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DWS Report No: P WMA 12/T30/00/5314/14

ENVIRONMENTAL IMPACT ASSESSMENT FOR THE MZIMVUBU WATER PROJECT

DEA REF. No 14/12/16/3/3/2/677 (Dam Construction)
14/12/16/3/3/2/678 (Electricity Generation)
14/12/16/3/3/1/1169 (Roads)

ENVIRONMENTAL MANAGEMENT PROGRAMME

DRAFT
February 2015

ENVIRONMENTAL MANAGEMENT PROGRAMME

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Authors:	*L Muruven and T Calmeyer*
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DEPARTMENT OF WATER AND SANITATION – DIRECTORATE: OPTIONS ANALYSIS

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Chief Director: Integrated Water Resource Planning

The following page must be signed upon awarding of the contract and serves as acknowledgment that the appointed Engineer and Contractor accept and understand the contents of this Environmental Management Programme as approved by the Developer.

DEVELOPER
Approved by the Department of Water and Sanitation: National Water Resources Infrastructure Branch

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Chief Director: Infrastructure Development *Date*

ENGINEER
Approved by the Department of Water and Sanitation: Engineering Services:

.....

Chief Director: Engineering Services *Date*

CONTRACTOR
Accepted by: _____

.....

Name: _____ *Date*

ENVIRONMENTAL IMPACT ASSESSMENT FOR THE MZIMVUBU WATER PROJECT

LIST OF REPORTS

REPORT TITLE	DWS REPORT NUMBER
Inception Report	P WMA 12/T30/00/5314/1
Scoping Report	P WMA 12/T30/00/5314/2
Environmental Impact Assessment Report	P WMA 12/T30/00/5314/3
Environmental Management Programme	P WMA 12/T30/00/5314/14
Integrated Water Use License Application for the Mzimvubu Water Project: Technical Report	P WMA 12/T30/00/5314/4
Ntabelanga Dam borrow pits and quarry Environmental Management Plan	P WMA 12/T30/00/5314/5
Lalini Dam borrow pits and quarry Environmental Management Plan	P WMA 12/T30/00/5314/6
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Wetland Assessment	P WMA 12/T30/00/5314/16
Rapid Reserve Determination: Tsitsa River at Lalini	P WMA 12/T30/00/5314/17

ENVIRONMENTAL IMPACT ASSESSMENT FOR THE MZIMVUBU WATER PROJECT

DEA REF No. 14/12/16/3/3/2/677 (Dam construction application)
14/12/16/3/3/2/678 (Electricity generation application)
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ABBREVIATIONS

CER	Contractor's Environmental Representative
DEA	Department of Environmental Affairs
DWS	Department of Water Affairs
EA	Environmental Authorisation
EAP	Environmental Assessment Practitioner
ECO	Environmental Control Officer
EER	Engineer's Environmental Representative
EIA	Environmental Impact Assessment
EIR	Environmental Impact Report
EMPR	Environmental Management Programme
GN	Government Notice
MSDS	Material Strategy Data sheets
MAR	Mean Annual Runoff
NEMA	National Environmental Management Act (No.107 of 1998)
NEMWA	National Environmental Management: Waste Act (Act 59 of 2008) .
OHSA	Occupation Health and Safety Act (Act 85 of 1993)
UIF	Unemployment Insurance Fund
SANCOLD	South African National Committee on Large Dams
IAIA	International Association for Impact Assessment
IAIAsa	International Association for Impact Assessment South African affiliate
DM	District Municipality
DAFF	Department of Agriculture Forestry and Fisheries

1. INTRODUCTION

1.1 BACKGROUND

The Mzimvubu River catchment in the Eastern Cape of South Africa is within one of the poorest and least developed regions of the country. Development of the area to accelerate the social and economic upliftment of the people was therefore identified as one of the priority initiatives of the Eastern Cape Provincial Government.

Harnessing the water resources of the Mzimvubu River, the only major river in the country which is still largely unutilised, is considered by the Eastern Cape Provincial Government, as offering one of the best opportunities in the Province to achieve such development.

The five pillars on which the Eastern Cape Provincial Government proposed to model the Mzimvubu River water resources development are:

- Forestry;
- Irrigation;
- Hydropower;
- Water transfer; and
- Tourism.

As a result of this the Department of Water and Sanitation (DWS) commissioned the Mzimvubu Water Project, which consists of two multi-purpose dams on the Tsitsa River, a major tributary to the Mzimvubu River. Socio-economic upliftment is expected to be achieved through bulk potable water supply schemes for domestic and industrial water supply, bulk raw water supply schemes for irrigated agriculture, hydropower generation, the creation of temporary and permanent jobs, and associated development (**Figure 1**).

Environmental authorisation is required for the infrastructure components of the proposed Ntabelanga-Lalini Conjunctive Scheme. An Environmental Impact Assessment (EIA) process has been conducted as part of the application for environmental authorisation.

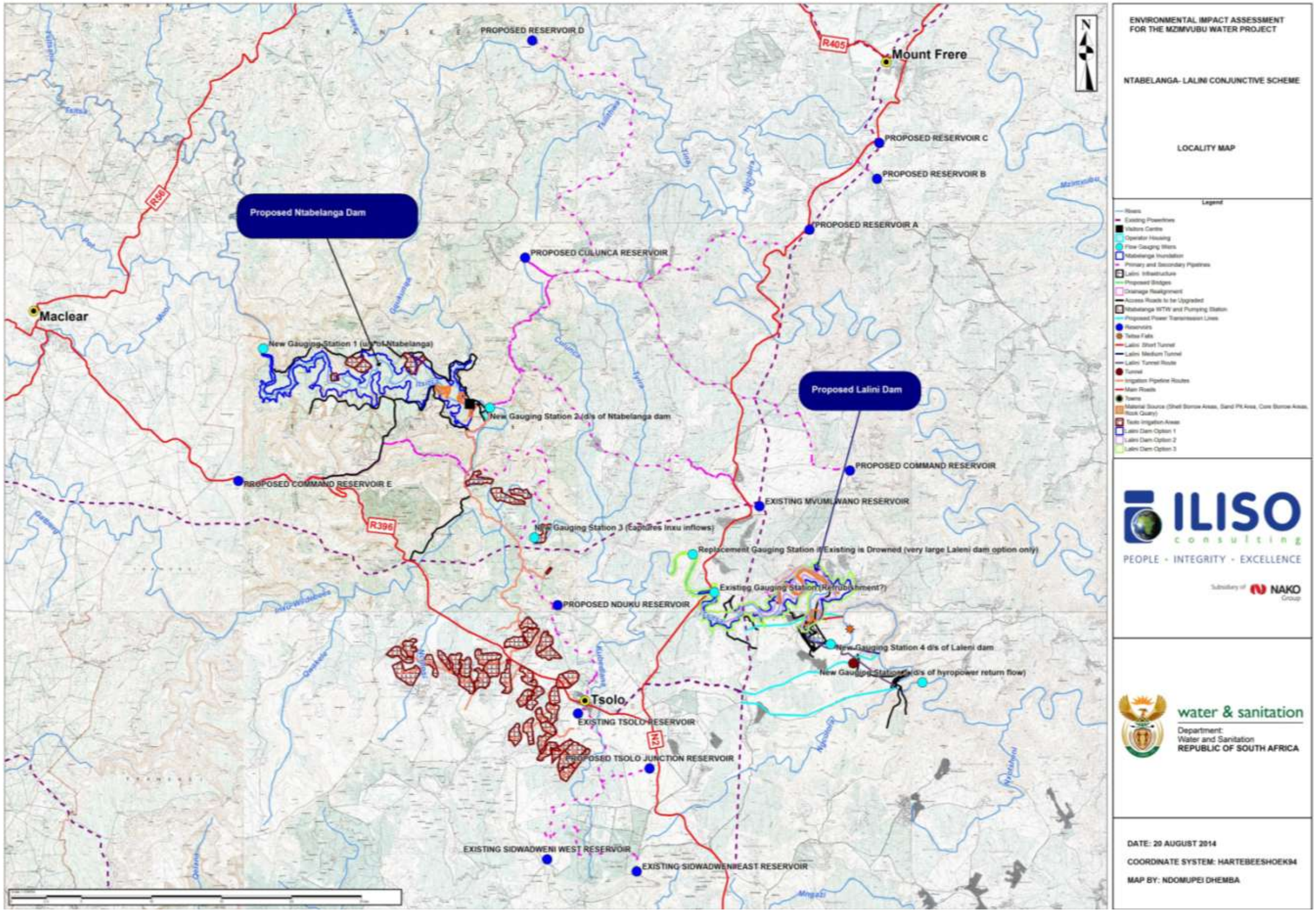

Figure 1-1: Locality map

1.2 PURPOSE OF THE EMPR

This document is an Environmental Management Programme (EMPR), compiled as part of the EIA for the Mzimvubu Water Project. The EMPR is aimed at ensuring that optimal environmental protection is achieved during the pre-construction, construction and operational phases of the project and covers the principles, responsibilities and requirements applicable.

Mitigation measures in the form of environmental management and mitigation plans are specified for purposes of minimising environmental impacts likely to be incurred during pre-construction and construction activities, as well as during operation.

The EMPR also provides a practical implementation framework for monitoring, auditing and taking corrective actions during implementation.

The EMPR is a dynamic document, which will be reviewed, revised and updated during the life span of the project.

Separate Environmental Management Plans have been compiled for the borrow areas and quarries, these are attached in **Appendix C**.

N.B.: Three applications for environmental authorisation have been submitted to Department of Environmental Affairs (DEA) for the dams and associated infrastructure, electrical generation and distribution infrastructure and road infrastructure respectively. This is because the responsibility for the implementation of these project components will likely be divided between three different entities. Institutional arrangements have however not been finalised and once DEA has made a decision in respect of the environmental authorisations, they will all be issued to Department of Water and Sanitation (DWS). Should the authorisation(s) be transferred to other parties at a later stage, this EMPR will still apply but will have to be revised accordingly.

1.3 APPROACH

Nine specialist studies were undertaken during the environmental assessment for the Mzimvubu Water Project, which considered the potential impacts of the Ntabelanga-Lalini conjunctive scheme and associated infrastructure on the receiving environment.

The findings of all the specialist studies were distilled, examined and captured in the Environmental Impact Report (EIR). All mitigation measures recommended by the specialists were assessed for relevance and summarised in the EIR. The proposed mitigation measures have been incorporated into the relevant sections of the EMPR

(for pre-construction, construction and operation) through the development of management and mitigation plans.

1.4 PROJECT TEAM

ILISO Consulting (Pty) Ltd was appointed as the independent Environmental Assessment Practitioner (EAP) to undertake the EIA and compile the EMPR with input from the specialists. The EIA project team consisted of:

Lea Muruven is an EAP with Masters degrees in Environmental Management and Political Science. She has over five years experience in impact assessment and environmental management and has been responsible for drafting impact assessment reports and Environmental Management Programmes, and conducting public participation processes, as well as high level environmental screenings for a variety of projects in the water, energy, transport and industrial sectors. Lea has an excellent understanding of the laws and regulations relating to air quality, water, biodiversity, heritage, and waste management in South Africa. She is a member of the South African Affiliate of the International Association for Impact Assessment.

Dr Martin van Veelen is a Professional Engineer with a PhD in aquatic health. He is a Fellow of the South African Institution of Civil Engineers, a member of the South African Society of Aquatic Scientists, of the Environmental Scientific Association, of the International Water Association, of the Water Institute of South Africa, and of the Vaal River Catchment Association. He is a certified Environmental Assessment Practitioner with over 30 years experience who specialises in project management, environmental impact assessments and water resource planning. He specifically has extensive experience in water quality, especially water quality management, water quality monitoring and water quality assessment. Martin has experience in managing projects that involve multi-disciplinary teams, and projects that involve public consultation and participation.

Terry Calmeyer is a certified Environmental Assessment Practitioner. She has a Masters degree in Environmental Management and specialises in Environmental Impact Assessments, the environmental components of project implementation and Project Management. Terry serves on the International Association of Impact Assessment (IAIA) Council, is the past President of the South African Affiliation of the International Association of Impact Assessment (IAIAsa) and an active member of the South African Committee on Large Dams (SANCOLD), the Environmental Law Association and the International Association for Public Participation. She has been involved in a variety of different types of EIAs including for transmission lines, water supply projects, dams, roads, railways, waste water treatment works and airports, in South Africa, Uganda, Lesotho, Botswana, Namibia and Mozambique. Terry was the EAP for the Groot Letaba Water Project (GLeWaP) and the Kobong pumped storage

scheme. She is the specialist environmental advisor on the Mooi Mgeni Transfer Scheme Phase 2.

Kim Dalhuijsen has an Honours degree in Zoology and Environmental Sciences from the University of the Witwatersrand and 1.5 years of work experience. She has been responsible for drafting impact assessment reports and Environmental Management Programmes, and assisting with public participation processes on a variety of projects. She is a member of the South African Affiliate of the International Association for Impact Assessment.

Joseph Masilela has a Diploma in Finance and Accounting and eight years experience in office administration and community liaison work that includes arranging meetings, facilitating community workshops, meetings with traditional authorities and assisting on all project related work. Joseph assists with secretarial functions for projects including maintaining attendance registers and databases for projects.

Ndomupei Dhemba is a Geographic Information Systems (GIS) and Remote Sensing specialist with a Masters degree in GIS and Remote Sensing for Environmental Management. She has 7 years experience in natural resources management including resource Inventorying and auditing, biodiversity assessment, and has been involved in a number of EIA programmes as a biodiversity and GIS & Remote Sensing Specialist in Zimbabwe, Tanzania and South Africa. She has worked with rural communities in the promotion of rural development through the sustainable utilization of Natural Resources through group projects, capacity building and EIAs of these projects. She also has experience in public participation and research particularly in the promotion of the use of remote sensing for biodiversity assessment. She is conversant with ArcGIS, ERDAS, ILWIS, Planet GIS and ENVI.

Nadine Duncan has an Honours Degree in Geography with 7 years experience in Planning and Environmental Impact Assessment related projects including for roads, storm water infrastructure, dams and power stations in South Africa. She has been involved in S24G Rectification Applications, Environmental auditing, project management and implementation. Nadine has also been involved in GIS, data management and Visual Impact Assessments. She has gained experience in Open Space Planning and Environmental Management Frameworks and is conversant in ArcGIS, AutoCAD, CorelDRAW, Google SketchUP, Photoshop, InDesign, and Illustrator.

Sandhisha Jay Narain is an Environmental Consultant with an Honours degree in Environmental Management. She has over 6 years onsite Environmental Management and Environmental Compliance Auditing and Monitoring experience. Sandhisha has been involved in the implementation of the Environmental Management Plan for the Moses Mabhida Stadium, served as the Environmental

Control Officer (ECO) for Transnet's Multi Purpose Pipeline Project and was project based as the Environmental Monitor at the Spring Grove Dam. Sandhisha is also an accredited Green Star SA Professional and is knowledgeable in the functioning of ISO 14001 Environmental Management Systems.

Dr Neville Bews is a senior social scientist and human resource professional with a PhD in Sociology and 36 years experience. He consults in the fields of Social Impact Assessments and research, and human resource management. He has worked on a number of large infrastructure, mining and water resource projects. He at times lectures at both the Universities of Pretoria and Johannesburg and is a Senior Fellow in the Centre for Sociological Research, Department of Sociology at the University of Johannesburg.

Stephen van Staden has a Masters degree from the University of Johannesburg in Environmental Management. Stephen has experience on over 1 000 environmental assessment projects specifically with aquatic and wetland ecological studies as well as terrestrial ecological assessments and project management. Stephen has a professional career spanning more than 10 years, most of which have been as the owner and managing member of Scientific Aquatic Services. He is registered by the South African River Health Project as an accredited aquatic biomonitoring specialist and as a Professional Natural Scientist with the South African Council for Natural Scientific Professions in the field of ecology. Stephen is also a member of the Gauteng Wetland Forum and South African Soil Surveyors Association.

Menno Klapwijk obtained a B.Sc. degree in Landscape Architecture at Texas A&M University. Menno is a registered Landscape Architect (South African Council for Landscape Architectural Professionals). He has 32 years experience in integrated environmental assessment and planning for existing and future land uses, visual impact assessment, mining and quarry reclamation and development planning and design. He’s been involved in Landscape design for corporate headquarters, office and industrial parks, housing developments, hotels, plazas and pedestrian malls as well as recreation planning and planning and design for conservation areas, natural resource areas, nature reserves and game farms.

William Mullins has a BSc degree and 38 years experience in the agricultural and economic field. He has been involved in economic growth and development strategies for regions and sub-regions in South Africa; sectoral economic analyses; various cost-benefit analysis studies; environmental impact studies and policy analysis including irrigation projects; constructing a Building Construction Model for South Africa with specific reference to the impact of Government Capital Expenditure and the Construction of National and Regional Input Output Tables as well as the compilation of National, Regional or Multi-Regional SAM. William has also worked in specialist fields like the SKA Telescope study, and impact studies for Eskom.

Bob Pullen obtained BSc(Eng), MSc(Eng) and MBL degrees. He played a major role in the conception of the Thukela-Vaal Project, and was responsible for much of the construction phase. His interest in and experience with environmental management issues led to his significant roles in managing various Reserve determination assignments and Environmental Impact Assessments (Groot Letaba, Levhuvhu and Thukela Rivers in Limpopo and KwaZulu-Natal) and to the implementation of social components of Environmental Management Plans. Important examples of the last-mentioned are the Relocation Policy Framework for Nandoni Dam near Thohoyandou (465 households, 1 000 graves, four archaeological sites and 2 100 subsistence farmers) and the relocation of about 130 graves and ten archaeological sites at De Hoop Dam in the Steelpoort River, both in Limpopo. He was also responsible for managing implementation of the Environmental Management aspects associated with construction of Spring Grove Dam in the Mooi River, KwaZulu-Natal.

Len van Schalkwyk has an MA in Archaeology and 25 years of professional experience as a practising archaeologist and heritage resource manager in South Africa, Botswana and Mozambique. His research interests have focussed on the Iron Age of southern Africa, while his management specialisations are heritage impact assessments, community liaison and ancestral grave management.

James Cross obtained BA, LLB and LLM (Constitutional and Environmental Law) degrees from the University of Stellenbosch. He subsequently obtained a Diploma in Corporate Law from the Rand Afrikaans University (now University of Johannesburg). During 1997, James was admitted as an attorney and commenced practising law at Blakes Maphanga Incorporated. James has 18 years experience consulting with clients in the environmental consulting, engineering, heavy industrial, mining and property development sectors. His environmental law practice includes legal interpretation of environmental legislation and the drafting of legal opinions, administrative appeals, and preparation of legal requirements assessments, legal auditing, drafting and review of commercial agreements, advice on legal authorisation processes as well as legal training. He is regularly requested to assist with environmental, health and safety due diligence investigations within the context of mergers and acquisition transactions. James has been consulting to the public sector (government and parastatals) on statutory development projects. He has acted as external legal advisor and drafter of regulations under the Protected Areas Act 57 of 2003 and consults to government on the transfer of environmental impact assessment requirements from mining to environmental legislation. James has written numerous articles on aspects of environmental law, has lectured to students at the University of Pretoria and University of Stellenbosch and presented papers at various Cameron Cross and other sponsored seminars and events. He is presently the course leader for the Certificate in Environmental Law presented by the University of Pretoria.

Table 1-1: Specialist Project Team summary

Consultant Name	Company Name	Field of speciality
Dr Neville Bews	Dr Neville Bews and Associates	Social Impact Assessment
Stephen van Staden	Scientific Aquatic Services	Ecology and wetlands
Menno Klapwijk	Bapela Cave Klapwijk	Visual Impact Assessment
William Mullins	Mosaka Economic Consultants cc. t/a Conningarth Economists	Economics and Agricultural economics
Bob Pullen	Independent Consultant	Relocation Policy Framework
Len van Schalkwyk	eThembeni Cultural Heritage	Heritage
James Cross	Mervyn Tabacks Incorporated	Legal Advisor

1.5 STRUCTURE OF THE REPORT

The report is structured as follows:

Chapter 1 of the EMPR serves to outline the background to the project.

Chapter 2 provides a project description.

Chapter 3 provides an organisational structure and the roles and responsibilities of the various departments and construction team.

Chapter 4 specifies compliance monitoring requirements.

Chapter 5 highlights all relevant legislative requirements and principles.

Chapter 6 provides the measures applicable to the Pre-construction Phase.

Chapter 7 presents the Relocation Policy Framework.

Chapter 8 provides mitigation and management plans for the construction phase. It is divided according to the following sub-sections:

- **Chapter 8.1** Socio-economic management and mitigation plan.
- **Chapter 8.2** Public Consultation and disclosure management and mitigation plan.
- **Chapter 8.3** Construction site management and mitigation plan.
- **Chapter 8.4** Solid Waste management and mitigation plan.
- **Chapter 8.5** Visual Aesthetics management and mitigation plan.
- **Chapter 8.6** Air quality management and mitigation plan.
- **Chapter 8.7** Noise Control management and mitigation plan.
- **Chapter 8.8** Traffic management and mitigation plan.
- **Chapter 8.9** Water management and mitigation plan.
- **Chapter 8.10** Aquatic Ecosystem management and mitigation plan.
- **Chapter 8.11** Material Sourcing and Earthfill Stockpiles management and mitigation plan.
- **Chapter 8.12** Topsoil management and mitigation plan.
- **Chapter 8.13** Spoil management and mitigation plan.

- **Chapter 8.14** Fauna and Flora management and mitigation plan.
- **Chapter 8.15** Heritage management and mitigation plan.
- **Chapter 8.16** Health and Safety management and mitigation plan.
- **Chapter 8.17** Rehabilitation management and mitigation plan.
- **Chapter 8.18** Monitoring requirements.
- **Chapter 8.19** Site Closure requirement

Chapter 9 provides mitigation and management plans for the operation phase.

2. PROJECT OVERVIEW

2.1 PROJECT LOCATION

The project footprint spreads over three District Municipalities (DMs) namely the Joe Gqabi DM in the north west, the OR Tambo DM in the south west and the Alfred Nzo DM in the east and north east.

The proposed Ntabelanga Dam site is located approximately 25 km east of the town of Maclear and north of the R396 Road. The proposed Lalini Dam site is situated approximately 17 km north east of the small town Tsolo. Both are situated on the Tsitsa River.

2.2 MAIN PROJECT COMPONENTS

Water Resource Infrastructure includes:

- A dam at the Ntabelanga site with a storage capacity of 490 million m^3;
- A dam at the Lalini site with a storage capacity of approximately 150 million m^3;
- A tunnel/conduit and power house at Lalini dam site for generating hydropower;
- Five new flow measuring weirs will be required in order to measure the flow that is entering and released from the dams. These flow gauging points will be important for monitoring the implementation of the Reserve and for operation of the dams.
- Wastewater treatment works at the dam sites;
- Accommodation for operations staff at the dam sites; and
- An information centre at each of the dam sites.

The Ntabelanga Dam will supply potable water to 539 000 people, which is estimated to increase to 730 000 people by year 2050. The domestic water supply infrastructure will include:

- A river intake structure and associated works;
- A regional water treatment works at Ntabelanga Dam;
- Potable bulk water distribution infrastructure for domestic and industrial water requirements (primary and secondary distribution lines);
- Bulk treated water storage reservoirs strategically located; and
- Pumping stations.

The Ntabelanga Dam will also provide water to irrigate approximately 2 900 ha. This project includes bulk water conveyance infrastructure for raw water supply to edge of field.

About 2 450 ha of the high potential land suitable for irrigated agriculture is in the Tsolo area and the rest near the proposed Ntabelanga Dam and along the river,

close to the villages of Machibini, Nxotwe, Culunca, Ntshongweni, Caba, Kwatsha and Luxeni.

There will be a small hydropower plant at Ntabelanga Dam to generate between 0.75 MW and 5 MW (average 2.1 MW). This will comprise a raw water pipeline from the dam to a building containing the hydropower turbines and associated equipment, and a discharge pipeline back to the river just below the dam wall. The impact is expected to be similar to that of a pumping station.

Another small hydropower plant will be constructed at the proposed Lalini Dam.

The larger hydropower plant at the Lalini Dam and tunnel (used conjunctively with the Ntabelanga Dam) will generate an average output of 30 MW if operated as a base load power station and up to 150 MW if operated as a peaking power station. The power plant will require a pipeline (approximately 4.6 km) and tunnel (approximately 3.2 km) linking the dam to the power plant downstream of the dam and below the gorge.

The power line to link the Lalini power station to the existing Eskom grid will be approximately 13 km. Power lines will be constructed to supply power for construction at the two dam sites and for operating five pumping and booster stations along the bulk distribution infrastructure.

The area to be inundated by the dams will submerge some roads. Approximately 80 km of local roads will therefore be re-aligned. Additional local roads will also be upgraded to support social and economic development in the area. The road design will be very similar to the existing roads as well as be constructed using similar materials.

The project is expected to cost R 12.45 billion and an annual income of R 5.9 billion is expected to be generated by or as a result of the project during construction and R 1.6 billion per annum during operation. It will create 3 880 new skilled employment opportunities and 2 930 un-skilled employment opportunities during construction.

2.3 ALTERNATIVES

The following project level alternatives were assessed:

- Three hydro power tunnel positions and associated power lines;
- Peak versus Base load power generation;
- Three different dam sizes for the Lalini Dam; and
- The no project option.

For the construction camps, pipeline routes and new roads, the specialists identified sensitive areas, and deviations to avoid these areas were proposed.

2.4 SUMMARY OF THE EIA FINDINGS

While the project was assessed holistically, it is acknowledged that the impacts associated with the various infrastructure components have different degrees of significance. Impacts are summarised below for the dams and associated infrastructure, electricity generation and distribution infrastructure, and road infrastructure.

2.4.1 Dams and associated infrastructure

The construction of the dams, and to a lesser extent the associated infrastructure (including construction offices, potable and raw water distribution infrastructure, borrow pits and quarries etc.) will have significant negative impacts on the terrestrial and aquatic ecology, as well as on the wetlands. To a large extent these impacts will be permanent.

The riparian and wetland areas, as well as a portion of the mountain/rocky outcrop areas and Euphorbia Forest near the Lalini Dam wall that provide habitat for sensitive indigenous vegetation as well as fauna, including possible red data list and protected species, will be lost and the habitat within the river will be permanently altered. This impact is considered to be of high significance.

In addition, wetlands in the project area provide important ecological services in the way of sediment trapping, nutrient cycling and toxicant assimilation, flood attenuation and biodiversity maintenance. Considering the extensive, and often severe, erosion within the study area and greater catchment, sediment trapping is especially important. In view of this, the permanent loss of wetland habitat due to inundation is regarded as being of high significance. The anticipated cumulative loss of riparian and wetland habitat arising from the construction of the dams is estimated to be 1035 hectares. Overall however, the loss of riparian and wetland habitat is deemed to constitute a relatively insignificant fraction of the wetland resources within the Mzimvubu sub Water Management Area.

At Lalini Dam, large scale loss of habitat for animals will result in a loss of animal species numbers and diversity, as species leave the area, adapt to the new environment in lower numbers, or are lost in totality within the study area. In particular, the loss of wetlands, lower grassland areas, mountain bushveld and rocky outcrops will directly impact on the population of red data list and protected species.

At Ntabelanga Dam, the main concern relates to the loss of key breeding crane populations. Wetlands and grasslands within the Ntabelanga Dam basin are used by cranes (Crowned Cranes, Blue Cranes and Wattled Cranes) for breeding and foraging. Cranes are red data list species, threatened with extinction throughout South Africa; Crowned Cranes in particular are listed as endangered by IUCN with

rapidly declining populations. Loss of wetlands and grasslands has been identified as one of the main contributing factors. This impact is considered to be of high significance.

Most of the above-mentioned impacts are permanent and thus extend into the operation phase.

The EAP recommends, as indicated by DEA, that any Environmental Authorisation is subject to the Water Use Licence (WUL) being obtained and complied with. The WUL takes the Reserve, which includes the Ecological Water Requirements (EWR), into account. The EWR are determined to protect the in-stream aquatic and riparian ecology of the river by setting the limits of deviation from the natural flow beyond which the impact would be unacceptable.

For this assessment, the specialists and EAP have assumed that the EWR, as defined in the Reserve determinations will be adhered to during the construction and operational phases. Adhering to the EWR will ensure that sufficient water goes over the Tsitsa Falls to prevent the endemic cremnophytes identified at the Falls from being negatively affected, and that the river downstream of the hydropower plant outlet works can also be maintained in an acceptable ecological state.

The most critical socio-economic impacts associated with the construction of the dams relate to relocation and resettlement, the influx of construction workers, and risks and nuisances associated with construction activities. These impacts can be highly disruptive to communities and need to be carefully managed and mitigated.

In terms of affected households and assets, 62 structures and 19.9 km^2 of cultivated land are located within the Ntabelanga Dam basin and will have to be relocated or compensated. At the Lalini Dam site, 12 structures and 7.6 km^2 of cultivated land are located within the dam basin (alternative 1).

Regarding the proposed potable and raw water pipeline routes, 124 structures are located within the pipeline servitudes (feasibility level pipeline routes). This is a large number but it is possible to realign the pipelines during the detailed design stage to avoid most of these structures and minimise, or altogether eliminate, the need for relocation and associated negative social impacts.

The proposed pipelines are largely located within transformed habitat and construction will have a low to very low impact on terrestrial and aquatic ecology and wetlands, provided the mitigation measures contained in the EMPR are adhered to. These include, inter alia, minor realignments to avoid protected trees, and realignments to avoid wetlands where possible.

The Tsitsa River contributes a small percentage of the flow in the Mzimvubu River that reaches the estuary. The Ntabelanga/Lalini system will always be operated in a manner that fulfills the EWR downstream of the hydropower plant outfall, both in terms of minimum and maximum flows. The project is also not expected to impact on the water quality. The sizes of the Ntabelanga and Lalini Dams are such that they will support the EWR and the Best Attainable State for the estuary, as set out in the estuarine Reserve determination. The impact on the estuary is therefore predicted to be negligible.

The Macro-Economic Impact Analysis found that during the peak of the construction period, the Ntabelanga Dam will result in 2 299 direct employment opportunities created in the Province, with another 843 indirect and 1 036 induced jobs. Of the direct jobs an estimated 1 057 will be semi-skilled and 771 low-skilled and should be recruited from the local community. There is a positive impact on the GDP to the value of R282.7 million. Low income households will also receive a total of R82.42 million out of a total of R528.11 million.

Although only for a short period, the construction activity of the Ntabelanga Dam will contribute considerably to the economy of the region and the province.

The proposed construction of the Lalini Dam and accompanying hydropower plant will also contribute considerably to the economy. At the peak of construction of the dam 815 direct jobs will be created with another 491 indirect and 604 induced jobs in the provincial economy. Of the direct jobs an estimated 375 will be semi-skilled and 273 low-skilled, most of which should be recruited from the local community. There is a positive impact on the Gross Domestic Product to the value of R164.6 million. Low income households are expected to receive a total of R52.38 million out of a total of R335.64 million of the total impact on households.

During operation, both dams will indirectly provide important social and economic benefits at a local, provincial and national level, as the water they supply will enable:

- The provision of potable water to many households in the project area and beyond, which will have a direct positive impact on the quality of life of the recipients;
- The emergence of an agricultural sector which will be able to actively contribute to the economy of the area and of the province; and
- The provision of electricity to alleviate pressures on the national grid and cross-subsidise the cost of the other components of the project.

The irrigation component of the project will contribute an estimated R129.3 million per year to the GDP and a total household income at R146.6 million with R38.6 million for low-income households. The total fulltime employment opportunities is estimated at 1 976 of which 1 301 is direct on the farms.

The agricultural component of the project may, however, place an additional work burden on women who may have to undertake such tasks as weeding.

2.4.2 Electricity generation and distribution

During construction, the main impact of the electricity generation and distribution infrastructure relates to the construction of the tunnel/conduit and hydropower plant. For the construction of the power line linking the Lalini hydropower plant to the grid, three alternatives were considered and are discussed in more detail below.

During operation, the primary concern relates to the alteration of the natural flow rate and water levels in the Tsitsa River due to releases of water through the tunnel/conduit for hydropower generation. This constitutes a risk for the riparian habitat and the ability of the riparian zone to support biodiversity, with secondary impacts on flow sensitive species, species of conservation concern and aquatic biodiversity in general. The EWR should be adhered to at all times in order to manage this risk. After mitigation, the impact is rated as very low to medium low.

The impact on health of electromagnetic fields associated with power lines has not been determined. From a social point of view, the risk, or perceived risk, is considered to be the main impact of the power line during operation. The precautionary principle will be applied and human settlements and activities within the power line servitude will be restricted.

As far as the electricity generation and distribution component of the project is concerned, the main benefit will be the substantial income generated from the sale of renewable energy, and feeding this power into the national grid.

2.4.3 Roads

In general, road upgrades, and to a lesser extent new access roads and road realignments will have a low to very low impact on terrestrial and aquatic ecology and wetlands, provided effective mitigation is implemented.

However, the construction of new roads in the vicinity of the Lalini Dam wall (i.e. haul roads), as well as the access road to the Lalini hydropower plant are located within highly sensitive areas with regard to fauna and flora, and will have a very high negative impact. Alternative access routes to the hydropower plant that could avoid the impact on this sensitive area need to be considered. It is also recommended that a walk-down to undertake search and rescue be done by a qualified specialist before construction of the haul road and access road commences.

During operation, roads will result in a risk of collisions with animals, which is likely not to be fully mitigated.

From a social perspective, 26 structures are within the footprint of proposed roads and road servitudes and may require relocation. The preferred mitigation is to realign the roads to avoid structures as much as possible in order to minimise or altogether eliminate the need for relocation and associated negative social impacts.

Road alignments, the new and upgraded roads will facilitate easier access to the areas served which may indirectly stimulate economic development. On the other hand, this could hasten effects of globalisation and changes to local norms and culture.

2.4.4 Comparative assessment of alternatives

- **Preferred power generation mode**

  The EWR have been determined to protect the in-stream aquatic and riparian ecology of the river by setting the limits of deviation from the natural flow beyond which the impact would be unacceptable. Whichever option of hydropower generation results in the greatest financial income while still fully meeting the EWR is therefore recommended. This still needs to be confirmed.

- **Preferred tunnel/power line alternative**

  The aquatic assessment found that in order to reduce the area of impact in terms of silting, sedimentation, decrease in water quality and excessive vegetation growth, the shortest possible section between the dam wall and discharge point should be preferred (i.e. Alternative 1: short hydropower tunnel and associated power line). However, fatal flaws have been identified for Alternative 1 in terms of faunal, floral, and visual impacts. In particular, the power line crosses large sections of indigenous and possible protected trees, and the impact on the faunal habitat on the mountain and within the gorge was not considered viable.

  After the environmental assessment had been conducted Alternatives 1 and 2 (associated with the short and medium length tunnels respectively) were eliminated by the technical team due to the presence of deep steep gorges which provide no access to where the tunnel daylights and the hydropower plant would be located. In addition Alternatives 1 and 2 would have significantly less head to generate power, leaving only Alternative 3.

  Alternative 3 (associated with the longest pipeline/tunnel and power line) as it is currently proposed has a very high visual impact and also crosses more sensitive floral habitats. It was recommended that this power line be realigned in order to avoid sensitive areas in terms of ecology and visual aspects. The power line route recommended by the EAP is shown in **Figure 6-1.**

- **Preferred dam size for Lalini Dam**

  With regard to the Lalini Dam, three dam sizes were considered.

The smallest dam size (Alternative 2) is preferred from a number of perspectives. Firstly, it involves the least loss of cultivated land and structures (i.e. 1 dwelling and 4.9km^2 of cultivated land, compared to 12 structures and 7.6km^2 of cultivated land for technically preferred Alternative 1) and is therefore the socially preferred option. Secondly, it will result in the lowest direct loss of wetland habitat, and is thus considered to be the most viable option in terms of wetland conservation. Thirdly, it will result in the inundation of the least amount of floral and especially sensitive floral vegetation and habitat and is therefore the preferred alternative in terms of floral impacts. Finally, while all 3 alternative dam sizes will lead to a definite impact on population size of endangered, vulnerable and protected indigenous faunal species. Alternative 2 is regarded as impacting the least on faunal RDL species.

Notwithstanding this, no major red flags or fatal flaws were found with technically preferred Alternative 1 (i.e. medium dam size). The technically preferred option is therefore acceptable with the careful application of mitigation measures aimed at reducing the social impact on displaced and host communities, as well as the impacts on ecology and wetlands.

As detailed designs have not yet been finalised for the Lalini Dam, the EAP's recommendation is that the final dam size be within the range of proposed Alternatives 1 and 2 (i.e. a Full Supply Level of between 752.42 mamsl and 763.61 mamsl).

- **No project alternative**

  By and large, the no project alternative will result in the status quo being maintained.

  The following points can however be noted:

  - Although no loss or decrease in sensitive species and habitats is expected, the current impacts such as overgrazed veld and alien proliferation along the riparian features will continue. Thus the ecological state of these areas will not improve if the no project alternative is implemented.
  - No loss of faunal habitat and RDL and protected species is expected. This should be seen in contrast to the definite impact on population size of endangered, vulnerable and protected indigenous faunal species resulting from the construction of the Lalini Dam.
  - In terms of aquatic ecology, the no project alternative will best ensure maintenance of ecological integrity within the system with the current rocky habitat in fast flowing clear water being maintained.
  - It is expected that wetland habitats will still undergo alterations as a result of the continued impacts of anthropogenic activities such as vegetation clearing, sediment winning, crop cultivation within wetland habitats, etc. Additionally, due to the extensive erosion within the study area and the catchment, sediment inputs to wetland and riparian habitats are anticipated, thus potentially altering flow

patterns within wetlands and riparian zones, as well as smothering vegetation and aquatic macro-invertebrates.

- No negative impacts will accrue to heritage resources. In particular, residents will not be subject to the high emotional cost associated with ancestral grave relocation. Conversely, the scientific knowledge inherent in resources such as archaeological sites will remain unrecovered until and unless funding for research is obtained from another source.
- There is an obligation on the State to advance the interests of the poor and, in accordance with the Bill of Rights, take adequate measures in ensuring that all citizens have access to basic housing, health care, food, water, social security, education and a healthy environment. In addition to this South Africa has a policy of recognising the human right to water at both the Constitutional and policy levels. A no project alternative would contradict these obligations as the Department of Water and Sanitation and the Eastern Cape Province would lose an opportunity to supplement the water resources in the area and consequently to deliver both domestic water and water for irrigation. Together with this lost opportunity would be the loss of a number of job opportunities, not only associated with the construction of the dams and infrastructure, but also associated with the productive potential of the irrigation scheme. With the area being one of the least developed and poorest in the country these losses will have severe social consequences. With the Mzimvubu River being the largest undeveloped water resource in the country any loss of benefits associated with the use of this river will be of national significance.

3. ORGANISATIONAL STRUCTURE

Effective environmental management during the planning, design and construction phases of the project will be dependent on a number of project personnel. The purpose of this section is to define roles for personnel and allocate responsibilities in the execution of the EMPR. The diagram below indicates the organisational structure (figure 3.1).

This organisational structure assumes DWS is the authorisation holder.

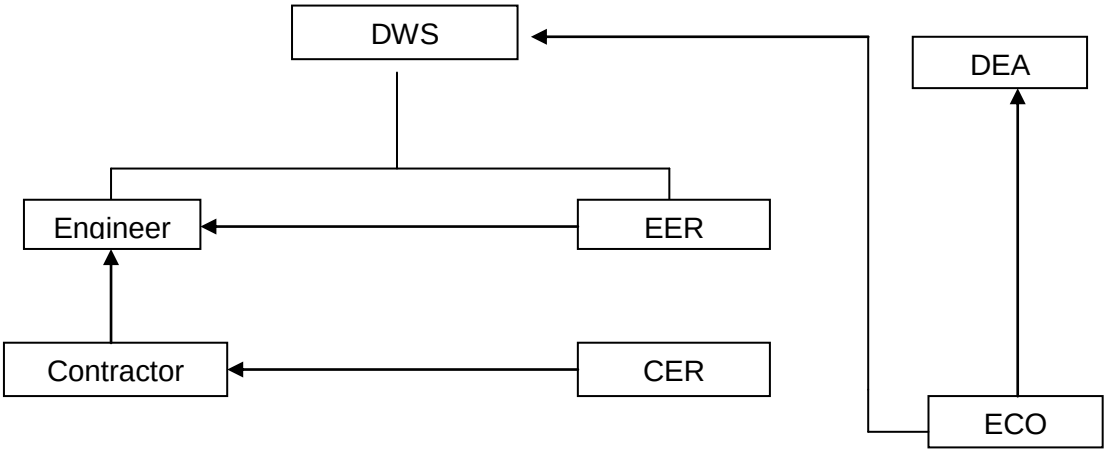

Figure 3.1: Reporting structure

3.1 DEPARTMENT OF ENVIRONMENTAL AFFAIRS (DEA)

The DEA, on behalf of the Minister, plays a lead role in the implementation of national environmental policies, legislation and regulations. Their role is to ensure that the Mzimvubu Water Project is implemented in a sustainable manner, in compliance to the relevant environmental legislation. DEA is responsible for approving the EMPR for the Mzimvubu Water Project and any revisions and amendments thereto.

3.2 DEPARTMENT OF WATER AND SANITATION (DWS)

DWS is the applicant of the authorisation, the developer of the project and the Contractor's and Engineer's Client. Under the South African environmental law, applicants are accountable for the potential impacts of activities being undertaken as well as managing these impacts. DWS, therefore, has the overall environmental responsibility to ensure that the implementation of the EMPR complies with national and provincial legislation as well as with the conditions of the Environmental Authorisation (EA).

DWS must compile a project communication strategy that includes directly affected persons and anybody with rights to any immediately adjacent properties that must be submitted to the DEA prior to the commencement of construction.

DWS may delegate environmental compliance / responsibility to nominated agents such as the Engineer.

The holder of the authorisation must submit an environmental audit report upon completion of the construction and rehabilitation activities.

The environmental audit report must indicate the date of the audit, the name of the auditor and the outcome of the audit in terms of compliance with the environmental authorisation conditions as well as the requirements of the EMPR.

3.3 ENGINEER

The Engineer is responsible for design of the works and supervision of the contract. The Engineer is DWS' representative onsite and is ultimately responsible for:

- Compliance with legal environmental requirements;
- Confirming that the EMPR forms part of the contract documents;
- Placing the EMPR on the site meeting agenda;
- Directing on site teams implementation and compliance with the EMPR;
- Consulting and co-operating with the Environmental Control Officer (ECO) appointed by the DWS on environmental matters;
- Reporting to DWS; and
- The Engineer may appoint an Engineer's Environmental Representative (EER) to plan and direct the implementation of the EMPR and provide advice on environmental matters.

The EER will:

- Provide support and advice, via the Engineer regarding environmental matters during the entire project lifecycle;
- Distribute all statutory requirements, including permits, authorisations and licences;
- Keep a copy of the Environmental Authorisation and EMPR on site;
- Provide Environmental Awareness training for the Engineers staff;
- Ensure that the Code of Conduct is signed by all personnel responsible for activities that could have a negative impact on the environment;
- Report at site construction meetings;
- Manage a schedule of Internal Audits. Internal audit reports are submitted to the Engineer;
- Maintain and manage a complaints register;
- Maintain and manage an incidents and non-conformance register;

- Keep a record of proof of all training undertaken on site; and
- Keep records relating to monitoring and auditing on site and make these available for inspection to any relevant and competent authority in respect of this development.

3.4 ENVIRONMENTAL CONTROL OFFICER (ECO)

An Independent Environmental Control Officer (ECO) will be appointed by DWS to monitor and audit compliance and report environmental compliance to DEA. Once appointed, the name and contact details of the ECO must be submitted to the Director: Compliance Monitoring of the DEA. The ECO will:

- Keep records of all activities on site, problems identified, transgressions noted and a task schedule of tasks undertaken by the ECO;
- Confirm that the requirements of the EMPR are communicated, understood, and implemented by personnel on site;
- Manage scheduled audits and inspections on contractors' performance on site.
- Monitor EMPR compliance through regular site visits and inspections during the pre-construction, construction and rehabilitation phases;
- Submit compliance reports to DEA;
- Submit emergency incident reports (example in **Appendix B**) to DEA for all Level 3 to 5 incidents (as defined in **Table 4.1**); and
- All documentation e.g. audit/monitoring/compliance reports and notifications, required to be submitted to the Department in terms of this authorisation, must be submitted to the *Director: Compliance Monitoring* at the DEA.

3.5 CONTRACTOR

The Contractor implements the EMPR specifications on site. The Contractor may appoint an environmental representative (the Contractor's Environmental Representative (CER)) to assist with the implementation of the EMPR.

The Contractor's Environmental Representative (CER) will:

- Provide Environmental Awareness training for Contractors Engineers, foremen, site staff and any visitors to the site. A record of all training and visitors induction must be kept on site;
- Ensure that the Code of Conduct is signed by all personnel responsible for activities that could have a negative impact on the environment;
- Undertake monitoring and analysing of data, and reporting to Engineer and the ECO on a monthly basis; and
- Maintain and manage an incidents and non-conformance register.

3.6 CONTRACTOR MANAGEMENT

Contractor management will be affected through specific activities as listed below:

- At the tender briefing meeting environmental management expectations during the project shall be highlighted;
- The EMPR shall be included with the tender documents;
- Once the Contractor is appointed they should be instructed to develop a document that should indicate how they plan to ensure compliance with the EMPR; and
- Fines and penalties shall be managed in accordance with the Public Management Finance Act.

3.7 PENALTIES AND FINES

A penalties and fines system shall be developed and implemented by the Contractor.

A guideline of minimum fine values is provided for minor, moderate and serious offences in the table below.

Table 3-1: Table depicting guidelines for fines and offences

Offences	Fine
Minor offences Littering Possession of intoxication substances on site. Failure to use ablutions. Moving on areas recently landscaped. Disturbing grassed areas. Not parking in demarcated areas. Not using safety equipment Wasting of water and electricity. Not removing domestic waste off site. Not stockpiling topsoil adequately.	R 1500 - 00
Moderate offences Oil spills Persistent oil leeks on vehicles. Generation of excessive dust and noise. Transgression of the speed limit. Illegal fires. Burying of waste. Use of intoxicate substances on site. Lack of erosion control. Entering non-demarcated areas. Hunting and snaring. Damaging of pre- identified trees.	R 5000-00
Serious offences Large oil/ hazardous waste spill.	

Removal of pre-identified trees. Damage of pre- identified heritage sites or objects. Continually exceed noise limits. Transgression of legal requirements. Sanitation facilities not adequate. Pollution of groundwater. Removal of any protected plant or other species. Damage or pollution of wetlands.	R15 000.00

These fines should be issued in addition to any remedial costs included as a result of the non-compliance, as well as any statutory penalty or fine (if applicable) which will also be for the offender's expense.

4. COMPLIANCE MONITORING

4.1 CODE OF CONDUCT

The Engineer must compile a Code of Conduct that all of the Engineer's and Contractor's personnel responsible for activities that have potential impacts on the environment must sign.

4.2 METHOD STATEMENTS

A Method Statement must be compiled for every activity undertaken by the Contractor. The Method Statements must include the following information:

- Responsible person (name and ID number) and an alternative (name and ID number);
- Legal Requirements;
- Training Requirements;
- PPE required;
- Method by which the activity will be undertaken;
- Emergency Procedures;
- Response in the case of a non-compliance; and
- All Method Statements must be signed by the Engineer.

An example of a Method Statement is included in **Appendix A**.

Method Statements for the following activities are required by this EMPR:

- Training;
- Fencing;
- Waste Management;
- Water (including Storm water) Management;
- Erosion control;
- Air Quality Management;
- Noise Management
- Traffic Management;
- Emergency response plan; and
- Rehabilitation.

The EER or ECO may require additional Method Statements for any aspects or activities that are identified as problematic or not complying with targets in the EMPR.

4.3 INCIDENTS AND NON-CONFORMANCES

According to Section 30 of the National Environmental Management Act (NEMA): *"Incident" means an unexpected sudden occurrence including a major emission, fire*

or explosion leading to serious danger to the public or potential serious pollution of or detriment to the environment, whether immediate or delayed.

In terms of the above definition:
The Emergency response plan/method statement should be initiated in response to an incident. The incident must be reported to the ECO and DEA as per Section 30 (3) of NEMA. An emergency incident report required in terms of Section 30(5) of NEMA (example attached as **Appendix B**) must be submitted to DEA's Environmental Management Inspectorate for processing. A close out certificate will be issued by the Inspectorate indicating that measures undertaken were to the department's satisfaction.

A chemical spill is defined as a potential liquid hydrocarbon or chemical spill or other release which can create a hazard to life or property or create environmental damage. Examples include liquid hydrocarbons, compressor or other equipment lube oil, evaporative cooler acid water, liquid odorant, or other substances that contain controlled or hazardous substances. Spills and other environmental incidents have been classified according to the risk to the environment and appropriate responses are indicated in **Table 4-1**.

Table 4-1: Classification of Environmental Incidents

Level	Definition	Response Required
Level 1	A Minor Emergency which can be controlled entirely by the personnel and facilities located within the immediate vicinity of the accident/incident site. These include events which cause minor property or equipment damage that are non-disruptive to operations, and do not pose a safety risk to personnel or property outside of the boundaries of Clients's property.	Recorded in the incidents register and managed accordingly
Level 2	A Level 2 Incident is defined as a Moderate Emergency which is disruptive, but not extensive, and forces a portion of the employer operation to be temporarily suspended or shut down. A Level 2 Incident is a spill or hazardous product release which has the potential to cause harm to personnel, the public, or the environment and includes a chemical spill of more than 35 l to land; or any chemical spill to water resources.	Recorded in the incidents register and managed accordingly
Level 3 to 5 Incidents	A Level 3 to 5 Incident is defined as a Serious (3), Major (4) to Catastrophic (5) alert requiring the intervention of external support services and that can have serious impacts on ecology, humans and on the	Report the incident to the ECO immediately. The ECO will submit an emergency incident report

Level	Definition	Response Required
	overall Project.	to DEA. The incident must also be recorded in the incidents register

In the above cases, it will be the decision of the site management and Engineer as to whether work stoppage must be implemented. In most cases, work in the area where the incident occurred will be stopped until all safety clearances have been given. Unless, there is a fatal accident, then the whole site will stop.

The holder of the authorisation must notify DEA, in writing and within 48 (forty eight) hours, if any condition of the Environmental Authorisation cannot be or is not adhered to. The notification must be accompanied by reasons for the non-compliance. Non-compliance with a condition of the Environmental Authorisation may result in criminal prosecution or other actions provided for in NEMA and the regulations.

4.4 CHECKING AND CORRECTIVE ACTION

4.4.1 Monitoring

A series of environmental variables that are to be monitored during the pre-construction and construction phases should be developed for identified aspects, such as surface water monitoring, noise monitoring, air quality monitoring etc. Monitoring results should be presented monthly. Where the target values are not met, further mitigation action (development of detailed method statements) should be considered.

4.4.2 Inspections

Some potential impacts are difficult to monitor quantitatively such as soil erosion and waste management. Daily visual inspections of all construction sites should be undertaken.

4.4.3 Internal Audits

Where monitoring data and the inspection reports highlight problems, an internal audit could be initiated. The EER is responsible for undertaking Internal Compliance Audits that cover the EA, EMPR, Method Statements and Tender Specification. The purpose of the audit is to ascertain the source of the problem and define what action must be taken to prevent its re-occurrence. Detailed method statements could be the outcome of the internal audit.

4.4.4 ECO audits

The ECO will undertake quarterly audits and submit audit reports to DEA, after client review.

4.4.5 Corrective action

There are several levels at which corrective action can be affected, namely verbal instructions, written instructions and contract notices.

5. LEGISLATIVE REQUIREMENTS AND PRINCIPLES

5.1 ENVIRONMENTAL PRINCIPLES

The following principles should be considered at all times during the pre-construction and construction phase activities.

- The environment is considered to be composed of both biophysical and social components.
- Construction is a disruptive activity and due consideration must be given to the environment, including the social environment, during the execution of a project to minimise the impact on affected parties.
- Minimisation of areas disturbed by construction activities (i.e. the footprint of the construction area) should minimise many of the construction related environmental impacts of the project and reduce rehabilitation requirements and costs.
- As minimum requirements, all relevant standards relating to international, national, provincial and local legislation, as applicable, shall be adhered to. This includes requirements relating to waste emissions (e.g. hazardous, airborne, liquid and solid), waste disposal practices, noise regulations, road traffic ordinances, etc.
- Every effort should be made to minimise, reclaim and/or recycle "waste" material.

5.2 ENVIRONMENTAL PERMITS, LICENCES AND AUTHORISATIONS

Commencement of the project is subject to obtaining all necessary permits, licences and/or authorisations required in terms of South African environmental legislation. A number of activities were applied for as part of the EIA process. Should the project trigger any other activities not included in the applications submitted, a separate application process must be followed and these activities authorised before the project can commence.

Such activities may include:

- **Blasting** - Blasting permits are required from the Department of Mineral Resources in accordance with the Explosives Act (Act No 26 of 1956).

- **Waste management** - The management of waste is regulated by the National Environmental Management: Waste Act (Act 59 of 2008) (NEMWA) and associated Regulations.
  GN 921 lists Waste Management Activities in respect of which a Waste Management Licence (WML) is required; these include various activities associated with the storage of waste, reuse, recycling and recovery of waste, treatment of waste (which includes the remediation of contaminated land) and disposal of waste. The Schedule to the Notice distinguishes between two

categories of waste management activities which require licensing and for which a basic assessment process (for Category A Waste Management Activities) or an Environmental Impact Assessment process (for Category B Waste Management Activities) must be conducted. A third category (Category C) refers to activities for which norms and standards have been set.

Construction activities usually result in general as well as hazardous waste.

WMLs are required for, amongst others:

- The storage of general or hazardous waste in lagoons;
- The disposal of inert waste to land in excess of 25 tons;
- The disposal of any hazardous waste to land;
- The disposal of general waste to land covering an area of more than 50m^2 and
- The disposal of domestic waste generated on premises in areas not serviced by the municipal service where the waste disposed exceeds 500 kg per month.

Schedule 3 of the NEMWA, as amended, defines "general waste" as waste that does not pose an immediate hazard or threat to health or to the environment, and includes—

(a) domestic waste;
(b) building and demolition waste;
(c) business waste; and
(d) Inert waste; or
(e) any waste classified as non-hazardous waste in terms of the regulations made under section 69, and includes non-hazardous substances, materials or objects within business, domestic, inert, building and demolition wastes as outlined in Schedule 3 of the Act.

Where

"building and demolition waste" means waste, excluding hazardous waste, produced during the construction, alteration, repair or demolition of any structure, and includes rubble, earth, rock and wood displaced during that construction, alteration, repair or demolition; and includes discarded concrete, bricks, tiles and ceramics, discarded wood, glass and plastic, discarded metals, discarded soil, stones and dredging spoil and “other” discarded building or demolition wastes.

"inert waste" means waste that—

(a) does not undergo any significant physical, chemical or biological transformation after disposal;
(b) does not burn, react physically or chemically biodegrade or otherwise adversely affect any other matter or environment with which it may come into contact; and

(c) does not impact negatively on the environment, because of its pollutant content and because the toxicity of its leachate is insignificant and which include discarded concrete, bricks, tiles and ceramics, discarded glass and discarded soil, stones and dredging spoil, as listed in Schedule 3 of the Act.

Sludge will be dewatered/pressed/dried (depending upon the actual process selected at detailed design stage) and the treated sludge will be disposed to farmland or at a licensed approved solid waste disposal site. The sludge will be classified before it is disposed of in order to prove that it is not hazardous. A Waste Management Licence may be required if it is disposed to land and covers more than 50 m^2.

A WML may be required for the settling ponds that will be used to capture runoff from the batching and crusher plants (Activity (1) of Category A: Storage of general waste in lagoons).

The construction of the tunnel at the Lalini Dam for the generation of hydro power will result in spoil (inert general waste) that needs to be disposed of, if it cannot be utilised as aggregate or fill material, and may require a WML.

No WML Applications are included in this EIA process and if applications are required, they will have to be applied for separately. It is recommended that all activities that may require a WML are considered during the design stage so that assessments and applications can be made, and a licence received, before the activity is undertaken.

NEMWA GN 926 presents the norms and standards for the storage of waste. The requirements of waste storage facilities; management of waste storage facilities; and general provisions required, are outlined therein.

- **Storage of hazardous substances** - Hazardous substances must be stored and handled in accordance with the appropriate legislation and standards, which may include the Hazardous Substances Act, the Occupational Health and Safety Act, and relevant associated Regulations. No more than 500 m^3 of hazardous substances may be stored on site without an environmental authorisation.

- **Health and safety of work teams** - Construction Regulations (2003) published under the Occupational Health and Safety Act (Act No 85 of 1993) apply to construction activities including “the moving of earth, clearing of land, the making of an excavation, piling, or any similar type of work”. A “health and safety plan” which addresses hazards, and includes safe working procedures to mitigate, reduce or control the hazards identified, is required under this Act. A risk assessment must also be undertaken by an appropriately qualified person(s) and the Contractor shall ensure that all employees under his or her control are

informed, instructed and trained by a competent person regarding any hazard and the related work procedures before any work commences, and thereafter at such times as may be determined in the risk assessment.

- **Heritage resources –** Before any heritage resources are demolished or damaged a permit must be obtained. Permit applications must be submitted to the relevant Heritage Resources Authority (i.e. the South African Heritage Resources Agency and/or the Eastern Cape Provincial Heritage Resources Authority).

- **Removal of graves -** Permits are required for the removal of graves in terms of the National Heritage Resources Act (No 25 of 1999) section 36.

- **Removal of trees –** The removal of trees protected in terms of the National Forests Act (No 84 of 1998) requires a licence from the Department of Agriculture, Forestry and Fisheries (DAFF).

- **Removal and transportation of endangered fauna and flora -** A permit must be obtained from the provincial nature conservation agency for the removal or destruction of indigenous protected and endangered plant and animal species. Copies of permits required must be submitted to the DEA for record keeping purposes.

- **Water abstractions –** Water abstracted from any sources for construction purposes requires authorisation from DWS.

- **Asphalt Plants** - GN 893 of 2013 in GG 37054 dated 22 November 2013 provides a list of activities which result in atmospheric emissions which have or may have a significant detrimental effect on the environment, including health, social conditions, economic conditions, ecological conditions or cultural heritage. Activities include Macadam preparation (the mixing of aggregate and tar or bitumen to produce road surfacing in permanent facilities and mobile plants). These activities require an Atmospheric Emissions Licence in terms of Section 37 of the Act.

- **Borrow areas and Quarries -** Government Gazette No 26501 dated July 2004 states that the Minister of the Mineral Resources, acting in terms of section 106 (1) of the Mineral and Petroleum Resources Development Act, 2002 (Act No 28 of 2002) (MPRDA) exempts the Department of Water and Sanitation, amongst other institutions, from the provisions of sections 16, 20, 22 and 27 of said Act in respect of any activity to remove any mineral for the construction and maintenance of dams, harbours, roads and railway lines and for purposes incidental thereto. Section 106 (2) of the MPRDA says that in such cases the DWS must still compile an Environmental Management Programme (EMPR) for

approval in terms of Section 39 (4) of the Act. Any new borrow areas and quarries not authorised as part of the EIA process must be authorised separately.

5.3 CONSTRUCTION INDUSTRY DEVELOPMENT BOARD

The Construction Industry Development Board (CIDB) is a Schedule 3A public entity established by Act of Parliament (Act 38 of 2000) to promote a regulatory and developmental framework that builds the construction delivery capability for South Africa's social and economic growth.

The Construction Registers Service of the CIDB comprises the Register of Contractors and the Register of Projects which have been established in terms of the CIDB Act (Act 38 of 2000). The Register of Contractors grades and categorises contractors according to financial and works capability. It is mandatory for public sector clients to apply the Register of Contractors when considering construction works tenders. The Register of Contractors facilitates public sector procurement and serves as a framework for contractor development.

6. PRE-CONSTRUCTION SPECIFICATIONS

6.1 GENERAL

This section of the EMPR provides a framework for environmental protection during the planning and design phases of the project, leading up to, but not including, the establishment on site by the appointed contractor. This period will typically include relocation and compensation of affected communities (discussed in **Chapter 7**), land acquisition, as well as investigative activities such as confirmation of materials availability, archaeological site protection and rescue and fencing.

The pre-construction activities are the responsibility of DWS as the authorisation holder. Should the authorisation be transferred to another party, that party would be responsible as per the relevant organisational structure.

6.2 DECISIONS REGISTER

A Decisions Register must be established and maintained, and must be available to any member of the public who wishes to access it. The register should include, *inter alia*, all commitments made to stakeholders during the public participation process, which are recorded in the Issues and Responses Report (see **Appendix B** of the EIR).

6.3 LAND ACQUISITION

The proposed project is located on state-owned land which is administered by traditional authorities. The land is therefore currently subject to communal land tenure arrangements.

DWS, in consultation with the Department of Rural Development and Agrarian Reform will formally acquire the land that will be directly affected by the project (e.g. footprint of the dams and pipeline servitudes) once the project has been officially promulgated as a Government Waterworks.

6.4 PROTECTION OF VEGETATION

a) Search and rescue of all indigenous vegetation (e.g. *Aloe* species, *Euphorbia* species, *Cussonia* species) must be undertaken by a suitably qualified specialist. The search, rescue and relocation operation should take place prior to clearing any areas affected by construction. The dam basins, the areas impacted by the access road to the hydropower plant and haul roads at Lalini Dam, areas of the footprint that have been identified as sensitive (see **Appendix D**), as well as the areas identified by the floral specialist for rescue and relocation (see **Appendix E**) must be subjected to search and rescue. Floral species must be

relocated to similar habitat types, outside of infrastructure footprint areas. All the required permits must be obtained.

b) Linear infrastructure should be re-aligned to avoid protected trees. Where this is not possible, permits for the moving or destruction of these trees must be obtained in terms of the National Forests Act.
c) Planning of temporary roads and access routes should take place within areas of lower sensitivity or where historic vegetation transformation has occurred (refer to sensitivity maps in **Appendix D**).
d) An investigation must be undertaken by a qualified specialist to determine whether any waterfall dependent plants in the gorge and on the cliff could be significantly impacted and whether they require relocation; and findings of the investigation must be implemented.

6.5 PROTECTION OF FAUNA

a) Should any RDL faunal species, species of conservational concern or other common faunal species be found within the affected environment, these species must be relocated to similar habitat within the vicinity of the study area with the assistance of a suitably qualified specialist.
b) Rescue and relocation of faunal species needs to be conducted by an appointed specialist where islands are formed by the flooding of the valley.
c) No wild, domesticated or farm animals may, under any circumstances, be fed, hunted, snared, captured, injured or killed. Personnel must report any animal found dead or injured in traps or snares to the Engineer who will take appropriate action.

6.6 PROTECTION OF CULTURAL HISTORICAL ASPECTS AND GRAVES

a) Thorough identification of abandoned homesteads affected by the project is required.
b) No associated infrastructure may be located within 100 m of graves outside the full supply levels, and if unavoidable, these graves should also be relocated.
c) The archaeological site identified in the proposed Ntabelanga Dam basin (**Table 6-1**) should be mapped in detail, with judicious sampling, authorised by a permit from ECPHRA. Thereafter the site may be destroyed once a destruction permit has been issued by ECPHRA.
d) The archaeological site identified in the proposed Lalini Dam basin (**Table 6-1**) basin should be mapped and excavated/sampled, authorised by a permit from ECPHRA. Thereafter the site may be destroyed once a destruction permit has been issued by ECPHRA.
e) A detailed survey of potential Early Iron Age sites should be undertaken once crops have been harvested and vegetation clearance has occurred.
f) Fieldwork to identify heritage resources affected by news roads, pipelines, and electrical infrastructure must be undertaken, and mitigation measures

recommended, once final infrastructure locations and routes have been surveyed and pegged.

g) The personnel and consultants may not disturb, deface, destroy or remove protected heritage resource features, whether fenced or not. If any archaeological features, graves or skeletal remains are found, work must cease and the Engineer must be informed immediately. Work may proceed only once the site has been investigated by a person nominated by the Engineer and has been signed off as being cleared.

Table 6-1: Archaeological sites identified within the dam basins

Ntabelanga Dam Basin	**Location relative to FSL**	**Coordinates**	
LSA knapping floor	948 m asl. Within FSL	31 06.550 S	28 30.746 E
Laleni Dam Basin			
EIA smelting site c. 900AD	732 m asl. Within FSL	31 15.030 S	28 55.555 E

6.7 PROTECTION OF AQUATIC ECOSYSTEMS

Ongoing biomonitoring must take place from 1 year prior to construction (on a quarterly basis) and throughout construction and operation (on a minimum of a six monthly basis in the spring and autumn of each year) to determine trends in ecology and define any impacts requiring mitigation.

Aquatic biomonitoring should take place to monitor aquatic ecological trends in the receiving environment at strategic points upstream and downstream of the impoundments, weirs and crossings as well as upstream and downstream of the hydroelectric generation tunnel. If any trends are observed where impacts on the aquatic ecology are becoming unacceptable, measures to reduce the impacts must be immediately implemented.

The following assessments must be undertaken as part of the aquatic biomonitoring:

1. Habitats assessment
    a. IHIA
    b. IHAS

2. Macro-invertebrate assessment
    a. SASS5
    b. MIRAI

3. Annually
    a. Fish assessments using FRAI
    b. Riparian vegetation using VEGRAI

All aquatic biomonitoring should be undertaken by a suitably qualified and South African River Health Program (SA RHP) accredited assessor.

6.8 DISASTER MANAGEMENT

Develop a disaster management plan that includes a well-developed public communication process and evacuation plan, for implementation during the construction phase.

6.9 SITE LAYOUT PLANNING

a) Minimise construction footprints during the design of the project components, prior to commencement of construction.
b) In determining the site layout for the site office, cognisance must be taken of sensitive and no-go areas, which are defined by the botanist, zoologist, wetland specialist and archaeologist prior to impacting the area, as well as protecting and maintaining existing private/communal property, fences and gates.
c) Ensure that contractor lay-down areas are included in the initial areas demarcated for clearing in order to minimise vegetation loss, and ensure as far as possible, that they do not encroach into wetland / riparian zones or their respective buffer zones.
d) Clearly demarcate sensitive areas into which no construction activities should encroach.
e) Where construction will obstruct existing access, be sure to allow for alternative temporary access routes.

6.10 ACCESS ROADS, ROAD REALIGNMENTS AND ROAD UPGRADES

a) Adjust road alignments so as to avoid as many structures as is feasible.
b) Adjust road alignments to avoid cutting and destroying protected tree species as much as possible.
c) The haul road linking the borrow areas to the Lalini Dam construction site must be realigned to avoid going through the town of Lalini.
d) The proposed access road for construction vehicles through Lotana village must be realigned to avoid the village.
e) In determining the final route and extent of access/haul roads, cognisance must be taken of sensitive and no-go areas, which are defined by the botanist, zoologist, wetland specialist and archaeologist prior to impacting the area, as well as protecting and maintaining existing private/communal property, fences and gates.
f) If it is absolutely unavoidable that wetland / riparian habitat is affected during the construction of new roads, especially during bridge or culvert construction, disturbance to any wetland crossings must be minimised and suitably rehabilitated. The design of such culverts / bridges should allow for wetland soil conditions to be maintained both upstream and downstream of the crossing to such a degree that wetland vegetation community structures upstream and

downstream of the crossing are maintained. In this regard, special mention is made of:

- The crossing designs of bridges must ensure that the creation of turbulent flow in the system is minimised, in order to prevent downstream erosion.;
- The design of such culverts and/or bridges should ensure that the permanent wetland zone should have inundated soil conditions throughout the year extending to the soil surface;
- The design of such culverts and/or bridges should ensure that the seasonal wetland zone should have water-logged soils within 300 mm of the soil surface at all times;
- Temporary wetland zone areas should have waterlogged soil conditions occurring within 300 mm of the land surface during the summer season;
- In order to achieve this all crossings of wetlands should take place at right angles wherever possible.

g) Specific components which require the provision of drainage facilities are:
   - Abutments, retaining walls and culvert barrels, behind which drainage filters and pipes are required to collect ground water and dispose of this through weepholes;
   - Abutment girder beds which require the provision of collector channels and outlet pipes to remove water which has leaked through expansion joints or has arisen from driving rain or condensation;
   - Deck roadway surface subject to direct rainfall, which must be disposed of via drainage scuppers, supplemented in certain instances by grid inlets and concealed drainage pipes
   - Deck concrete surface on the uphill side of concrete nosings, asphalt plug joints or proprietary joints, which cause the entrapment of water which has percolated through the asphalt surfacing and must be disposed of through small drainage pipes;
   - Deck concrete surface on the uphill side of the transverse concrete housings for the expansion joints which seal off the area beneath the sidewalks and entrap water which has percolated through the sand fill and must be disposed of through drainage pipes; and
   - Drip notches in the underside of deck cantilevers, strictly in compliance with the configuration and positions shown on the drawings. The careless omission of drip notches can lead to the defacement of the soffits and sides of bridge decks through runoff water laden with silt and other contaminants even before construction of the balustrades.

h) Surface water runoff from access roads and the final road structure needs to be curtailed and slowed down by the strategic placement of energy dissipation structures.

i) Where high speed travelling is possible, speed bumps/ berms must be placed across the road to slow moving vehicles. This is particularly important near villages, schools, clinics, etc.

j) Adequate stormwater management must be incorporated into the design of the proposed structure in order to prevent erosion and the associated sedimentation of the system for the life of the structure. Particular attention must be given to the area adjacent to the road reserve to ensure that stormwater energy is dissipated and does not cause erosion in these areas.
k) All crossing construction should be undertaken in the low flow season and must be completed within 6 months.
l) Clearly demarcate sensitive areas into which no construction activities should encroach.
m) As some roads and bridges will be inundated by the dams, new bridges and road realignments will be required. This will influence travel routes, distances and travel times. Where the proposed realignments will result in significant increases in travel times and distances (e.g. travelling from the villages north of Ntabelanga Dam to Maclear), alternative routes must be provided in order to maintain or improve the current level of service in the areas concerned. The necessary studies (e.g. traffic study and cost benefit analysis) must be conducted to determine the best way to provide an alternative route/crossing point to Maclear.
n) The link road from Siqikini to Lotana should be investigated during implementation in conjunction with the Provincial Department of Transport. This should be part of the further development of the area to be investigated during implementation of the project.

6.11 PRE-CONSTRUCTION DESIGN REQUIREMENTS AND PROJECT PLANNING

These specifications are intended to guide the engineers, scientists, surveyors, Contractors and other parties that will be involved in detailed planning for the project and act as a reference during the planning and design of the scheme. The objective is to operationalise the recommendations in the EIA that are to be addressed at the design phase of the project:

a) No associated infrastructure may be located within 100 m of graves outside the full supply levels, and if unavoidable, these graves should be relocated.
b) Sections of the power line that require bird diverters must be identified and bird diverters must be placed accordingly.
c) The discharge point from the hydropower plant and discharge structure must be designed and positioned in a way that would minimise incision, erosion and changes to instream habitat structures.
d) Stratification is predicted to occur in the proposed new dams, and the release of cold, anoxic bottom water will have a detrimental effect on water quality and aquatic life up to a distance of about 15 km downstream of the dam wall. To overcome this effect a multiple level outlet structure must be installed, with outlets at no more than 6.5 m intervals, starting 7 m below the full supply level of the dam. Valves must be designed to ensure the immediate aeration of released water.

e) An investigation on the necessity and design specifications for an eel-way should be undertaken and findings implemented.
f) A noise baseline must be undertaken to establish existing ambient noise levels where sensitive receptors will be affected by construction. The baseline study should include recommended monitoring points for noise monitoring during the construction phase.
g) Strategically placed sections of earth berm or equivalent noise attenuation barrier may be necessary along the edges of the respective road reserves to adequately protect noise sensitive areas as identified in the noise baseline study.
h) Acoustic design should ensure that the overall generated noise level from the new hydropower plants does not exceed the limits specified for rural districts in SANS 10103:2008.
i) An air quality baseline must be undertaken to establish existing PM10 and dust fallout levels where there are sensitive receptors. The baseline study should include recommended monitoring points for air quality monitoring and set limits for dust levels during the construction phase.
j) A water quality baseline must be undertaken.
k) Restrict disruptive construction activities to the drier months wherever feasible, in order to avoid sedimentation and erosion of wetland / riparian features associated with the activities due to the soils of the area being highly susceptible to erosion.
l) Determine the locality of the registered landfill site and hazardous waste disposal facilities nearest to the construction site as well as the capacity and condition of these sites. If the landfill site(s) near the construction site is not registered, consider assistance to upgrade the site as part of the project.
m) If sand, rock or aggregate is to be brought in from sources other than the borrow areas situated in the dam basin, a Traffic Impact Assessment must be undertaken, and a traffic management plan must be compiled if necessary.

6.11.1 Pipeline route realignments

a) Pipelines should be realigned as far as possible to avoid any structures, graves, and to a lesser extent, assets (such as cultivated fields). It seems that there may be some scope to move the hydro pipeline and tunnel junction further west or south, where there are no dwellings, which is the socially preferred option.
b) Pipelines should be realigned as far as possible to avoid cutting and destroying protected trees.
c) The final alignment of pipeline routes must also take into consideration the sensitivity maps developed by the wetland and flora specialists (see **Appendix D**) in order to minimise footprints in sensitive areas.
d) Support structures for pipelines must be placed outside of riparian features, channelled valley bottom wetlands and drainage lines. Should it be essential to place such support structures within these features, the designs of such structures must ensure that the creation of turbulent flow in the system is minimised, in order to prevent downstream erosion. No support pillars should be

constructed within the active channels and infrastructure should cross wetlands at right angles.

6.11.2 Power line route realignments

a) It is recommended that Alternative 3 (furthest from the Falls) be selected but re-aligned to drop below the ridge line into the adjacent valley where it will have the valley sides to provide a backdrop and reduce the silhouette image against the skyline (see **Figure 2**).
b) The final power line route should as far as possible avoid any structures, graves, and to a lesser extent, assets (such as cultivated fields); and must also take into consideration the sensitivity maps developed by the wetland and flora specialists (e.g. rocky outcrops and mountain bushveld habitat zones) (see **Appendix D**) in order to minimise footprints in sensitive areas. Support structures for power lines should not be placed within sensitive wetland / riparian and floral habitats.

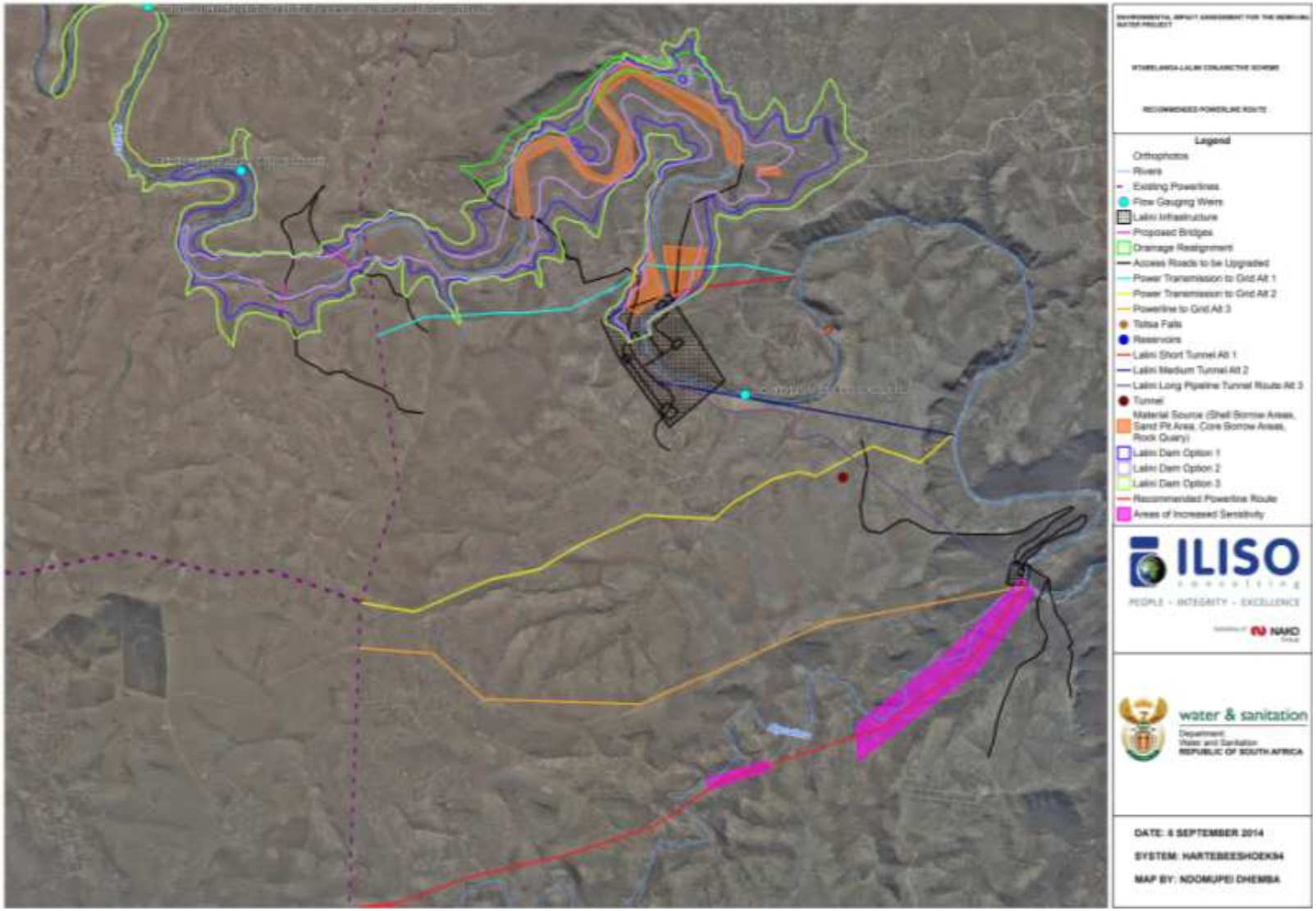

Figure 6-1: Recommended power line route alignment

6.12 AUTHORISATION OF LISTED ACTIVITIES

Any activity that requires authorisation in terms of the NEMA or any Specific National Environmental Management Act that is not included in the EIA must be authorised through a separate process (e.g. amendment application). This may for instance be required for project components which were not yet finalised at the time of undertaking fieldwork and compiling the EIA report, such as power lines to supply power during construction at Ntabelanga and Lalini Dam sites, as well as access roads to the borrow areas and quarries within the Ntabelanga Dam basin.

6.13 INVESTIGATIVE ACTIVITIES

Investigative activities include geotechnical and other pre-construction activities on site.

6.13.1 Arrangements for access on site

The DWS must establish a protocol for liaising with traditional authorities and for responding to all queries from occupiers of the land. A liaison officer must be nominated to be the direct contact with the traditional authorities during the pre-construction period.

The DWS Liaison Officer will be responsible for interacting with and obtaining consent from traditional authorities and occupiers of the land (where relevant) to access the project site. The period and conditions for access to the site(s) will be agreed formally with the traditional authorities and occupiers of the land (where relevant).

6.13.2 Identification of accredited site personnel

Each person required to be on site as a member of the investigating personnel must be issued with an identification card and will be required to carry this card on their person at all times as an identification document.

6.13.3 Access roads and access points

All personnel must make use of existing roads and tracks as far as possible.

6.13.4 Record-keeping

The DWS Liaison Officer will keep a record of all field visits and contacts with traditional authorities and occupiers of the land by investigating personnel.

6.13.5 Accommodation

Personnel accommodation must as far as possible be placed in an urban area or registered lodges.

6.13.6 Requirements for managing environmental impacts on site

Hydrocarbon wastes, accidental spills and hazardous wastes

Compliance with all national, regional and local legislation with regard to the disposal of hydrocarbons, chemicals, solvents and any other harmful and hazardous substances and materials must be ensured. All hazardous waste must be collected in receptacles located on a drip tray on site for disposal at a registered hazardous waste disposal site. Accidental chemical spills must be contained for cleanup and control by the supplier, or by a professional pollution control service provider. Fuel spill absorption kits must be available on site.

Vehicles and equipment must undergo regular inspection and maintenance to avoid fuel and oil leaks, as well as to remove combustible material that may be the cause of accidental fires. All areas from which surface water runoff could possibly be contaminated by oils, grease and fuel must be identified and made safe.

Water pollution control

No substance which may cause water pollution may be stored within the 1:100 year flood line, or within a horizontal distance of 100m (whichever is greater) of a watercourse, drainage line or identified wetland. No waste of any nature may be dumped into any watercourse, drainage line or wetland. Swimming, bathing, and the cleaning of clothing, tools or equipment in all watercourses, drainage lines and wetlands is prohibited.

Access to water for geotechnical drilling purposes

No water use, as per Section 21 of the National Water Act (Act No. 36 of 1998) (including any activities in wetlands), is permitted without the necessary authorisation. This authorization must be obtained by DWS.

Water for human consumption

Water for human consumption will be brought to site by the Contractor in a water tank and the water will be obtained from a potable source.

Fire prevention and management

No open fire is permitted in works areas or in camping areas and the collection on site of firewood or other fuel is strictly prohibited. Fires may only be lit in designated areas. Fire suppression equipment must be located at specific points in work areas, storage sites and field camps, as designated by DWS. The Contractor will ensure that specific staff undergo basic fire fighting training and place on record copies of certificates to this effect. The Contractor will ensure that all staff working on site have gone through fire danger awareness training before work on site can commence. The fire fighting equipment required on site is:

- Fire extinguishers (dry powder canisters) placed at storage, field camps and accommodation sites;

- A 500 litre water tanker with pump on a dedicated fire fighting bakkie; and
- Hand held equipment (fire beaters and Raco).

Protection of fauna
See **section 6.4**.

Protection of vegetation
See **section 6.3**.

Topsoil conservation
Topsoil is defined as the A Horizon which is the upper soil profile approximately 200 mm deep. The topsoil cleared for purposes of an investigation must be stock-piled separately from the sub-soils and replaced from where it was removed once investigations have been completed. After completion of drilling and excavation of trail pits the Contractor must rehabilitate the disturbed sites by replacing the topsoil and landscaping the area to control storm runoff.

Protection of cultural and heritage resources
See **section 6.5**.

Solid waste management
No dumping or littering must be allowed. Domestic and all other waste from any temporary accommodation area, from any storage area and from all work areas and drilling activities must be collected and disposed of at the nearest registered solid waste disposal facility. No solid waste may be burned on site. The Contractor must provide proof of landfill acceptance and waste receipt to DWS.

Toilet facilities
Contractors must provide at least one portable chemical toilet at each work area for every 30 workers at that site. Site toilets may not be located within the 1:100 year flood line, or within a horizontal distance of 100m (whichever is greater) of a watercourse, drainage line or identified wetland. Site toilets must be regularly maintained and cleaned so as to keep them in good, functional working order and in an acceptable state of hygiene. Drinking water facilities and hand washing facilities must be located conveniently near to site toilets. Toilets must be screened from view by means of shade cloth.

Infilling in river
Contractors may not make infillings by soil or any other material in a river or wetland for crossing or drilling purposes without prior authorisation.

Landscaping and rehabilitation
All test pits dug for investigation purposes must be properly filled in, compacted and covered with topsoil. Special attention should be paid to alien and invasive control

within these areas. Alien and invasive vegetation control should take place throughout all phases of the development.

Damage to property

Any damage caused to property must be reported immediately to the DWS Liaison Officer who will report it to the landowner and arrange for repairs to be done or for a claim for compensation to be lodged with the DWS. The cost of repairs or compensation for accidental damage will be for the account of the Contractor.

Health and safety specifications

The DWS Health and Safety Requirements shall apply to all Contractors. Informal fires should be prohibited.