ENVIRONMENTAL MANAGEMENT PROGRAMME

LUSIKISIKI REGIONAL WATER SUPPLY SCHEME, LUSIKISIKI, EASTERN CAPE PROVINCE, SOUTH AFRICA

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1 INTRODUCTION

1.1 Objectives of an EMPr

The Environmental Management Programme (EMPr) has been compiled to provide recommendations and guidelines according to which compliance monitoring can be done during the planning and design, construction, operational phases of the Lusikisiki Regional Water Supply Scheme as well as to ensure that all relevant factors are considered to ensure for environmentally responsible development.

This EMPr informs all relevant parties [the Proponent, the Contractor, the Environmental Control Officer (ECO) and all other staff, contractors and consultants employed by the Department of Water and Sanitation and/ or the Project Company responsible for the implementation of the water supply scheme] at the site as to their duties in the fulfilment of the legal requirements for the pre-construction, construction and operation of the Lusikisiki Regional Water Supply Scheme with particular reference to the prevention and mitigation of anticipated potential environmental impacts.

All parties should note that obligations imposed by the EMPr are legally binding in terms of the environmental authorisation (EA) granted by the relevant environmental permitting authority.

The objectives of an EMPr are to:

- Ensure compliance with regulatory authority stipulations and guidelines which may be local, provincial, national and/or international;
- Ensure that there is sufficient allocation of resources on the project budget so that the scale of EMPr-related activities is consistent with the significance of project impacts;
- Verify environmental performance through information on impacts as they occur;
- Respond to unforeseen events;
- Provide feedback for continual improvement in environmental performance;
- Identify a range of mitigation measures which could reduce and mitigate the potential impacts to minimal or insignificant levels;
- Detail specific actions deemed necessary to assist in mitigating the environmental impact of the project;
- Identify measures that could optimize beneficial impacts;
- Create management structures that addresses the concerns and complaints of Interested and Affected Parties (I&APs) with regards to the development;
- Establish a method of monitoring and auditing environmental management practices during all phases of the activity;
- Ensure that safety recommendations are complied with; and
- Specify time periods within which the measures contemplated in the final environmental management programme must be implemented, where appropriate.

1.2 Form and function of an EMPr

An EMPr is focused on sound environmental management practices, which will be undertaken to minimise adverse impacts on the environment through the lifetime of a development. In addition, an EMPr identifies which measures will be in place or will be implemented to manage any incidents and emergencies that may occur during operation of the facility. As such the EMPr provides specifications that must be adhered to, in order to minimise adverse environmental impacts associated with the operations of the water supply scheme.

The content of the EMPr is consistent with the requirements as set out in Regulation 33 of the 2010 EIA Regulations stated below:

According to regulation 33 of GN R 543, an environmental management programme must include:

(a) Details of –
  (i) The person who prepared the environmental management programme; and
  (ii) The expertise of that person to prepare an environmental management programme;
(b) Information on any proposed management or mitigation measures that will be taken to address the environmental impacts that have been identified in a report contemplated by these Regulations, including environmental impacts or objectives in respect of –
  (i) Planning and design;
  (ii) Pre-construction and construction activities;
  (iii) Operation or undertaking of the activity;
  (iv) Rehabilitation of the environment; and
  (v) Closure, where relevant.
(c) A detailed description of the aspects of the activity that are covered by the draft environmental management programme;
(d) An identification of the persons who will be responsible for the implementation of the measures contemplated in paragraph (b);
(e) Proposed mechanisms for monitoring compliance with and performance assessment against the environmental management programme and reporting thereon;
(f) As far as is reasonably practicable, measures to rehabilitate the environment affected by the undertaking of any listed activity or specified activity to its natural or predetermined state or to a land use which conforms to the generally accepted principle of sustainable development, including, where appropriate, concurrent or progressive rehabilitation measures;
(g) A description of the manner in which it intends to –
  (i) Modify, remedy, control or stop any action, activity or process which causes pollution or environmental degradation;
  (ii) Remedy the cause of pollution or degradation and migration of pollutants;
  (iii) Comply with any prescribed environmental management standards or practices;
  (iv) Comply with any applicable provisions of the Act regarding closure, where applicable;
  (v) Comply with any provisions of the Act regarding financial provisions for rehabilitation, where applicable;
(h) Time periods within which the measures contemplated in the draft environmental management programme must be implemented;
(i) The process for managing any environmental damage, pollution pumping and treatment of extraneous water or ecological degradation as a result of undertaking a listed activity;
(j) An environmental awareness plan describing the manner in which –
  (i) The applicant intends to inform his or her employees of any environmental risk which may result from their work; and
  (ii) Risks must be dealt with in order to avoid pollution or the degradation of the environment;
(k) Where appropriate, closure plans, including closure objectives.

1.3 Legal requirements

Construction must be according to the best industry practices, as identified in the project documents. This EMPr, which forms an integral part of the contract documents, informs the contractor as to his duties in the fulfilment of the project objectives, with particular reference to the prevention and mitigation of environmental impacts caused by pre-construction, construction and operation activities associated with the project. The Contractor should note that obligations imposed by the approved EMPr are legally binding in terms of environmental statutory legislation and in terms of the additional conditions to the general conditions of contract that pertain to this

project. In the event that any rights and obligations contained in this document contradict those specified in the standard or project specifications then the latter shall prevail.

The Contractor shall identify and comply with all South African national and provincial environmental legislation, including associated regulations and all local by-laws relevant to the project. Key legislation currently applicable to the design, construction and implementation phases of the project must be complied with. The list of applicable legislation provided below is intended to serve as a guideline only and is not exhaustive:

- The Constitution Act (No. 108 of 1996)
- National Environmental Management Act (NEMA) (No.107 of 1998, revised 2010)
- National Environment Management: Biodiversity Act (No. 10 of 2004)
- National Forests Act (No. 84 of 1998)
- National Heritage Resources Act (No. 25 of 1999)
- National Environmental Management: Air Quality Act (No. 39 of 2004)
- Occupational Health and Safety Act (No. 85 of 1993)
- National Water Act (No. 36 of 1998)
- Hazardous Substances Act (No. 15 of 1973)
- Nature and Environmental Conservation Ordinance (No. 19 of 1974)
- National Environmental Management: Protected Areas Act (No. 31 of 2004)
- Mineral and Petroleum Resources Development Act (No. 28 of 2002)
- Conservation of Agricultural Resources Act (No. 43 of 1983)
- Municipal by-laws and planning
    - The Qaukeni Local Municipality SDF (2005)
    - The Ingquza Hill Local Municipality IDP (2014/2015)

1.4 Environmental authorisation

In accordance with the requirements of the National Environmental Management Act (Act No 107 of 1998) (NEMA), and relevant EIA regulations made in terms of this Act and promulgated in August, 2010 (Government Notice R543), and listed activities under (Government Notice R 544, 545, 546), the proposed Lusikisiki Regional Water Supply Scheme was subjected to a Full Scoping & Environmental Impact Assessment.

In terms of the EIA process, all reports generated from the environmental studies form part of a series of documents for the project. The Environmental Impact Assessment Report (EIR) identified potentially significant environmental impacts and was the main report in the series. Additional Specialist Assessments served to supplement the assessment contained in the EIR.

This EMPr interprets the findings of the EIR, and prescribes project-specific specifications to be achieved. In addition to the requirements of Regulation 33 of GNR 543, this EMPr is based on the principles of Integrated Environmental Management (IEM). The EMPr is a progressive working document which will be updated based on the relevant conditions stipulated in the Environmental Authorisation (EA). The EMPr will then be submitted to DEA (along with the final approved layout) for approval prior to the commencement of construction.

2 DETAILS OF THE ENVIRONMENTAL ASSESSMENT TEAM

According to regulation 33 of GN R 543, an environmental management programme must include:

(a) details of –
  (i) the person who prepared the environmental management programme; and
  (ii) the expertise of that person to prepare an environmental management

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Project team:

- Dr Alan Carter (Project Leader and EAP)
- Dr Cherie-Lynn Mack (Aquatic Specialist)
- Mr Lungisa Bosman (Public Participation, Social Specialist)
- Mr Roy de Kock (Project Manager, Ecological Specialist)
- Dr Greer Hawley (Social Specialist)
- Ms Caitlin Smith (EIA Report Generator, Aquatic Specialist)
- Ms Rosalie Evans (Visual Specialist, Public Participation)
- Ms Nande Suka (Public Participation)
- Ms Tarryn Martin (Ecological Specialist)
- Ms Ayanda Zide (Ecological Specialist)

Dr Alan Carter (Project Leader and EAP)
Director of the East London Office, has extensive training and experience in both financial accounting and environmental science disciplines with international accounting firms in South Africa and the USA. He is a member of the American Institute of Certified Public Accountants and holds a PhD in Plant Sciences. He is also a certified ISO14001 EMS auditor with the American National Standards Institute and the British Standards Institute.

Dr Cherie-Lynn Mack (Aquatic Specialist)
Principal Environmental Consultant, holds a PhD and MSc (with distinction) degrees in Environmental Biotechnology, with a BSc degree in Microbiology and Biochemistry. She has postgraduate research experience in industrial and domestic wastewater treatment technologies, with particular emphasis on the coal and platinum mining industries. Her interests lie in the water sector, with experience in ecological reserve determination and water quality monitoring and analysis. She has experience in water quality analysis and industrial wastewater treatment research.

Mr Lungisa Bosman (Public Participation)
Senior Environmental Consultant, holds a Bachelor of Social Science (1993) from UCT, with majors in Public Administration & Sociology, and a Post Graduate Diploma in Organisation and Management. Lungisa has gained considerable experience in social facilitation and community education and has been involved in a number of projects where he has brought his facilitation skills to bear. These include the ADM and Chris Hani State of Environment studies.
Mr Roy de Kock (Project Manager, Ecological Specialist)
Roy is a Senior Consultant holding a BSc Honours in Geology and an MSc in Botany from the Nelson Mandela Metropolitan University in Port Elizabeth. His MSc thesis focused on Rehabilitation Ecology using an open-cast mine as a case study. He has been working for CES since 2010, and is based at the East London branch where he focuses on Ecological and

Agricultural Assessments, Geological and Geotechnical analysis, Environmental Management Plans, mining applications and various environmental impact studies. Roy has worked on numerous projects in South Africa, Mozambique and Malawi.

Mr Roy de Kock (Project Manager, Ecological Specialist)
Senior Consultant, Roy holds a BSc Honours in Geology and an MSc in Botany from the Nelson Mandela Metropolitan University in Port Elizabeth. His MSc thesis focused on Rehabilitation Ecology using an open-cast mine as a case study. He has been working for CES since 2010, and is based at the East London branch where he focuses on Ecological and Agricultural Assessments, Geological and Geotechnical analysis, Environmental Management Plans, mining applications and various environmental impact studies. Roy has worked on numerous projects in South Africa, Mozambique and Malawi.

Dr Greer Hawley (Social Specialist)
Principal Consultant, has a BSc degree in Botany and Zoology and a BSc Honours in Botany from the University of Cape Town. She completed her PhD thesis (Microbiology) at Rhodes University. Greer has been involved in a number of diverse activities. The core academic focus has been directed in the field of taxonomy both in the plant and fungal kingdom. Greer's research ranges from studying fresh and marine algae, estuarine diatoms, Restio species classification in the fynbos and forest vegetation and fungal species identification and ecology. Greer's study of fungi have also contributed towards an understanding of soil ecology and "below ground" ecology. She is currently working on numerous impact assessments at the East London branch.

Ms Caitlin Smith (EIR Generator, Aquatic Specialist)
Environmental Consultant. Caitlin holds a BSc degree in Geology and Geography and a BSc Honours Degree (with distinction) in Geology both obtained from Nelson Mandela Metropolitan University. Caitlin has 4 years' experience as a mining geologist in the heavy mineral sand mining industry.

Ms Rosalie Evans (EMPr, Visual Specialist, Public Participation)
Environmental Consultant. Rosalie holds a BA Social Dynamics degree with majors in Geography and Psychology, as well as BA (Hons) in Geography and Environmental Studies - both from Stellenbosch University. Rosalie's honours dissertation analysed the role of small grains in soil carbon sequestration in the agricultural sector of the Western Cape. Her academic focuses include renewable energy, sustainable development and the interactions between humans and their environment.

Ms Nande Suka (Public Participation)
Environmental Consultant. Nande holds a BSc degree with majors in Botany and Zoology (2010) and BSc Honours in Terrestrial Botany (2011), both obtained at the Nelson Mandela Metropolitan University in Port Elizabeth. Her academic focus was in the broad field of Environmental Management and with great interest on impact assessments, environmental planning and conservation.

Ms Tarryn Martin (Ecological Specialist)
Tarryn holds a BSc (Botany and Zoology), a BSc (Hons) in African Vertebrate Biodiversity and an MSc with distinction in Botany from Rhodes University. Tarryn's Master's thesis examined the impact of fire on the recovery of C3 and C4 Panicoid and non-Panicoid grasses within the context of climate change for which she won the Junior Captain Scott-Medal (Plant Science) for producing the top MSc of 2010 from the South African Academy of Science and Art as well as an Award for Outstanding Academic Achievement in Range and Forage Science from the Grassland Society of Southern Africa. She conducts vegetation assessments including vegetation and sensitivity mapping to guide developments and thereby minimise their impacts on sensitive vegetation. Tarryn has conducted a number of vegetation and impact assessments in Mozambique (to IFC standards) which include the Lurio Forestry Project in Nampula, the Syrah Graphite Mine in Cabo del Gado and the Baobab Iron Ore Mine in Tete, Mozambique. Tarryn has also co-designed and implemented the Terrestrial Monitoring Program for Kenmare, MOMA, a heavy minerals mine in Mozambique. This monitoring program includes an assessment of forest health. She has also

worked on the Lesotho Highlands Development Authority botanical baseline survey for phase 2 of the Lesotho Highlands Water Project.

Ms Ayanda Zide (Ecological Specialist)
Environmental Consultant, holds a BSc in Botany, Microbiology and Chemistry and a Bsc (Hons) in Botany where her thesis focused on identifying and characterising galls and gall forming insects and associated pathogens (Fungi) on the mangrove species Avicennia marina. Courses in her honours year included Diversity Rarity and Endemism (DRE), Pollination Biology, Estuarine Ecology, Rehabilitation Ecology, a Stats course and a short GIS course. Her research interests lie in biological invasion, conservation, rehabilitation ecology, plant biotechnology and water research. Ayanda conducts vegetation and impact assessments that guide proposed developments to reduce their impacts on sensitive vegetation. As part of these surveys she identifies and maps the vegetation communities and areas of high sensitivity. She has worked as a botanical assistant on the Lesotho Highlands Development Authority botanical baseline survey and has conducted groundtruthing surveys for developments in the Eastern Cape.

Expertise of company:

Coastal & Environmental Services (CES) was established in 1990 as a specialist environmental consulting company. Recently EOH Group of Companies acquired the shares in CES. EOH is the largest provider of enterprise applications, technology, outsourcing, cloud and managed services. The group is active in South Africa, Africa and the United Kingdom and has a strong Black Economic Empowerment profile. This integration will allow CES to combine EOH's great reach and reputation with CES's recognised excellence in environmental and social advisory services, thus maximising CES's strengths and comprehensive offerings in the environmental and social fields.

3 PROPOSED ACTIVITY

According to regulation 33 of GN R 543, an environmental management programme must include:

(c) A detailed description of the aspects of the activity that are covered by the draft environmental management programme;

3.1 Description of proposed activity

The Department of Water & Sanitation (DWS) appointed AECOM SA (Pty) Ltd. (consulting engineers) in 2010, to undertake a Feasibility Study for Augmentation of the Lusikisiki Regional Water Supply Scheme (LRWSS). This study reported that a combination of surface water (Zalu Dam) and groundwater would be the most feasible solution for the long-term water supply for the LRWSS. The Zalu Dam was found to be the most feasible surface storage option for the areas surrounding the Lusikisiki area. The south-western portion of the study area, mostly falling within Port St Johns Local Municipality, will be supplied with borehole water from cluster standalone schemes.

The DWS proposes to begin the second phase of the scheme to augment the existing water supply in the area from Lusikisiki to Port St Johns (Ingquza Hill and Port St John's Local Municipalities). This will involve two water resources:

3.1.1 Surface water

The construction of the Zalu Dam on the Xura River to the west of Lusikisiki, which will also involve the upgrading of the Lusikisiki water treatment works and the expansion of the potable water reticulation in the Lusikisiki area; and

3.1.2 Groundwater

A groundwater abstraction scheme which will consist of two distinct projects:

a) Augmentation of the LRWSS with groundwater (serving mostly Ingquza Hill and a small portion of PSJ LM)
b) Stand-alone schemes (serving mostly PSJ LM)

3.2 Site Location

The study area for the EIA falls within the OR Tambo District Municipality and comprises the entire region between Lusikisiki (up to about 15 km inland) and the coast, extending from the Mzimvubu River in the south-west to the Msikaba River in the north-east (see Figure 1). This area includes the Zalu Dam site and its catchment in the Xura River, conveyance routes between the dam and control reservoirs, as well as borehole sites that could be developed for augmentation of water supplies from groundwater and the routes of the main pipelines from the boreholes to control reservoirs.

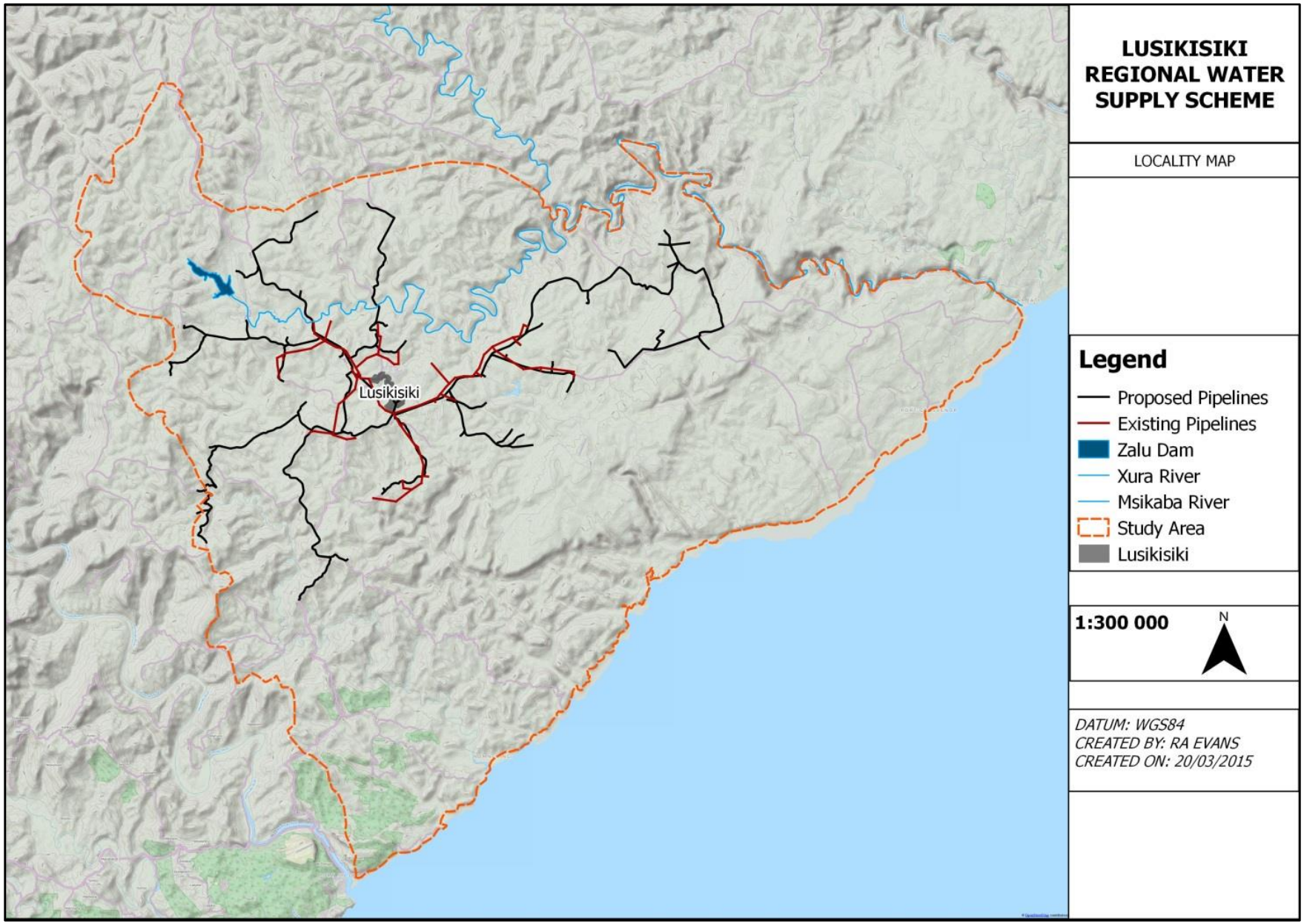

Figure 1: Locality map of the proposed Zalu Dam and pipelines for the LRWSS.

4 SCOPE OF THE EMPr

In order to ensure a holistic approach to the management of environmental impacts during the construction and operation of the proposed water supply scheme, this EMPr sets out the methods by which proper environmental controls are to be implemented by the Contractor and all other parties involved.

The EMPr is a dynamic document subject to influences and changes as are wrought by variations to the provisions of the project specification.

4.1 Layout of the EMPr

The EMPr is divided into three phases of development. Each phase has specific issues unique to that period of the construction and operation of the distribution line and associated infrastructure. The impacts are identified and given a brief description. The three phases of the development are then identified as below:

4.1.1 Planning and Design Phase

This section of the EMPr provides management principles for the planning and design phase of the project. The procedures, environmental actions and responsibilities as required during the planning and design phase are specified.

4.1.2 Construction Phase

This section of the EMPr provides management principles for the construction phase of the project. Environmental actions, procedures and responsibilities as required during the construction phase are specified. These specifications will form part of the contract documentation and therefore the Contractor will be required to comply with these specifications to the satisfactory of the Proponent and ECO.

4.1.3 Operational and maintenance phase

This section of the EMPr provides management principles for the operation and maintenance phase of the project. Environmental actions, procedures and responsibilities as required during the operation and maintenance phase are specified.

5 ROLES AND RESPONSIBILITIES

According to regulation 33 of GN R 543, an environmental management programme must include:

(d) An identification of the persons who will be responsible for the implementation of the measures contemplated in paragraph (b);

5.1 Proponent

Department of Water and Sanitation (DWS) is the proponent and shall therefore be the entity ensuring that the ECO monitors the implementation of the EMPr and compliance with the authorisation. However, if DWS appoints a Contractor to implement the project and hence implement the proposed mitigation measures documented in this EMPr on their behalf; the successful contractor's responsibilities are outlined in Section 5.2 that follows.

5.2 Contractor

The successful Contractor shall:

- Provide the relevant information for the finalisation of the EMPr in terms of methodologies which are required to be implemented to achieve the environmental specifications contained herein and the relevant requirements contained in the environmental authorisation, if issued by DEA;
- Be responsible for the overall implementation of the EMPr in accordance with the requirements of the environmental authorisation, if issued by DEA;
- Ensure that all third parties who carry out all or part of the Contractor's obligations under the Contract comply with the requirements of this EMPr;
- Be responsible for obtaining any outstanding environmental permits, e.g. borrow pit permits which are required for the construction of the LRWSS;
- Ensure that the appointment of the Environmental Site Officer (ESO) is subject to the approval of Mainstream.

5.3 Resident Engineer

The Resident Engineer (RE) will be appointed by the Proponent and will be required to oversee the construction programme and construction activities performed by the Contractor. The RE is expected to liaise with the Contractor and ECO on environmental matters, as well as any pertinent engineering matters where these may have environmental consequences. The RE will oversee the general compliance of the Contractor with the EMPr and other pertinent site specifications. The RE will also be required to be familiar with the EMPr specifications and further monitor the Contractor's compliance with the Environmental Specifications on a daily basis, through the Site Diary, and enforce compliance.

5.4 Environmental Site Officer

The Contractor shall appoint a nominated representative of the contractor as the ESO for the contract. The ESO will be site-based and shall be the responsible person for implementing the environmental provisions of the construction contract.

There shall be an approved ESO on the site at all times.

The ESO's duties will include, inter alia, the following:

- Ensuring that all the environmental authorisations and permits required in terms of the applicable legislation have been obtained prior to construction commencing.
- Reviewing and approving construction method statements with input from the ECO and Resident Engineer, where necessary, in order to ensure that the environmental specifications contained within the construction contract are adhered to.
- Assisting the Contractor in finding environmentally responsible solutions to problems.
- Keeping accurate and detailed records of all activities on site.
- Keeping a register of complaints on site and recording community comments and issues, and the actions taken in response to these complaints.
- Ensuring that the required actions are undertaken to mitigate the impacts resulting from non-compliance.
- Reporting all incidences of non-compliance to the ECO and Contractor.
- The ESO shall submit regular written reports to the ECO, but not less frequently than once a month during the construction phase of the LRWSS.

The ESO must have:

- The ability to manage public communication and complaints.
- The ability to think holistically about the structure, functioning and performance of environmental systems.
- The ESO must be fully conversant with the EIR and EMPr for the LRWSS and all relevant environmental legislation.
- The ESO must have received professional training, including training in the skills necessary to be able to amicably and diplomatically deal with the public as outlined in bullet point one above.

The ECO shall be in the position to determine whether or not the ESO has adequately demonstrated his/her capabilities to carry out the tasks at hand and in a professional manner. The ECO shall therefore have the authority to instruct the contractor to replace the ESO if, in the ECO's opinion, the appointed officer is not fulfilling his/her duties in terms of the requirements of the construction contract. Such instruction will be in writing and shall clearly set out the reasons why a replacement is required and within what timeframe. The ECO shall visit the development site and in addition to the responsibilities listed in section 5.4 below, review the performance of the ESO and submit regular performance reviews to DWS, but not less frequently than once a month.

5.5 Environmental Control Officer

For the purposes of implementing the conditions contained herein, DWS shall appoint an ECO for the contract. The ECO shall be the responsible person for ensuring that the provisions of the EMPr as well as the environmental authorisation are complied with during the construction period. The ECO will be responsible for issuing instructions to the contractor where environmental considerations call for action to be taken. The ECO shall submit regular written reports to DWS, but not less frequently than once a month.

The ECO will be responsible for the monitoring, reviewing and verifying of compliance with the EMPr and conditions of the environmental authorisation by the Contractor. The ECO's duties in this regard will include, inter alia, the following:

- Confirming that all the environmental authorisations and permits required in terms of the applicable legislation have been obtained prior to construction commencing.
- Monitoring and verifying that the EMPr, EA and Contract are adhered to at all times and taking action if specifications are not followed.
- Monitoring and verifying that environmental impacts are kept to a minimum.

- Reviewing and approving construction method statements with input from the ESO and Engineer, where necessary, in order to ensure that the environmental specifications contained within this EMPr and environmental authorisation are adhered to.
- Inspecting the site and surrounding areas on a regular basis regarding compliance with the EMPr, EA and Contract.
- Monitoring the undertaking by the Contractor of environmental awareness training for all new personnel on site.
- Ensuring that activities on site comply with all relevant environmental legislation.
- Ordering the removal of, or issuing spot fines for person/s and/or equipment not complying with the specifications of the EMPr and/or EA.
- Undertaking a continual internal review of the EMPr and submitting any changes to DWS and/or DEA (in case of major changes) for review and approval.
- Checking the register of complaints kept on site and maintained by the ESO and ensuring that the correct actions are/were taken in response to these complaints.
- Checking that the required actions are/were undertaken to mitigate the impacts resulting from non-compliance.
- Reporting all incidences of non-compliance to DWS.
- Conducting annual environmental performance audits in respect of the activities undertaken relating to the project. The ECO shall also submit compliance audit reports to DEA, in accordance with the requirements of the environmental authorisation. Such reports shall be reviewed by DWS, prior to submission.
- Keeping a photographic record of progress on site from an environmental perspective. This can be conducted in conjunction with the ESO as the ESO will be the person that will be onsite at all times and can therefore take photographic records weekly. The ECO would need to check and ensure that the ESO understands the task at hand.
- Recommending additional environmental protection measures, should this be necessary.
- Providing report back on any environmental issues at site meetings.

The ECO must have:

- A good working knowledge of all relevant environmental policies, legislation, guidelines and standards;
- The ability to conduct inspections and audits and to produce thorough, readable and informative reports;
- The ability to manage public communication and complaints;
- The ability to think holistically about the structure, functioning and performance of environmental systems; and
- Proven competence in the application of the following integrated environmental management tools:
    - Environmental Impact Assessment.
    - Environmental management plans/programmes.
    - Environmental auditing.
    - Mitigation and optimisation of impacts.
    - Monitoring and evaluation of impacts.
    - Environmental Management Systems.

The ECO must be fully conversant with the EIR, EMPr, EA (if issued) for the LRWSS and all relevant environmental legislation.

DWS shall have the authority to replace the ECO if, in their opinion, the appointed officer is not fulfilling his/her duties in terms of the requirements of the EMPr or this specification. Such instruction will be in writing and shall clearly set out the reasons why a replacement is required and within what timeframe.

6 MITIGATION AND/OR MANAGEMENT MEASURES

According to regulation 33 of GN R 543, an environmental management programme must include:

(b) Information on any proposed management or mitigation measures that will be taken to address the environmental impacts that have been identified in a report contemplated by these Regulations, including environmental impacts or objectives in respect of –
(i) planning and design;
(ii) pre-operations and operations activities;
(iii) operation or undertaking of the activity;
(iv) rehabilitation of the environment; and
(v) closure, where relevant.

(f) As far as reasonably practicable, measures to rehabilitate the environment affected by the undertaking of any listed activity or specified activity to its natural or predetermined state or to a land use which conforms to the generally acceptable principle of sustainable development, including, where appropriate, concurrent or progressive or progressive rehabilitation measures;

(g) A description of the manner in which it intends to –
(i) modify, remedy, control or stop any action, activity or process which causes pollution or environmental degradation;
(ii) remedy the cause of pollution or degradation and migration of pollutants;
(iii) comply with any prescribed environmental management standards or practices:
(iv) comply with any applicable provisions of the Act regarding closure where applicable;
(v) comply with any provisions of the Act regarding financial provisions for rehabilitation, where applicable;

(i) the process for managing any environmental damage, pollution, pumping and treatment of extraneous water or ecological degradation as a result of undertaking a listed activity;

A variety of potential impacts are associated with the planning & design, construction and operation activities for this project. These impacts can be categorised as general impacts as well as site specific impacts. General best practice rules to construction should be followed at all times. In addition to this the specific mitigation measures and recommendations, as highlighted by the EIR and various specialists for this specific site, are highlighted in Table 6-1 below.

6.1 Planning & Design Phase

GENERAL MITIGATION MEASURES	
Activity/Issue	***Specification***
Compliance with relevant environmental legislation and policy	• Ensure that all relevant legislation and policy is consulted and further ensure that the project is compliant with such legislation and policy. • These should include (but are not restricted to): Local and District Spatial Development Frameworks, Eastern Cape Biodiversity Conservation Plan (ECBCP), Local Municipal bylaws • In addition, planning for the construction and operation of the proposed water supply scheme should consider available best practice guidelines. • Ensure that all legal matters pertaining to permitting have been completed prior to construction. In particular, all necessary Water Use Licences must be in order.
Traffic and transport	• Project planning should include a plan for traffic control that will be implemented, especially during the construction phase of the dam and associated infrastructure.

	• Careful planning of the routes taken by heavy vehicles must highlight areas of road that may need to be upgraded in order to accommodate these vehicles. Once identified, these areas must be upgraded if necessary. • One of the areas that will likely require upgrading is the bridge near Palmarton Mission. This will also require a WULA.
Visual intrusion	• During the planning and design phase, any buildings or structures should be painted, tiled, etc. using neutral colours such as grey, beige or dark green (roof only). • The planning and design phase should, where possible, plan for buildings and structures to be constructed in low lying areas to reduce their visual intrusion on the surrounding landscape. • The planning and design of the Zalu Dam wall should include a plan for grassing large barren areas of the dam wall and planting trees to screen the dam wall from nearby dwellings. • Ensure that plans are made to replant indigenous vegetation (that is removed during the construction phase) nearby to reduce the effect of vegetation removal on the aesthetic quality of the inundation area.
Loss of land due to Zalu Dam construction	• An alternative site for the existing foot path must be planned around the inundation area. The local community must be consulted to assist in deciding on a new position for the footpath.
Impact of proposed layout on sensitive environments	• Sensitive environments described in the EIA must be taken into account when planning the route of infrastructure. • For example, a 20 m buffer should be kept between the edge of a grave and the edge of the pipeline.
SPECIALIST MITIGATION MEASURES	
Activity/Issue	***Specification***
Loss of indigenous and sensitive vegetation	• All species of special concern, protected or vulnerable must be avoided or transplanted. • The existing roads must be utilised for access. • New access roads must only be constructed if there is no alternative, and the width of existing roads and tracks must be kept to a minimum. • Where feasible the pipeline must be located in areas that are already impacted on and degraded. • A relocation and search and rescue plan for sensitive plant species must be developed. • Existing roads must be used where feasible; • Align roads and pipelines within a single corridor and keep this as narrow as feasible; • Where practical and feasible, avoid locating linear infrastructure (such as roads and pipelines) through areas of high and moderate sensitivity. • Where feasible, avoid locating the pipeline and access road alongside streams and wetlands.
Loss of sensitive areas	• A relocation and search and rescue plan for sensitive plant and animal species must be developed. • Consideration should be given to establishing a possible conservation area near the inundation area for relocated plant species (for e.g Scarp forest).
Alien and invasive plants	• An alien vegetation management plan must be developed before construction commences

Loss of sensitive aquatic habitat	• Planning of the location and routing of infrastructure must be undertaken with suitable regard for the environment. • Suitably qualified specialists MUST be consulted during the planning and design phase.
Scheduling of construction	• Wherever possible, construction activities must be undertaken during the driest part of the year to minimize downstream sedimentation due to excavation, etc. • When not possible, suitable stream diversion structures must be used to ensure that rivers/streams are not negatively impacted by the activity
Changes to fluvial geomorphology	• Ensure that scour countermeasures are incorporated into the design of the bridge • Adequate bank stabilisation measures must be incorporated into the design of the bridge
Flood attenuation	• The bridge must be designed to accommodate the risks associated with the 1:100 flood wherever possible • Flood attenuation plans must be drawn up by a qualified engineer and approved by DEA and DWS
Destruction of heritage features due to incorrect placement of pipelines and associated infrastructure	• The recommendations of the Heritage specialist must be considered in the routing of the pipeline and associated infrastructure. • For example, a 20 m buffer should be kept between the edge of a grave and the edge of the development footprint.
Loss of land due to Zalu dam construction	• The process for land acquisition by DWS must be conducted through the traditional authorities operating in the areas as they have jurisdiction over land allocations. • Individual land users must be identified and engaged. • Current landowners and land users should be sufficiently compensated. Compensation must be equitable across gender and age.
Disturbance of grave sites	• Pipeline routes need to be planned around grave sites as specified in the Heritage Specialist report (20m buffer around grave sites) • The community should be consulted before pipeline routes are established to ensure any grave sites that were not identified in the Heritage Specialist report are identified, mapped and taken into account in the pipeline layout.
Stimulation of economic growth	• DWS should, in their consideration of water use applications, consider the benefit to local communities. • DWS should readily facilitate water use activities that will benefit the community. • Construction camps and settlements can be converted into tourism or recreation facilities.

6.2 Construction Phase

GENERAL MITIGATION MEASURES	
Activity/Issue	***Specification***
Socio-economic	• During construction all care should be taken to ensure that the ecological reserve volume of water is always released into the river downstream of the dam.
Nuisance dust	• Nuisance dust should be reduced by implementing the following: · o Damping down of exposed areas; o Retention of vegetation where possible; o Excavations and other clearing activities must be restricted to agreed working times and permitting weather conditions to avoid drifting of sand and dust into neighbouring areas; o Implementing a speed limit of 30km/h on dirt roads; o Attending to complaints emanating from the lack of dust control.
Construction camp	• The ECO must assist in the siting of structures and supervise any bush clearing (although this is not anticipated) for the construction camp. • Construction camp should be fenced to avoid sprawl.
Alien and invasive plants	• Alien plants should be removed from the site through appropriate methods e.g. hand pulling, chemical, cutting, etc. under supervision from the ECO. • Disturbed areas must be rehabilitated.
Fire	• Fire extinguishers should be available on site • There should be no burning of construction waste or debris onsite.
Noise	• Machinery that causes noise must only be operated at appropriate times (during the day and at normal working hours).
Stormwater management	• Stormwater control measures must be implemented to avoid soil erosion and siltation of drainage lines.
Soil erosion	• Vegetation must be retained where possible to avoid soil erosion. • If slopes are cleared during construction, these must be rehabilitated as soon as possible to minimize soil erosion losses using local indigenous vegetation.
Management of general waste	• Littering must be avoided and litter bins must be made available at various strategic points on site. Refuse from the construction site must be collected on a regular basis and deposited at an appropriate landfill site. • The ECO should monitor the neatness of the work sites as well as the Contractor campsite.
Hazardous substances	• The storage of fuels and hazardous materials must be located away from sensitive water resources. • All hazardous substances (e.g. diesel, oil drums, etc.) must be stored in a bunded area or other secured areas. • Stormwater control measures must be implemented during construction.
Management of construction waste	• All construction materials must be stored in a central and secure location with controlled access and an appropriate impermeable surface. • All excess waste must be disposed of at an appropriately licensed landfill site. • Stormwater control measures must be implemented to mitigate the risk of runoff water causing pollution.
SPECIALIST MITIGATION MEASURES	
Activity/Issue	***Specification***

Loss of sensitive vegetation during construction	• All species of special concern, protected or vulnerable must be avoided or transplanted. • The existing roads must be utilised for access. • New access roads must only be constructed if there is no alternative, and the width of existing roads and tracks must be kept to a minimum width. • In the unlikely event that a protected tree species needs to be removed, a permit to do so must be obtained from DAFF. • Laydown areas and turning areas must be located in areas that have already been impacted or show evidence of degradation. The ECO must identify such areas. • The servitude of the pipeline must be kept to a minimum. • Where feasible the pipeline must be located in areas that are already impacted on and degraded. • Rehabilitation of the disturbed areas and the remaining stockpiles (if any) must take place immediately after construction. • Topsoil must be stockpiled separately to sub soil. • The dam site must be surveyed and the pipeline route should be surveyed prior to construction during spring and mid-summer in order to locate protected geophytic plant species and transplant them in the neighbouring environment. • During excavations for the dam foundation, a search and transplant of species of special concern found in the topsoil layer must be undertaken
Disturbance to surrounding vegetation and fauna	• Restrict construction activities to post-dawn and pre-dusk. • Construction must be undertaken in the shortest time practical • All staff employed during construction must sign a daily register. • Construction workers should be cautioned against poaching. • No construction residence may be set up on site. • An independent ECO must inspect the immediate vegetation for evidence of snares. • Construction activities must be demarcated and vegetation clearing and top soil removal limited to these areas. • Dense vegetation that resembles Thicket or Forest must not be removed. In cases where this is unavoidable the ECO must be consulted and an assessment of the vegetation must be undertaken. • No construction must be undertaken in an area demarcated in this report as a sensitive area, or its associated buffer, unless authorised by an independent ECO. • Construction activities must be limited to delineated development areas.
Disturbance of sensitive aquatic areas	• Construction through watercourses must only take place where necessary and must occur within the smallest possible construction footprint. • Construction through watercourses must preferably take place during the dry season, and must immediately be followed by erosion stabilisation and re-vegetation.
Soil erosion and environmental degradation due to poor rehabilitation	• Implement a rehabilitation programme • Monitor success of re-vegetation. Success is considered achieved when there is 80% or more vegetation cover.
Channel banks and soils	• No concrete mixing will take place within 32m of the river bank • A serviced CO_2 fire extinguisher should be available on site in the event that wet concrete is accidentally spilled into the river

	• During construction, all care should be taken to ensure that the ecological reserve volume of water is always released into the river downstream of the dam site.
Channel banks and soils	• Construction activities should take place during the driest season
Sedimentation	• The river must be diverted away from areas where excavation within the inundation area is to take place. • Excavation should take place in the drier months of the year in order to limit the influence of stormwater on the mobilization of sediment. • If necessary, stabilize berms must be used to prevent stormwater from carrying sediment into the existing river channel.
Water quantity	• During construction, all care must be taken to ensure that the ecological reserve volume of water is always released into the river downstream of the dam site.
Water quality	• No concrete mixing will take place within 32m of the river bank. • A serviced CO2 fire extinguisher (for releasing carbon dioxide gas into the affected area to neutralize pH levels) should be available on site in the event that wet concrete is accidentally spilled into the river. • No machinery should be parked overnight within 50 m of a watercourse. • All stationary equipment must be equipped with a drip tray to retain any oil leaks. • Monitors should be stationed 50 m upstream and downstream of the crossing site on a flowing stream. They should be trained to observe and identify bentonite releases, and have the equipment capacity to rapidly relay information to the drilling team. • Appropriate containment measures must be implemented to minimise the further release of slurry into the watercourse • The pressure levels of the lubricating slurry must be closely monitored while drilling is in progress, as a rapid or sudden loss of pressure could indicate a potential release of slurry into a fracture. • Excavation/trenching should take place during the driest season. • Where possible, silt fences must be installed to collect sediments mobilized during construction. • Banks must be monitored for signs of erosion, and measures must be taken to minimize the erosion as soon as possible. • Pipe bridge pilings should not be placed on stream banks wherever possible. • Where this is not possible, ensure that appropriate sediment collection measures are put in place.
Riparian vegetation	• Removal of riparian vegetation should take place under the supervision of the ECO. • Removal of the alien invasive vegetation should be prioritised. • Banks should be artificially stabilised as soon as possible if significant riparian vegetation is removed.
Hydrology	• Coffer dams during bridge construction must not be left in place for longer than 30 days. • All work within the river should be completed during the dry season, when flows are at their lowest. • Water in the river must be allowed to pass downstream of the construction. If necessary this should be achieved via a temporary diversion – this should not be in place for more than 30 days. • Coffer dams must not be left in place for longer than 30 days.
Destruction of	• The ECO must be informed of the possibility that trace fossils might

underlying fossils	be exposed on the bedding planes of the Ecca Group shales during deep excavations for the construction of the Zalu Dam wall and spillway. • If fossils are recorded the palaeontologist, ECPHRA and SAHRA must be notified and the fossils recorded according to SAHRA specification.
Damage to heritage features	• If any graves/heritage features are damaged during construction then construction must stop immediately. • It must be reported to the ECO, Heritage Specialist and SAHRA. • If human graves are uncovered during construction then all activity must stop immediately. • The police and ECPHRA must to be notified immediately. • If any other archaeological artefacts are uncovered during construction then construction must stop and these should be reported to the ECO, Heritage Specialist and SAHRA/ECPHRA immediately.
Influx of job seekers	• A project steering committee consisting of the DWS, contractor (community liaison person), recruitment agency, community leaders, elders, youth, ward councillors and the IHLM LED (Local Economic Development) must be established in order to: o Conduct an audit of the affected communities in terms of employment capacity o Identify potential workers from the affected communities o Identify possible conflicts in and between communities o Recommend support programmes that would assist with conflict minimisation and resolution • The following are mitigation measures for crime: o Support the Traditional Authorities role of exerting control over land allocation in order to prevent densification of people around the construction areas. o The DWS and contractor must encourage settlement in Lusikisiki by providing daily transport for "outside" workers who settle in the town of Lusikisiki, to and from the construction to minimise the potential crime factor in the rural areas. o All construction workers must be clearly identifiable and wear easily recognisable uniforms. They need to carry identification cards issued by the contractor. o Ensure that the SAPS has access to construction sites o Encourage the local communities to report suspicious activity to the community liaison or nearest environmental site officer. o The contractor must prevent loitering around the construction camp by providing transport to and from the camp sites. o All construction and camp sites must be fenced and secure. • Mitigation measures for increased prostitution and sexual behaviour: o Support national and local awareness programmes that discourage promiscuity, especially at schools in the project area. o Ensure that condoms are easily accessible to all construction workers. • HIV/AIDS (non-discrimination, awareness, prevention and health care support) policy must be implemented. • Condoms must be easily accessible to all construction workers. • Develop and implement a HIV/AIDs education and behaviour

	change programme for all contracted construction workers. This must extend to the communities located near the construction site. • Existing public health care centres and programmes such as TAC must be involved in the HIV/AIDS campaigns. The HIV/AIDS prevalence must be monitored through these agencies. • Voluntary counselling and testing must be encouraged for all workers. • DWS is limited in its capacity to enhance the benefits of this impact. The proponent must link the Provincial Department of Economic Development and Local Municipal LED (Local Economic Development) programmes with small to medium enterprises (including communities) in the area so that a state of "readiness" to optimise economic benefits is achieved. This may involve training in the following sectors: business, tourism, catering etc.
Stimulation of economic growth	• Equal job opportunities for women and men must be promoted. • Employment must be managed by a recruitment agency/office that uses a selection system that ensures recruitment of semi and unskilled workers from all local, impacted communities in accordance with recent government policies related to local procurement. • Where appropriate, employees involved in the construction phase should be incorporated in the permanent maintenance staff for the operational phase; and • Particular attention must be paid to employment opportunities for women and disabled persons. • The proponent must ensure that the principal of utilising local business resources (suppliers and SMMEs) in accordance with recent government policies related to local procurement forms part of the procurement specifications. Examples of local business resources that must be considered: o Catering services o Transport services o Quarries/borrow pits (where necessary) o Small civils o Accommodation o Security o Hygiene services o Fencing • Implement a skills development programme which includes training in business, project management, monitoring and evaluation.
Impact on health and general quality of life	• DWS should promote awareness of the project (with LMs, Department of Health, SAPS, etc.) and the potential pressure to provide services for new households. • Regularly monitor the schools and clinics in order to determine whether there are sufficient resources. When resources are deemed insufficient, DWS must communicate with the relevant departments for assistance. • Mitigation measures for noise and dust: o Noise and dust prevention measures must be implemented. o Dust along access roads must be monitored. o Ensure that communities have an easy grievance reporting mechanism, e.g. through a project steering or liaison committee • Mitigation measures for traffic safety: o Develop and inform all affected communities of the formal construction routes.

	○ All vehicle operators and drivers must undergo regular training, clearly outlining the high safety risk to local rural communities ○ Erect signage making communities aware of the high safety risk due to heavy construction vehicles on the road. ○ Traffic calming devices such as speed bumps must be considered on rural access roads. • Mitigation measures for fire safety: ○ No fires must be lit outside construction camps. ○ Fires that are lit must be in a contained area. The fire must be monitored for cinders and extinguished when no longer needed. ○ Firefighting equipment must be stored onsite ○ The construction campsite must be surrounded by a firebreak. ○ Fire risks must form part of the construction worker training.

6.3 Operational Phase

GENERAL MITIGATION MEASURES	
Activity/Issue	***Specification***
Visual intrusion	• During the operational phase, the vegetation that has been planted (grassing and/or trees) must be maintained and rehabilitated if necessary. • During the operational phase, the associated infrastructure must be maintained and must adhere to the planning and design phase associated infrastructure aesthetic control recommendations. • During the operational phase, the replanted indigenous vegetation in the offset area should be maintained.
Socio economic	• The dam operating rules must stipulate that the ecological reserve volume is released at all times.
Maintenance	• Pipelines MUST be regularly monitored for leaks. If these are identified immediate actions must be taken to repair leaks. • Regular maintenance and inspections of pipelines should take place.
Hazardous chemical storage	• All hazardous substances must be stored in appropriately secure locations.
Increased stormwater run-off	• Stormwater control measures must be followed.
Waste management	• Ensure there are sufficient containers at all operational facilities available for collecting waste. • No waste must be buried on site. • Waste must be collected on a regular basis and disposed of at a licensed landfill site.
SPECIALIST MITIGATION MEASURES	
Activity/Issue	***Specification***
Alien Vegetation	• Design and Implement an Alien Vegetation Management and Monitoring Plan; • Eradicate alien plants as they appear; and monitor the study area for any new invasive plants. • Alien vegetation must be monitored for at least 6 months after construction has been completed.
Geomorphology	• The dam operating rules must stipulate that there be infrequent but regular releases of water from the lower section of the dam, allowing sediment to move through the system.

Riparian Vegetation	• The dam operating rules must stipulate that there be regular releases of sediment from the dam. • The dam operating rules must stipulate that the ecological reserve volume is released at all times and that seasonality is maintained in the river downstream of the dam.
Fish	• The dam operating rules must stipulate that the ecological reserve volume is released at all times and that seasonality is maintained in the river downstream of the dam.
Macroinvertebrate	• The dam operating rules must stipulate that the ecological reserve volume is released at all times and that seasonality is maintained in the river downstream of the dam.
Hydrology and sediment dynamics	• Pipe bridge pilings on the banks or bed of the watercourse must be designed to limit the effects of scour on the sediment flows in the stream
Impact on health and general quality of life	• Safe and controlled swimming sites should be developed. • A water safety awareness campaign should be implemented by DWS. • Ensure signage of drowning risks is visible in high activity areas such as the river/dam crossing. • The implementation of a swimming programme for local scholars should be considered. • DWS should promote awareness of the project (with LMs, Department of Health, SAPS, etc.) and the potential pressure to provide services for new households.
Stimulation of economic growth	• The proponent is limited in terms of their input regarding the spin-off business opportunities as these depend on investor interest and market demand. However they play a key role in permitting water use activities. DWS should therefore, in their consideration of water use applications, consider the benefit to local communities and ensure that equitable benefits are realised and readily facilitate water use activities that will benefit the community.

7 ENVIRONMENTAL MONITORING

According to regulation 33 of GN R 543, an environmental management programme must include:

(e) proposed mechanisms for monitoring compliance with and performance assessment against the environmental management programme and reporting thereon;

7.1 General environmental monitoring

A monitoring programme will be implemented for the duration of the construction of the LRWSS. This programme will include:

- Establishing a baseline through the taking of photographs of identified environmental aspects and potential impact sites along the routes prior to construction
- Monthly monitoring and audits during the pre-construction, construction and post-construction phase will be conducted by the ECO to ensure compliance to the EMPr conditions, and where necessary make recommendations for corrective action. These audits can be conducted randomly and do not require prior arrangement with the Project Coordinator.
- While construction is taking place at Lusikisiki, the ECO must be on site at least twice a week to ensure that protected plant and tree species are adequately demarcated.
- Compilation of an audit report with a rating of compliance with the EMPr. The ECO shall keep a photographic record of any damage to areas outside the demarcated site and construction area. The date, time of damage, type of damage and reason for the damage shall be recorded in full to ensure the responsible party is held liable. All claims for compensation emanating from damage should be directed to the ECO for appraisal. The Contractor shall be held liable for all unnecessary damage to the environment. A register shall be kept of all complaints from the Landowner or community. All complaints / claims shall be handled immediately to ensure timeous rectification / payment by the responsible party.

8 ENVIRONMENTAL AWARENESS

According to regulation 33 of GN R 543, an environmental management programme must include:

(j) An environmental awareness plan describing the manner in which –

(i) the applicant intends to inform his or her employees of any environmental risk which may result from their work; and

(ii) risks must be dealt with in order to avoid pollution or the degradation of the environment;

Contractors shall ensure that its employees and any third party who carries out all or part of the Contractor's obligations are adequately trained with regard to the implementation of the EMPr, as well as regarding environmental legal requirements and obligations. Training shall be conducted by the ECO where necessary.

Environment and health awareness training programmes should be targeted at three distinct levels of employment, i.e. the executive, middle management and labour. Environmental awareness training programmes shall contain the following information:

- The names, positions and responsibilities of personnel to be trained.
- The framework for appropriate training plans.
- The summarised content of each training course.
- A schedule for the presentation of the training courses.

The ECO shall ensure that records of all training interventions are kept in accordance with the record keeping and documentation control requirements as set out in this EMPr. The training records shall verify each of the targeted personnel's training experience.

The Developer shall ensure that adequate environmental training takes place. All employees shall have been given an induction presentation on environmental awareness and the content of the EMPr. The presentation needs to be conducted in the language of the employees to ensure it is understood. The environmental training shall, as a minimum, include the following:

- The importance of conformance with all environmental policies.
- The environmental impacts, actual or potential, of their work activities.
- The environmental benefits of improved personal performance.
- Their roles and responsibilities in achieving conformance with the environmental policy and procedures and with the requirement of the Agency's environmental management systems, including emergency preparedness and response requirements.
- The potential consequences of departure from specified operating procedures;
- The mitigation measures required to be implemented when carrying out their work activities.
- Environmental legal requirements and obligations.
- Details regarding floral/faunal species of special concern and protected species, and the procedures to be followed should these be encountered during construction.
- The importance of not littering.
- The importance of using supplied toilet facilities.
- The need to use water sparingly.
- Details of and encouragement to minimise the production of waste and re-use, recover and recycle waste where possible.
- Details regarding archaeological and/or historical sites which may be unearthed during construction and the procedures to be followed should these be encountered.

8.1 Monitoring of environmental training

The Contractor must monitor the performance of construction workers to ensure that the points relayed during their introduction have been properly understood and are being followed. If necessary, the ECO and / or a translator should be called to the site to further explain aspects of environmental or social behaviour that are unclear. Toolbox talks are recommended.

9 COMPLIANCE WITH THE EMPr

According to regulation 33 of GN R 543, an environmental management programme must include:

(e) Proposed mechanisms for monitoring compliance with and performance assessment against the environmental management programme and reporting thereon;

(i) The process for managing any environmental damage, pollution, pumping and treatment of extraneous water or ecological degradation as a result of undertaking a listed activity;

A copy of the EMPr must be kept on site at all times during the construction period. The EMPr will be binding on all contractors operating on the site and must be included within the Contractual Clauses.

It should be noted that in terms of the National Environmental Management Act No 107 of 1998 (Section 28) those responsible for environmental damage must pay the repair costs both to the environment and human health and the preventative measures to reduce or prevent further pollution and/or environmental damage (The 'polluter pays' principle).

9.1 Non-compliance

The contractors shall act immediately when notice of non-compliance is received and correct whatever is the cause for the issuing of the notice. Complaints received regarding activities on the construction site pertaining to the environment shall be recorded in a dedicated register and the response noted with the date and action taken. The ECO should be made aware of any complaints.

Any non-compliance with the agreed procedures of the EMPr is a transgression of the various statutes and laws that define the manner by which the environment is managed. Failure to redress the cause shall be reported to the relevant authority for them to deal with the transgression, as it deems fit.

The Contractor is deemed not to have complied with the EMPr if, *inter alia*:

- there is evidence of contravention of the EMPr specifications within the boundaries of the construction site, site extensions and roads;
- there is contravention of the EMPr specifications which relate to activities outside the boundaries of the construction site.
- environmental damage ensues due to negligence;
- construction activities take place outside the defined boundaries of the site; and/or
- the Contractor fails to comply with corrective or other instructions issued by the Engineer within a specific time period.

It is recommended that the engineers/contractors institute penalties for the following less serious violations and any others determined during the course of work as detailed below:

- Littering on site.
- Lighting of illegal fires on site.
- Persistent or un-repaired fuel and oil leaks.
- Any persons, vehicles or equipment related to the Contractor's operations found within the designated "no-go" areas.
- Excess dust or excess noise emanating from site.
- Possession or use of intoxicating substances on site.
- Any vehicles being driven in excess of designated speed limits.
- Removal and/or damage to fauna, flora or cultural or heritage objects on site.
- Urination and defecation anywhere except at designated facilities.

9.2 Emergency preparedness

The Contractor shall compile and maintain environmental emergency procedures to ensure that there will be an appropriate response to unexpected or accidental actions or incidents that will cause environmental impacts, throughout the construction period. Such activities may include, *inter alia*:

- Accidental discharges to water and land.
- Accidental exposure of employees to hazardous substances.
- Accidental fires.
- Accidental spillage of hazardous substances.
- Accidental toxic emissions into the air.
- Specific environmental and ecosystem effects from accidental releases or incidents.

These plans shall include:

- Emergency organisation (manpower) and responsibilities, accountability and liability.
- A list of key personnel and contact details.
- Details of emergency services available (e.g. the fire department, spill clean-up services, etc.).
- Internal and external communication plans, including prescribed reporting procedures where required by legislation.
- Actions to be taken in the event of different types of emergencies.
- Incident recording, progress reporting and remediation measures required to be implemented.
- Information on hazardous materials, including the potential impact associated with each, and measures to be taken in the event of accidental release.
- Training plans, testing exercises and schedules for effectiveness.

The Contractor shall comply with the emergency preparedness and incident and accident-reporting requirements, as required by the Occupational Health and Safety Act, 1993 (Act No 85 of 1993), the NEMA, 1998 (Act No 107 of 1998), the National Water Act, 1998 (Act No 36 of 1998) and the National Veld and Forest Fire Act, 1998 (Act No 101 of 1998) as amended and/or any other relevant legislation.

9.3 Incident reporting and remedy

If a leakage or spillage of hazardous substances occurs on site, the local emergency services must be immediately notified of the incident. The following information must be provided:

- the location;
- the nature of the load;
- the extent of the impact; and
- the status at the site of the accident itself (i.e. whether further leakage is still taking place, whether the vehicle or the load is on fire).

Written records must be kept on the corrective and remedial measures decided upon and the progress achieved therewith over time. Such progress reporting is important for monitoring and auditing purposes. The written reports may be used for training purposes in an effort to prevent similar future occurrences.

9.4 Penalties

Where environmental damage is caused or a pollution incident, and/or failure to comply with any of the environmental specifications contained in the EMPr, the developer and/or contractor shall be liable.

The following violations, and any others determined during the course of work, should be penalised:

- Hazardous chemical/oil spill and/or dumping in non-approved sites.
- Damage to sensitive environments.
- Damage to cultural and historical sites.
- Unauthorised removal/damage to indigenous trees and other vegetation, particularly in identified sensitive areas.
- Uncontrolled/unmanaged erosion.
- Unauthorised blasting activities (if applicable).
- Pollution of water sources.
- Unnecessary removal or damage to trees.

10 CLOSURE PLANNING

According to regulation 33 of GN R 543, an environmental management programme must include:
(k) where appropriate, closure plans, including closure objectives.

Final site cleaning - the contractor shall clear and clean the site and ensure that everything not forming part of the permanent works is removed from site before issuing the completion certificate or as otherwise agreed.

Rehabilitation - the contractor (landscape architect/horticulturist) shall be responsible for rehabilitating and re-vegetation of all areas disturbed/areas earmarked for conservation during construction to the satisfaction of the engineer and ECO.

10.1 Post-Construction environmental audit

A post-construction environmental audit must be carried out and submitted to DEA at the expense of the developer so as to fulfil conditions of the EA granted. Objectives should be to audit compliances with the key components of the EMPr, to identify main areas requiring attention and recommend priority actions. The audit should be undertaken annually and should cover a cross section of issues, including implementation of environmental controls, environmental management and environmental monitoring.

Results of the audits should inform changes required to the specifications of the EMPr or additional specifications to deal with any environmental issues which arise on site and have not been dealt with in the current document.

10.2 Management review and revision of the EMPr

The EMPr is to be reviewed annually for the first three years and then once every five years thereafter, by an independent environmental consultant, unless otherwise specified by the authorities. The auditor is to highlight issues to be addressed in the EMPr or changes required during the annual audit. These points are to be included as an annexure to the EMPr and to be considered during the review process. Recommended changes to the EMPr must be forwarded to DEA for approval and comment, before subsequently being incorporated into the EMPr.

10.3 General review of EMPr

The EMPr will be reviewed by the ECO on an ongoing basis. Based on observations during site inspections and issues raised at site meetings, the ECO will determine whether any procedures require modification to improve the efficiency and applicability of the EMPr on site.

Any such changes or updates will be registered in the ECO's record, as well as being included as an annexure to this document. Annexure of this nature must be distributed to all relevant parties.

11 REPORTING

11.1 Administration

Before the contractor begins each construction activity, the Contractor shall give to the ECO and engineer a written method statement setting out the following:

- The type of construction activity.
- Locality where the activity will take place.
- Identification of impacts that might result from the activity.
- Identification of activities or aspects that may cause an impact.
- Methodology and/or specifications for impact prevention for each activity or aspect.
- Methodology and/or specifications for impact containment for each activity or aspect.
- Emergency/disaster incident and reaction procedures.
- Treatment and continued maintenance of impacted environment.

The contractor may provide such information in advance of any or all construction activities provided that new submissions shall be given to the ECO and/or engineer whenever there is a change or variation to the original.

The ECO and/or engineer may provide comment on the methodology and procedures proposed by the Contractor but he shall not be responsible for the contractor's chosen measures of impact mitigation and emergency/disaster management systems. However, the contractor shall demonstrate at inception and at least once during the contract that the approved measures and procedures function properly.

11.2 Good housekeeping

The contractor shall undertake "good housekeeping" practices during construction. This will help avoid disputes on responsibility and allow for the smooth running of the contract as a whole. Good housekeeping extends beyond the wise practice of construction methods that leaves production in a safe state from the ravages of weather to include the care for and preservation of the environment within which the site is situated.

11.3 Record keeping

The engineer and the ECO will continuously monitor the contractor's adherence to the approved impact prevention procedures and the engineer shall issue to the contractor a notice of non-compliance whenever transgressions are observed. The ECO should document the nature and magnitude of the non-compliance in a designated register, the action taken to discontinue the non-compliance, the action taken to mitigate its effects and the results of the actions. The non-compliance shall be documented and reported to the engineer in the monthly report. These reports shall be made available to DEA when requested.

The Contractor shall ensure that an electronic filing system identifying all documentation related to the EMP is established.

A list of reports likely to be generated during all phases of the Project is provided below, and all applicable documentation must be included in the environmental filing system catalogue or document retrieval index.

- Final Environmental Impact Assessment Report.
- Environmental Management Plan.
- Final design documents and diagrams issued to and by the Contractor.

- All communications detailing changes of design/scope that may have environmental implications.
- Daily, weekly and monthly site monitoring reports.
- Complaints register.
- Medical reports.
- Training manual.
- Training attendance registers.
- Incident and accident reports.
- Emergency preparedness and response plans.
- Copies of all relevant environmental legislation.
- Permits and legal documents, including letters authorising specific personnel of their duties as part of emergency preparedness teams e.g. fire teams, etc.
- Crisis communication manual.
- Disciplinary procedures.
- Monthly site meeting minutes during construction.
- All relevant permits.
- Environmental Authorisation on the EIA from the DEA.
- All method statements from the Contractor for all phases of the project.

11.4 Document control

The Contractor and resident engineer shall be responsible for establishing a procedure for electronic document control. The document control procedure should comply with the following requirements:

- Documents must be identifiable by organisation, division, function, activity and contact person.
- Every document should identify the personnel and their positions, who drafted and compiled the document, who reviewed and recommended approval, and who finally approved the document for distribution.
- All documents should be dated, provided with a revision number and reference number, filed systematically, and retained for a five year period.

The Contractor shall ensure that documents are periodically reviewed and revised, where necessary, and that current versions are available at all locations where operations essential to the functioning of the EMPr are performed. All documents shall be made available to the independent external auditor.

12 CONCLUSIONS

Although all foreseeable actions and potential mitigations or management actions are contained in this document, the EMPr should be seen as a day-to-day management document. The EMPr thus sets out the environmental and social standards, which would be required to minimise the negative impacts and maximise the positive benefits of the LRWSS as detailed in the EIR and associated specialist reports. The EMPr could thus change daily and, if managed correctly, lead to successful planning & design, construction and operational phases.

Further guidance should also be taken from any conditions contained in the EA, if the project is granted approval, and that these DEA conditions must be incorporated into the final EMPr.

All attempts should be made to have this EMPr available, as part of any tender documentation, so that the engineers and contractors are made aware of the potential cost and timing implications needed to fulfil the implementation of the EMPr, thus adequately costing for these.