNDWATER INVESTIGATION

Historical observations and previous work suggest that when the Clanwilliam Dam is full, the few groundwater springs/seeps located in the area discharge at a faster rate. The raising of Clanwilliam Dam could raise the local groundwater table, and could result in the discharge of groundwater in the surrounding areas, the springs in Clanwilliam town being of particular concern. However if the flows increase in the springs, this additional water could be utilised productively within the town. An extensive hydrogeological survey is unlikely to add much knowledge to the data collected in the previous investigations. It is therefore suggested that a focused hydrogeological assessment be undertaken, to determine the impact that a raised Clanwilliam Dam could have on the hydrogeology of the adjacent areas. The Terms of Reference for the hydrogeological assessment are as follows:

- The production of a hydrogeological scoping report covering the following:
    - The hydrogeological context of the area, fluctuations in the groundwater table and spring flows with changes in the dam levels and rainfall trends;
    - A schematic cross-sectional diagram showing the relationship of the water table in the Skurweburg and Peninsula aquifers as related to the three levels of potential raising of Clanwilliam Dam; and
    - Data limits and recommendations.

Umvoto Africa, led Ms Rowena Hay has been appointed to undertake the hydrogeological assessment. Ms Hay has undertaken extensive work in the area, most recently as part of the WODRIS Study, and has an extensive knowledge of the aquifer systems in the area. Ms Hay's CV is included in **Annexure K** of the Scoping Report.

5.4 HERITAGE IMPACT ASSESSMENT

Within the basin of the potentially raised Clanwilliam Dam, there are numerous known sites containing rock art and stone tools dated to the LSA. These sites are considered to be a significant heritage resource. Similarly, heritage

resources are likely to found in the areas to the west of the N7, and may be destroyed when those portions of the N7 are realigned.

In light of the significance of heritage resource considerations in the area surrounding the Clanwilliam Dam and the road realignment corridors, it is suggested that a heritage assessment be undertaken to determine the relative impact of the various alternatives being considered on heritage resources. The Terms of Reference for this heritage assessment should be as follows:

- Undertake a field survey of the area that may be affected by inundation and the road realignment corridor alternatives;
- Identify rock art sites, completing site record forms for each site;
- Identify open scatters of artefacts, completing site record forms for each site;
- Identify built structures, completing site record forms for each site; and
- Compile a detailed assessment of the heritage sites that may be affected by the various dam raising scenarios and road alignment alternatives.

The Archaeology Contracts Office (ACO), led by Mr. Tim Hart has been appointed to undertake the heritage assessment. ACO undertook the heritage assessments that formed part of the Olifants/Doring River Basin Study Phase I (1999) and was referred to in the Olifants/Doring River Basin Study Phase II (2003), and consequently know the area and subject matter well. Mr Hart's CV is included in **Annexure K** of the Scoping Report.

5.5 SOCIAL IMPACT ASSESSMENT

In light of the social implications of, amongst other things, loss of land and infrastructure, impacts on livelihoods, and the potential benefits of additional water in the area, it is suggested that a Social Impact Assessment (SIA) be undertaken. The Terms of Reference for this assessment would be as follows:

- The identification and assessment of the social impacts associated with the loss of land and infrastructure due to the raising of the dam wall and realignment of the N7;
- The identification and assessment of social and development opportunities and constraints associated with changing land-uses in and around the dam, as a result of the raised dam and realigned road;
- The identification and assessment of the social impacts on other downstream users;
- The identification and assessment of the social impacts associated with the construction phase of the project, including the potential influx of job seekers and construction workers to the area; and

- The identification and assessment of the social impacts on upstream water users.

Mr Tony Barbour, a private consultant, has been appointed to undertake the social impact assessment. He will be assisted by staff from UCT's Environmental Evaluation Unit. Mr Barbour has undertaken many SIAs and has experience of working in the study area. Mr Barbour's CV is attached as **Annexure K** of the Scoping Report.

6 REASONABLE PROJECT ALTERNATIVES IDENTIFIED DURING SCOPING

The Scoping investigation has reviewed a range of project alternatives associated with the proposed activities. Pursuant to this assessment, which was based on input from the authorities, I&APs and various professionals, a shortlist of reasonable project alternatives have been identified for further, more detail investigation during the EIR phase, namely:

First Tier Alternatives: Clanwilliam Dam Raising

Alternative levels of raising, including:
- Strengthening of the dam wall only;
- Raising the dam wall by 5 m;
- Raising the dam wall by 10 m; or
- Raising the dam wall by 15 m.

Second Tier Alternatives: Realignment of the N7 National Road and other affected roads

The Realignment of the N7 in the vicinity of the dam wall:
- Three alternative realignment options for Section 4 of the N7 with a total length of up to 2700 m, in vicinity of the Clanwilliam Dam wall.

Raising of a 500 m portion of the N7 in the vicinity of the road to Algeria:
- Design and layout considerations.

Raising of a 100 m portion of the river crossing road (DR1487), between the N7 and Algeria:
- Design and layout considerations.

Third tier alternatives: Within project alternatives

Outlet structure alternatives:
- Design and layout considerations

Fourth tier alternatives: Construction specific layout alternatives

Layout alternatives would exist for the establishment of a construction village to house a part of the work force, provision of services (potable water, electricity and waste water) to the construction village, and the establishment of temporary access tracks. These would only be determined at a much later stage in the project, and could therefore not be assessed in detail during this EIA process.

7 THE ENVIRONMENTAL IMPACT REPORT

The purpose of the EIR would be to undertake a comparative assessment of the relative significance of the potential environmental impacts for the various dam raising level and road realignment alternatives. The EIR would thus include the following:

- A brief overview of the potential environmental impacts and reasonable alternatives identified during the Scoping investigation.
- A summary of the key findings of the various specialist studies as they pertain to the affected environment.
- An overview of the public participation process conducted during the compilation of the EIR.
- A detailed assessment of the significance of the potential environmental impacts for the various project alternatives. This assessment, which would use the methodology outlined in Section 4.1.2, would be informed by the findings of the specialist studies, professional judgement and comment from the various I&APs.
- An overview of the full range of mitigation measures including an indication of how these would influence the significance of any potential environmental impacts, including a framework Environmental Management Plan. The mitigation measures would be informed by the specialist studies, professional experience and comment received from the I&APs.
- A set of recommendations regarding the way forward, should any of the proposed alternatives be authorised in terms of the Environment Conservation Act, would be provided.

8 PUBLIC PARTICIPATION PROCESS

The purpose of the Public Participation Process would be to provide I&APs with adequate opportunity to have input into the environmental process. The public participation process would include the following:

8.1 PUBLIC COMMENT ON THE DRAFT EIR

Following the completion of the Draft EIR (refer to Section 7 above), it will be lodged at the Clanwilliam and Cape Town public libraries, at the Clanwilliam Municipal office and on the Ninham Shand website (www.ninhamshand.co.za). Registered I&APs will be notified of the lodging by means of letters, and given a minimum of 21 days in which to comment on the report. During the comment period, a public meeting would be held in

Clanwilliam to enable I&APs to provide feedback on the draft report. The public would be notified of the meeting in the letter used to inform the I&APs of the lodging of the Draft Report.

All written correspondence would be in English and Afrikaans. The public meeting would be run in English and Afrikaans, with the allowance for translation to Xhosa, if required.

The public comments would be consolidated into an Annexure of the EIR. This would take the form of an issues trail, which would summarise the issues raised and provide the Project Team's responses thereto. The draft report would also be revised in light of feedback from the public.

8.1.1.1 Opportunity for Appeal

All registered I&APs would be notified in writing of the release of the Record of Decision. They would be reminded of their right to appeal against DEA&DP's decision to the Minister of Environmental Affairs and Development Planning in terms of the Environment Conservation Act.

8.2 PROPOSED PROGRAMME

Refer to **Appendix A** for a summary of the proposed programme.

9 PERSONNEL

As for the Scoping Report phase, Karen Shippey would manage the study and Ashwin West would undertake the requisite reporting. Doreen Februarie of Nospiho Consultancy would facilitate the public participation process and the Ninham Shand Environmental Department Manager, Mike Luger, would provide strategic guidance to the study. Moreover, as outlined in Section 5 above, various specialists would be commissioned to undertake the proposed specialist studies.

APPENDIX A: PROPOSED PROGRAMME

APPENDIX K

CVs of Relevant Specialists

Ninham Shand Consulting Services

Name	M Luger
Profession	Environmental Scientist
Yrs with firm	10
DOB	1968
Nationality	South African

Role in the Study	Task Co-ordinator – Biophysical/ Socio-economic
Level of Responsibility	F

Key Qualifications

Mr Luger has 10 years experience in environmental impact assessments, overseen the development of several environmental management plans and conducted many public processes.

Relevant Experience

CMC Water Augmentation Study : Responsible for managing environmental aspects of study to augment water supply for Cape Metropolitan Area, inclusive of Reserve determinations.
Breede River Basin Study : Managed all environmental aspects including the environmenimpact assessment, and Reserve determinations for the river, estuary, groundwater, wetlands and water quality as well as integration.
Berg River monitoring review: Undertook review of proposed monitoring programme to ascertain implications of Skuifraam Scheme on the river and estuary and drafted proposed management structure and job descriptions.
Skuifraam Dam Review: Undertook a review of the process followed for the Skuifraam Scheme against the World Commission on Dams guidelines.
Skuifraam Supplement Scheme: Conducted an environmental impact assessment of the proposed abstraction of water from the Berg River.
Olifants/Doring River Basin Study: Co-ordinated the environmental study teams, and compiled the environmental assessment report.
Palmiet River Catchment Management Study: Undertook an assessment of the available data and prepared proposals for the catchment management plan.
Western Cape System Analysis Evaluation Study: Compiled information document for the conference to facilitate public input into selection of water supply options.
Skuifraam Dam: Compiled an environmental impact assessment and co-ordinated the vegetation, archaeological, faunal, social, forestry and instream flow requirements.

Professional Registration and Affiliations

Member, International Association for Impact Assessment
Member, Southern African Institute of ecologists and Environmental Scientists

Ninham Shand Consulting Services

Name	K Shippey
Profession	Environmental Scientist
Yrs with firm	2
Date Of Birth	1974
Nationality	South African

Role in the Study	Task Leader
Level of Responsibility	E

Key Qualifications

BSc (Geology and Environmental & Geographical Science), University of Cape Town, South Africa, 1995; BSc (Hons) (Environmental and Geographical Science), University of Cape Town, South Africa, 1997; MSc (Environmental & Geographical Science), University of Cape Town, South Africa, 2001

Over 7 years working in the environmental impact assessment, management and policy field. Experience in project design, understanding of the ecological, social and sustainable development issues including specialist input co-ordination and process development

Relevant Experience

Olifants Doring Water Management Area Internal Strategic Perspective, South Africa

Responsible for the Olifants Doring WMA Internal Strategic Perspective. Personal responsibilities included interviewing DWAF staff, consolidating information, holding workshops, identifying strategies and drafting the ISP documents.

Table Mountain Aquifer Feasibility and Pilot Project, South Africa

Investigation of potential source of water to augment the City's supply. Provided Project management and environmental and technical input, by undertaking various levels of Environmental Impact Assessment (EIA), undertaking public participation and education and supervising a team of four team members

Professional Registration and Affiliations

Certified Environmental Assessment Practitioner, Environmental Assessment Practitioners of South Africa

Associate member, South African Institute of Ecologists and Environmental Scientists

Environmental Scientist In-Training, South African Council for Natural Science Professions

Ninham Shand Consulting Services

Name	A West
Profession	Environmental Scientist
Yrs with firm	0-1
Date Of Birth	15/07/1976
Nationality	South African

Role in the Study	EIA support
Level of Responsibility	B

Key Qualifications

BSc (Zoology and Environmental & Geographical Science), University of Cape Town, South Africa, 1998, BSc (Hons) (Environmental & Geographical Science), University of Cape Town, South Africa, 1999

As an Environmental Scientist, Mr West has been involved in Environmental Impact Assessments, water studies and the development, implementation and review of Environmental Management Systems, in South Africa and the UK.

Relevant Experience

Plettenberg Bay Water Study, Plettenberg Bay, Western Cape, South Africa

Provided environmental input investigating water augmentation options for Plettenberg Bay. Provided specialist environmental input into an environmental impact assessment process for the construction of an emergency pipeline to the Roodefontein Dam. Ongoing input with respect to the public participation process

Lower Orange River Management Study, South Africa

Provided input into the environmental aspects of the pre-feasibility study and report. Providing assistance with the public consultation process.

Laingsburg Cemetery Development, Laingsburg

Provided environmental input into the site selection for a proposed cemetery development/ extension during the design phase. Involved with the compilation of the application and screening checklist.

Professional Registration and Affiliations

Member, International Association for Impact Assessment, South African affiliate.

Ninham Shand Consulting Services

Name	AC Spinks
Profession	Environmental Scientist
Yrs with firm	4
Date Of Birth	1970
Nationality	South African

Role in the Study	EMP and EMPR Design
Level of Responsibility	D

Key Qualifications

BSc (Botany and Zoology), University of Cape Town, South Africa, 1991, BSc (Hons) (Zoology), University of Natal (Pietermaritzburg), South Africa, 1992. PhD (Zoology), University of Cape Town, South Africa, 1998.

Dr Spinks has compiled and monitored the implementation of approximately 30 Environmental Management Programmes, and EIAs, EMPR's and opportunities and constraints reports

Relevant Experience

Berg Water Project Scope of Services, Franshhoek, Environmental Scientist

Appointed by the Trans-Caledon Tunnel Authority to assist them in compiling the Scope of Services document for the Environmental Management Plan for the Berg Water Project (viz. Skuifraam Dam and Supplement Scheme).

Reservoir, Simonstown, Task Manager for environmental management programme

Appointed by the South Peninsula Administration of the City of Cape Town to compile an Environmental Management Plan, and oversee its implementation, for the construction of the Red Hill Reservoir above Simonstown.

Table Mountain Dams, Cape Town, Task Manager for environmental components

Appointed by the City of Cape Town to supervise the implementation of an Environmental Management Plan for the upgrading of the dams within the Cape Peninsula National Park.

Athlone Wastewater Treatment Works Refurbishment, Cape Town
Task Manager for environmental components

Appointed by the City of Cape Towns Wastewater Department to facilitate compliance with the environmental requirements for refurbishment activities at the Athlone Wastewater Treatment Works, which included the compilation of seven Environmental Management Plans and managing the supervision of the implementation of these Environmental Management Plans.

Professional Registration and Affiliations

South Africa Council for Natural Science Professions, Professional Natural Scientist (400098/02)

Certification Board for Environmental Assessment Practitioners, Certified Environmental Assessment Practitioner and Founder Member

International Association for Impact Assessment: South African Affiliate, Member

Nosipho Consultancy

<*Insert Photograph*>		
	Name	Doreen Februarie
	Profession	Social Worker
	Yrs with firm	4
	Date Of Birth	30/11/60
	Nationality	South African

Role in the Study	Task Leader – Public Participation Process
Level of Responsibility	E

Key Qualifications

Diploma Social Work 1983 University of the Western Cape

Diploma in Human Resource Management Peninsula Technikon

Relevant Experience

2001 – currently: Olifants Doorn Water Management Area: Facilitation Public Participation Process

1999 -Breede River Water Management Area: Facilitation Public Participation Process

1994-1999 Area Manager : National council for Child and Family Welfare

1984-1994 Social Worker : Department of Social Services : Worcester

Professional Registration and Affiliations

Black Business Forum

Western Cape Business Opportunity Forum

UMVOTO AFRICA

<*Insert Photograph*>		
	Name	Elizabeth Rowena Hay
	Profession	Hydrogeologist
	Yrs with firm	10
	DOB	21/10/1955
	Nationality	South African

Role in the Study	Groundwater Investigation
Level of Responsibility	E

Key Qualifications

BSc (Geology)		1978	University of Cape Town
BSc (Hons)	(Geology)	1981	University of Cape Town
MSc	(Geology)	1984	University of Cape Town

Since founding her own independent consultancy she has been involved in urban waste-site studies, regional hydrogeological mapping, and exploration for rural and urban groundwater supplies in various parts of the Western Cape, with on-going research emphasis on the Table Mountain Group (TMG) fractured-rock aquifer. Her computer-modelling interests have been maintained through detailed and regional hydrogeological modelling studies of: the Uitspan Colliery near Witbank; the Namakwa Sands Mining Project on the Northern Cape coast; the proposed artificial rowing canal for Cape Town's 2004 Olympic Bid Committee; surface-/groundwater interactions around disputed boreholes in the Hex River Valley; deep thermal TMG groundwater flow between the Cedarberg/Koue-Bokkeveld ranges and the Western Cape coastal plain.

Relevant Experience

Project Manager and Principal Hydrogeologist, Deep Artesian Groundwater Exploration for Oudtshoorn Supply (DAGEOS)

Project Executive and Main Consultant, Western Cape Olifants–Doring River Irrigation Study

Project Manager and Principal Hydrogeologist - Reconnaissance investigation into the development and utilisation of Table Mountain Group groundwater using the E10 catchment as a pilot study area (Cape Artesian Groundwater Exploration Project (CAGE) for Department of Water Affairs and Forestry (DWAF)

Project Manager and Principal Hydrogeologist, Citrusdal Municipality groundwater supply – exploration, development, testing and licensing of well field

Consultant, DWAF Development of Internal Strategic Perspectives

Professional Registration and Affiliations

Member, South African Council for Natural Scientific Professions (Pr. Sci. Nat.)

Private Consultant

<*Insert Photograph*>		
	Name	Dorothea Anna Boucher
	Profession	Botanist
	Yrs with firm	-
	DOB	04 August 1953
	Nationality	South African

Role in the Study	Botanical Support
Level of Responsibility	

Key Qualifications

B.Sc. Univ. Stellenbosch, 1974.

B.Sc. Hons. (Botany) - Univ. Stellenbosch, 1975.

M.Sc. (Botany) - Univ. Stellenbosch, 1978.

Relevant Experience

Feb. – Nov. 1976. Temporary Research Assistant, Dept. of Botany, Univ. Stellenbosch.

Jan. – Dec. 1976. Part-time replacement for Lecturer, Dept. of Botany, Univ. Stellenbosch.

Aug. – Sept. 1977. Part-time replacement for Professor, Dept. of Botany, Univ. Stellenbosch.

Aug. – Nov. 1982. Part-time Research Assistant, Bureau for Advanced Education, Univ. Stellenbosch.

1983. Cape Technicon, Part-time lecturer in Botany.

1985. Part-time replacement for Senior Lecturer in Botany, Univ. Western Cape.

1989 – 1994. Part-time Research Assistant, Dept. Botany, Univ. Stellenbosch. (Flora of Namaqualand).

Professional Registration and Affiliations

Private Consultant

<*Insert Photograph*>		
	Name	N.D. Impson
	Profession	Conservation Scientist
	Yrs with firm	12
	DOB	1/4/1962
	Nationality	RSA

Role in the Study	Specialist fish report
Level of Responsibility	Independent specialist

Key Qualifications:
MSc Ichthyology and Fisheries Science, Rhodes 1988

Relevant Experience

1. 3 yrs EIA experience with the then CPA Chief Directorate of Nature and Environmental Conservation (1991-1994)
2. 9 yrs experience as senior and principal conservation scientist with Cape Nature Conservation, with specific responsibility for freshwater fish conservation in the W Cape province (1995-2003)
3. Detailed knowledge of freshwater fish distribution and status in the Olifants River System, as well as conservation issues affecting these fishes.
4. Substantial publications record in popular and scientific format.

Professional Registration and Affiliations

Previously with South African Society of Aquatic Scientists

Archaeology Contracts Office

Name	T.J.G. Hart
Profession	Archaeologists and heritage impact assessor
Yrs with firm	16
Date Of Birth	29/07/60
Nationality	South African

Role in the Study	Heritage impact assessment
Level of Responsibility	D

Key Qualifications

B.A.	University of Cape Town	1979-1982
B.A. (Hons) (Archaeology)	University of Cape Town	1983
M A (Archaeology)	University of Cape Town	1985-1989

Relevant Experience

I have been involved in a wide rage of archaeological projects ranging from excavation of fossil sites to the conservation of historic buildings, significant places; San rock art, pre-colonial archaeological sites, and industrial structures. Together with my team members I have also been involved in heritage policy development, development of the profession. I have teaching experience within a university setting and have given many public lectures on archaeology related matters. In recent months I have been involved in developing minimum standards for the government body (SAHRA) who implement our national heritage legislation. The ACO team has completed over 300 heritage related projects including dam surveys (Doorn –Oliphants, Khatse), and works regularly in the context of large development projects, particularly mining operations.

Professional Registration and Affiliations

- Member of the Southern African Association of Archaeologists (SAAA)
- Council member, Southern African Association of Archaeologists
- Permit committee, Council of Heritage Western Cape
- Member of the Cultural Resource Management Section SAAA (Principal Investigator status)
- Secretary Cultural Resource Management section of SAAA
- Specialist and generalist member of AHAP.

Private Consultant

<*Insert Photograph*>		
	Name	Tony Barbour
	Profession	Environmental Researcher
	Yrs with firm	3
	DOB	8 June 1961
	Nationality	South African

Role in the Study	Social Impact Assessment
Level of Responsibility	D/ E

Key Qualifications

BSc (Rhodes University, 1984)
BEcon (Hons), (Rhodes University, 1985)
MSc Environmental Science (University of Cape Town, 1992).

Relevant Experience

- Project Manager for the development of Social Assessment and Development Framework for Department of Water Affairs and Forestry (2002-);
- Joint project manager for the development of socio-economic, health and land-use monitoring program for the communities forced to resettle as a result of the construction and operation of the Maguga Dam, Swaziland. Project was a joint venture between the EEU, Institute of Natural Resources and University of Swaziland (2001-2002);
- Socio-economic assessment for the Darling Wind Farm EIA, Darling, Western Cape. (2001).
- Social assessment for Outeniqua Pass – N2 bypass EIA, George, Western Cape, South Africa (1998).
- Social assessment for the Coastal Park EIA. Cape Town, Western Cape (1997).
- Social assessment for Sparrebosch Golf Course EIA, Knysna, Western Cape (1996).
- Social assessment for Riviersonderend – N2 bypass EIA, Riversonderend, Western Cape, South Africa (1991).
- Managed and facilitated a range of public participation processes ranging from public participation processes for hazardous waste sites to processes for establishment of proposed toll roads (1992-).
- Managed and involved in over 20 environmental assessment processes (1992-).

Professional Registration and Affiliations

Member of International Association of Impact Assessors (IAIA), Southern Africa.

APPENDIX L

Letter of Notification to Registered I&APs

NINHAM SHAND
CONSULTING SERVICES

81 Church Street, Cape Town, 8001
P O Box 1347, Cape Town, 8000
Tel: +27 21 481 2400 / Fax: +27 21 424 5588
E-mail: enviro@shands.co.za
Website: www.shands.co.za

17 October 2005

Dear Sir/ Madam

RAISING OF CLANWILLIAM DAM AND ASSOCIATED REALIGNMENT OF AFFECTED ROADS IN THE CLANWILLIAM AREA: DRAFT SCOPING REPORT AND PUBLIC MEETING

The Department of Water Affairs and Forestry (DWAF) will undertake remedial measures at the Clanwilliam Dam in near future. This presents an opportunity to simultaneously raise the dam wall, should it be desirable from an economic, social and environmental perspective. DWAF consequently appointed the Clanwilliam Dam Raising Association, comprising Ninham Shand Consulting Services, Asch and Jakoet & Associates, to undertake the Feasibility Study for the Raising of Clanwilliam Dam in the Western Cape. As an integral part of the Feasibility Study, an Environmental Impact Assessment (EIA) is being undertaken.

A public meeting was held on 20 July 2005 in Clanwilliam, where the public were presented with background to the EIA and given the opportunity to raise any issues or concerns. Two further meetings were held with directly affected landowners on 16 and 18 August 2005 in Clanwilliam and Cape Town respectively. A Draft Scoping Report has since been compiled and will be lodged at the Clanwilliam and Cape Town public libraries and the Clanwilliam Municipal offices from Wednesday 19 October 2005. Comments on the report will be received until Tuesday 8 November 2005. The attached Executive Summary provides key information concerning the project. An electronic copy of the full Draft Scoping Report can be downloaded from the Ninham Shand website at the following address: www.ninhamshand.co.za

A public meeting will be held on Tuesday, 1 November 2005 at the Clanwilliam Bowling Club from 10h00 to 12h00 where the findings of the Draft Scoping Report will be presented and the public will have an opportunity to provide any comments on the report. If you have any questions or comments, please submit these to the Public Participation Co-ordinator, Doreen Februarie; Tel: (021) 903 5911, Fax: (021) 903 8376 or Email: nosiphocc@telkomsa.net

Yours sincerely

DOREEN FEBRUARIE
Public Participation Co-ordinator
Nosipho Consultancy

KAREN SHIPPEY
EIA Co-ordinator
(Certified Environmental Assessment Practitioner)

CONTACT DETAILS:

Public Participation:
Nosipho Consultancy
P O Box 174 KUILSRIVER 7579
(t) (021) 903-5911 (f) (021) 903-8376
nosiphocc@telkomsa.net

Technical Team
P. O. Box 1347
CAPE TOWN 8000
(t) (021) 481 2400 (f) (021) 424 5588
Erik.vanderberg@shands.co.za

NINHAM SHAND
CONSULTING SERVICES

81 Church Street, Cape Town, 8001
P O Box 1347, Cape Town, 8000
Tel: +27 21 481 2400 / Fax: +27 21 424 5588
E-mail: enviro@shands.co.za
Website: www.shands.co.za

Liewe Heer / Dame

17 Oktober 2005

VERHOGING VAN DIE CLANWILLIAMDAM EN GEPAARDGAANDE HERBELYNING VAN PAAIE IN DIE OMGEWING VAN CLANWILLIAM WAT HIERDEUR GERAAK WORD:
KONSEP EVALUERINGSVERSLAG EN OPENBARE VERGADERING

Die Departement van Waterwese en Bosbou (DWAF) moet binnekort om damveiligheidsredes noodsaaklike herstelwerk aan die Clanwilliamdam aanbring. Dit skep die geleentheid om die damwal terselfdertyd te verhoog, indien dit vanuit 'n ekonomiese, maatskaplike en omgewingsperspektief aanvaarbaar is. Om hierdie rede het DWAF die Vereniging vir die Verhoging van die Clanwilliamdam, wat bestaan uit Ninham Shand Raadgewende Dienste, Asch en Jakoet & Vennote, aangestel om 'n uitvoerbaarheidstudie oor die verhoging van die Clanwilliamdam in die Wes-Kaap uit te voer. Die omgewingsinvloedbepaling vorm 'n integrale deel van hierdie uitvoerbaarheidstudie.

'n Openbare vergadering is op 20 Julie 2005 in Clanwilliam gehou waartydens agtergrond oor die omgewingsinvloedbepaling (OIB) gegee is en die publiek die geleentheid gebied is om kwessies en knelpunte te opper. Twee verdere vergaderings met grondeienaars is op 16 en 18 Augustus onderskeidelik in Clanwilliam en Kaapstad gehou. 'n Konsep Evalueringsverslag is intussen opgestel en sal op Woensdag 19 Oktober 2005 by die openbare biblioteke te Clanwilliam en Kaapstad, asook die Clanwilliam munisipale kantore, vir kommentaar beskikbaar gestel word. Die sluitingsdatum vir kommentaar is Dinsdag 8 November 2005. Die vernaamste inligting oor die projek word in die aangehegte Uitvoerende Opsomming weergegee. 'n Elektroniese weergawe van die volledige Konsep Evalueringsverslag kan van Ninham Shand se webwerf by: www.ninhamshand.co.za afgelaai word.

'n Openbare vergadering waartydens die bevindinge van die Konsep Evalueringsverslag voorgelê sal word en die publiek die geleentheid sal kry om kommentaar te lewer, vind op Dinsdag 1 November 2005 van 10:00 – 12:00 by die Clanwilliam Rolbalklub plaas. Indien u enige kommentaar of vrae het, word u versoek om met die Koördineerder: Openbare Deelname, Doreen Februarie, by tel: (021) 903-5911, faks: (021) 903-8376 of epos: nosiphocc@telkomsa.net in verbinding te tree.

Die uwe

DOREEN FEBRUARIE
Koördineerder: Openbare Deelname

KAREN SHIPPEY
Koördineerder: Omgewingsinvloedbepaling
(Geregistreerde Omgewingstakseringspraktisyn)

KONTAKBESONDERHEDE:

Openbare Deelname:
Nosipho Consultancy
Posbus 174 KUILSRIVIER 7579
(t) (021) 903-5911 (f) (021) 903-8376
nosiphocc@telkomsa.net

Tegniese Span
Posbus 1347
KAAPSTAD 8000
(t) (021) 481 2400 (f) (021) 424 5588
Erik.vanderberg@shands.co.za

APPENDIX M

Minutes of Public Meetings and Attendance Register

Item	Notes of Meeting	Action
	EIA for the Raising of the Clanwilliam Dam **PRESENTATION OF DRAFT SCOPING REPORT** **2nd Public Meeting** **1st November 2005** **Clanwilliam Bowling Club, Clanwilliam** **10:00 – 12:00**	
	Mr A Brown DWAF, Options Analysis Mr A Parker DWAF, WC Region Mr F van Heerden DWAF, Clanwilliam Mr E van der Berg Ninham Shand Ms K Shippey Ninham Shand Mr A West Ninham Shand Ms D Februarie Nosipho Consultancy Mr N Mouton Nosipho Consultancy Mr F Abrahams Private Consultant	AB AP FvH EvdB KS AW DF NM FA
1.	**Welcome and Introduction** DF the meeting facilitator, AB and AP welcomed the attendees to the meeting and urged stakeholders to raise their concerns and issues. DF emphasised that although the meeting proceedings would be conducted in Afrikaans, participants were free to participate in their own language and that translators were available. She requested that participants peruse the minutes of the previous meeting and any required corrections bring to the attention of the project team. She mentioned that Mr Willie Enright (DWAF Regional Office) apologised for his absence. DF introduced the project team as follows: **The DWAF:** Alan Brown - Study Manager Abdulla Parker - DWAF Regional Office, Bellville Francois van Heerden - DWAF Local Office, Clanwilliam **The Clanwilliam Dam Raising Association:** Erik van der Berg - Study Leader Karen Shippey - EIA Task Leader Doreen Februarie - Public Participation Task Leader Ashwin West - Team Member Niklaas Mouton - Team Member Faldee Abrahams - Team Member	DF AB AP
2	**Meeting Rules and Agenda** DF asked meeting attendees to obey the meeting rules and show respect for one another.	DF
3	**The purpose of the meeting** DF indicated that the purpose of the meeting was: ▪ To provide a brief overview and progress of the Feasibility Study for the Raising of Clanwilliam Dam; ▪ To present the findings of the Draft Scoping Report; and ▪ To discuss and obtain public comment on the Draft Scoping	DF

	Report and Plan of Study for the Environmental Impact Assessment	
4	**Background to the Feasibility Study for the Raising of Clanwilliam Dam** EvdB gave a brief overview of the Feasibility Study and reported on the progress of the Study to date (Refer to **Appendix A** for a copy of the presentation).	EvdB
5	**Questions on the Feasibility Study and Progress**	DF
	5.1 Mr B Wiese enquired whether land in Van Rhynsdorp for new irrigation was taken into account in the Study. EvdB responded that the WODRIS study focussed more on that area but that the study took into account the water requirements of the area. **5.2** Mr T Basson noted that water allocation amounts have been steadily reduced over the years and wanted to know to what extent DWAF would reduce quotas in future. AP replied that there was not enough water in the system to meet current requirements. He mentioned that the phenomenon of Global Climate Change would further reduce the amount of available water. He expressed the view that the water situation was a challenge not only for the DWAF but also for all stakeholders in the area. He mentioned that the DWAF had an extensive invasive alien vegetation clearing programme in place in an effort to increase water supply. He urged farmers to study crop suitability and use more efficient methods of crop irrigation. Mr G van Zyl (DWAF) commented that provision had to be made for the Ecological Reserve and that this, in itself, might lead to further reductions in quotas even if climate change were not a factor. **5.3** Ms Kleynhans commented that raising the dam wall may have a negative impact on global warming.	
6	**EIA for the raising of the Clanwilliam Dam** KS presented an overview of the required environmental impact assessment process (Refer to **Appendix A**). She reiterated the importance of public involvement and input into the process.	KS
7	**Findings of Draft Scoping Report** AW gave a detailed presentation of the findings of the Draft Scoping Report (Refer to **Appendix A**). Reference was also made to the Executive Summary of the Draft Scoping Report which was posted to all registered I&APs.	AW
8	**General Discussion**	DF
	8.1 Ms Kleynhans asked whether alternatives to not raising the dam were looked at. KS replied that the "No-go option" was seriously considered but when weighed against factors such as the need by farmers in the area for water, water for resource - poor farmers and	

	provision for the Reserve, the raising of the dam emerged as one of the best options for the water management area (WMA). Furthermore, since maintenance work was required on the dam wall, simultaneously raising the wall could be undertaken fairly economically. She also mentioned that it was the DWAF's policy to encourage water demand management in the area and that the recent drought had forced users investigate ways of using water more efficiently, especially in terms of irrigation, which was a major activity in the area. KS then referred to an earlier comment by Ms Kleynhans concerning the impact of raising the dam on global warming. She stated that studies have shown that, in terms of environmental impact, raising the dam would have significantly less impact than building a new dam else where in the catchment.	
	8.2 Mr Nel raised the concern about job creation and employment opportunities for local residents. KS responded that the Social Impact Assessment currently being undertaken would specifically address this issue. She mentioned that it was the DWAF's policy, when accessing skills as well as buying material, to focus on the local area first. One of the ways to ensure that local labour would be used was to specify certain levels of local employment in construction contracts.	
	8.3 Mr Christo Smit raised the question that farmers needed advance notification if the dam would be raised, in order to undertake strategic planning. KS replied that there were certain legal processes that needed to take place before a decision could be taken but that the DWAF was aware that farmers needed to be informed timeously. AB responded that construction would probably start during 2007/2008 and that the construction period would last two to three years. Mr G van Zyl of the DWAF commented that, with regards to local employment, negotiations would commence as soon as a decision to raise the dam was taken and a commencement date set for construction. AP reminded stakeholders that they needed to look at both sides of the coin as there was the possibility that the dam would not be raised.	
	8.4 Mr T Basson enquired about the cost of the dam and whether users would be paying more for water. EvdB replied that at this stage he could not provide an answer to that question as this was the focus of the Feasibility Study which was not yet complete.	
	8.5 Mr J Smit expressed concern regarding the flooding of farm dams. KS replied that this would fall under inundation of existing infrastructure, which would affect the economic viability of a farm and impacting on livelihood security. She said that it was being included in the impact assessment process. She also said that DWAF is required by law to compensate farmers for any losses incurred.	
	8.6 Mr J Roux made the following comments: ▪ Raising the dam could have a positive influence on global warming ▪ There needed to be a move away from the concept of water allocation per hectare to per volume as farmers farmed per volume of water and not per hectare of water ▪ The cost impact on irrigation was going to be key to the	

	decision whether the dam would be raised or not. Stakeholders needed to know as soon as possible what the cost impact would be. AP responded that the cost of raising the dam could be substantial and that Agriculture had already indicated that they did not want to be burdened with the costs. He mentioned that other sources of funding needed to considered to ease the financial burden on the end user.	
	8.7 AP felt that stakeholders needed to be reassured that all options had been studied and that raising of the Clanwilliam Dam emerged as the most cost-effective option. AW explained that at the start of the study a Screening of Options Process was undertaken where all potential options were considered and evaluated, looking at all the potential dams in the area and also at other means of securing water. At the end of the process the raising of the Clanwilliam Dam, along with development of off-channel dams and the development of groundwater schemes emerged as the best option with regards to financial, environmental and socio-economic impacts. A Screening of Options Report was produced and was made available at the Clanwilliam Public Library and the Clanwilliam Municipal Office as well as on the Ninham Shand website. He mentioned that the report was still available in the library and on the website.	
	8.8 Mr G Stone noted that the Ninham Shand website had been malfunctioning. KS said that the error had been corrected and apologised for any inconvenience. Mr Stone enquired whether the sediment in the dam could possibly be used for construction purposes. KS responded that DWAF would stipulate in their Geotechnical Report the type and amount of building material required and from where it would be accessed. She mentioned that in terms of the Department of Mineral and Energy legislation, there were fewer legal requirements for authorisation if sediment was obtained from the dam basin, rather than from elsewhere.	
	8.9 Mr Christo Smit asked if the dam was going to be raised how the water would be dispersed downstream. EvdB replied that the study would consider the current canal, possible upgrading of the existing canal system as a means of distribution as well as down the river itself although the latter might pose problems as far as water quality was concerned. He also mentioned that water would be released in a slow, steady stream from the Clanwilliam Dam downstream to the Bulshoek Dam, making it attractive to abstract from this river reach. There was also a need have to look at the distribution of water upstream of the dam through river abstraction and concomitant storage in small farm dams.	
10	**Way Forward** DF outlined the way forward (Refer to **Appendix A**). Ms Kleynhans requested that the closing date for comments on the Draft Scoping Report be extended to 15 November 2005. KS acceded to her request on behalf of the project team. KS once again urged stakeholders to study the report as their inputs were important.	DF

11	**Closure** DF and KS thanked everyone for their attendance and participation. The meeting closed at 12:00.	DF, KS

I:\HYDRO\400415 Clanwilliam Dam\R65 Public participation\EIA Process\1 Nov public meeting minutes\2ND PUBLIC MEETING MINUTES 1 nov draft~aw + ks comments.doc

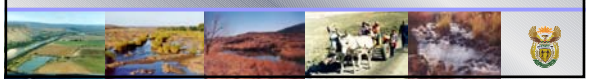
EIA for the Raising of Clanwilliam Dam

PRESENTATION OF THE DRAFT SCOPING REPORT

1 November 2005

Agenda

10:00	Welcome and Introduction
10:10	Meeting Rules and Agenda
10:20	Background to the Feasibility Study
10:40	Draft Scoping Report
11:05	Discussion
11:55	Way Forward and Closure

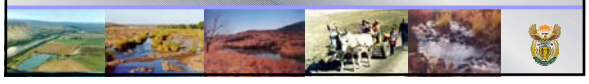


Welcome and Introduction

- Alan Brown – Study Manager
- Abdulla Parker – DWAF Regional Office
- Francois van Heerden – DWAF Local Office
- Erik van der Berg – Study Leader
- Karen Shippey – EIA Task Leader
- Doreen Februarie – PP Task Leader
- Ashwin West – Team Member
- Dawid Mouton – Team Member

Meeting Rules

- Timing
- Language
- Record of the Meeting
- Respect others
  - Turn off cellphone
  - Say your name before you speak
  - Speakers must be recognised by the facilitator before speaking



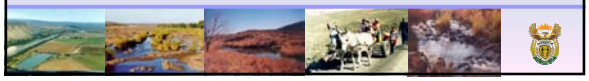
Purpose of the Meeting

- Recap of the Feasibility Study
  - Overview and progress of Feasibility Study
- Present the findings of the Draft Scoping Report
- Opportunity for public comment on the report and plan of study for EIA

Background to the Feasibility Study for the Raising of the Clanwilliam Dam

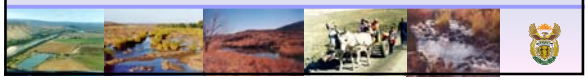
Need for Feasibility Study

- Dam safety remedial work required
- Provision for Ecological Reserve
- Opportunity for cost-effective augmentation
- Address needs of resource-poor farmers
- Demand for improved assurance of supply
- Other future needs



Objectives

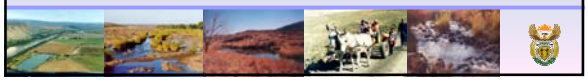
- Screen water resource development options
- Determine technical feasibility, environmental and social acceptability, economic viability of raising dam by 5, 10 or 15m
- Evaluate complementary augmentation options:
  - Additional off channel storage
  - Address illegal abstractions
  - Groundwater
  - Clearing alien vegetation
  - Reducing system losses and WDM
- Evaluate resource poor farming opportunities and viability
- Meet policy and legal obligations
  (environmental, heritage and mining authorisations)



Overall Process

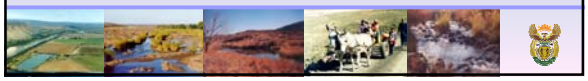
March 2006	Feasibility Study for the Raising of Clanwilliam Dam completed
June 2006	DWAF decision whether to raise Clanwilliam Dam
July 06 – Feb 07	Final dam design
July 06 onwards	Negotiations with affected parties re aquirement of land
March 2007	Commencement of construction activities

Progress of the Feasibility Study for the Raising of Clanwilliam Dam

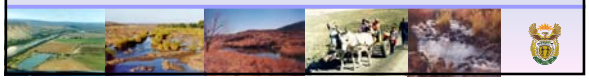


Study tasks

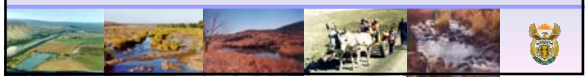
- Inception
- Screening of Options
- Water quality
- Yield analysis
- Groundwater
- Irrigation
- Preliminary design and cost estimate
- Financial and economic analysis
- Resource poor farmers
- Public participation
- Environmental authorisation



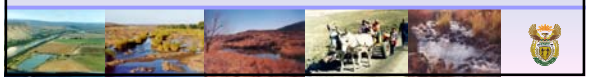
- **Water Quality Modelling**
  - Data for the water quality model collected
  - Modelling completed
  - Reporting 90%
- **Yield Analysis**
  - Awaiting information on
    - farm dams above Clanwillaim Dam
    - land use
    - abstraction from Clanwilliam Dam
    - estuarine water requirements



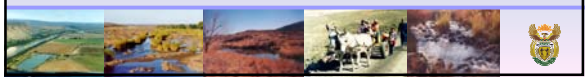
- **Groundwater**
  - Results of other groundwater studies have been reviewed
  - Field work to determine potential wellfield sites completed
  - Undertaking preliminary design of boreholes
  - Investigating opportunities for conjunctive use
- **Irrigation**
  - Compiled a soil map of the study area
  - 2 workshops held in August with farmers/producers/ experts to discuss crop suitability, management practices, irrigation water requirements



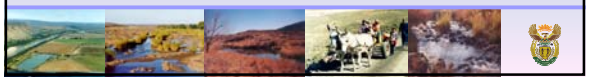
- **Irrigation cont.**
  - Compiled a report on the operation of the Olifants River system
  - Obtained information on water allocations and irrigation practices
  - For the WDM subtask, information needed:
    - Irrigation areas
    - Crop water requirements, irrigation efficiency



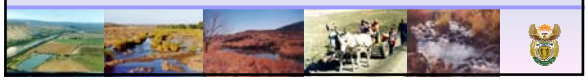
- **Preliminary Design and Cost Estimate**
  - Sediment survey and flood hydrology completed
  - Awaiting information on
    - Geotechnical investigation
    - Water quality modelling
  - Gathering information on potentially inundated infrastructure – reporting under way
- **Financial and Economic Analysis**
  - Evaluating farming potential by modelling typical farming situations



- **Resource Poor Farmers**
  - Data on existing RPF schemes has been gathered
  - Meetings have been convened with key stakeholders
  - Preparing an initial list of possible development options for RPFs
- **Public Participation**
  - Convened 2 agricultural workshops for the Irrigation task
  - Convened a stakeholder meeting for the RPF task
  - Convened 3 meetings for the EIA task (1 public [July], 2 landowners[August])

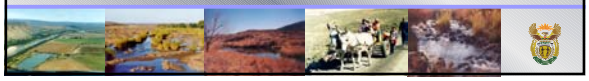


Questions on the Feasibility Study

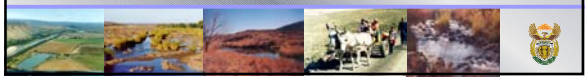


Agenda

	10:00	Welcome and Introduction
	10:10	Meeting Rules and Agenda
	10:20	Background to the Feasibility Study
→	10:40	Draft Scoping Report
	11:05	Discussion
	11:55	Way Forward and Closure

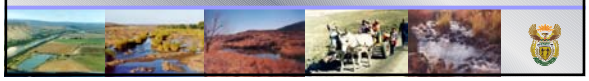


EIA process for the raising of Clanwilliam Dam



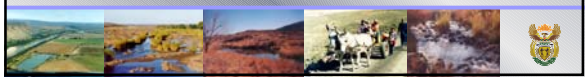
Purpose of the EIA

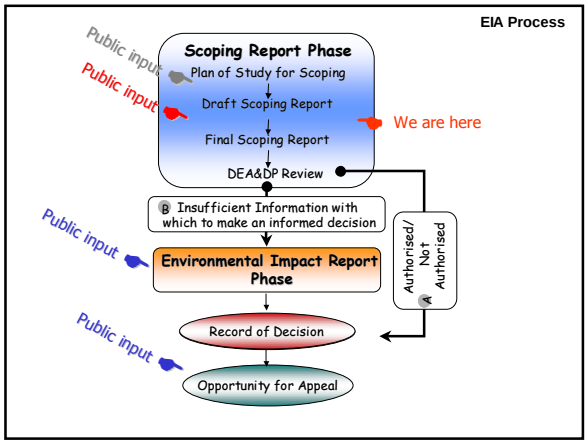
- Component of Feasibility Study
- To satisfy requirements of:
  - Environment Conservation Act
  - National Environmental Management Act
  - National Heritage Resources Act
  - Mineral & Petroleum Resources Development Act
- To identify potential environmental impacts (social and biophysical) & determine their likely significance
- To allow for public involvement
- To inform DWAF's decision

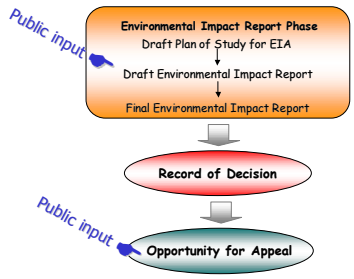


Scope of the EIA

- Environmental Impact Assessment focuses on:
  - The raising of Clanwilliam Dam by 5,10 or 15m
  - Direct impacts of inundation
  - Re-alignment of the N7 National Road
  - Implications of inundating other roads in the Clanwilliam area
  - Broadly describes indirect and cumulative impacts, incl. those of increased irrigation
  - Heritage Impact Assessment
  - Borrow pits and quarry site required for dam and roads materials







DRAFT SCOPING REPORT

Purpose of Draft Scoping Report

- Identify impacts and alternatives requiring more detailed investigation in the EIR phase
- Based on:
  - Literature review
  - Professional input (technical & environmental)
  - Public input
  - Forms basis for Plan of Study for EIA

Availability of Draft Scoping Report

- Lodged in Clanwilliam and Cape Town public libraries, Clanwilliam Municipal office and LORWUA office from 19 October 2005
- Available on the Internet:
  http://www.ninhamshand.co.za
- Registered I&APs notified & sent Executive Summary on 17 October 2005

Comment on Draft Scoping Report

- Captured at meetings and in response forms
- Scoping Report and Plan of Study for EIA revised in light of comment
- All comments will be attached to Final Scoping Report submitted to DEA&DP
- DEA&DP may require additional changes to Plan of Study for EIA in light of comment

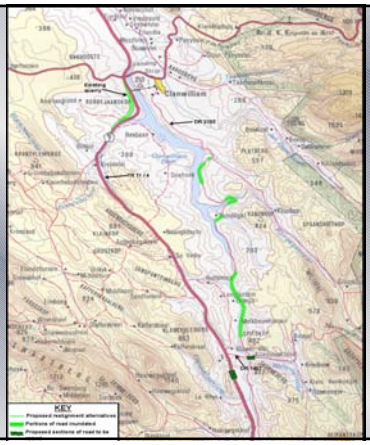
Identification of Alternatives

Identification of Alternatives

- 4 tiers of alternatives identified:
  - 1st tier – Clanwilliam Dam raising
  - 2nd tier – Realignment of N7 and other affected roads
  - 3rd tier – Within project alternatives
  - 4th tier – Construction specific layout alternatives

1st Tier Alternatives

- Focussed on the raising of Clanwilliam Dam
  - 'No-go' or do nothing option
  - Strengthening the dam wall (no raising)
  - 5 m raising
  - 10 m raising
  - 15 m raising



2nd Tier Alternatives

- Realignment of roads inundated as a result of the dam raising:
- N7 in the vicinity of the dam wall
  - 'No-go' option
  - 3 realingment options
- N7 in the vicinity of intersection with DR1487 (Algeria intersection)
  - 'No-go' options
  - Design & layout considerations

2nd Tier Alternatives cont.

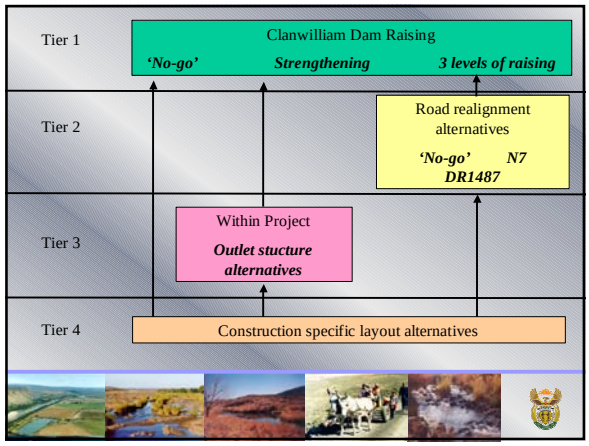
- Raising of a 100m length of DR1487, Olifants River crossing
  - 'No-go' option
  - Design and layout considerations

3rd Tier Alternatives

- Dam Outlet structure alternatives
  - Outlet structure design alternatives
  - Construction method alternatives

4th Tier Alternatives

- Constuction layout alternatives
  - Alternative layout for access roads, construction village location etc, within the construction camp area
  - Not assessed in detail during the EIA process, due to a lack of information at this stage
  - Will identify footprint, but not layout



Identification of Impacts

Biophysical Impacts

- Flora
- Fauna
- Aquatic environment
- Groundwater Resources
- Sourcing constrtuctin material
- Impact of road inundation

Socio-Economic Impacts

- Visual
- Heritage resources
- Inundation of other infrastructure
- Livelihood security
- Recreational facilities
- Local economy
- Macro-economics

Specialist Studies

•Botanical Assessment	Dr C Boucher
•Freshwater Fish	D Impson
•Groundwater Investigation	Umvoto Africa
•Heritage Assessment	ACO
•Social Impact Assessment	T Barbour

- Other impacts will be assessed by Ninham Shand with reference to experts

Agenda

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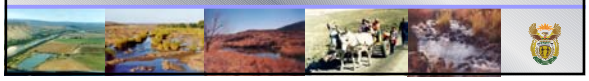
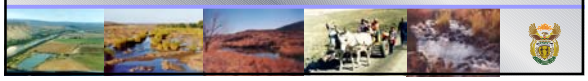
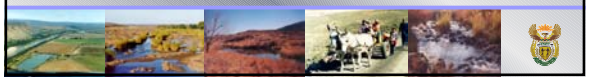


General Discussion

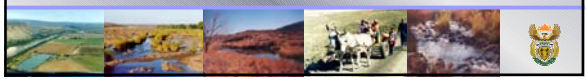


Way Forward



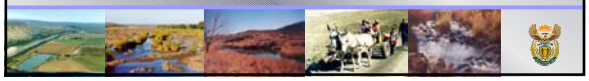
Way Forward

- Comments period for Scoping Phase ends on 8 November 2005
- Finalise Scoping Report/ Plan of Study for EIA and submit to DEA&DP
- Revise Plan of Study to satisfy DEA&DP requirements
- Finalisation of specialist studies
- Compilation of EIR
- 3rd Public meeting ~ early Feb



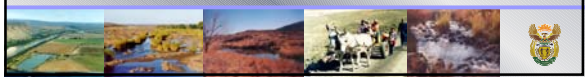
Draft Scoping Report

- Available for viewing at:
  - Clanwilliam & Cape Town public libraries
  - Municipal office, Clanwilliam
  - LORWUA office
  - http://www.ninhamshand.co.za



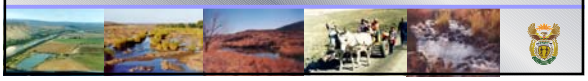
Comment on the DSR

- Send comments to:
  - Public Participation Co-ordinator
    Nosipho Consultancy
    PO Box 174
    Kuils River, 7579
  - Tel: (021) 903 5911
  - Fax: (021) 903 8376
  - Email: Nosiphocc@telkomsa.net



Close of Meeting

Thank you for attending



APPENDIX N

Comments Received during the Draft Scoping Report Comment Period

From: Erik VanDerBerg
To: Shippey, Karen; tbarbour@telkomsa.net; watermarkcc@hyperlink.co.za; West, Ashwin
Date: 04/11/2005 08:01:52
Subject: Fwd: C.P. van der Merwe (Rondegat Sitrus) Verhoging van Clanwilliamdam

For your information - typical farm impact. This however highlights the importance of the secondary road.

Regards
Erik

E (Erik) van der Berg
Associate
Ninham Shand Consulting Engineers
P O Box 1347
Cape Town
8000

Tel: +27 (0)21 481 2462
Fax: +27 (0)21 424 5588
Cell: +27 (0)82 553 5795
E-mail: Erik.vanderberg@shands.co.za
Internet: www.shands.co.za

>>> "Charl van der Merwe" <rondegat@lando.co.za> 03/11/2005 12:46:43 >>>
Hello

My naam is Charl van der Merwe en ek is die eienaar van die plaas Rondegat wat aan die Clanwilliamdam grens.

Ek wil net graag die volgende punte uitstippel wat my boerdery aktiwiteite erg gaan raak indien die Clanwilliamdam 10m of 15m verhoog gaan word naamlik:

Pyplyn:
1. My plaas is aangelê op die Rondegatrivier en ek onttrek tans al my water vir my sitrus daaruit. Daar is 60 hektaar waterregte toegeken aan my uit die Rondegatrivier. Indien die Clanwilliamdam wel verhoog gaan word, gaan my 225mm asbespyplyn wat ongeveer 2,5 tot 3km lank is toestoot - d.w.s die hoofbron waaruit my plaas sy water vandaan kry gaan dan heeltemal afgesny word en wegval. Die terrein maak dit ook heeltemal onmoontlik om die pyplyn te skuif, en indien dit hoër geskuif kan word, ek nie drukking by my hoofpomp gaan kry deur gravitasie wat ek tans huidiglik nou kry nie. Daar is ook huidiglik geen kostes verbonde vir die water wat ek uit die Rondegatrivier uit onttrek nie aangesien die water op gravitasie (eie druk) in 'n asbespyplyn na my plaas gevoer word, en dan vandaar met 'n elektriese pomp na my boorde gepomp word. Indien ek nie meer water op gravitasie uit die Rondegatrivier kan onttrek nie weens die pyplyn wat gaan toesstoot, en ek moet water uit die Clanwilliamdam onttrek, sal ek dit moet pomp en gaan dit vir my baie duur kos. Indien dit sou gebeur dat ek die pyplyn gaan verloor, daar ernstig gekyk sal moet word na ander alternatiewe soos bv. die 60 hekt waterregte oordra van die Rondegatrivier na die Clanwilliamdam, en hoe gaan dit kostegewys vir my beinvloed?

Pad- Vervoer:
2. Ek en so ook ander sitrus boere vervoer tans al ons sitrusprodukte vanaf Rondegat op die grondpad na Citrusdal en Kaapstad (d.w.s die oostelike oewer). Soos dit tans op die kaart aandui, gaan 'n baie groot gedeelte van daardie pad onder water toestoot en sal ek en so ook baie ander boere nie ons vrugte op daardie pad kan vervoer nie. Die mense (kopers) wat my vrugte by my aankoop betaal ook self die vervoer, en dit gaan 'n groot inpak hê op die vervoerkostes van my sitrus sodra vragmotors via Clanwilliam moet ry om op Rondegat te kom. Dit is ongeveer 'n ompad van

40km. Die grondpad vanaf Rondegat na Citrusdal word ook as 'n alternatiewe roete gebruik wanneer daar bv. 'n ongeluk op die N7 plaasvind ens. Baie toeriste gebruik ook daardie roete. Dit is dus vir ons as sitrus boere sowel as toeriste van uiterste belang dat daardie roete behoue bly. Indien dit nie behoue gaan bly nie, sal dit vir almal 'n groot ekonomiese knou gee en sal dit toeriste asook hengelaars wat kompetisies hou op die dam negtief beinvloed.

Sitrusboorde en 2 boorgate:
3. My sitrusboorde is die enigste hoofbron van inkomste wat ek het en 100% van my boorde is volwasse bome. Indien die dam met 10 of 15 m verhoog gaan word, sal dit beteken dat ongeveer 25% tot 30% van my boorde gaan toesstoot en sal ek gedwonge nuwe boorde moet aanplant. Dit neem vir 'n sitrusboom ongeveer 5 tot 6 jaar voordat hy weer geld genereer. Om nuwe boorde te vestig gaan 'n onsettende groot finansiële inpak hê en gaan dit jare neem om weer gelyk te kom tot waar ek tans huidiglik is. Ek het ook 2 boorgate wat vir my sitrusboorde sowel as vir huiswater-doeleindes gebruik word wat gaan toestoot. Die boorgate gebruik ek in tye van nood wanneer die Rondegatrivier gedurende Des, Jan, Feb, en Maart nie genoegsame water het om my boorde en vir huishoudelike gebruik van water te kan voorsien nie. Dit is vir my as boer dus van uiterste belang dat my boorgate behoue bly aangesien ek nie van ander moontlike plekke op my plaas verseker is wanneer daar weer geboor moet word nie. Dit bly altyd 'n risiko wanneer daar geboor word aangesien dit kostegewys onsettend duur is om te boor en jy nie verseker is van enige ondergrondse water nie. Watter versekering het ek en gaan ek kry om adisionele water iewers anders te bekom gedurende bogenoemde maande wanneer dit op sy droogste is?

Geboue en hoof-kragtoevoer punt (Eskom):
4. Ek het 'n stoor en 'n pomphuis sowel as 'n vakansiehuis op my plaas wat gaan toesstoot indien die dam 10 of 15m verhoog gaan word. Die spasie op my plaas is baie beperk indien ek 'n nuwe stoor, pomphuis sowel as 'n vakansiehuis moet van nuuts af oprig. Indien die dam 15m verhoog gaan word, gaan die kragpunt wat ook die hoofkragtoevoer op die plaas is toestoot.

Algemeen:
Ek vra u om baie ernstig na bogenoemde aspekte en na alle opsies te kyk sodat dit vir my as boer ekonomies en finansiëel vatbaar sal wees. Ek is ook ten gunste daarvan dat die Clanwilliamdam verhoog moet word, aangesien dit vir Clanwilliam en sy mense baie sal beteken. Dit is ook 'n geleentheid vir Kleinboere om die geleentheid aan te gryp sodat die vergoging van die dam ook vir hulle die geleentheid skep om suksesvol te kan boer en te kan leef. So ook gaan die verhoging van die Clanwilliamdam dit vir toeriste 'n aansienlike geleentheid gee om te belê in eiendomme langs die dam sowel as in Clanwillam self. Die verhoging van die Clanwilliamdam gaan ook baie werksgeleenthede skep vir baie werkloses ens.

Ek sien uit daarna om saam met Departement Waterwese om 'n tafel te sit en te vergader om alle moontlike geskille wat daar kan en gaan ontstaan op 'n vreedsame wyse te bespreek en te probeer oplos. Ek glo ook dat daar alternatiewe gevind sal word. Wat die hoogte van die damwal betref, is my wens dat die besluit op 5m sal wees.

Die Uwe

C.P. VAN DER MERWE

RONDEGAT SITRUS
TEL/FAKS: 027-4822527
SEL: 082 7772757

CC: dirki@iafrica.com; fsamaai@asch.com; icb@dwaf.gov.za

From: "D Februarie" <nosiphocc@telkomsa.net>
To: "Karen Shippey" <Karen.Shippey@shands.co.za>
Date: 01/11/2005 03:36:21 PM
Subject: Fw: Clanwilliam Dam

----- Original Message -----
From: "Alison Burns" <aliburns@telkomsa.net>
To: "Doreen Februarie" <Nosiphocc@telkomsa.net>
Sent: Monday, October 31, 2005 9:37 PM
Subject: Clanwilliam Dam

> Dear Doreen,
>
> Thank you for an excellent report which I have just read. We do
> have some concerns around continued water supply and it may be useful
> for you to know our background. We bought the smallholding
> 'Uitsig' last year. It is approximately 5 Km downstream from the
> dam on the East side of the river. We have an allocation of 6 ha of
> water from the canal system. We are in the process of establishing
> olive orchards. This is a new crop for the Clanwilliam area and as
> yet untried. We are investing a large proportion of our retirement
> funds into the project. In a years time we will have a very
> young, vulnerable orchard so,for us, there is a lot at stake, and
> water is of prime concern.
>
> 1.4 "changes to the canal system... no specific information is
> available at his stage"
> 5.3.6 "distribution and cost of water"
> 5.4b "sediment increase"
> 5.4f "interruption of water services"
> The above paragraphs indicate that our water supply and quality is
> likely to be at risk. To what extent is this anticipated and what
> would the time frame be. It could be potentially disastrous and if
> warned at this stage we could put the entire project on hold if the
> risks were significant, but this would hugely impact our future plans.
> 5.4b "affect the river channel habitats"
> Is there a possibility of surges of water from the dam. Our fear
> would be that our lower orchards would be at risk. We are planning
> fairly extensive earthworks to extend our available land and would
> not want this washed away.
> 5.4l "dust" what is the prevailing wind direction and would
> we be in the path of dust that could also damage young trees?
>
> We are hoping to be at the meeting tomorrow morning but should we be
> unable to come at the last minute we would be grateful for feedback
> on these concerns.
>
> Regards
> Alison Burns(Wrench) and Lou Wrench
>
>
>
>

From: "D Februarie" <nosiphocc@telkomsa.net>
To: "Karen Shippey" <Karen.Shippey@shands.co.za>
Date: 01/11/2005 03:36:42 PM
Subject: Fw: Dam

---- Original Message ----
From: "Alison Burns" <aliburns@telkomsa.net>
To: "Doreen Februarie" <Nosiphocc@telkomsa.net>
Sent: Monday, October 31, 2005 9:57 PM
Subject: Dam

> Hi again Doreen,
> One further comment, as we understand, there is a shortfall of 55
> million cu m before the ecological reserve of approximately 18
> million cu m is added, giving a total of 72 million cu m. By
> raising the dam wall by 15 m we would gain 40 million cu m, but
> still be short 32 million cu m on requirements. It does not seem
> viable to consider anything less that the maximum raising possible.
> Regards,
> Lou andAlison
>
>

From: "D Februarie" <nosiphocc@telkomsa.net>
To: "Ashwin West" <Ashwin.West@shands.co.za>, "Karen Shippey" <Karen.Shippey@shands.co.za>
Date: 21/11/2005 09:53:59
Subject: Fw: Comments on the Draft Scoping Report

----- Original Message -----
From: "Rahube Mmamotiti Mary (BVL)" <RahubeM@dwaf.gov.za>
To: <nosiphocc@telkomsa.net>
Sent: Thursday, November 17, 2005 3:06 PM
Subject: Comments on the Draft Scoping Report

> Dear Doreen
>
> I went through the report and its great. Check only Page 22 the last
> sentence it says " Any one wishing to find out more about more about
> EAPSA....." there is a repetition of words.
>
> Thank you and best regards,
> Mmamotiti
>
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APPENDIX O

Issues Trail

RAISING OF CLANWILLIAM DAM AND ASSOCIATED REALIGNMENT OF AFFECTED ROADS, COMMENTS FROM I&APS				
	Individual	**Organisation**	**Issue or Concern**	**Action/ Response**
1	CP van der Merwe	Rondegat Sitrus	If th dam is raised by 10 or 15m, various infrastructure on the Rondegat Citrus farm would be inundated, including 3km pipeline from the Rondegat River, pumps, boreholes, a pumphouse and holiday house, and the electricity supply to the farm.	Noted. Information on the infrastructure lost has been forwarded to the specialists dealing with infrastructure implications of raising the Clanwilliam Dam.
			Furthernore, if the dam is raised by 10 or 15m, 25% to 30% of the citrus orchards would be inundated, with 5 to 6 year period for new plants to reach the point of production.	Noted. DWAF has a compensation policy with regards to acquiring land for water projects. If the dam was raised, DWAF would enter in negotiations with affected landowners regarding compensation for lost infrastructure and income.
			The eastern gravel road is of great importance to the citrus farmers, as they use the road to transport produce to Citrusdal and Cape Town. If the road was lost, a 40km detour via Clanwilliam would be required, which would push up the price of the produce significantly.	Noted. Impact of inundation of the eastern gravel road will be assessed in the EIR phase.
2	A & L Wrench	Landowners	Owners of an olive farm 5km downstream of the dam wall, and therefore have concerns regarding the availability and supply of water.	
			The Scoping Report suggests that water supply and quality could be an issue. To what extent is this anticipated and what are the time frames?	Additional water made available through the raising of the dam would have to be allocated, and the cost of the water as well as distribution would have to be considered. There is a need for social upliftment in the area, and opportunties and mechanisms are being investigated as part of the Feasibility Study for the Raising of Clanwilliam Dam. This will be considered during the EIR phase. With respect to water quality and supply, impacts of increased sediment are likely to be minimal, and for short periods of time, limited to the construction phase. Water supply via the Clanwilliam canal system is unlikely to be affected during the construction period. If the decision to raise the dam were to be taken, construction would only commence in 2007, for the earliest
			Would there be surges of water from the dam, as this could affect the lower olive orchards.	If the dam were raised, a new outlet structure would be installed, to make allowance for ecological flow requirement releases. Releases of various sizes would be made, to cater for the varying needs of the riverine and estuarine environment.
			Dust would damage young trees. What is the prevailing wind direction and would the orchards be in the dust path.	This will be assessed during the EIR phase.
3	M Rahube	DWAF	Note typographical errors on page 12 of the Draft Scoping Report.	Noted.

FEASIBILITY STUDY FOR THE RAISING OF CLANWILLIAM DAM

Study Reports

No	Report name	DWAF Report numbers	NS Report numbers
1	Inception	No report number	4414
2	Screening of Options	P WMA 17/E10/00/0405	4415
3	Water Quality	P WMA 17/E10/00/0506	4416
4	System Analysis	P WMA 17/E10/00/0607	4417
5	Groundwater Resources	P WMA 17/E10/00/0707	4418
6	Environmental Scoping	P WMA 17/E10/00/0805	4419
7	Environmental Impact	P WMA 17/E10/00/0907	4420
8	Soils, Water Requirements and Crops	P WMA 17/E10/00/1106	4422
9	Water Management Plan for the Olifants-Doorn Catchment Management Area	P WMA 17/E10/00/1207	4423
10	Opportunities for the Supply of Water to Resource-poor Farmers	P WMA 17/E10/00/1307	4424
11	Irrigation Development and Water Distribution Options	P WMA 17/E10/00/1407	4425
12	Impacts on Roads and other Infrastructure	P WMA 17/E10/00/1507	4426
13	Financial Viability of Irrigation Farming	P WMA 17/E10/00/1607	4427
14	Socio-economic Impact Assessment	P WMA 17/E10/00/1707	4428
15	Financial Evaluation	P WMA 17/E10/00/1807	4455
16	Main	P WMA 17/E10/00/1907	4429

No	Reports by DWAF	DWAF Report numbers	NS Report numbers
17	Feasibility Design of Raising (Engineering Design) and Design Report Addendum	-	4430
18	First Engineering Geological Materials Report (Course Aggregate) For Proposed Raising (Council for Geoscience)	-	4431
19	Farm Dams (Options Analysis): include under Report 4 as Appendix	-	4432