6. LEGISLATION AND GUIDELINES CONSIDERED IN THE EIA

The Constitution of the Republic of South Africa Act (Act 108 of 1996) as amended by the Constitution of the Republic of South Africa Amendment Act (Act 35 of 1997) is the most important piece of national legislation, since it provides a framework within which all other laws of the country, including environmental law, must be formulated and interpreted.

The Bill of Rights is fundamental to the Constitution, and in Section 24 it is stated that 'Everyone has the right (a) to an environment that is not harmful to their health or well-being; and (b) to have the environment protected, for the benefit of present and future generations, through reasonable legislative and other measures that (i) prevent pollution and ecological degradation; (ii) promote conservation; and (iii) secure ecologically sustainable development and use of natural resources while promoting justifiable economic and social development'.

This Environmental Impact Assessment is being undertaken in compliance with the National Environmental Management Act (107 of 1998) (NEMA) (**Section 6.1**). Cognisance is also taken of other applicable legislation (**Section 6.2**) and international considerations (**Section 6.3**). The principles and guidelines emanating from the World Commission on Dams have also been noted (**Section 6.4**).

6.1 NATIONAL ENVIRONMENTAL MANAGEMENT ACT

The National Environmental Management (NEMA) Act (Act 107 of 1998) is a 'principles-based Act' that provides South Africa's overarching environmental legislation. This Act has as its primary objectives to provide for co-operative environmental governance by establishing principles for decision-making on matters affecting the environment, institutions that will promote co-operative governance, and procedures for co-ordinating environmental functions exercised by organs of state.

The Act provides for the right to an environment that is not harmful to the health and well-being of South African citizens; the equitable distribution of natural resources;

sustainable development; environmental protection; and the formulation of environmental management frameworks.

NEMA contains a set of principles that govern environmental management, and against which all environmental management plans and actions are measured. Sustainable development requires the consideration of all relevant factors including the following:

- Environmental management must place people and their needs at the forefront of its concern, and serve their physical, psychological, developmental, cultural and social interests equitably.
- That pollution and degradation of the environment are avoided, or, where they cannot be altogether avoided, are minimised and remedied.
- That waste is avoided, or where it cannot be altogether avoided, minimised and reused or recycled where possible and otherwise disposed of in a responsible manner.
- That a risk averse and cautious approach is applied, which takes into account the limits of current knowledge about the consequences of decisions and actions.
- Responsibility for the environmental health and safety consequences of a policy, programme, project, product, process, service or activity exists throughout its life cycle.
- The participation of interested and affected parties in environmental governance must be promoted, and all people must have the opportunity to develop the understanding, skills and capacity necessary for achieving equitable and effective participation, and participation by vulnerable and disadvantaged persons must be ensured.
- Decisions must take into account the interests, needs and values of all interested and affected parties, and this includes recognising all forms of knowledge, including traditional and ordinary knowledge.

- Community well-being and empowerment must be promoted through environmental education, the raising of environmental awareness, the sharing of knowledge and experience and other appropriate means.

- The right of workers to refuse work that is harmful to human health or the environment and to be informed of dangers must be respected and protected.

- Decisions must be taken in an open and transparent manner, and access to information must be provided in accordance with the law.

- The vital role of women and youth in environmental management and development must be recognised and their full participation therein must be promoted.

The requirements for environmental authorisation are regulated by Government Notices 385, 386 and 387 of 21 April 2006, published in terms of Chapter 5 of NEMA.

Under these regulations the proposed development of Nwamitwa Dam and bulk water supply infrastructure contains activities that potentially have a detrimental effect on the environment in terms of the following items in GN 386 and 387 of 21 April 2006: These activities are presented in **Table. 6.1**.

Table 6.1: Activities listed in GN 386 and 387 that require authorisation from DEAT

Number and date of the relevant notice:	Activity No (s) (in terms of the relevant or notice) :	Describe each listed activity:
No. R 387 of 21 April 2006	1 (c)	The above ground storage of a dangerous good, including petrol, diesel, liquid petroleum gas or paraffin, in containers with a combined capacity of 1000 cubic metres or more at any one location or site including the storage of one or more dangerous goods, in a tank farm.
No. R 387 of 21 April 2006	1 (e)	Any process or activity which requires a permit or license in terms of legislation governing the generation or release of emissions, pollution, effluent or waste and which is not identified in Government Notice No.

Number and date of the relevant notice:	Activity No (s) (in terms of the relevant or notice) :	Describe each listed activity:
		R. 386 of 2006.
No. R 387 of 21 April 2006	1 (p)	The treatment of effluent, wastewater or sewage with an annual throughput capacity of 15000 cubic metres or more.
No. 387 of April 2006	2	Any development activity, including associated structures and infrastructure, where the total area of the developed area is, or is intended to be, 20 hectares or more.
No. 387 of April 2006	5	The route determination of roads and design of associated physical infrastructure, including roads that have not yet been built for which routes have been determined before the publication of this notice and which has not been authorised by a competent authority in terms of the Environmental Impact Assessment Regulations, 2006 made under section 24(5) of the Act and published in Government Notice No. R.385 of 2006, where – it is a national road as defined in section 40 of the South African National Roads Agency Limited and National Roads Act, 1998 (Act No. 7 of 1998); it is a road administered by a provincial authority; the road reserve is wider than 30 metres; or The road will cater for more than one lane of traffic in both directions.
No. 387 of April 2006	6	The construction of a dam where the highest part of the dam wall, as measured from the outside toe of the wall to the highest part of the wall, is 5 metres or higher or where the high-water mark of the dam covers an area of 10 hectares or more.
No. 387 of April 2006	7	Reconnaissance, exploration, production and mining as provided for in the Mineral and Petroleum Resources Development Act 2002 (Act No. 28 of 2002), as amended in respect of such permits and rights.
No. 387 of April 2006	8	In relation to permits and rights granted in terms of 7 above, or any other right granted in terms of previous mineral legislation, the undertaking of any reconnaissance, exploration, production or mining related activity or operation within a exploration, production or mining area, as defined in terms of section 1 of the Mineral and Petroleum Resources Development Act, 2002 (Act No. 28 of 2002).

Number and date of the relevant notice:	Activity No (s) (in terms of the relevant or notice) :	Describe each listed activity:
No. 386 of April 2006	1 (k)	The bulk transportation of sewage and water, including storm water, in pipeline with – an internal diameter of 0.36 metres or more; or A peak throughput of 120 litres per second or more.
No. 386 of April 2006	1 (m)	Any purpose in the one in ten year flood line of a river or stream, or within 32 metres from the bank or a river or stream where the flood line is unknown, excluding purposes associated with existing residential use, but including – canals; channels; bridges; dams; and weirs
No. 386 of April 2006	1 (n)	The off-stream storage of water, including dams and reservoirs, with a capacity of 50 000 cubic metres or more, unless such storage falls within the ambit of the activity listed in item 6 of Government Notice No. R 387 of 2006.
No. 386 of April 2006	1 (o)	The recycling, reuse, handling, temporary storage or treatment of general waste with a throughput capacity of 20 cubic metres or more daily average measured over a period of 30 days, but less than 50 tons daily average measured over a period of 30 days.
No. 386 of April 2006	4	The dredging, excavation, infilling, removal or moving of soil, sand or rock exceeding 5 cubic metres from a river, tidal lagoon, tidal river, lake, in-stream dam, floodplain or wetland.
No. 386 of April 2006	7	The above ground storage of a dangerous good, including petrol, diesel, liquid petroleum gas or paraffin, in containers with a combined capacity of more than 30 cubic metres but less than 1000 cubic metres at any one location or site.
No. 386 of April 2006	8	Reconnaissance, prospecting, mining or retention operations as provided for in the Mineral and Petroleum Resources Development Act, 2002 (Act No. 28 of 2002), in respect of such permissions, rights,

Number and date of the relevant notice:	Activity No (s) (in terms of the relevant or notice) :	Describe each listed activity:
		permits and renewals thereof.
No. 386 of April 2006	15	The construction of a road that is wider than 4 metres or that has a reserve wider than 6 metres, excluding roads that fall within the ambit of another listed activity or which are access roads of less than 30 metres long.

Section 24(C) of NEMA, as amended, indicates that the Minister of the national Department of Environmental Affairs and Tourism (DEAT), or an organ of state with delegated powers, is the Competent Authority (CA) when, amongst others, the applicant is a national department. As the Department of Water Affairs and Forestry is a national department, this application was submitted to the DEAT, and not the Provincial department.

6.2 OTHER APPLICABLE LEGISLATION

6.2.1 Overview

A limited scoping of relevant legislation was undertaken in order to identify the key legal issues related to the proposed project. Applicable key environmental legislation, which must be considered by the DWAF during the implementation of the proposed project is summarised in **Table 6.2**.

Table 6.2: Summary of applicable legislation

Legislation	Sections	Relates to
The Constitution Act (No 108 of 1996)	Chapter 2	Bill of Rights
	Section 24	Environmental rights
	Section 25	Rights in property
	Section 32	Administrative justice
	Section 33	Access to information

Legislation	Sections	Relates to
National Environmental Management Act (No 107 of 1998) as amended	Section 2	Defines the strategic environmental management goals, principles and objectives of the government. Applies through-out the Republic to the actions of all organs of state that may significantly affect the environment
	Section 24	Provides for the prohibition, restriction and control of activities which are likely to have a detrimental effect on the environment.
	Section 28	The developer has a general duty to care for the environment and to institute such measures as may be needed to demonstrate such care
NEM: Protected Areas Act (No 57 of 2003)		The Act came into operation on 01 November 2004. The aim of the Act is to provide for the protection and conservation of ecologically viable areas representative of South Africa's biological diversity, natural landscapes and seascapes. In 2004, the National Environmental Management: Protected Areas Amendment Act 31 of 2004 was promulgated to amend Act 57 of 2003 with regard to the application of that Act to national parks and marine protected areas. The NEM: Protected Areas Amendment Act was published for public information on 11 February 2005 and came into operation on 01 November 2005. The NEM: Protected Areas Act, as amended by the NEM: Protected Areas Act 31 of 2004 repeals sections 16, 17 & 18 of the ECA as well as the National Parks Act with the exception of section 2(1) and Schedule 1.
The Conservation of Agricultural Resources Act (No 43 of 1983) and regulations	Section 6	Implementation of control measures for alien and invasive plant species
Natural Environmental Management: Air Quality Act		Dust control

Legislation	Sections	Relates to
(Act No. 39 of 2004) and regulations		Air pollution by fumes emitted by vehicles
National Environmental Management: Air Quality Act (No 39 of 2004)	Section 32	Control of dust
	Section 34	Control of Noise
	Section 35	Control of offensive odours
Occupational Health and Safety Act (No 85 of 1993) and regulations	Section 8	General duties of employers to their employees
	Section 9	General duties of employers and self employed persons to persons other than their employees
National Environmental Management: Biodiversity Act, 2004 (Act 10 of 2004) (NEMBA),		Strategy for achieving the objectives of the United Nation's Convention on Biological Diversity, to which South Africa is a signatory
	Sections 65-69	These sections deal with restricted activities involving alien species; restricted activities involving certain alien species totally prohibited; and duty of care relating to alien species
	Sections 71 and 73	These sections deal with restricted activities involving listed invasive species and duty of care relating to listed invasive species.
National Forests Act (No 84 of 1998) and regulations	Section 7	No person may cut, disturb, damage or destroy any indigenous, living tree in a natural forest, except in terms of a licence issued under section 7(4) or section 23; or an exemption from the provisions of this subsection published by the Minister in the

Legislation	Sections	Relates to
		Gazette.
	Sections 12-16	These sections deal with protected trees, with the Minister having the power to declare a particular tree, a particular group of trees, a particular woodland; or trees belonging to a particular species, to be a protected tree, group of trees, woodland or species. In terms of section 15, no person may cut, disturb, damage, destroy or remove any protected tree; or collect, remove, transport, export, purchase, sell, donate or in any other manner acquire or dispose of any protected tree, except under a licence granted by the Minister.
Fencing Act (No 31 of 1963)	Section 17	Any person erecting a boundary fence may clean any bush along the line of the fence up to 1.5 metres on each side thereof and remove any tree standing in the immediate line of the fence. However, this provision must be read in conjunction with the environmental legal provisions relevant to protection of flora.
National Water Act (No 36 of 1998) and regulations	Section 19	Prevention and remedying the effects of pollution.
	Section 20	Control of emergency incidents
All relevant Provincial Legislation and Municipal bylaws		
Water Services Act (Act 108 of 1997)		
Development Facilitation Act (Act 67 of 1995)	Section 42	relates to investigation and authorisation of non-statutory land development processes
	Section 44	relates to Land development on behalf of the State or local government body

Legislation	Sections	Relates to
National Heritage Resources Act (Act 25 of 1999)	Section 32	Relates to objects of cultural and historical significance
	Part 2	Relates to general protections of archaeological structures and burial grounds.
Promotion of Access to Information Act (Act 2 of 2000) as amended by the Promotion of Administrative Amendment Justice Act (Act 53 of 2002)		relates to creation of a culture of transparency and accountability
Promotion of Administrative Justice Act (Act 3 of 2000).	Section 5	Relate to the time period allowed for administrative action whose right are materially or adversely affected by the administrative action
	Section 9	Relates to the variations of the time periods for judicial review.
	Section 10	Relates to procedures for public enquiries
Expropriation Act (Act 63 of 1975)	Section 2	Relates to the power of the relevant minister to expropriate property for public and certain other purposes.
	Section 7	Relates to the relevant ministers' decision to expropriate land and appropriate notice being given to landowners.
Mineral and Petroleum Resources Development Act (Act 28 of 2002)	Sections 39 & 106	Relates to sourcing material for construction."
Limpopo Environmental Management Act (Act no 7 of 2003)		The Act refers to the management and protection of the environment in the Limpopo Province, to secure ecologically sustainable development and responsible use of natural resources in the province is applied and interpreted in accordance with NEMA and relates to the listing of protected species and management thereof..

6.2.2 Authorisation of borrow areas

Compliance with the Mineral and Petroleum Resources Development Act, 2002 (Act 28 of 2002) (MPRDA) is fulfilled by taking such material from the property of government water works wherever possible, and using it on the same government water works for improving the safety of that government water works. (Section 106 (3) of the MPRDA states "any land owner or lawful occupier of land who lawfully takes sand, stone, rock, gravel or clay for farming or for effecting improvements in connection with such land or community development purposes, is exempt from the provisions of the subsection (1) as long as the sand, stone, rock, gravel or clay is not sold or disposed of'.)

In the event of fill or similar material having to be acquired from outside the bounds of the government water works for improvement of those works, then the contents of Regulation Gazette no. 792 of 25 July 2004 which addresses the exemption of organs of State from certain provisions of the MPRDA are noted, which state that the Minister of Minerals and Energy, acting in terms of Section 106 (1) of that act "hereby exempt the Department of Water Affairs and Forestry, from the provisions of Section 16, 20, 22 and 27 of the said act in respect of any activity to remove any mineral for the construction and maintenance of dams, harbours, road and railway lines and for purposes incidental thereto." However, in such cases the department although exempted from such provisions must submit an Environmental Management Programme (EMProgramme) for approval in terms of Section 39 (4) of the Act, and the EMProgramme is submitted for approval and that DWAF is not an applicant.

A Memorandum of Understanding has also been compiled between the Department of Water Affairs and Forestry and the Department of Minerals and Energy concerning the financial provision associated with rehabilitation of quarries and borrow areas used for the construction or maintenance of dams or any other water resource infrastructure . Where approval is sought for an environmental management programme for quarries or borrow area outside the footprint of a government water works, a copy of this Memorandum of Understanding should be included in the submission with confirmation that the cost of rehabilitating such quarry or borrow area

is included in the approved budget for the construction works associated with the dam safety rehabilitation programme activities of the dam in question.

6.2.3 The Reserve

In accordance with the National Water Act, the Reserve is that portion of water required to meet basic human needs, and the needs of the aquatic ecosystem. The Department of Water Affairs and Forestry undertook a preliminary Reserve determination for the Groot Letaba River in 2006, and the resulting requirements will be taken into account in both the yield analysis and technical design of the project.

6.3 INTERNATIONAL CONSIDERATIONS

The DWAF is required to continuously liaise with the country's neighbours, specifically Mozambique, during the planning and implementation of the GLeWaP in line with international protocols and agreements. Under consideration is the potential impact on Mozambique of the GLeWaP.

The EIA needs to take note of the associated responsibilities linked to the Revised SADC Protocol on Shared Watercourse Systems and the new SADC Water Policy that will shortly be signed and ratified by SADC countries.

6.4 WORLD COMMISSION ON DAMS

The final report of the World Commission on Dams (WCD) was published in November 2000. The objectives of this Commission were to review the effectiveness of large dams and develop internationally acceptable principles, strategic priorities and criteria and guidelines for application in projects aimed at providing water supplies to meet the needs of society. The Commission, now disbanded, held no legal authority and each nation is responsible for implementing the recommendations on its own accord.

Key findings of the WCD are as follows:

- Dams have made an important and significant contribution to human development and the benefits derived from them have been considerable.

- However, in many cases, an unacceptable and often unnecessary price has been paid to secure those benefits, especially in social and environmental terms, by people displaced, by communities located downstream from a new dam, by taxpayers, and by the natural environment.

- A lack of equity in the distribution of benefits has called into question the value of many dams in meeting water and energy development needs, when compared to alternatives.

- By bringing to the table all those whose rights are involved and who bear the risks associated with different options for water and energy resources development, the conditions for a positive resolution of competing interests and conflicts are created.

- Negotiating outcomes will greatly improve the development effectiveness of water and energy projects by eliminating unfavourable projects at an early stage, and by offering, as a choice, only those options that key stakeholders agree represent the best ones to meet the needs in question.

  The WCD identified seven strategic priorities, supported by policy principles, to provide a principled and practical way forward for decision-making. These strategic priorities have been included within the assessment framework for this proposed project and are summarized as follows:

- Gaining public acceptance.

  Public acceptance of key decisions is essential for equitable and sustainable water and energy resources development. This requires the use of decision-making processes and mechanisms that enable informed participation by all groups of people, and result in the demonstrable acceptance of key decisions. With regard to the GLeWaP, various parallel means of communication and participation have been implemented.

- Comprehensive options assessment.

  Alternatives to dams often exist. To explore these alternatives, the needs for water, food and energy must be assessed and objectives clearly defined. The appropriate development response must be identified from a range of options. These options are based on comprehensive and participatory assessment of the full range of policy, institutional and technical aspects. In the assessment process, social and environmental aspects must have the same significance as economic and financial factors. The options assessment process should continue through all stages of planning, project development and operations.

- Addressing existing dams.

  Opportunities exist to optimise the benefits from many existing dams and these must be considered. Dams and the context in which they operate are not static over time. Changes in water use priorities, physical and land use changes in the river basin, technological developments, and changes in public policy expressed in environmental, safety, economic, and technical regulations may transform benefits and impacts.

- Sustaining rivers and livelihoods.

  Rivers, watersheds and aquatic ecosystems are the biological 'engines' of the planet. They are the basis for life and the livelihoods of local communities. Dams transform landscapes and create risks of irreversible impacts. Understanding, protecting and restoring ecosystems at river basin level are essential to foster equitable human development and the welfare of all species. Options assessment and decision-making around river development must prioritise the avoidance of impacts, followed by the minimisation and mitigation of harm to the health and integrity of the river system. These aspects are well-known and form part of the issues raised during Scoping. The manner in which they will be addressed, and negative impacts mitigated, form part of the Impact Assessment, inclusive of Specialist Studies, that will follow Scoping.

- Recognising entitlements and sharing benefits.

Joint negotiations with adversely affected people result in mutually agreed and legally enforceable mitigation and development provisions. Affected people are beneficiaries of the project. Successful mitigation, resettlement and development are fundamental commitments and responsibilities of the State and the developer. They bear the onus to satisfy all affected people moving from their current context and resources.

- Ensuring compliance.

  Ensuring public trust and confidence requires that the governments, developers, regulators and operators meet all commitments made for the planning, implementation and operation of dams. Regulatory and compliance frameworks need to use incentives and sanctions to ensure effectiveness where flexibility is needed to accommodate changing circumstances.

- Sharing rivers for peace, development and security.

  Storage and diversion of water on transboundary rivers has been a source of considerable tension between countries and even within countries. The use and management of such shared resources must increasingly become the subject of mutual self-interest for regional co-operation and peaceful collaboration. This leads to a shift in focus from the narrow approach of allocating a finite resource, to the sharing of rivers and their associated benefits in which States can become innovative in defining the scope of issues for discussion.

6.5 NON-REGULATORY ACTIVITIES

Within the configuration of the GLeWaP, there are a number of activities that are being undertaken but which do not require environmental authorisation by the Department of Environmental Affairs and Tourism. These activities are being addressed by the Department of Water Affairs and Forestry to demonstrate best practice and to align the GLeWaP with the strategic priorities arising from the WCD. Non-regulatory activities that are currently being undertaken include:

- Water conservation and demand management assessments.

- A Regional economic/macro-economic assessment.
- International protocols and agreements.
- Provision of the Reserve for the Groot Letaba River.

These studies will be undertaken as part of the wider GLeWaP and their results and findings will be fed back into the EIA, notably, the Environmental Impact Report that will be drafted following the completion of Specialist Studies that form part of the Impact Assessment Phase of the EIA.

7. PUBLIC PARTICIPATION IN THE SCOPING PHASE

7.1 INTRODUCTION

Public participation is an essential and legislative requirement for environmental authorisation. The principles that necessitate communication with society at large are best embodied in the principles of the National Environmental Management Act (Act 107 of 1998, **Chapter 1**), South Africa's overarching environmental law. In addition, the Generic Public Participation Guidelines 2001 of the Department of Water Affairs and Forestry contain further guidelines for public participation.

The public participation process for the Groot Letaba River Water Development Project (GLeWaP) has been designed to satisfy the requirements laid down in the above legislation and guidelines. **Figure 7.1** provides an overview of the EIA technical and public participation processes, and shows how issues and concerns raised by the public are used to inform the technical investigations of the EIA at various milestones during the process. This section of the report highlights the key elements of the public participation process to date.

7.2 OBJECTIVES OF PUBLIC PARTICIPATION IN THE EIA

The objectives of public participation in an EIA are to provide sufficient and accessible information to I&APs in an objective manner to assist them to:

- During Scoping:
- Identify issues of concern, and provide suggestions for enhanced benefits and alternatives.
- Contribute local knowledge and experience.
- Verify that their issues have been considered.

During the Impact Assessment:

- Verify that their issues have been considered either by the EIA Specialist Studies, or elsewhere.
- Comment on the findings of the EIA, including the measures that have been proposed to enhance positive impacts and reduce or avoid negative ones.

The key objective of public participation during Scoping is to help define the scope of the technical studies to be undertaken during the Impact Assessment.

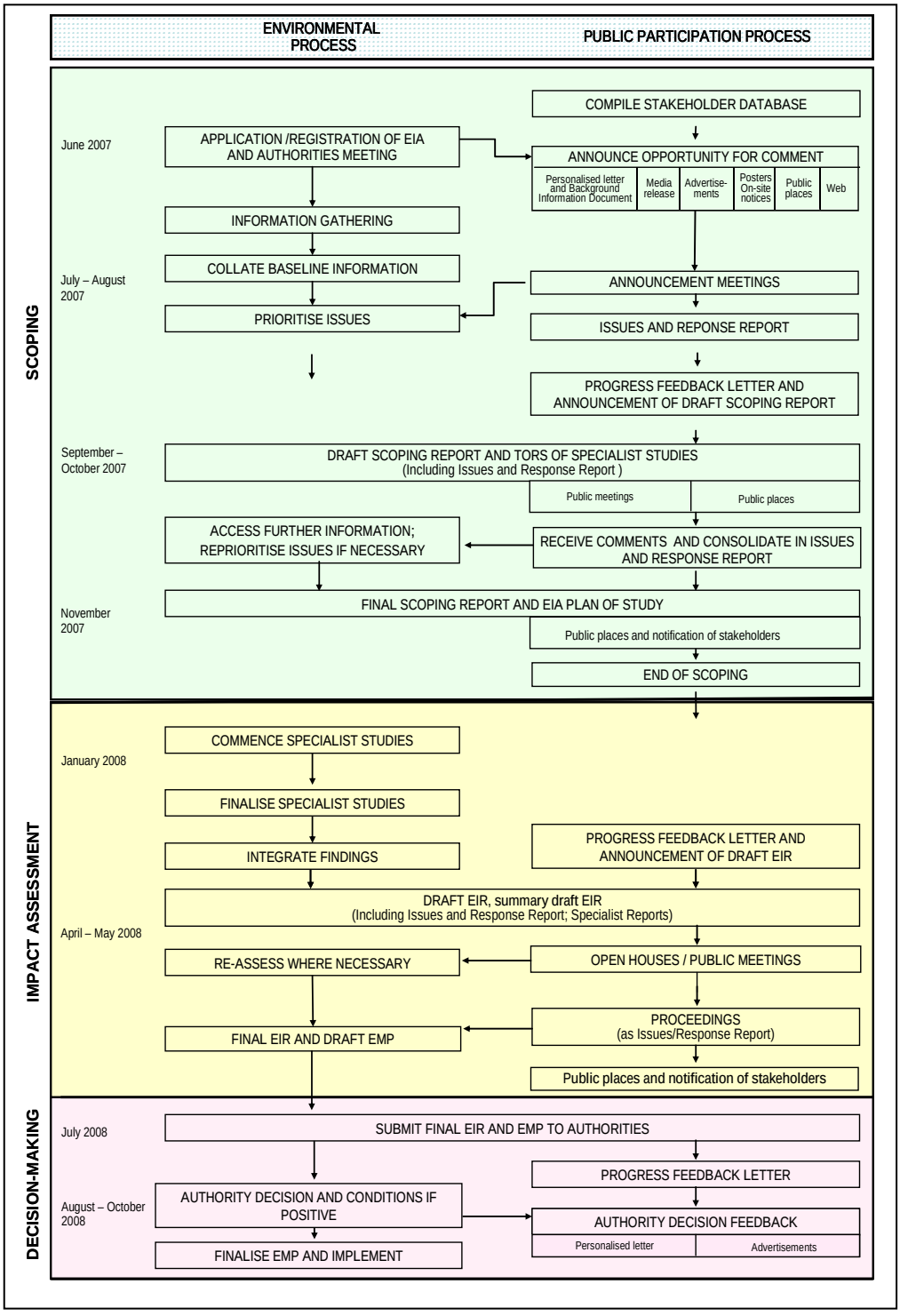


Figure 7.1: Technical and public participation process and activities that comprise the Environmental Impact Assessment for the Groot Letaba River Water Development Project

7.3 IDENTIFICATION OF INTERESTED AND AFFECTED PARTIES

The direct mailing list for this EIA consists of almost 1 350 individuals and organisations from both within the project area and beyond its boundaries (**Appendix B**). These include all those I&APs that expressed an interest during the Announcement Phase of the project between July and August 2007. **Table 7.1** shows that these I&APs represent a broad spectrum of sectors of society. Consultation has taken place with representatives of different sectors of society, rather than with every individual in the project area. Nevertheless, special efforts were made to obtain the contributions of all people who may be affected directly by the proposed project.

Table 7.1: Sectors of society represented by I&APs on the direct mailing list

❑ National government ❑ Provincial government (Limpopo) ❑ Local government (district as well as local municipalities) ❑ Organised agriculture ❑ Business/Commerce ❑ Environmental and conservation organisations ❑ Health ❑ Industry ❑ Education: local schools and universities	❑ Local landowners (In the dam basin area) ❑ Local communities, including tribal authorities, women's groups, development committees and other community based organisations (CBOs) in the project area ❑ Media (print and broadcast) ❑ Labour unions ❑ Water organisations (Irrigation Boards, Water Boards, Water Committees, and Water User Associations)	❑ Non Government Organisations (NGOs) ❑ Ratepayers Associations ❑ Researchers and consultants ❑ Tourism ❑ Transport

7.4 ANNOUNCEMENT OF OPPORTUNITY TO BECOME INVOLVED

The opportunity to participate in the EIA was announced in July and early August 2007 in four languages (English, XiTsonga, Sepedi and Afrikaans) as follows:

- Telephonic notification to the directly affected landowners on the farms directly affected by the proposed dam.
- Five meetings with stakeholders in the project area. See details below in **Table** 7.2.

- Distribution of a letter of invitation to become involved, addressed to individuals and organisations by name, accompanied by a Background Information Document containing details of the proposed project including maps of the project area and the dam site, and a registration sheet (**Table 7.3** and **Appendix D**).

- Leaving the Background Information Document (**Appendix D**) at public places in the study area (**Table 7.4**).

- Advertisements (**Appendix D**) in the media (**Table 5.7**).


THIS IS YOUR ADVERT

Hobby evolves into income

Sue Elmayr

ENVIRONMENTAL IMPACT ASSESSMENT

THE GROOT LETABA RIVER WATER DEVELOPMENT PROJECT (GLeWaP) INFRASTRUCTURE DEVELOPMENT BY THE DEPARTMENT OF WATER AFFAIRS AND FORESTRY

PUBLIC COMMENT ENCOURAGED

Volkswagen DIY service kits from just R190. (Including oil)

Plate 7.1: Example of advertisement

- Project notice boards at the following localities along roads in the project area:

  - Tzaneen Dam;

Plate 7.2: Notice at the Tzaneen Dam

- At the Tarentaal Friendly Grocer shop and service station on the R71 on route to the proposed dam site;

- At the crossing with the R71 and the road from Taganashoek – on route to the proposed dam site;

- At the crossing with the R71 and the road towards/from Giyani (R529);

- At the Caltex Service Station, close to The Junction at the Letaba River;

- At the crossing with the R71 and the road towards/from Letsitele/Lyndenburg (R529);

- Close to the proposed dam site on the road reserve at the Gubitz Farm (Delhi);and

Plate 7.3: Notice board on the road reserve at the Gubitz Farm

- Close to the proposed dam site on the road reserve at the farm La Gratitude.

- All documentation published on the project web site - (www.dwaf.gov.za/projects/GrootLetaba)

Table 7.2: List of meetings held during the announcement of the EIA

Date	Venue	Time	Attended by:
Monday, 30 July 2007	Mopani District Municipality, Banquet Hall, Giyani	09:00 – 15:00 .	Key stakeholders and authorities
Tuesday, 31 July 2007	Fair View Country Lodge, Tzaneen	09:00 – 13:00	Key stakeholder and authorities
Tuesday, 31 July 2007	Groot Letaba Water User Association's offices, Tzaneen	14:00 – 16:00	Members of the Groot Letaba Water User Association's management board, representatives of irrigation boards and major water users
Wednesday, 1 August 2007	Tribal Council offices, Nwamitwa	09:00 – 13:00	Nwamitwa community, Ward Councillors, Chief Valoyi. Hosi Nwamitwa

Wednesday, 1 August 2007	The Letaba Junction, Letsitele	14:00 – 16:00	Directly affected land owners in the dam basin area

Table 7.3: Project announcement distribution data

Distribution	English	Afrikaans	Sepedi and Xonga
By mail, leaving in public places and leaving with stakeholders during meetings			
Almost 1 350 stakeholders on direct mailing list.	800	200	350
Nine newspapers and three radio stations.	20	20	20
Public places (e.g. libraries, post offices, office receptions of stakeholder organisations, etc).	150	50	80
During meetings as mentioned in Table 7.2	400	200	300
Department of Water Affairs and Forestry project and study teams and Limpopo Regional Office	100	100	150

Table 7.4: Public places where BIDs were available

Town/area/district	Locality	Contact person	Telephone
Giyani	Mopani District Municipality	Mr Timothy Maake Municipal Manager	(015) 811 6300
Giyani	Great North Farmers	Mr PM Mathe President and member	(015) 812 2913
Tzaneen	Greater Tzaneen Municipality	Mr Mabakane Mangena Municipal Manager	(015) 307 8000
Modjadjiskloof	Greater Letaba Municipality	Mr IP Mutshinyali Municipal Manager	(015) 309 9246
Giyani	Greater Giyani Municipality	Mr Silence Makhubele Municipal Manager	(015) 811 5500/44
Phalaborwa	BaPhalaborwa Municipality	Office of the Municipal Manager	(015) 780 6301

Table 7.5: Advertisements to announce opportunity to contribute to the EIA

Advertisements/announcements	Date published/announced
Newspapers	
Bulletin	20 July 2007
Ekasi bulletin	20 July 2007
Letaba Herald	19 July 2007
Seipone	18 July 2007
Agri Spectrum	25 July 2007
Northern Review	19 July 2007
Capricorn Voice	18 July 2007
Mopani News	19 July 2007
Polokwane Observer	19 July 2007
* Several newspapers such as the Daily Sun, Letaba Herald and others published information about the proposed project.	
Radio Stations	
Munghana Lonene FM, Polokwane	During the week of Monday 16 July - 20 July 2007
Thobela FM, Polokwane	During the week of Monday 16 July - 20 July 2007
Greater Lebowakgomo	During the week of Monday 16 July - 20 July 2007
Radio Sekgosese	During the week of Monday 16 July - 20 July 2007
Radio Univen	During the week of Monday 16 July - 20 July 2007
* Several other radio stations such as Jacaranda, RSG, Radio Botlokwa also announced information about the project	

7.4.1 Parallel stakeholder liaison by the Department of Water Affairs and Forestry

In addition to the public participation process for the EIA, the Department of Water Affairs and Forestry has initiated several parallel stakeholder liaison initiatives for the project as a whole. Issues relevant to the EIA identified during these initiatives are incorporated into the process on an ongoing basis.

Table 7.6 lists the Department's formal liaison structures for this project, their purpose and representivity. **Table 7.7** lists additional Departmental liaison activities.

Table 7.6: Department of Water Affairs and Forestry formal liaison structures established for the Groot Letaba River Water Development Project.

Liaison Structure	Purpose	Representivity
Project Steering Committee (Meetings already took place on 29 March and 29 August 2007)	Guidance pertaining to strategic issues related to the project, including international matters	▪ Department of Water Affairs and Forestry and other relevant national departments (DEAT, Treasury) ▪ Limpopo Government ▪ Municipalities in the project area ▪ Key sectors such as conservation
International Liaison Strategy Committee	Liaison with neighbouring states	Department of Water Affairs and Forestry – specifically members that liaise with the Limpopo Basin Permanent Technical Committee
Institutional and Finance Strategy Committee	Strategic guidance relating to the development of institutional arrangements and financing matters	Department of Water Affairs and Forestry: Directorates
Project Management and Co-ordination Team	To co-ordinate and synchronize all the activities, to ensure efficient communication and to manage components and phases of the project	Department of Water Affairs and Forestry: Options Analysis and other nominated members

Table 7.7: Departmental stakeholder liaison outside formal structures

Sector/Organisation	Purpose	Activity
Various National, Provincial and Local Government Authorities	To promote cooperative governance by providing them with project information, obtain their comment and support	Written invitations by Director General, presentation at various occasions (May, August 2007, etc)
Local authorities	To be informed of water requirements; to reach agreement on off-take points	Various meetings
National and Provincial Roads Authorities	To deliberate road realignments and diversions, and new road infrastructure	Various meetings
Eskom	To discuss electricity requirements and supply	Various meetings
Department of Environmental Affairs and Tourism	To discuss the Environmental Impact Assessment	Various meetings

7.5 DRAFT SCOPING REPORT PUBLIC COMMENT PERIOD

7.5.1 Draft Scoping Report

The purpose of the Draft Scoping Report (DSR) was to enable I&APs to verify that their contributions have been captured, understood and correctly interpreted. The issues identified by the I&APs and by the environmental technical specialists, have been used to define the Terms of Reference for the Specialist Studies that will be conducted during the Impact Assessment Phase of the EIA. A period of four weeks was available for public review of the Draft Scoping Report (from Wednesday, 3 October – Wednesday 31 October 2007).

In addition, a Summary of the DSR was compiled and translated into Afrikaans, XiTsonga and Sepedi, and proactively mailed to all key stakeholders as well as those who requested copies.

In addition to media advertisements that announced the opportunity to participate in the EIA, the opportunity for public review was announced as follows:

- In the Background Information Document (**Appendix D**).

- At various meetings (as outlined previously).
- In a letter sent out in September 2007 (**Appendix D**), and addressed personally to almost 1 350 individuals and organisations. The letter included a reply sheet for stakeholders to request their own copies of the report, and to register for one of the two public meetings that were held on 12 and 13 October 2007.
- Radio announcements on regional radio stations.
- Telephone calls to key stakeholder organisations.

The Draft Scoping Report, including the Issues and Response Report, and its Summary (in Afrikaans, XiTsonga and Sepedi) was distributed for comment as follows:

- Left in public places throughout the project area and beyond (**Table 7.8**).
- Mailed to key stakeholders.
- Mailed to I&APs who requested the report.
- Distributed at the public meetings (Section 6.1).
- Posted on the Department of Water Affairs and Forestry's web site.

I&APs had the opportunity to comment on the report in various ways, such as completing the comment sheet that accompanied the report, submitting individual comments in writing or by email, attending public meetings and one-on-one discussions with members of the EIA team during the meetings.

7.5.2 Review of the Draft Scoping Report

Public meetings (12 October 2007 in Tzaneen and 13 October 2007 in Nwamitwa) were held to assist I&APs to comment on the Draft Scoping Report and to raise additional issues that may be considered necessary. The content of the report was presented verbally during the meetings. Each meeting also had a visual component to stimulate small-group discussions with members of the EIA team in the language of choice of I&APs. **Table 7.8** lists these meetings, their times and venues.

Consolidated proceedings of the two meetings will be distributed to everyone who attended with a request to verify that their contributions were recorded correctly. A copy of the minutes is attached to this report as part of **Appendix D.**

Table 7.8: List of public places in the project area and beyond where Background Information Documents and the Draft Scoping Report were lodged for public review

Town/area/district	Locality	Contact person	Telephone
Mokwakwaela area, Letaba	1.1.1.a.1 Mokwakwaela Multi Purpose Community Centre	Mr Shilubane	082-453 3774
Sekgosese area, Duiwelskloof, Letaba	Sekgosese Multi Purpose Community Centre	Mr MC Tshamamo	083 289 7955
Modjadjiskloof area, Letaba	Greater Letaba Local Municipality	Mrs H Kruger	(015) 309-9246/7
Letaba region	Department of Water Affairs and Forestry	Ms Morongwa Mbhalati	(076) 931 6177
Tzaneen area, City Centre	Greater Tzaneen Local Municipality Agatha Street, Civic Centre, Tzaneen	HOD: Public Participation: Mr Moroka Molale HOD Communication: Mr ZS Mkhatshwa	(015) 307 8000
Shilubane village, Tzaneen	Vula Mehlo Multi Purpose Community-Thusong Centre	HOD: Public Participation: Mr Moroka Molale HOD Communication: Mr ZS Mkhatshwa	(015) 307 8000
Tzaneen	Tzaneen Public Library	HOD: Public Participation: Mr Moroka Molale HOD Communication: Mr ZS Mkhatshwa	(015) 307 8000
Letsitele area	Letsitele Public Library	HOD Public Participation: Mr Moroka Molale HOD Communication: Mr ZS Mkhatshwa	(015) 307 8000
Haenertzburg	Haenertzburg Public Library, Mare Street, Community Centre	Ms Minnie de Villiers	(015) 276 4707
Tzaneen area, Letsitele	Agri Letaba	Mr Louis van Rooyen	(015) 345 1817
Tzaneen	Groot Letaba Water Users Association Offices	Mr Jurg Venter	(015) 307 2651
Tzaneen	Department of Water Affairs and Forestry	Mr Jakkie Venter/ Mr Isaac Nyatlo	(015) 307 3627/ 8600
Khopo village, Tzaneen	Lesedi Thusong Centre	HOD: Public Participation: Mr Moroka Molale HOD Communication: Mr ZS Mkhatshwa	(015) 307 8000
Xihoko village, Tzaneen	Xihoko Multi Purpose Community Centre	HOD: Public Participation: Mr Moroka Molale HOD Communication: Mr ZS Mkhatshwa	(015) 307 8000
Nwamitwa village, Tzaneen	Valoyi Traditional office	HOD: Public	(015) 307 8000

Town/area/district	Locality	Contact person	Telephone
		Participation: Mr Moroka Molale HOD Communication: Mr ZS Mkhatshwa	
Nwamitwa village, Tzaneen	Nwamitwa Traditional office	HOD: Public Participation: Mr Moroka Molale HOD Communication: Mr ZS Mkhatshwa	(015) 307 8000
Nkowankowa, Tzaneen	Nkowankowa Multi Purpose Community Centre, Nkowankowa	HOD: Public Participation: Mr Moroka Molale HOD Communication: Mr ZS Mkhatshwa	(015) 307 8000
Relela village, Tzaneen	Relela Multi Purpose Community Thusong Centre	HOD: Public Participation: Mr Moroka Molale HOD Communication: Mr ZS Mkhatshwa	(015) 307 8000
Dzumeri village, Giyani	Dzumeri Community Centre	Office of the Municipal Manager	(015) 812 5233
Giyani	Greater Giyani Local Municipality	Office of the Municipal Manager	(015) 812 5233
Giyani, Mopani District	Mopani District Municipality	Office of the Municipal Manager	(015) 811 5500
Giyani, Mopani District	Department of Water Affairs and Forestry	Mrs Matsie Molapisane	(015) 812 0090
Phalaborwa	Ba-Phalaborwa Local Municipality	Ms Riana Smit	(015) 780 6302
Namakgale, Phalaborwa	Namakgale Police Station Calvin Ngobeni Street, opposite Sediba Accommodation and next to magistrate offices	Station Commissioner	(015) 769 1530
Polokwane	Department of Water Affairs and Forestry	Ms Sarah Mamabolo/ Mrs Leah Matlala	(015) 290 1444
Mokwakwaela area, Letaba	Mokwakwaela Multi Purpose Community Centre	Mr Shilubane	082-453 3774
Sekgosese area, Duiwelskloof, Letaba	Sekgosese Multi Purpose Community Centre	Mr MC Tshamamo	083 289 7955
Modjadjiskloof area, Letaba	Greater Letaba Local Municipality	Mrs H Kruger	(015) 309-9246/7
Letaba region	Department of Water Affairs and Forestry	Ms Morongwa Mbhalati	(076) 931 6177

7.5.3 Obtaining comment and contributions

The following opportunities were available during Scoping for I&APs to contribute comment:

- Completing and returning registration sheets on which space was provided for comment.
- Providing comment telephonically or by email to the public participation office.
- Two public meetings with stakeholders in the project area (**Table 7.9**).

Table 7.9: Public meetings to comment on the Draft Scoping Report

Date	Venue	Time
Friday, 12 October 2007	Tzaneen Lodge	08:30 – 13:00
Saturday, 13 October 2007	Runnymede Thusong Centre, Nwamitwa Village	08:30 – 13:00

7.5.4 Final Scoping Report

The Final Scoping Report was prepared after the public comment period closed on 31 October 2007. It was updated with any additional issues raised by I&APs and new information that was generated as a result of this process. It is to be distributed to the Authorities and key I&APs, and to those individuals who specifically request a copy. I&APs will be notified of the availability of the report (see example of the letter as part of **Appendix D**).

Once the lead authority for the EIA has approved the Final Scoping Report, the Impact Assessment Phase of the EIA will commence.

7.6 ISSUES AND RESPONSE REPORT AND ACKNOWLEDGEMENTS

Issues raised thus far, including issues raised during the Announcement and Scoping Phase, are captured in an Issues and Response Report (Version2), appended to this DSR (**Appendix C**). This report was updated to include the additional I&AP contributions that were made based on the information presented in the Draft Scoping Report and at the public meetings held on 12 and 13 October 2007.

The contributions made by I&APs are acknowledged in writing.

8. DESCRIPTION OF ENVIRONMENTAL ISSUES AND POTENTIAL IMPACTS

The proposed infrastructure components of the GLeWaP project are likely to result in impacts on the:

- quantity and quality of river flows (**Chapter 8.1**);
- terrestrial ecology (**Chapter 8.2**);
- social processes (**Chapter 8.3**);
- economic processes (**Chapter 8.4**);
- physical infrastructure (**Chapter 8.5**);
- public health (**Chapter 8.6**); and
- heritage resources (**Chapter 8.7**).

Specific impacts related to construction activities must also be considered (**Chapter 8.8**). Other impacts considered are mentioned in **Chapter 8.9**).

8.1 QUANTITY AND QUALITY OF RIVER FLOWS

8.1.1 Key Issues related to river flows

One of the objectives of the project is to make it possible to improve the management of water resources so as to stop degradation of the conservation status of the riverine ecosystem downstream of the dam. This will result in a positive impact on the ecological status of the river. However, if not implemented correctly a change in the flow and mean annual run-off (MAR) in the downstream Groot Letaba River could result in:

- The degradation of downstream habitat in the Groot Letaba River (both in-stream and riparian). Floods are needed to scour the banks, maintain channels, recharge riverbanks for riparian vegetation growth, to distribute seeds, etc;
- Altered biotic stimuli (i.e. floods induce spawning in certain fish species); and
- Changes in the composition and diversity of aquatic fauna and riparian vegetation.

The dam could create a suitable habitat for aquatic weeds, algae blooms and exotic fish species. The newly created dam basin habitat could also cause an ideal habitat for Bilharzia and malaria vectors.

The proposed dam is situated on the confluence of the Nwanedzi River and Groot Letaba River. No fish or aquatic macro-invertebrate data exist for the Nwanedzi River and not much is known about the extent to which fish in the Groot Letaba River is influenced by this ephemeral tributary, or regarding the interaction between the occurrence of aquatic macro-invertebrates in this tributary and the Groot Letaba River. Inundation of well established riparian vegetation on the southern bank of the Nwanedzi River was also indicated as a concern.

The proposed dam will form a barrier that will further prevent fish migration in the Groot Letaba River and this will result in the further reduction of the genetic stability of the fish population in the long-term. Fish movement/migration from the Groot Letaba River upstream into the Nwanedzi River will also be prevented.

Areas downstream of the proposed dam still have good riparian vegetation, especially the areas in the Hans Merensky Nature Resort, Letaba Ranch and the KNP. Lowering of the conservation status of the Groot Letaba River in the downstream conservation areas, especially the KNP, is a concern.

8.1.2 Reserve Determination

The overexploitation of the Letaba River and the subsequent need for compulsory licences in order to achieve adequate resource protection, led to the Letaba

Catchment Reserve Determination Study (DWAF, 2006). The overall objective of this study was to provide a sufficient range of Ecological Water Requirements (EWR) scenarios to allow for an ecological Reserve for the various reaches of the Letaba River and its main tributaries within South Africa.

In the Reserve Determination Study the Letaba River Catchment was delineated into nine Resource Units (RU), each unit being geographically and ecologically homogenous. Not all of these RU's could however be catered for during the Reserve study, either because the characteristics of the river within the RU did not meet the criteria for an EWR site or as a result of budget limitations. Seven EWR sites were selected within these RUs and represent a critical site within the relevant river section. These sites were selected with the objective to maximize the opportunities for accurately determining a Comprehensive Reserve for the Letaba River:

- EWR1: Groot Letaba River upstream of Tzaneen Dam (Appel). This site is located between Ebenezer and Tzaneen Dam.
- EWR2: Letsitele River (Letsitele Tank)
- EWR3: Groot Letaba River (Hans Merensky). This site is located downstream of the Tzaneen Dam and upstream of the Molototsi River confluence, about 7km upstream of Prieska Weir.
- EWR4: Groot Letaba River upstream of KNP (Letaba Ranch). This site is situated downstream of the Molototsi River and upstream of the confluence with the Klein Letaba River.
- EWR5: Klein Letaba River, downstream of the confluence of the Middle Letaba River and Middle Letaba Dam
- EWR6: Groot Letaba River in KNP (Lonely Bull). This site is situated downstream of the confluence with the Klein Letaba River.
- EWR7: Groot Letaba River in KNP (Letaba Bridge), downstream of EWR6.

Site EWR3 is situated closest to the proposed dam site, downstream from Tzaneen Dam. Data gathered at this site will therefore serve as baseline for the aquatic ecological assessment to be conducted for the GLeWaP study. Data from site EWR3, EWR4, EWR6 and EWR7 will be crucial in the development of a release strategy for the proposed dam. The latter two sites are situated in the KNP and results from these two sites are driving the system.

Present Ecological State (PES) for each Resource Unit of the main ecological drivers (hydrology, geomorphology and water quality) and ecological responses (riparian vegetation, aquatic macro-invertebrates and fish) were determined and integrated into an overall EcoStatus. Ecological Categories and alternative categories were recommended based on the results of the PES and are summarized in **Table 8.1**.

Table 8.1: The EcoClassification results for the PES of each component per EWR site (from DWAF, 2006)

	EWR1	EWR1	EWR3	EWR4	EWR5	EWR6	EWR7
Hydrology	C	C	D	D	C/D	D	D
Physico-chemical	B	C/D	C	B/C	B	C	C
Geomorphology	C	D/E	C	C/D	C	C	C
Fish	C	C	C	C	B	C	C
Invertebrates	C/D	D	D	D	C	D	D
Riparian Vegetation	C	D/E	D	D	B	C	C
EcoStatus	C	D	C/D	C/D	C	C	C

The above Ecological Categories (EC) is the primary EcoSpecs, and maintenance of these EcoSpecs will form the basis for the Impact Assessment for the proposed dam.

Table 8.2: Present Ecological State (PES), Ecological Importance and Sensitivity (EIS), Socio-cultural Importance (SI) and

Recommended Ecological Class (REC) for each EWR site (from DWAF, 2006)

	PES	IMPORTANCE		REC
		EIS	SI	
EWR1	C	Mod	Low	C
EWR2	D	Mod	Low	D
EWR3	C/D	High	Mod	C/D
EWR4	C/D	High	High	C/D
EWR5	C	Mod	Mod	C
EWR6	C	High	Low	C
EWR7	C	High	Low	C

One of the objectives of the Reserve study was to recommend and motivate specific low and high flows for maintaining ecological conditions within a specific Ecological Category. The methods followed were the Habitat Flow Stressor Responses for low flows and a combination of the Building Block Methodology (BBM) and DRIFT method for the high flows. The results are summarized in **Table 8.3**.

Table 8.3: Instream Flow Requirements for EWR sites in the Letaba River expressed as a percentage of the natural Mean Annual Run-off (MAR) for the recommended Ecological Categories (EC)

	EWR1	EWR2	EWR3	EWR4	EWR5	EWR6	EWR7
REC	C	D	C/D	C/D	C	C	C
Maintenance low flows (%)	10.47	32.06	1.29	2.82	8.48	2.17	3.23
Drought low flows (%)	15.76	4.32	0.23	0.44	0.30	0.93	0.09
High flows (%)	15.76	11.11	11.78	15.84	24.27	7.86	7.65
Long-term mean of MAR (%)	27.56	38.78	14.15	20.76	24.27	10.74	11.26

Various operational flow scenarios were developed for each EWR site and their ecological and social-economic consequences described. Seven different scenarios were evaluated for each EWR site in terms of its impact on the ecology, system, yield, goods & services, and overall economic activities. An optimised scenario was devised that would have the least overall impact on the users and the ecology (**Table 8.4**). The flow regime associated with the selected scenario provides the best balance between ecological sustainability and social and economic development. This scenario was accepted and approved by DWAF at a meeting in September 2005 (DWAF, 2006)

Table 8.4: Selected operational flow scenario summarized as a percentage of the MAR

	Annual EWR (million m3)	Virgin MAR (million m3)	Annual EWR (% nMAR)
EWR1	19.75	71.27	27.71
EWR2	31.756	86.06	36.90
EWR3	42.448	364.49	11.65
EWR4	69.87	402.26	17.37
EWR5	17.054	95.01	17.95
EWR6	47.0317	546.59	8.60
EWR7	51.52	561.67	9.17

The Reserve study (DWAF, 2006) also included an assessment of the practicality of improving ecological conditions. This is specifically important in view of the fact that KNP officials requested an improved PES within the KNP, in line with their mandate to improve biodiversity within the park. Based on available information, the improvement of the PES within the KNP (from PES of C to a REC of B) is at this stage not regarded as attainable, unless the release strategy from the proposed dam can result in more assured flow in the river during August to October. This aspect will be investigated during the Impact Assessment.

8.1.3 Strategic Downstream Users

A reduction in the quantity and quality of the water in the Groot Letaba River system will potentially impact on downstream users. The Kruger National and Mozambique are two significant downstream users.

International obligations to Mozambique must not be compromised by the implementation of this project. In this regard, the Department of Water Affairs and Forestry is following the recommendations and conditions contained within the Revised SADC Protocol on Shared Watercourses and continuously liaise with the co-basin countries through the Limpopo Basin Permanent Technical Committee.

The Kruger National Park not only contributes significantly to South Africa's responsibility to maintain the country's biodiversity as committed in the signing of the United Nations Convention on Biodiversity (1992), but is also is a major economic driver in the region and contributes significantly to the national economy. The water required (quantity and quality) to maintain these functions is a priority.

8.1.4 Water Quality

The issues with respect to water quality centre around two effects. The first is the storage of a large quantity of water in the proposed dam, which can lead to eutrophic conditions and an increase in salinity due to the concentrating effect of evaporation losses. These problems tend to be accentuated during periods of prolonged low inflow.

The second issue is a possible change in water quality in the river downstream of the dam. The change can be far-reaching, such as a cumulative change in salinity as a result of reduced flows, or it can be of a local nature, such as changes in temperature directly downstream of the dam due to the release of colder bottom water.

8.2 TERRESTRIAL ECOLOGY

The main factors of disturbance in the project area are human settlements, agriculture and forestry. Nearly 60 % of the project area is transformed or degraded by such developments.

According to Rouget et al (2006):

- Critically Endangered vegetation types have been transformed to such an extent that the remaining habitat is less than that required to represent 75% of species diversity.
- Endangered vegetation types have lost up to 40 % of their original extent, and are exposed to partial loss of ecosystem function.
- Vulnerable vegetation types have lost up to 20 % of their original extent, resulting in some ecosystem functions potentially being altered.
- Least Threatened vegetation types have retained more than 80% of their original extent, and disruption of ecosystem functioning is assumed to be insignificant.

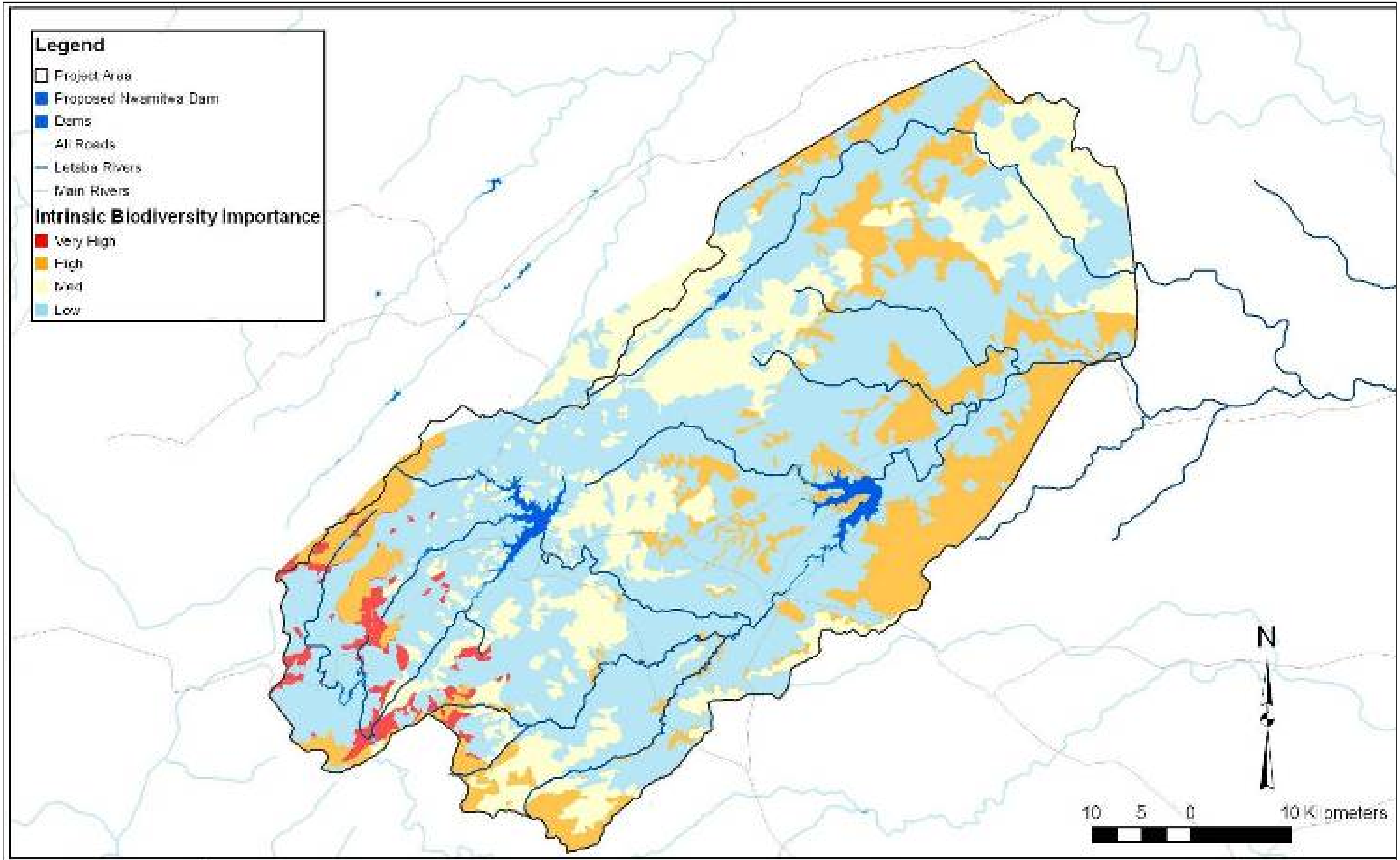
On this basis, Woodbush Granite Grassland is the most threatened of the vegetation types. However, being in the upper catchment, it (and Northern Escarpment Quartzite Sourveld – Vulnerable) is not likely to be directly affected by the proposed developments. Conversely, Tzaneen Sour Bushveld (Endangered) is likely to be impacted by water-supply projects downstream of the proposed Nwamitwa dam. Moreover, the inundation of the dam will directly impact on Granite Lowveld, a Vulnerable vegetation type.

Although a total of 256 species of Red Data flora and fauna could potentially occur in the study area (147 plant, 45 mammal, 48 bird, 9 reptile & amphibian, and 7 invertebrate), at least 107 species could be endemic or near-endemic (locally or regionally), and 284 are likely to be protected, the construction of the infrastructure components of the proposed project will not affect the terrestrial ecology of the entire

catchment or study area. There impacts will only be experienced locally in the areas where there are construction activities.

Figure 8.1 depicts an integration of the spatial conservation importance / sensitivity profiles for the biotic groups. This map is designed to inform the development planning process, and to provide a basis for impact assessment.

Vegetation types have been ranked and assigned importance ratings ranging from Low to Very High. Areas designated of high conservation importance for a particular biotic group would be considered 'sensitive' to development because of the potential impacts of such development on that particular group. **Table 8.5** summarizes the levels of conservation importance of each vegetation type in terms of the conservation-important biota potentially represented there.



water & forestry

ILISO CONSULTING

GROOT LETABA RIVER WATER DEVELOPMENT PROJECT (GLeWaP)

CONSERVATION IMPORTANCE OF INTRINSIC BIODIVERSITY

FIGURE 8.1

Date: September 2007
Map Ref: P/L Letaba Catchment
System: WGS84

Table 8.5: Level of conservation importance of each vegetation type

Importance value	Number of species									
	Granita Lowveld	Gravelotte Rocky Bushveld	Lowveld Rugged Mopaneveld	Northern Escarpment Quartzite Sourveld	Northern Mistbelt Forest	Ohrigstad Mountain Bushveld	Subtropical Freshwater wetlands*	Tsende Mopaneveld	Tzaneen Sour Bushveld	Woodbush Granite Grassland
Plants	High	High	High	Very High	High	High	Med	High	Very High	Very High
Mammals	High	Med	Med	High	High	Med	Low	High	Med	High
Birds	High	Med	High	High	High	Med	Low	High	Med	High
Reptiles & Amphibians	Med	Low	Low	High	High	Low	Med	Med	Med	High
Invertebrates	Very High	High	High	Med	Med	Med	Very High	Very High	High	Very High
RANK	2	8	7	2	5	9	10	2	6	1
Intrinsic Biodiversity Value	High	Med	Med	High	High	Med	Med	High	Med	Very High

It also attempts to rank the vegetation types on the basis of their 'intrinsic biodiversity' reflected in the integration of all the component importance values. Thus some idea of intrinsic biodiversity value or 'ecological sensitivity' is realized and mapped **(Figure 8.1**).

Vegetation types with the highest percentage area intact, with the highest biodiversity values, and that are the most threatened are those that are likely to present the greatest constraints to development. Conversely, those with the lowest percentage area intact, with the lowest biodiversity values, and that are the least threatened are those that are likely to present the greatest opportunities for development.

On this basis, it is apparent from **Table 8.6** that those vegetation types that have most area intact do not have a particularly high biodiversity value, and are also not significantly threatened (e.g. Gravelotte Rocky Bushveld and Lowveld Rugged Mopaneveld). These would probably offer most opportunity for development. Conversely, those that have least area intact do have High biodiversity values and are significantly threatened (e.g. Granite Lowveld, Tsende Mopaneveld and Tzaneen Sour Bushveld). These would probably present the greatest constraints to development.

Table 8.6: Biodiversity Value and Degree of Transformation per vegetation type

Vegetation Type	Ecosystem Status	Intrinsic Biodiversity Value	Natural Area (ha)	Transformed & Degraded area (ha)	% Natural
Granite Lowveld	Vulnerable	HIGH	24 104	72 909	25%
Gravelotte Rocky Bushveld	Least Threatened	MEDIUM	4 480	1 379	76%
Lowveld Rugged Mopaneveld	Least Threatened	MEDIUM	17 737	11 061	62%
Tsende	Least Threatened	HIGH	23 903	35 549	40%

Vegetation Type	Ecosystem Status	Intrinsic Biodiversity Value	Natural Area (ha)	Transformed & Degraded area (ha)	% Natural
Mopaneveld					
Tzaneen Sour Bushveld	Endangered	MEDIUM	53 368	60 536	47%
Total			123 592	181 434	41%

Site-specific ecological field surveys and impact assessments will take place before development commences. On site surveys of flora and fauna will be undertaken in summer from October 2007 to February 2008. It will therefore be possible to screen all of the conservation-important plant and animal species potentially present in the project area, making assessment of ecological sensitivity at farm scale more objective. The potential impacts of the proposed development would be more clearly identified, and mitigation measures to reduce impacts will be more accurately defined.

8.3 SOCIAL PROCESSES

8.3.1 Potential impacts as a result of demographic processes

The demographic profile of the communities in the study area (**Chapter 5**) is typical of rural communities, with low education and employment levels. Increasing the population density in an area which is already overpopulated and poor could lead to negative and positive impacts. If the community has the capacity to accommodate additional people, the presence of construction workers could lead to a temporary boost in the local economy as a result of construction workers making use of local services. However, a community that is unable to meet its own needs might be unable to sustain additional demands on the local services, which might lead to conflict if services are depleted (e.g. the local grocery store running out of supplies due to the extra demand) or not provided adequately (e.g. sanitation).

Interaction and relations between local communities and construction workers might lead to illnesses, death and/or births. Dam failure can lead to the loss of life and

severe injuries, as well as psychological trauma, which leads to demographic changes.

The high percentage of females imply that males out-migrate, and/or are outlived by females. It is possible that there is a high percentage of child-headed households in the study area. The high percentage of young people and women imply they are probably most severely affected by lack of money and resultant developmental problems such as lack of water, walking long distances to fetch water, lack of electricity, accessibility to health facilities, etc. The project should focus on improving the quality of life of these vulnerable groups by giving them job opportunities.

The IDP of the MDM suggests that the level of literacy has a bearing on employment and urbanisation status. The bulk water distribution area, which will benefit from the proposed dam, consists of rural villages. The literacy and employment levels are therefore most likely to be low. This has implications for the type of jobs they will be able to do, and the extent of the economic impact on their lives.

8.3.2 Institutional change processes and municipal service impacts with the project

During construction, institutional changes can be expected as a result of the project as the influx of people will put a strain on institutional structures. The resultant health and safety, and environmental impacts could be significant. This will also depend on whether construction workers will be housed in communities or in a construction village.

During operation, settlements, agricultural production of commercial farmers and emerging black farmers, as well as the tourism industry between the Drakensberg Escarpment and the Kruger National Park will benefit. The positive impacts are the health benefits, increase in social equity, stabilised economic growth, and employment opportunities. However, the significance of the impact depends whether institutional processes are such that:

- Safe, reliable water supplies for domestic and industrial use are supplied;

- The frequency, intensity and duration of restriction on the use of water allocated for irrigation of high value crops are minimized ;
- . Resources are distributed equitably;
- Maintenance is done;
- Unauthorized connections are managed;
- Cost recovery is managed;
- Multi-disciplinary planning and co-operation at appropriate levels of government is done to enable inclusive long term plans to be drawn up;
- The integration of the project with the Spatial Development Frameworks of municipalities;
- The integration of the project with the seven industrial clusters, specifically horticulture and livestock production.

8.3.3 Land use change processes and potential impacts

The proposed dam basin will inundate commercial citrus farms and may potentially impact on some houses and possibly small-scale farming areas.

The size of the dam must therefore be such that it indeed optimally benefits the beneficiaries. The risk is that a dam built to full capacity might not optimally benefit the beneficiaries. For example, the water may cover important infrastructure which might negatively impact on many users in and on the borders of the proposed dam basin. Building a smaller dam might mitigate these impacts. It is therefore necessary to understand the impact of different full supply levels on the beneficiaries to propose an optimal full supply level. This will also have positive implications for DWAF in that the economic and social impacts will be reduced, positively impacting on the sustainability of the GLeWaP.

To determine the optimal full supply level, the impacts of different proposed purchase levels should be assessed in more detail in the EIA Phase. The implication of different full supply and purchase levels on the livelihood and quality of life of beneficiaries should be considered, to contribute to the selection of an optimal full supply level. "Optimal benefit" will have to be defined, based on the definitions of livelihood and quality of life, and the data gathered.

8.3.4 Socio-cultural change processes

Socio-cultural processes are the way in which humans behave, interact and relate to each other and their environment and the belief and value systems which guide these interactions. This includes the movement patterns, which indicate how relationships are maintained, and the way in which space creates a sense of place.

Cultural Landscape

Little information on the cultural landscape and attachment to place within the study area is available at this stage, and will have to be further assessed in the Impact Assessment Phase. Tribal Authorities in the area will have to be identified, and the heritage specialist report will have to be accessed. The nature of the cultural landscape will give an indication of the level of attachment to place. Components that give an indication of the cultural landscape are:

- Genealogical Landscape
- Knowledge of Place
- Place-based Values and Ethics
- Environmental knowledge
- Home place and identity

(Cultural Attachment to Place: A Framework for Identifying and Working with Traditionally Associated Peoples in Southern Appalachia Benita J. Howell, 2003).

Sense of place

The potential impact on socio-cultural behaviour and the related perception of environmental changes could either have a positive or a negative impact on sense of place. It could be positive if people perceive the project as a means of job creation, free water, and infrastructural and/or economic development, not intrusive and safe. Potential negative impacts include the visual impact and the resultant intrusion on sense of place.

People choose to live in an area because of what they value: status, safety, nature, family links, etc. A sense of connectedness a person/community feels towards a place or places develop as a result of these values. Much of what is valuable in a culture is embedded in place, which cannot be measured in monetary terms. Place attachment may be evident at different geographic levels, e.g. site specific (e.g. a house, burial site, tree where religious gatherings take place), area specific (e.g. a region), and physiographic specific (attachment to the look and feel of an area). Personal emotions, memories and cultural activities are associated with a place. It is because of a sense of place and belonging that some people loath to be moved from their dwelling place, despite the fact that they will be compensated for the inconvenience and impact on their lives. Once the proposed dam basin is filled with water, the current land use, sense of place and cultural landscape will be permanently lost changed. The related impacts on a psycho-social level will be different for different people and will have to be assessed in more detail in the EIA Phase.

Socio-cultural processes and Construction workers

Construction workers form part of a significant section of the South African population known as migratory workers. The social cultural issues associated with this section of the population have been thoroughly researched. Due to their unique situation, construction workers engage in behaviour that makes them vulnerable, such as risky sexual behaviour (e.g. unprotected sex) and destructive behaviour (e.g. alcohol abuse, damaging the environment), which could be explained by their migratory status. When they are separated from their homes, they are also distanced from traditional norms, prevailing cultural traditions and support systems that normally regulate behaviour within a stable community. In addition, it might also be that construction workers who are faced with dangerous working conditions and the risk of physical injury might be more preoccupied by immediate (direct) risks and therefore

tend to disregard salient (more indirect) risks, such as HIV infection. Again, it is likely that HIV transmission occurs, as the local population might be uneducated about the risk and transmission of HIV and would therefore more easily engage in risky behaviour as a result of ignorance. More money in circulation from construction workers also impacts on the family structure as preference is given to money over family.

Not only do health issues impact on communities, but the physical safety of communities can also be endangered as a result of the influx of job seekers and construction workers (e.g. potential increase in crime). This has a negative mental health impact, such as fear. Conflict could also occur as a result of alcohol abuse, resentment that locals did not get jobs, and cultural differences.

The construction activities, construction vehicles and movement patterns of these vehicles and equipment could also impact on the health and safety of communities. However, this only becomes a real concern if such activities occur in close proximity to roads and settlements.

8.3.5 Bio-physical change processes and potential impacts

The construction workers could be housed in a construction village or the surrounding communities. Their presence will impact on the environment, which in turn will impact on the surrounding communities. Littering and water pollution, air, and dust pollution could be experienced during the construction phase of the project.

Vehicles used for construction and maintenance activities could also create air and dust pollution, and further damage the environment. New and/or temporary roads will have to be opened, blasting will take place, noise will increase, and the environment might degrade aesthetically.

As a secondary impact, the presence of roads leading to the dam may open up a previously inaccessible natural environment, resulting in the consequences of tourism activities: destruction of wildlife or waterfowl habitats, over-usage of certain areas, pollution from litter and motor vehicles, wildlife disturbance, etc.

During operation, the presence of the dam could lead to health impacts, for example the presence of mosquitoes and bilharzia could be exacerbated. There are also positive health impacts:

- The availability of water for washing and bathing will prevent diseases such as trachoma, scabies, and fungal skin diseases;
- Water borne diseases e.g., typhoid, dysentery and diarrhoea will be prevented by the provision of clean water and sanitation;
- Removal of breeding sites will prevent diseases e.g. malaria and dengue;
- Removal of habitat can prevent diseases such as guinea worm.

8.4 ECONOMIC PROCESSES

The proposed project could impact on the following economic aspects:

- Economic effect

The proposed project will have an impact on the economy due to the financial spending (estimated to be in the excess of R1 500 million), increased infrastructure investment and increased expenditure by employees.

- Employment

Temporary employment will be created during the construction phase of the project resulting in increased expenditure, as well as additional economic spin-offs that will result.

Since some of the high-intensity citrus farm land will be inundated by the proposed Nwamitwa dam, some of the farmers and farm workers could be negatively affected by job losses.

Temporary employment contracts will be terminated when the construction activities are complete. This could result in a loss of income and spending in the immediate

area at that time. Affected parties should be informed of this from the start of the project so that unrealistic expectations are not.

Full-time employment during the operation of the project may also have a permanent effect on the economy. Apart from any permanent directly created jobs there may be scope for other jobs due to spin-off effects in the economy as well as stimulation of additional income generating activities resulting from improved water supply. The proposed project could prevent job losses due to current water supply not meeting demands.

- Business output and sales

The employment opportunities created by the construction of proposed project may lead to an increase in buying power in the area leading to an increase in business sales and the opportunity for the development of new businesses sales.

Any persons that acquire employment in the operation phase of the project could experience an increase in their standards of living. The availability of water in the region may also stimulate income generating activities and impact on local business sales and standards of living.

- Government income and expenditure

The proposed project may cause an economic injection to the area that could lead to increased government income during both construction and operation. Any resultant new economic activities, such as tourism developments, could increase the tax base and income in the form of Company tax; PAYE; UIF; and Rates and taxes. The capacity of the local municipality to provide services may improve.

- Standards of living

Increased employment opportunities during construction and possibly operation could increase the buying power and size of the market in the area, increase entrepreneurial opportunities due to the needs of construction activities (such as building materials, or foodstuffs), and improve accessibility for local villagers to retail

outlets. New businesses may be established and a general increase in sales could raise the general standard of living in the area.

- Agriculture production and loss of agricultural land

Some agricultural land (mostly existing citrus plantations) will be inundated by the proposed Nwamitwa dam. The financial value of the permanent loss of agricultural land will be calculated during the EIA phase.

- Ownership and land use patterns

The proposed project will require land and servitude acquisition. Both private and traditional authority land will probably be affected.

- Stimulation of income generating activities

The improved ability to manage the water resources in the catchment during operation could stimulate the development of recreational opportunities and tourism related development. This could cause a permanent economic upliftment in the area. Property values.

8.4.1 Property values

Property values and the sale of property during the construction period could be negatively affected due to uncertainty of property owners and potential new property owners of the impacts of the proposed project. Potential new property owners could be deterred from purchasing property or farm land that is near to the site due to the perceived negative impacts of the construction such as safety and security, increased crime, increased population, workers camps, etc.

It is not foreseen that property values will be affected negatively during the operation/maintenance phase. Property values on looking the Nwamitwa Dam could even possibly increase in value.

8.5 PHYSICAL INFRASTRUCTURE

Some existing infrastructure (roads, electricity supply, pipelines, tele-communications, railways, other facilities) could be directly impacted on by the proposed infrastructure development project. Any temporary or permanent disruptions in these services must be mitigated.

Of particular concern are the R529, D1292 and P43/3 will have to be re-aligned to accommodate the dam. This may result in longer distances for villagers, general road users, and citrus farmers who need to transport input requirements and citrus products to and from farming enterprises. Temporary road diversions may also be required to accommodate specific construction activities.

8.6 PUBLIC HEALTH

Instead of having a flowing river, the construction of the dam will result in a standing body of water. Not only is the nature of flow different, but the extent of the water means that the vectors of disease associated with water are now closer to where the people are living (**Figure 3.1**).

Construction workers' situations make them vulnerable to high-risk sexual behaviour. There are ample research results to indicate that there is a direct link between temporary migration and HIV infection. Research also seems to indicate that construction workers might be more at risk of contracting HIV from members of local communities, as opposed to transmitting the infection to community members. An HIV/Aids survey should be carried out before the project and a follow up study once the dam is completed. The study should include the contract workers from and their families who accompany them and advocacy on how to prevent transmission of HIV should be provided. The feasibility of this should be assessed. The United Nations have drawn up guidelines on HIV/Aids and large projects.

The potential benefits of reticulated clean water, with improvements in sanitation and hygiene, as well as those associated with a general increase in the standard of living, are, however, large.

8.7 HERITAGE RESOURCES

Cultural heritage resources are broadly defined as all non-physical and physical human-made occurrences, as well as natural occurrences that are associated with human activity. These include all sites, features and objects of importance, either individually or in groups, in the history, architecture and archaeology of human (cultural) development. The study area is known to have some areas where archaeological sites may occur.

8.8 MINIMISING CONSTRUCTION RELATED IMPACTS

The actual physical construction activities are known to have some very specific impacts in addition to the impacts on the river (**Chapter8.1**), on the terrestrial ecology (**Chapter 8.2**), and on social and economic processes discussed in **section 8.3** and **8.4**. These include increased traffic, noise, and dust.

8.9 OTHER ISSUES

Other issues that have been raised, but not considered key are:

- Water Rights;
- Climate Change; and
- Sedimentation.

8.9.1 Water Rights

Landowners likely to be affected by the proposed dam basin would like to know how their water rights will be affected by expropriation of land for the Government Water Works. This applies firstly to landowners that may lose a part of their farm, but will still be left with a viable piece of land. They would like to know whether they will be able to keep the full current allocation of water that they have. Secondly, many farmers own a few different pieces of land in the area. If they cannot continue to farm on the remainder of land after land acquisition, will they be able to exercise the water allocations currently on land that will be inundated on a completely different piece of

land? This includes surface water abstraction and groundwater. Some farmers have boreholes that may be inundated by the proposed dam that they would like to have replaced.

Some people (emerging black farmers) living in the villages in the area would like to have access to more water than they currently have. They would like to know what the process is for them to apply for this.

These issues are not considered environmental impacts of or on the project, but rather process queries that will be addressed directly.

8.9.2 Climate Change

Both the questions of whether climate change has been taken into account in the formulation of the project and whether the project could have an impact on climate change have been considered.

The concerns around the first aspect relate to possible changes in the availability of water or land use conditions in the region as a result of climate change. If this were to actualize, the impact would be on the flow (hydrology) in the river. Available climate change prediction models have been considered, but different models provide different specific local predictions and all with high levels of uncertainty. The possibility of climate change affecting the flows in the river is therefore accommodated in the hydrological modelling by building in a margin for error in the future predictions, which is common accepted practice.

Secondly, the surface area of the dam will be relatively small in terms of global climate change factors. It is expected that the dam will not have any noticeable impact on the climate of the region.

Climate change will therefore not be studied in further detail in the EIA phase of the project.

8.9.3 Sedimentation

The significance of the impact of changes in sedimentation downstream of the proposed dam was raised as a concern by a stakeholder representing the Kruger National Park. This will be investigated in the Impact Assessment Phase.

9. PLAN OF STUDY FOR EIA

9.1 INTRODUCTION TO THE EIA PHASE

The Scoping Phase of the project focuses on identifying and describing the key issues that require specialist investigations in the EIA (**Chapter 8**). These specialist studies will be undertaken in the EIA Phase of the project. Likely impacts identified will be confirmed and evaluated according to criteria (**Chapter 9.4**) to determine their significance. Mitigation measures to minimize any significant negative impacts and optimized on beneficial opportunities will be proposed.

Alternatives to the proposed project have been fully investigated (**Chapter 4**) and confirm that the proposed project is the preferred option. The specialist studies will therefore only focus on the proposed project and not investigate the alternatives any further.

The Public Participation Process that commenced with the Announcement and Scoping Phase will continue in the EIA Phase (**Chapter 9.5**).

This project is being subject to an internal peer review to be undertaken by Sean O Beirne. Sean has an MSc in Geography and 16 years experience in leading and managing environmental assessments in South Africa, Mozambique and the Russian Federation, the design and implementation of Environmental Management Systems (EMS) for ISO 14001 Certification and post EIA Environmental Management Programmes (EMPs), and applications of Strategic Environmental Assessment (SEA). He has been involved in the peer and external review of major projects in South Africa. Sean is responsible for the peer review of the project.

9.2 SPECIALIST STUDIES

The following specialist studies will be undertaken in the EIA Phase:

- Aquatic Ecology;

- Water Quality;
- Terrestrial Ecology;
- Heritage Resources;
- Social and Landuse Processes;
- Health Impacts;
- Economic Processes;
- Traffic Impacts;
- Visual Impacts;
- Noise Impacts; and
- Air quality.

All specialist studies will be undertaken in compliance with regulation 33(2) of GN 385, and will include:

'(a) details of –

(i) the person who prepared the report; and

(ii) the expertise of that person to carry out the specialist study or specialised process;

(b) a declaration that the person is independent in a form as may be specified by the competent authority;

(c) an indication of the scope of, and the purpose for which, the report was prepared;

(d) a description of the methodology adopted in preparing the report or carrying out the specialised process;

(e) a description of any assumptions made and any uncertainties or gaps in knowledge;

(f) a description of the findings and potential implications of such findings on the impact of the proposed activity, including identified alternatives, on the environment;

(g) recommendations in respect of any mitigation measures that should be considered by the applicant and the competent authority;

(h) a description of any consultation process that was undertaken during the course of carrying out the study;

(i) a summary and copies of any comments that were received during any consultation process; and

(j) any other information requested by the competent authority.'

Any mitigation measures required will be defined for inclusion in the EMP.

In addition to the specialist studies mentioned above, the significance of the impact of changes in sedimentation downstream of the site, resulting from building the proposed dam at the site known as Nwamitwa will be investigated in the Impact Assessment Phase.

9.2.1 Aquatic Ecology

The aquatic ecology specialist study will be undertaken by Veronica Rall from Golder Africa Associates (Pty) Ltd. Veronica Rall is an experienced aquatic scientist with an MSc in Natural Sciences. She has conducted various aquatic ecological studies relating to all the major ecological components associated with fluvial hydro systems (ecological and biotic integrity assessments, species assemblages - fish and invertebrates, population dynamics, Instream Flow Requirement studies, establishment of microhabitat suitability criteria, water quality and quantity

assessments, toxicity and ecological risk assessments, pathway assessments, habitat assessments and functional status assessments) in South Africa and neighbouring countries (Lesotho, Swaziland, Botswana, Namibia and Angola) over the past 12 years.

Information gathered for the Letaba Catchment Reserve Determination Study (DWAF, 2006) is adequate to assess the impacts of the proposed dam on the aquatic fauna of the downstream Groot Letaba River. Available baseline data on the aquatic fauna and riparian vegetation is comprehensive. Some additional information will however be required to assess the impact of the proposed dam on the Nwanedzi River, habitat alteration and destruction within the dam basin and the disruption of longitudinal connectivity. The information provided by the Letaba Catchment Reserve Determination Study (DWAF, 2006) will also be used as basis for the development of a release strategy for the maintenance of the downstream PES for fish, aquatic macro-invertebrates and riparian vegetation components of the concerned aquatic system (as determined during the Reserve Study, DWAF, 2006). This will be conducted with input from the hydrologist in order to ascertain the supply and availability of water for use by the downstream ecosystem.

Table 9.1 Aquatic Ecology Tasks

Timing	Task
July 2007 – August 2007:	Obtain high resolution satellite imagery of the proposed dam's area of impoundment and plan field survey
October 2007:	Conduct a field survey to obtain additional data required Field survey to gather data on the aquatic fauna and riparian vegetation of the Nwanedzi River and the proposed area of inundation, using standard bioassessment protocols Obtain samples for genetic assessments in order to assess the degree of genetic variation in upstream and downstream fish populations
By February 2008:	Liaise with other specialists, especially Hydrologist. Use existing Reserve (DWAF, 2006) as basis for the development of a release strategy for the maintenance of the downstream PES for the fish, aquatic macro-

Timing	Task
	invertebrates and riparian vegetation. Compile and submit draft EIR, pre-construction and construction EMP.
	The Final EIR and EMP will be submitted two weeks after receipt of comments from the client.

9.2.2 Water Quality

Dr Martin van Veelen will undertake the water quality specialist study.

The effect of the proposed dam on water quality will be studied as follows:

- Obtain all available water quality data from the Department of Water Affairs and Forestry's data bank.
- Determine from the data the current water quality as well as an assessment of the natural background conditions.
- Predict the water quality in the dam by means of a mass balance.
- Predict the changes in water quality downstream of the dam by analyzing a future predicted steady-state flow condition.
- Assess the fitness for use of the predicted water quality in terms of the South African Water Quality Guidelines for the uses of the water that have been identified.
- Propose mitigating measures where needed and appropriate.

Previous water quality studies, especially the work that was done to determine the Reserve, will be used to verify the results of the study and to derive the resource quality objectives.

9.2.3 Terrestrial Ecology

The Terrestrial Ecology specialist study will be undertaken by a team from Ecorex lead by Graham Deall. Graham Deall is a terrestrial ecologist and is registered as a botanical scientist with the South African Council of Natural Scientific Professions (SACNASP). He has an MSc in Vegetation Ecology, and has 25 years professional experience in Southern Africa (mostly South Africa, Swaziland and Lesotho). His experience covers vegetation surveys and mapping, conservation evaluation, impact assessment, impact mitigation, vegetation monitoring, range-condition assessment, land-use evaluation and plant-resource assessment. For the past 10 years he has specialised in Terrestrial Ecological studies for Environmental Impact Assessments involving dam-building, radio-tower construction, open-cast mining, township establishment, resort development, irrigation schemes, transmission lines, water supply projects, roads and railways.

Site-specific ecological field surveys and impact assessments will be undertaken for the areas that will be directly affected by construction activities. On-site surveys of flora and fauna will be undertaken in summer from October to February. It will therefore be possible to screen all of the conservation-important plant and animal species potentially present in the directly affected areas, making an assessment of ecological sensitivity more objective. The potential impacts of the proposed development will be more clearly identified, and mitigation measures to reduce impacts defined.

Crucial aspects to be included in field surveys are outlined for each biotic group as follows:

Plants

The nine most significantly threatened plant species potentially present in the project area and which will be carefully searched for during field surveys are listed in **Table** 9.2 with an indication of the most favourable survey time (to co-incide with the flowering season).

Table 9.2: Plant species to be especially targeted during detailed summer surveys

Species	Family	Form	RD Status	Flowering season	Flower colour
Aloe monotropa	Asphodelaceae	Succulent	VU	Sep-Dec	Red
Borassus aethiopica	Arecaceae	Tree	LC	Not important	Not important
Encephalartos transvenosus	Zamiaceae	Tree	STBA	Not important	Not important
Ensete ventricosum	Musaceae	Tree	LC	Not important	Not important
Melinis tenuissima	Poaceae	Grass	LC	Apr-Jun	Not important
Mondia whitei	Apocynaceae	Climber	LC	Oct-Feb	Green/Purple
Oberonia disticha	Orchidaceae	Epiphyte	NT	Feb-Mar	Straw
Siphonochilus aethiopicus	Zingiberaceae	Geophyte	VU	Nov-Dec	Pink/Mauve
Xylopia parviflora	Annonaceae	Shrub	LC	Oct-Dec	Yellow/Green

Stakeholders raised concern that some plants in the study that have importance to local communities could be affected by the project. The terrestrial ecology specialist study will include identifying these plants and their locations, with the assistance of knowledgeable locals from the area, in their specialist study.

Mammals

In order to provide mitigation for potential impacts on mammals, an attempt will be made to confirm the presence of Red Data mammals. The following strategy will be adopted in the remaining non-transformed areas of vegetation:

- Rocky outcrops will be searched for bat roosts, elephant shrews;
- Nocturnal surveys will be conducted to search for hedgehogs, rodents, shrews;
- Drift fence / pitfall traps used in the reptile surveys will be checked for small mammals ; and

- Walk-in traps (e.g. Sherman traps) to be laid in transects through representative habitats; for a minimum of five days.

Birds

In order to provide mitigation for potential impacts on mammals, an attempt will be made to confirm the presence of Red Data bird species. The following strategy will be adopted in the remaining non-transformed areas of vegetation:

- Early morning searches to be conducted along the perennial rivers in order to search for numerous threatened water-associated species;
- As many large trees as possible to be searched for bird of prey nests, particularly along the rivers and in mature woodland; and
- Representative transects will be walked through all relevant habitats and all bird species heard and seen will be recorded.

Reptiles and Amphibians

The presence of threatened, endemic and protected reptiles and amphibians will be confirmed in order for impacts to be mitigated. The following sampling techniques will be used:

- a proportional number of drift fences combined with pit-fall traps will be constructed in each major vegetation type;
- nocturnal searches will be conducted between October and January (calling season of Pyxicephalus adspersus); in order to optimise likelihood of finding the bullfrogs, the searches will be conducted soon after heavy rains; and
- Likely reptile habitat, such as large rock slabs, will be surveyed during the day for resting reptiles.

Invertebrates

Field surveys for invertebrates will include night-time searches with ultraviolet light for the protected scorpions, especially the three predicted Hadogenes species, as presence/absence of Hadogenes can only be reliably ascertained by using this

technique. Daytime searches for these and all other protected scorpion species will also be carried out.

A combination of pitfall trapping and day-time searches will be used to confirm presence/absence of the protected beetle and spider species and surveys will be carried out during the wet summer months (November-March).

Visual searches and netting will be required to survey dragonfly, damselfly and butterfly populations. However, non-overlap of flight periods of the butterflies (September-November for Wolkberg Widow and Lotana Blue, November-December for Stevenson's Copper, December-January for Wolkberg Zulu and February-March for Swanepoel's Brown) would lead to a requirement for at least three intensive surveys. Since all of the seven predicted Red Data Odonata and Lepidoptera species are only likely to occur well to the west and upstream of the proposed dam, and are therefore not likely to be impacted in any way, surveys will not be carried out for these species.

The EMP will include an appropriate invertebrate biodiversity-monitoring programme, including the description of baseline assessments of selected indicator taxa (e.g. Dromica spp.) that must be undertaken prior to any development of the site.

9.2.4 Heritage Resources

Dr Johhny van Schalkwyk will undertake the heritage resources specialist study. He has been working at the National Cultural History Museum, Pretoria, for the past 29 years. During that time he has actively done research in the fields of anthropology, archaeology, museology, tourism and impact assessment. This work was done in Limpopo Province, Gauteng, Mpumalanga, North West Province, Western and Northern Cape, Botswana, Zimbabwe, Lesotho and Swaziland. Based on this work, he has curated various exhibitions at different museums and has published more than 60 papers. During this period he has done more than 400 impact assessments (archaeological, anthropological and social) for various government departments and developers. Projects include roads, pipelines, dams, mining, water purification works, historical landscapes, refuse dumps and urban developments.

The study will be undertaken in compliance with National Heritage Resources Act (Act No. 25 of 1999), with special reference to Section 3. The heritage resources specialist survey the area to potentially be affected by the proposed development, identify and evaluate any sites, features and objects of cultural significance located in the area.

The impact of the proposed development on the sites or cultural material will be considered, and recommendations on steps to be taken prior to development will be made. These range from:

- High, where it would have a "no-go" implication on the project regardless of any mitigation;
- Moderate, where the impact could have an influence which will require modification of the project design or alternative mitigation;
- Low, where the impact will not have an influence on or require to be significantly accommodated in the project design, i.e. where no mitigation is required.

The significance of the sites, features and objects are determined by means of their historical, social, aesthetic, technological and scientific value in relation to their uniqueness, condition of preservation and research potential. It must be kept in mind that the various aspects are not mutually exclusive, and that the evaluation of any site is done with reference to any number of these.

The methodology includes:

- Survey of the literature

  A survey of the available literature would be done in order to review previous research and to determine the potential of the area.

- Data bases

Various databases would be consulted. Locally, these would include the Archaeological Data Recording Centre (ADRC), housed at the National Cultural History Museum, Pretoria and the Environmental Potential Atlas.

- Other sources

  The topocadastral and other maps would be studied. Similarly, aerial photographs, if available, would be studied. Local knowledge, e.g. people working in museums or at universities would also be accessed.

The total area would be inspected. Normally, a number of parallel transects would be walked over the site and all sites, features and object identified would be recorded. Special attention would be given to archaeological sensitive areas, e.g. outcrops (for stone walled sites and rock engravings), hills (for settlements and rock shelters), river banks (for Iron Age settlements), etc.

All sites, objects and structures that are identified are documented according to the general minimum standards accepted by the archaeological profession. Coordinates of individual localities are determined by means of the Global Positioning System (GPS) and plotted on a map. Map datum used (locally): Hartebeeshoek 94 (WGS84).

Mitigation of heritage sites that will be destroyed or damaged during development generally involve documentation (photographing and mapping) and, or excavation. An important part of mitigation of sites in the development area that will not to be damaged or destroyed during development is preparation of a heritage resources management plan. The plan will contain recommendations on the management of the objects, sites or features, and will also provide guidelines on procedures to be implemented if previously unidentified cultural resources are uncovered during later developments in the area. The EIA will only include the specification of mitigation measures for sites found during the survey, but no application of this mitigation.

During the public participation process Mr Ramalepe from the BaKgaga BaMaupa Communal Property Association expressed concern about what will happen to ancestral graves, ruins and other places of importance, such as places of worship in

the project area that could be submerge by the dam or impacted on by the construction activities. Mr van Schalkwyk will liaise with Mr Ramalepe to find out the location of the sites mentioned.

9.2.5 Social and Landuse Processes

Anita Bron of MasterQ research will undertake the social and Landuse impact assessment. She has a Masters degree in Research Psychology focussing on Environmental Psychology. She specialises in Social Impact Assessments, Social Marketing Research and Monitoring and Evaluation. She has completed Social Impact Assessments for developments such as transmission power lines, distribution lines, pipelines, mines, and substations. As part of her Social Impact Assessments, she also addresses impacts on health and safety, tourism and socio-economy. She reviewed a SIA for a multi products pipeline. She is a guest lecturer at the University of Johannesburg and lectures post graduate classes on information gathering and focus groups. She is currently completing a Masters degree in Social Impact Assessment at the University of Johannesburg. She is a member of SAMEA, the South African Monitoring and Evaluation Association.

The recommended studies in order to assess the impacts on the social processes are:

- Assess the relative socio-economic impacts of three possible Purchase Lines based on three possible Full Supply levels (0.5 MAR, 1 MAR and 1,5 MAR) in order to inform the decision of the size of the dam (this part of the investigation will be undertaken during the Scoping Phase in order to inform the decision on the size of the dam);
- assess the impacts on the demographics of the directly affected communities;
- assess the potential impact of displacement and resettlement;
- assess information on the construction, maintenance and decommissioning activities, timeframes, workforce, and potential to employ and train local people;

- assess the service delivery capacity of municipalities during construction and operation;
- propose a process of implementing local employment mitigation measures;
- compare the potential impacts of housing workers in the communities vs. a construction village;
- assess how the project might impact on spatial development plans;
- asses the loss of agricultural land and changes in agricultural activities during construction and operation;
- assess potential safety and health impacts;
- assess community attitudes towards as well as understanding of and expectations from the project;
- assess the impacts of the proposed land acquisition process; and
- Assess impacts on cultural landscape, sense of place, movement patterns.

Data collection methods will include:

- Participant Rural Appraisal which will include focus groups, interviews, and observation;
- Interviews with municipal and the DWAF officials, as well as project managers;
- Case studies of dams in a similar context; and
- Desktop research, including assessment of the Issues and Response Register, and other specialist reports.

9.2.6 Public Health Impacts

The Health Impact Assessment will be undertaken by Margot Saner and Andrew Dickson of Margor Saner and Associates (Pty) Ltd. Ms Margot Saner and Mr Andrew Dickson are Certified Occupational Hygienists (COH), registered with the Southern African Institute for Occupational Hygiene (SAIOH). In order to register as a COH it is required that persons have a minimum Masters with a 4 year qualification and a minimum of 5 years field experience. Ms Saner has 30 years of experience and Mr Dickson has 12 years in Occupational Hygiene, Environmental modeling and Environmental consultancy. At Present Margot Saner and Associates services more than 100 companies with sound assessments and management plans.

The Public Health Impact Assessment Specialist will focus on possible public health impacts that may be caused, aggravated or improved by the project and its operation. These could be direct effects associated with water supply and quality, or indirect effects such as those of immigration and employment, in the context of the existing human population, its health problems, and health services. The geographical area that will be considered in this specialist study will be limited to the Groot Letaba River catchment.

Baseline characterisation

The Public Health Impact Assessment specialist will provide a brief overview of the common health problems in the project area and the current capacity of existing health facilities and services in the area. The focus of the Specialist study will be:

- To determine the approximate number and general state of health of the construction and maintenance workers;
- To determine the approximate number and general state of health of the surrounding community;
- To determine possible health effects of being on site for the construction and maintenance workers;

- To determine possible health effects due to the presence of the construction and maintenance workers on the community;
- To determine how sanitation, housing, the provision of safe drinking water, bulk infrastructure and unauthorised connections will be managed for the construction workers;
- To determine how construction activities will cause changes to the environment and the indirect impact can be expected on the health of construction and maintenance workers and the community, including dust and litter;
- To determine possible health impacts as a result of water pollution caused by agriculture and other industrial activities; and
- To determine possible health impacts and issues surrounding water-related diseases that may be influenced by the project, including malaria, bilharzia and sanitation related diseases.

Impact Assessment

The major issues to be considered in the impact assessment are:

Construction Phase

The will examine the specific health risks associated with construction, such as:

- Transmittable diseases from construction and maintenance workers to the community;
- Transmittable diseases from the community to the construction and maintenance workers;
- Impacts of construction activities on workers. These include, dust, noise, operation of heavy machinery and traffic, including accidents at the sites or on the roads;
- Impacts of construction activities on the community. These include, dust, noise, effects of operation of heavy machinery and traffic, including accidents at the sites or on the roads; and

- How safety issues will be communicated to communities.

Operational Phase

The study will examine the following specific health risks associated with the operational phase:

- Changing water levels in operational phase. The shoreline will be exposed as water levels drop. The effect of the substrate, clay or sand has the potential to affect community health;
- The change from a flowing river to a large body of water will affect the community in terms of water-borne diseases, such as bilharzia and malaria; and
- The positive effects of a supply of clean high-quality water on the health of the community should also be investigated.

Health Management Plan

The feasibility of a HIV/AIDS and screening programme for construction and maintenance workers will be investigated.

Conclusion

The specialist recognises that it is primarily the responsibility of the Department of Health to investigate and mitigate public health issues. However, as this project may, in specific areas, increase or otherwise accentuate specific health related problems, the specialist needs to briefly highlight these areas and recommend mitigation measures. Responsibility for implementation may be vested with the project proponent or another organ of State in the spirit and practice of co-operative governance.

9.2.7 Economic Processes

Kayamandi (Pty) Ltd will undertake the economic processes specialist study.

Russell Aird is the Managing Director of Kayamandi Development Services (Pty) Ltd. He has 20 years experience in the fields of urban economics, economic development,

rural development, housing development, industrial sector expansion, and socio-economic development and water transfer schemes. Russell has been involved in numerous water related projects, especially water augmentation schemes, where his speciality has been determining the social and economic impacts of dams and pipelines as well as the impact on the donor and receiving populations and economy. Projects he has been involved in include the Orange Vaal Augmentation Planning Study (VAPS), Vaal River Eastern Sub-System Augmentation, Orange River Re-planning, Olifants River Water Resources Development Project and Hartebeestpoort Industrial Water Pipeline. Russell is also the project manager for a multi year project, to provide Business Support to DWAF for the Development of Management Interfacing and Socio-Economic Systems. Due to the multi dimensional nature of development projects Russell has evolved into a competent project manager and has successfully undertaken numerous studies and coordinated various projects of a multi-sectoral nature.

Nanja Churr has a degree in Town and Regional Planning and has done training in Canada in the fields of Regional Planning and Economic Investment Analysis, the theory of economic development, and the practice of Economic Development. She has extensive experience in the field of socio-economic development of communities, inclusive of the dynamic impacts associated with urban frameworks and infrastructure development/upgrading, as well as in conducting economic profiles and complimentary analysis and interpretation. Nanja has been involved with numerous economic frameworks, development plans, urban revitalisation studies, integrated development planning, local economic development plans, socio-economic research, macro-economic analysis, feasibility studies and business plan development and economic impact studies. Her experience in socio-economic impact studies includes impact studies for mines, pipelines, dams, roads and other infrastructures.

The purpose of the economic impact assessment study is to:

- define and describe the receiving environment (local, regional, broader, etc) from an economic perspective, and to identify, analyse and in detail to assess the opportunities and constraints arising from or potentially limiting the proposed project;

- assess the development impact of the proposed project on the economy of the region (including the improvement of the tax base), which will form an important component for establishing the overall feasibility of the Project; and

- quantify the impact of the proposed project on GGP, new business sales, employment, income generation; loss of resources, and personal income.

The various measures of direct economic impacts include:

- Total employment which reflects the number of additional jobs created by economic growth. This is the most popular measure of economic impact because it is easier to comprehend than large, abstract Rand figures. The total employment can be interpreted in terms of generally accepted definitions of job creation.

- Aggregate personal income rises as pay levels rise and/or additional workers are hired. Either or both of these conditions can occur as a result of business revenue growth. As long as nearly all of the affected workers live in the study area, this is a reasonable measure of the personal income benefit of a project or program.

- Value Added (which is normally equivalent to Gross Domestic Product or Gross Regional Product) is a broader measure of the full income effect. This measure essentially reflects the sum of wage income and corporate profit generated in the study area. However, in today's increasingly global economy, value added can be an overestimate of the true income impact on a local area, insofar as it includes all business profit generated there.

- Business Output (also referred to as revenue or sales volume) is the broadest measure of economic activity, as it generates the largest numbers. It includes the full (gross) level of business revenue, which pays for costs of materials and costs of labour, as well as generating net business income (profits).

- Property Values are also a reflection of generated income and wealth. When property values rise in a community as a result of increasing demand for

property that may be a direct consequence of increasing aggregate personal income or investment of business profits.

Information required will largely be accessed from site inspections, interrogation of maps and aerial photographs, technical discussions and meetings with local role players and stakeholders. Use will be made of existing databases and results from existing studies wherever possible.

Inception and delineation of study area

An assessment needs to be made on the current state of the economy in the project area. In order to undertake this study it would be essential to undertake a site visit in order to obtain key primary data and to delineate the study area.

For the purpose of economic analysis, a delineation of the study area is required. The study area and areas of impact need to be delineated into primary (local), secondary (surrounding area of impact) and tertiary area of investigation (broader area and International such as Mozambique). The primary area refers to farm areas and settlements directly affected by the dam and the length of area on which the proposed pipeline and related dam infrastructure will be located. The surrounding areas and communities/villages refer to the secondary area of investigation and the tertiary area of investigation refers to the broader area, major towns, municipal areas and District that will be economically impacted.

Base profile

To determine the potential economic impact that the proposed project will have on the region, it is necessary to compile a base profile of the study area. The data attained here will need to form the baseline data to be utilised in an input/output model. The profile will include economic structure, identification of sectoral development opportunities according to the SIC, sectoral production, economic base, employment, growth, potential, trends per sector (especially agriculture and tourism), specialisation, linkages and comparative advantages.

Impact Modelling and assessment

During scoping the following economic impacts, which need to be considered and quantified in this study, were identified:

- Economic effect
- Employment
- Business output and sales
- Government income and expenditure
- Standards of living
- Agriculture production and loss of agricultural land
- Ownership and land use patterns
- Stimulation of income generating activities
- Property values

The input-output model will be utilised to quantify the impact. The model will take cognisance of all the economic gains and losses. An assessment (quantitative and qualitative) is therefore required of the economic impacts.

The potential impact that will be incurred should there be some undue delay in the implementation of the proposed project should also be included. This implies the opportunity costs need to be determined.

The identified impacts need to be assessed in terms of nature, extent, duration, intensity, frequency of occurrence, probability, and will include reference to both positive and negative impacts during both operation and construction.

The current values of the impacts need to be calculated as well as the exact location and timing of the impacts. The techniques to be used to calculate the current value will depend on the nature of the particular element (e.g. gross margin per hectare in the case of irrigation land). Depending on the nature of the particular element, this

current value should be discounted over a certain period at a certain rate to arrive at the relocation or compensation costs.

Cognisance should also be taken of direct growth expectations and indirect growth expectations.

Impact and management measures reporting
Management and mitigation options that identify alternative ways of meeting needs, bringing about changes in plans, improving monitoring and management, and improving negative perceptions will be defined.

The specialist study will include:

- Economic baseline data (qualitative and quantitative);
- Positive and negative quantification of economic impacts, issues and aspects covering nature, extent, duration, intensity, frequency of occurrence, probability, and legal requirements (where applicable);
- Management plan to guide the development and maximize positive economic impacts and minimize negative economic impacts; and
- Recommendations: key interventions required to address risks and meet economic needs.

9.2.8 Traffic Impacts

Bert de Vries of ILISO Consulting will undertake the traffic specialist study. Bert is a registered professional engineer and specialises in traffic and transportation planning. He has been involved in a variety of Traffic Impact Assessments for major developments and environmental impact assessments. He has 30 years of traffic and transportation experience on projects in the Western and Eastern Cape, Gauteng and Swaziland.

The TIA will address the impact during construction and after completion of the dam. The TIA will investigate the effects of the relocation of roads on local travel around the dam.

Data Collection

Existing traffic information will be collected on the road network surrounding the dam, R71, P433 and the district roads which form part of the road network affecting the Nwamitwa Dam.

The traffic surveys will be undertaken to compliment the existing traffic data. Classified traffic counts will be undertaken from 06:00 – 18:00. In addition to traffic counts, vehicle occupancy counts will be undertaken to establish the number of person trips affected by the relocation of the roads.

Pedestrian and other non-motorised traffic will be surveyed. Limited origin and destination surveys might be undertaken for pedestrian and other non-motorised travel to determine the in- or decrease of travel distance between their origins and destinations.

Construction information will be collected to determine the flow of persons, goods and materials during construction. Furthermore the use of the dam for other than for bulk water uses will be ascertained, which might generate traffic after completion of the dam.

Road network information, road width and surface conditions as well as pavement management information will be collected to establish whether construction traffic could damage roads to be used for construction purposes.

Traffic Generation

Traffic generated by the dam will be determined from construction information. Traffic generated by the dam after construction might be minimal depending on activities, other than water storage, that will be allowed.

Traffic Impact

The traffic impact will be assessed during construction and after completion of construction for the normal daily traffic conditions.

The impact on travel of people in the area surrounding the dam will be assessed in relation with the road relocation programme.

The impact of increased heavy vehicular traffic on the road pavement and road structure will be assessed.

Mitigation

Mitigating measures will be proposed to minimise the impact of the dam if require.

9.2.9 Visual Impacts;

Karen James from Insite will undertake the visual impact assessment. Karen has a Bachelor's degree in Architectural Studies and an Honours degree in Landscape Architecture. She has been involved in governmental, commercial, retail and industrial development, master planning, environmental impact assessments (EIAs) and planning, as well as residential estate design projects. She works for Insite Landscape and Environmental Consultants and has compiled a number of Individual Visual Impact Assessments for previous Gautrain EIAs. These assessments were conducted over the proposed Northern and Southern Variants of the Gautrain Rapid Rail Link and included full Visual Analyses, with substantial visual graphics, Study Reports, as well as summaries for Proposed Mitigation techniques.

Basic Premises

There is a strong correlation between ecologically healthy landscapes and scenically intact landscapes and it is for this reason that the importance of the quality of our visual environment is of significant concern. At times when a 'visual resource' has to compete with the exploitation of the other resources of our country or region, or when infrastructure or development is imposed on the existing landscape, it is very often the scenic quality and character of that landscape that is diminished. It is the therefore the objective of a Visual Impact Assessment (VIA) to investigate and recommend a visual resource management system (VRM) that will identify the significance of and furthermore protect the quality of a visually positive environment.

The visual impact study is to be included to some extent in the Environmental Impact Assessment (EIA) that will focus on the proposed construction of a major dam on the farm Janetsi, an area which lies within the Groot Letaba River at the confluence of the Nwanedzi River.

A Visual Impact Assessment (VIA) will provide the project with a system of applying management policies to scenically important areas. These areas will be identified and geographically delineated according to their assessed qualitative attributes and sensitivity to viewing. Such a system will serve then as a management and decision-making tool for land managers, developers, engineers and decision-makers.

Terms of Reference

The terms of reference for this study are the following:

- Sketches and plans will be used in describing the components of the intended development as well as the study area.
- The landscape setting in which the dam development is proposed to lie will be described.
- The boundaries of the viewshed will be illustrated on a plan. This will also identify the critical surrounding land uses and view lines exposed to the view of the various structural and mechanical components.
- The change in the visual setting for each identified land use zone shall be analyzed and appropriately illustrated.
- The significance of the visual impact for each land use zone will be assessed according to a set of defined criteria.
- The impact significance for each land use zone or view line will be presented in the form of a table summary for ease of reference.
- Specific mitigation measures for each identified zone will be recommended, and their effectiveness in reducing a negative visual impact established.
- The assessment will investigate and address the visual impacts of the new dam in its various phases of construction and after its completion.

9.2.10 Noise Impacts

Derek Cosijn will undertake the noise specialist study. Derek is a professional engineer registered with the Engineering Council of South Africa (ECSA), a fellow of SAICE, a member of the Southern African Acoustics Institute (SAAI) and is a certified Environmental Assessment Practitioner (EAP). He is a partner with Jongens Keet Associates and Calyx Environmental cc. He has had 39 years of professional experience over a wide range of civil engineering, transportation planning, environmental and acoustic engineering projects. His area of special expertise is environmental noise (acoustical engineering). The environmental projects have ranged through EIAs and noise impact assessments, policy formulation and procedural guideline development. He has worked with a wide client base, ranging from the National Department of Transport, Provincial transportation/road authorities, Provincial environmental authorities, the metropolitan authorities and many local councils, to private organizations, and has also worked in Canada.

Noise Impact Assessment

i) A sufficiently detailed quantitative (by measurement) and qualitative assessment is to be undertaken within the area of influence of the planned Groot Letaba River Water Development Project (GLeWaP) in order to enable a full appreciation of the nature, magnitude, extent and implications of the potential noise impact.

ii) The noise impact assessment is to focus on the construction and operational noise impacts of proposed dams, the planned pipelines and related pump stations, and required appurtenant works.

iii) The level of investigation is to that of an environmental impact assessment (EIA).

iv) All aspects of the investigation are to conform to the requirements of relevant environmental legislation and noise standards.

v) The potential impacts of the pre-construction, construction and operational phases of the project are to be assessed.

vi) Where relevant, appropriate noise mitigating measures are to be identified. These need only be conceptual at this stage.

vii) There will be no direct involvement by the noise specialist in the public involvement programme.

9.2.11 Air quality

The air quality specialist study will be undertaken by Airshed. Reneé Thomas is an air quality consultant and has six years of experience in the field of air pollution impact assessment and air quality management. She was part of the Highveld Boundary Layer Wind Research Group based at the University of Pretoria. At Airshed Planning Professionals (previously Environmental Management Services) she has undertaken numerous air pollution impact studies and has provided extensive guidance to both industry and government on air quality management practices. She is currently completing her masters in micrometeorology. She has six years experience in conducting air quality impact assessments for a wide range of industries including: pulp and paper industries, pelletizer operations, refineries, cement operations, incinerators, chromium chemical operations, power stations, iron and steel industries, platinum industry, mining, cement industries, chlorine industries, ferro-silicon industries and fertilizer plants.

The following tasks will be undertaken:

Baseline Characterisation

Determine the regional climate and site-specific atmospheric dispersion potential, including:

- Analysis of meteorological data (from the nearest weather station to the site); and,
- Characterisation of ambient air quality and dustfall levels in the region based on available data recorded to date in the region (if available).
- Identification of the potential sensitive receptors within the vicinity of the proposed site.
- Identification of existing sources of dust emissions in area.
- The legislative and regulatory context for South Africa (also likely to include reference to the World Bank guidelines, the World Health Organisation and the European Community).

Impacts Assessment

The impacts assessment will include:

Construction Phase:

- Compilation of an emissions inventory, comprising the identification and quantification of sources of emission.
- Dispersion simulations of ambient respirable particulate concentrations and dust fallout from the construction activities for the proposed dam.
- Analysis of dispersion modelling results from both construction phases of the proposed dam, will include:
- Determine zones of maximum incremental ground level impacts (concentrations and dust fallout); and,
- Evaluation of potential for human health and environmental impacts.

Operational Phase:

A qualitative assessment of the proposed air quality due to the operation of the proposed dam.

Dust Management Plan

Development of a dust management planning component for the construction phase comprising of the following:

- Source prioritisation based on source contributions to total emissions and air quality related impact potentials;
- Identification of cost-optimised mitigation and management measures for priority sources;
- Determination of suitable timeframes, responsibilities, performance indicators and targets for selected mitigation and management measures;
- Development of a suitable ambient monitoring network, to fulfil the following functions:
- On-going characterisation of ambient air quality levels;
- Demonstrate the level of compliance with relevant air quality guidelines and standards, and deposition levels;
- Track progress of emission reductions measures being implemented; and,
- Provide early warning of adverse external impacts.

- Recommendation of emission controls and management measures to be taken into account in the project design phase in order to minimise the potential for air quality impacts.

9.3 ENVIRONMENTAL IMPACT REPORT

Once the specialist investigations have been completed and the findings and recommendations integrated by the team, an Environmental Impact Report will be prepared according to Government Notice R385, Section 32 (2) and will include the following:

- A description of the EAP who prepared the report;
- A detailed description of the proposed activity and route;
- A description of the environment that may be affected;
- A description of the PPP that was undertaken;
- A description of the need and desirability of the project and details of the alternatives that were investigated;
- Findings and recommendations of specialist studies;
- An indication of the method used to identify significance;
- A comparative assessment of all alternatives;
- An assessment of each potentially significant impact;
- An opinion of whether the activity should be authorised or not, and if is should be authorised, and conditions that should be made in respect of the authorisation;
- An Environmental Impact Statement; and
- A draft Environmental Management Plan.

9.4 ENVIRONMENTAL MANAGEMENT PLANS

Environmental Management Plans

A draft pre-construction Environmental Management Plan (EMP) and a generic construction EMP will be compiled and included in the Environmental Impact Assessment Report. The overall objective of these EMPs will be to present a workable document that explains how to operate and implement environmental protection requirements for construction. An EMP for the operational phase will not be included.

The EMP will contain and address the following aspects:

- Roles and responsibilities will be defined.
- Environmental specifications that are applicable to the project and its associated activities will be set out and will provide guidance in order to achieve these environmental specifications.
- Defining corrective actions which must be taken in the event of non-compliance with these environmental specifications.
- Specifying requirements and procedures for monitoring, auditing and reporting.
- Specifying requirements and procedures for record keeping.
- Acting as a monitoring and auditing reference tool for ensuring compliance with the provisions of the EMP.
- Making provision for review of the EMP.
- Defining how the management of the environment is reported and performance is evaluated.
- Specifying compliance with all applicable laws, regulations, standards and guidelines for the protection of the environment.

- Adopting the best practicable means available to prevent or minimise adverse environmental impacts.
- Describing all monitoring procedures required to identify impacts on the environment.
- Encouraging continual improvement of environmental performance.
- Facilitating the training of employees and contractors with regard to environmental obligations.

9.5 IMPACT ASSESSMENT METHODOLOGY

The key issues identified during the Scoping Phase informed the terms of references of the specialist studies summarised above. Each issue consists of components that on their own or in combination with each other give rise to potential impacts, either positive or negative and from the project onto the environment or from the environment onto the project. In the EIA the significance of the potential impacts will be considered before and after identified mitigation is implemented.

A description of the nature of the impact, any specific legal requirements and the stage (construction/decommissioning or operation) will be given. Impacts are considered to be the same during construction and decommissioning.

The following criteria will be used to evaluate significance:

Nature

The nature of the impact will be classified as positive or negative, and direct or indirect.

Extent and location

Magnitude of the impact and is classified as:

- **Local**: the impacted area is only at the site – the actual extent of the activity

- **Regional**: the impacted area extends to the surrounding, the immediate and the neighbouring properties.

- **National**: the impact can be considered to be of national importance.

Duration

This measures the lifetime of the impact, and is classified as:

- **Short term**: the impact will be for 0 – 3 years, or only last for the period of construction.

- **Medium term**: three to ten years.

- **Long term**: longer than 10 years or the impact will continue for the entire operational lifetime of the project.

- **Permanent**: this applies to the impact that will remain after the operational lifetime of the project.

Intensity

This is the degree to which the project affects or changes the environment, and is classified as:

- **Low**: the change is slight and often not noticeable, and the natural functioning of the environment is not affected.

- **Medium**: The environment is remarkably altered, but still functions in a modified way.

- **High**: Functioning of the affected environment is disturbed and can cease.

Probability

This is the likelihood or the chances that the impact will occur, and is classified as:

- **Low**: during the normal operation of the project, no impacts are expected.

- **Medium**: the impact is likely to occur if extra care is not taken to mitigate them.
- **High**: the environment will be affected irrespectively; in some cases such impact can be reduced.

Confidence

This is the level knowledge/information, the environmental impact practitioner or a specialist had in his/her judgement, and is rated as:

- **Low**: the judgement is based on intuition and not on knowledge or information.
- **Medium**: common sense and general knowledge informs the decision.
- **High**: Scientific and or proven information has been used to give such a judgement.

Significance

Based on the above criteria the significance of issues will be determined. This is the importance of the impact in terms of physical extent and time scale, and is rated as:

- **Low**: the impacts are less important, but may require some mitigation action.
- **Medium**: the impacts are important and require attention; mitigation is required to reduce the negative impacts
- **High**: the impacts are of great importance. Mitigation is therefore crucial.

Cumulative Impacts

The possible cumulative impacts will also be considered.

Mitigation

Mitigation for significant issues will be incorporated into the EMP for construction.

Table 9.3: Example of Impact Assessment Table

Description of potential impact		
Nature of impact		
Legal requirements		
Stage	Construction and decommissioning	Operation
Nature of Impact		
Extent of impact		
Duration of impact		
Intensity		
Probability of occurrence		
Confidence of assessment		
Level of significance before mitigation		
Mitigation measures (EMP requirements)		N/A
Level of significance after mitigation		N/A
Cumulative Impacts		
Comments or Discussion		

9.6 PUBLIC PARTICIPATION IN THE IMPACT ASSESSMENT PHASE

After the Scoping Phase, a detailed Environmental Impact Assessment will be carried out and an Environmental Impact Assessment Report (EIAR) prepared.

The purpose of the public participation process during the Impact Assessment Phase is to ensure that the Environmental Impact Assessment Report (EIAR) is made available to the public for comments. I&APs will comment on the findings of the EIA,

including the measures that have been proposed to enhance positive impacts and reduce or avoid negative ones. Once the review is completed, the authority may decide to request additional information on matters that may not be clear from the report, authorise the application with certain conditions to be complied with by the applicant or reject the application. An Environmental Authorisation reflecting the decision of the authority as well as any conditions that may apply will be issued to the applicant.

I&APs will be advised in good time of the availability of these reports, how to obtain them, and the dates and venues of public and other meetings where the contents of the reports will be presented for comment.

Public participation activities during the impact assessment phase of the EIA will revolve mainly around a review of the findings of the EIA, presented in the Draft Environmental Impact Report (EIR), a Summary Report of the Draft EIR, and the volume of Specialist Studies.

NB: The public participation process and scheduling suggested for the Impact Assessment Phase are provisional, since the Scoping Phase often points the way to the process that should be followed during the Impact Assessment Phase.

9.6.1 Progress Feedback

At the beginning of the Impact Assessment Phase (January 2008), all stakeholders on the database will receive a personalised letter to report on progress to date, to thank those who commented to date, and to outline the next steps in the process. They will again be offered the proceedings of the public meetings (held in October 2007) for their information, and will be advised that the Final Scoping Report had been handed to the authorities for approval that the Specialist Studies may proceed.

As part of the on-going communication process, every comment received from an I&AP will be responded to by way of a personalised letter of appreciation, indicating what will happen to the comment, e.g. will be taken up in the Specialist Investigations, etc. The broader body of stakeholders will continue to be informed of progress with

the Specialist Studies and the EIA and asked for their inputs on an ongoing basis up to the record of decision by the authorities.

9.6.2 Draft EIR and Summary Report

Findings of the environmental investigations will be integrated by the environmental consultants and captured in a Draft Environmental Impact Report (EIR). The report will include the Issues/Response Report, which will list every issue raised with an indication of where the issue was dealt with in the technical evaluations, and the relevant findings. It will also include a full description of the EIA process, including the necessary appendices.

A summary of the Draft EIR (probably around 25 pages) will be prepared for those I&APs that have neither the time nor the inclination to review the full EIR and the Specialist Studies. It will contain an abridged version of the full EIR, with emphasis on the findings, conclusions and recommendations. It must be noted that it is never possible in such a summary to provide the full reasoning behind all statements, findings, conclusions and recommendations. I&APs will be referred back to the full EIR report, which will be available in public places, for further information.

Announcement of opportunity to comment on findings

The availability of the Draft EIR and the Summary Report, as well as the comment period and the deadline for comment, will be announced by the following methods:

- Personalised letters to all individuals and organisations on the mailing list
- Posters at selected public places to announce the opportunity to comment
- Paid advertisements in the local and regional media
- Radio announcements on local radio stations (three languages).

Distribution

The full Draft EIR, including its Summary, the Issues and Response Report and the volume of Specialist Studies, will be left in public places (see Table 9 – same as the

public places used for the Draft and Final Scoping Reports) in the study areas where the broader public can have access to it, and will be on display at meetings with stakeholders.

Only in special cases, such as the decision-making and commenting authorities, will the full sets of reports be distributed. The Draft EIR alone, and individual Specialist Studies will, however, be distributed to stakeholders that specifically request them.

However, the Summary of the Draft EIR will be widely distributed, as follows:

- Mailed to those that request it, in the language of their choice
- Mailed to everyone registered to attend public meetings
- Be available for further distribution at the public meetings
- Personally handed to stakeholder leaders during meetings
- Be placed on the Web site.

Methods of public review

Public review of the Draft EIR will be by the following methods:

- Written comment, including email – a comment sheet asking I&APs to respond to particular questions will accompany the report; further written submissions will be encouraged
- Verbal comment during public meetings – see below
- One-on-one discussions with the EIA team members subsequent to the public meetings.

I&APs will be asked to keep the following in mind when reviewing the findings of the EIA:

- Verify that the issue(s) they have raised during the Scoping Phase have been considered in the report

- If the issue is not specifically considered in the report, verify that an indication has been provided of where and when it will be addressed

- Indicate which of the findings they agree with, and which not

- For those of the findings that they do not agree with, they will be asked to provide reasons and supporting information, or at least the sources where such information can be obtained. They are also welcome not to agree because of personal preference.

Public meetings

Similar to the scoping phase, three public meetings (table 6) will be convened to assist stakeholders to comment on the findings of the investigations.

Final EIR and its supporting reports

The Final EIR and its supporting reports will incorporate public comment received on the Draft EIR, and will be distributed mainly to the authorities and key I&APs. No summary of the Final EIR is foreseen.

Progress feedback

After the last round of public meetings, stakeholders will be informed by way of personalized letter that the Final EIR has been submitted to the authorities for decision-making, and approximately when the decisions can be expected.

9.6.3 Notification of the Environmental Authorisation

Once the authority's environmental authorisation has been issued, all stakeholders will receive a letter (within 7 days) and be advised of the appeals period, and thanked for their contributions during the environmental authorisation process.

After the Scoping Phase, a detailed Environmental Impact Assessment will be carried out and an Environmental Impact Report (EIR) prepared. This report will contain

descriptions of each feasible alternative to the process under consideration, an assessment of the environmental impacts of these alternatives, determination of the significance of the impacts, mitigation measures proposed to lessen the impacts. There will also be a section addressing the issues raised during scoping and a comparative assessment of the feasible alternatives.

The purpose of the public participation process during the Impact Assessment Phase is to ensure that the Environmental Impact Report (EIR) is made available to the public for comments. I&APs will be afforded an opportunity to verify that their issues have been considered either by the EIA Specialist Studies, or elsewhere. Also, I&APs will comment on the findings of the EIA, including the measures that have been proposed to enhance positive impacts and reduce or avoid negative ones. Once the review is completed, the authority may decide to request additional information on matters that may not be clear from the report, authorise the application with certain conditions to be complied with by the applicant or reject the application. An Environmental Authorisation reflecting the decision of the authority as well as any conditions that may apply will be issued to the applicant.

I&APs will be advised in good time of the availability of these reports, how to obtain them, and the dates and venues of public and other meetings where the contents of the reports will be presented for comment.

9.7 PROGRAMME

The EIA process commenced with a pre-application consultation with DEAT in March 2007. This was followed by a technical site visit, after which the application form was completed and submitted. The project announcement and public participation for the scoping phase took place during August 2007. The Draft Scoping Report has now been compiled and will be available for public comment from 15 September 2007 to 15 October 2007.

All the comments on the Draft Scoping Report will be considered and incorporated to produce a final Scoping Report for submission to DEAT in November 2007. Once the

DEAT has reviewed and responded to this report, the specialist studies can be concluded and the Draft Environmental Impact Assessment Report compiled.

The draft Environmental Impact Assessment Report will present the findings of the specialist studies and recommendation on how the project should be implemented to ensure environmental sustainability. This draft report will scheduled to be available for public comment in April 2008.

All the comments on the Draft Environmental Impact Assessment Report will be considered and incorporated to produce a Final Environmental Impact Assessment Report for submission to DEAT in July 2008. The DEAT will review and respond to this report by deciding whether the project can go ahead or not, and if it can, then under what conditions. This response is expected in October 2008. An appeal period will follow the authorisation.

Table 9.4: Summary of the EIA programme

Date	Activity
8 March 2007	Pre-application consultation
19 – 21 March 2007	Site Visit
22 June 2007	Application form submitted
August 2007	Scoping public participation
September/October 2007	Draft Scoping Report public comment period
November 2007	Submit Final Scoping Report
January 2008	Specialist studies and impact assessment
April – May 2008	Draft EIR and EMP public comment period
July 2008	Submit final EIR and EMP
August - October 2008	Authority Review

10. CONCLUSION AND RECOMMENDATIONS

The Environmental Scoping Studies undertaken in the Scoping phase of the Environmental Impact Assessment for the proposed Groot Letaba River Water Development Project have fulfilled the NEMA regulatory requirements and extensive measures have been taken to provide all interested and affected parties with the opportunity to participate in the identification of project alternatives and issues that require investigation.

The Scoping investigation has confirmed that the proposed project, together with supporting non-infrastructure components is the preferred option for providing improved water management to meet increased domestic, socio-economic development and ecological requirements in the catchment.

Although the studies have not identified any environmental fatal flaw issues, a number of potentially significant issues have been highlighted for further investigation in order to assess their significance, and to determine the need for the implementation of mitigation measures in order for the overall project to be environmentally sustainable. These issues are the potential impacts on:

- the quantity and quality of river flows;
- terrestrial ecology;
- social processes;
- economic processes;
- infrastructure;
- public health; and
- heritage resources.

The impacts of construction activities should also be assessed.

It is, therefore, recommended that the following specialist studies be conducted for the proposed project in the EIA Phase:

- Aquatic Ecology;
- Terrestrial Ecology;
- Heritage Resources;
- Social and Landuse processes;
- Health impacts;
- Economic processes;
- Traffic impacts;
- Noise impacts;
- Air quality impacts; and
- Visual impacts.

11. REFERENCES

Barnes, K.N. (2000)	*The Eskom Red Data Book of Birds of South Africa, Lesotho & Swaziland. BirdLife South Africa, Johannesburg.*
Basilewsky, P. (1977)	*Révision Du Genre Graphipterus Latreille (Coleoptera Carabidae).*
Back-ground Information Document (2007)	*Environmental Impact Assessment (12/12/20/978) for the Department of Water Affairs and Forestry's Groot Letaba Water Development Project (GLeWaP) Infrastructure Components*
Branch, W.R. (1988)	*South African Red Data Book - Reptiles & Amphibians. S.A.Nat.Scient.Programmes Report No. 151.*
Branch, W.R. (1998)	*Field Guide to Snakes and other reptiles of Southern Africa. Struik, Cape Town.*
DEAT (1998)	Convention on Biological Diversity: South African National Report to the Fourth Convention of the Parties. www.biodiv.org/doc/world/za/za-nr-01-en.pdf
Department of Agriculture, Limpopo Province (2005/2006)	*Limpopo Province Strategic Plan (http://www.treasury.gov.za/documents/budget/2005/provincial/strategic*
Dippenaar Schoeman, A.S. (2002)	*Baboon and Trapdoor Spiders of Southern Africa: An Identification Manual.* Plant Protection Research Institute Handbook No. 13. Agricultural Research Council, Pretoria.
DWAF (1994)	The Groot Letaba Water Resource Development: Feasibility Study Report Volume 4: Relevant Environmental Impact Prognosis. Annexure E: Nwamitwa ROIP.

Friedmann, Y. & Daly, B. (editors). (2004)	Red Data Book of the Mammals of South Africa: A Conservation Assessment. CBSG Southern Africa, Conservation Breeding Specialist Group (SSC/IUCN), Endangered Wildlife Trust. South Africa.
Greater Tzaneen (2007)	*Greater Tzaneen Integrated Development Plan 2007 - 2011*
Greater Tzaneen (2004)	*Greater Tzaneen Local Economic Development Plan*
Greater Tzaneen (2007)	*Greater Tzaneen Spatial Development Framework*
Harrison, J.A., Allan, D.G., Underhill, L.G., Herremans, M., Tree, A.J., Parker, V. & Brown, C.J. (1997)	The Atlas of Southern African Birds. Vols.1-2. Bird Life South Africa, Johannesburg.
Hockey, P.A.R., Dean, W.R.J. & Ryan, P.G. (eds.) (2005)	Roberts' Birds of Southern Africa. VII. Trustees of the John Voelcker Bird Book Fund, Cape Town.
Howell B.J. (2003)	*Cultural Attachment to Place: A Framework for Identifying and Working with Traditionally Associated Peoples in Southern Appalachia*
IUCN (2000)	*2001 IUCN Red List categories Version 3.1.* Prepared by the Species Survival Commission. IUCN. Gland, Switzerland.
Leeming, J. (2003)	*Scorpions of Southern Africa*. Struik Publishers, Cape Town.
Minter, L., Burger, M., Harrison, J.A., Braack, H.H., Bishop, P.J. and Kloepfer, D. (2004)	Atlas and Red Data Book of the Frogs of South Africa. Smithsonian Institute, Washington D.C.
Mucina, L. & Rutherford, M.C. (eds.)	The vegetation of South Africa, Lesotho &

(2006) Swaziland. *Strelitzia* 19. South African National Biodiversity Institute, Pretoria.

King, N and O'Beirne, S (n.d.) Improving the contribution of EIA to achieving Sustainable Development in South Africa – the case for formalised Independent Review within the EIA process

Peringuey, L. (1896) The Coleoptera of South Africa. Part II. Carabidae. *Transactions of the South African Philosophical Society*, 7(2):125-623.

Pieterse du Toit and Associates (2002) *Limpopo Spatial Rationale*

Prendini, L. (2001) Two new species of *Hadogenes* (Scorpiones: Ischnuridae) from South Africa, with a redescription of *Hadogenes bicolour* and a discussion on the phylogenetic position of *Hadogenes*. *The Journal of Arachnology* 29, 146-172.

Prendini, L. (2006) New South African Flat Rock Scorpions (Liochelidae: *Hadogenes*). *American Museum Novitates* 3502, 32pp.

Quantec Research (2006) *Global Insights*

Rouget, M, Jonas, Z, Desmet, P, Driver, A, Cowling, RM, Mohamed, B, Mucina, L, Rutherford, MC & Powrie, W. (2006) *Ecosystem Status and Protection Levels of vegetation types*. In: Mucina, L & Rutherford, MC (eds.) The vegetation of South Africa, Lesotho & Swaziland. *Strelitzia* 19. South African National Biodiversity Institute, Pretoria.

Samways, M.J. (2006) National Red List of south African Dragonflies (Odonata). *Odonatologica* (in press).

Samways, M.J. and Taylor, S. (2004) Impacts of alien invasive plants on Red-Listed South African dragonflies (Odonata). *South African Journal of Science* 100, 78-80.

Slootweg, R., Vanclay, F., *Function evaluation as a framework for the*

Van Schooten, M. (2001)	*integration of social and environmental impact assessment. Impact Assessment and Project Appraisal. Volume 19:19-28. UK: Beech Tree Publishing.*
South African Multi-stakeholder Initiative (2004)	*Applying the World Commission on Dams Report in South Africa (http://www.emg.org.za/documents/SA%20Initiative%20on%20the%20WCD%20-%20Substantive%20Report.pdf)*
Statistics South Africa (1996 and 2001)	*Census 1996 and Census 2001*
Tarboton, W and Tarboton, M (2005)	*A Fieldguide to the Damselflies of South Africa*. Published by the authors.
Tarboton, W. and Tarboton, M (2002)	*A Fieldguide to the Dragonflies of South Africa*. Published by the authors.
Taylor, P.J. (2000)	Bats of Southern Africa. University of Natal Press, Pietermaritzburg.
Van Wyk, A.E. & Smith, G.F (2001)	Regions of floristic endemism in southern Africa. Umdaus Press, Hatfield, South Africa.
Vanclay, F. (2002)	*Environmental Impact Assessment Review*
Werner, K. (2000)	*The Tiger Beetles of Africa*, Volumes 1 and 2, Taita Publishers.
Vanclay, F. n.d.	*'Social Impact Assessment.' Prepared for Thematic Review V.2: Environmental and Social Assessment for large dams. World Commission on Dams*
Vohra, S. (2007)	*HIA Guidelines – Discussion Draft*
Woodhall, S. (2005)	*Field Guide to the Butterflies of South Africa*. Struik Publishers, Cape Town.
Integrated Development Plans	
August 2002	Ba-Phalaborwa IDP
September 2002	Greater Giyani Municipality IDP

June 2002 Greater Letaba IDP
Mopani District Municiality IDP
May 2002 Greater Tzaneen Municipality IDP
Websites all accessed August 2007 except where otherwise indicated

http://dsp-psd.pwgsc.gc.ca/Collection/

http://posa.sanbi.org

http://tzaneen.com/tourism

http://www.demarcation.org.za (accessed June)
http://www.en.wikipedia.org/wiki/Land_use
http://www.lda.gov.za/index
http://www.soil.ncsu.edu/publications/BMPs/glossary.html
Personal Communications
Dr Max Clark, African Sky Projects Pty (Ltd), Pretoria, South Africa.
Dr Ansie Dippenaar-Schoeman, Plant Protection Research Institute, Agricultural Research Institute, Pretoria, South Africa.
Ian Engelbrecht, Resource Conservation Biology, Department of Animal, Plant and Environmental Sciences, University of the Witwatersrand, Johannesburg, South Africa
Dr Stefan Foord, Department of Zoology, University of Venda, South Africa.
Graham Henning, Lepidopterists Society of South Africa, Johannesburg, South Africa
Professor Mark Williams, Faculty of Veterinary Science, Onderstepoort, University of Pretoria, Pretoria, South Africa.