THE PROPOSED UPGRADING OF MAIN ROAD 231 BETWEEN THE NSELENI INTERCHANGE (N2-29) AND RICHARDS BAY

DRAFT ENVIRONMENTAL MANAGEMENT PROGRAM REPORT

June 2016

PREPARED BY: **PREPARED FOR: KZN DEDTEA & KZN DEPARTMENT OF TRANSPORT**

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PREFACE

This Environmental management program report was compiled to address the potential environmental, social and economic impacts associated with the proposed project, by prescribing meaningful and practical mitigation measures through specialist consultation and adherence to relevant environmental legislation, and to prevent the occurrence of irreversible environmental degradation. These mitigation measures must be made binding to all contractors during all of the project phases. In addition to the EMP, contractors must be compliant with the requirements set out in the Occupational Health and Safety Act (Act No. 85 of 1993), as well as all other laws and by laws, including the Construction regulations and the SANS set of standards.

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ABREVIATIONS & ACRONYMS

A	Authorities
C	Contractors
CA	Competent Authorities
CE	Consulting Engineers
CLO	Community Liaison Officer
CSIR	Council for Science and Industrial Research
D	Developer
DEAT	Department of Environmental Affairs and Tourism
DWS	Department of Water and Sanitation
EA	Environmental Authorisation
EAP	Environmental Assessment Practitioner
ECO	Environmental Control Officer
ECA	Environmental Conservation Act
EIA	Environmental Impact Assessment
ELO	Environmental Liaison
EMP / EMPr	Environmental Management Plan
EMS	Environmental Management System
EM	Environmental Manager
EO	Environmental Officer
ER / E	Engineers Representative
ESO	Environmental Site Officer
IAP	Interested and Affected Party
IEM	Integrated Environmental Management
DEDTEA	KwaZulu-Natal Department of Economic Development, tourism and environmental affairs

NEMA	National Environmental Management Act
PM	Project Manager
SABS	South African Bureau of Standards
SAMOAC	South African Manual for Outdoor Advertising Control
WMP	Waste Management Plan
WWF	World Wildlife Fund

DEFINITIONS

Alien species - Plants and animals which do not derive naturally from an area - they are brought in by humans. Alien plants often force indigenous species out of the area.

Alternative - A possible course of action, in place of another, that would meet the same purpose and need defined by the development proposal. Alternatives considered in the EIA process can include location and/or routing alternatives, layout alternatives, process and/or design alternatives, scheduling alternatives or input alternatives.

Aspect – Element of an organization's activities, products or services that can interact with the environment.

Auditing - A systematic, documented, periodic and objective evaluation of how well the environmental management plan is being implemented and is performing with the aim of helping to safeguard the environment by: facilitating management control which would include meeting regulatory requirements. Results of the audit help the organization to improve its environmental policies and management systems.

Biodiversity - The rich variety of plants and animals that live in their own environment.

Built environment - Physical surroundings created by human activity, e.g. buildings, houses, roads, bridges and harbours.

Compliance / Conformance – Adhering to conditions, standards, requirements

Conservation - Protecting, using and saving resources wisely, especially the biodiversity found in an area.

Contamination - Polluting or making something impure.

Corrective (or remedial) action - Response required to address an environmental problem that is in conflict with the requirements of the EMP. The need for corrective action may be determined through monitoring, audits or management review.

Degradation - The lowering of the quality of the environment through human activities, e.g. river degradation, soil degradation.

Ecology - The scientific study of the relationship between living things (animals, plants and humans) and their environment.

Ecosystem - The relationship and interaction between plants, animals and the non-living environment.

Environment - Our surroundings, including living and non-living elements, e.g. land, soil, plants, animals, air, water and humans. The environment also refers to our social and economic surroundings, and our effect on our surroundings.

Environmental Impact Assessment (EIA) - An Environmental Impact Assessment (EIA) refers to the process of identifying, predicting and assessing the potential positive and negative social, economic and biophysical impacts of a proposed development. The EIA includes an evaluation of alternatives; recommendations for appropriate management actions for minimising or avoiding negative impacts and for enhancing positive impacts; as well as proposed monitoring measures.

Environmental Management System (EMS) - Environmental Management Systems (EMS) provide guidance on how to manage the environmental impacts of activities, products and services. They detail the organizational structure, responsibilities, practices, procedures, processes and resources for environmental management. The ISO14001 EMS standard has been developed by the International Standards Organization.

Environmental policy - Statement of intent and principles in relation to overall environmental performance, providing a framework for the setting of objectives and targets.

Habitat - The physical environment that is home to plants and animals in an area, and where they live, feed and reproduce.

Hazardous waste - Waste, even in small amounts, that can cause damage to plants, animals, their habitat and the well-being of human beings, e.g. waste from factories, detergents, pesticides, hydrocarbons, etc.

Impact - A description of the potential effect or consequence of an aspect of the development on a specified component of the biophysical, social or economic environment within a defined time and space.

Indigenous species - Plants and animals that are naturally found in an area.

Infrastructure - The network of facilities and services that are needed for economic activities, e.g. roads, electricity, water, sewerage.

Integrated - Mixing or combining all useful information and factors into a joint or unified whole. See Integrated Environmental Management.

Integrated Environmental Management (IEM) - A way of managing the environment by including environmental factors in all stages of development. This includes thinking about physical, social, cultural and economic factors and consulting with all the people affected by the proposed developments. Also called "IEM".

Land use - The use of land for human activities, e.g. residential, commercial, industrial use.

Mitigation - Measures designed to avoid, reduce or remedy adverse impacts

Natural environment - Our physical surroundings, including plants and animals, when they are unspoiled by human activities.

Over-utilization - Over-using resources - this affects their future use and the environment.

Policy - A set of aims, guidelines and procedures to help you make decisions and manage an organisation or structure. Policies are based on people's values and goals. See Integrated Metropolitan Environmental Policy.

Process - Development usually happens through a process - a number of planned steps or stages.

Applicant / Proponent / Client - Developer. Entity which applies for environmental approval and is ultimately accountable for compliance to conditions stipulated in the Environmental authorisation (EA) and requirements of the EMP.

Recycling - Collecting, cleaning and re-using materials.

Resources - Parts of our natural environment that we use and protect, e.g. land, forests, water, wildlife, and minerals.

Scoping Report - A report presenting the findings of the scoping phase of the EIA. This report is primarily aimed at reaching closure on the issues and alternatives to be addressed in the EIA (in the case of a full EIA process).

Stakeholders - A subgroup of the public whose interests may be positively or negatively affected by a proposal or activity and/or who are concerned with a proposal or activity and its consequences. The term includes the proponent, authorities and all interested and affected parties.

Storm water management - Strategies implemented to control the surface flow of storm water such that erosion, sedimentation and pollution of surface and ground water resources in the immediate and surrounding environments are mitigated. This is specifically important during the construction and decommissioning phases of a project.

Sustainable development - Development that is planned to meet the needs of present and future generations, e.g. the need for basic environmental, social and economic services. Sustainable development includes using and maintaining resources responsibly.

Sustainability - Being able to meet the needs of present and future resources.

Waste Management - Classifying, recycling, treatment and disposal of waste generated during construction and decommissioning activities.

Wetlands - An area of land with water mostly at or near the surface, resulting in a waterlogged habitat containing characteristic vegetation species and soil types e.g. vleis, swamps.

Zoning - The control of land use by only allowing specific type development in fixed areas or zones.

1. INTRODUCTION

1.1 Brief Description and Location of project:

KZN Department of Transport proposes to undertake the 4.6 km upgrade of Main Road 231 (R619) from an existing single carriageway two lane road to a dual carriageway four lane urban arterial. Note that the complete project description is as per design report, and only an overview is provided here.

This will also entail upgrading and expansion of intersections, major and minor drainage upgrades, culverts, creation of bus and truck stops, channel realignment, road realignment and pavements.

The affected section begins roughly at the Via Davalia/R619 intersection at Aquadene/Brackenham and ends just before the N2 Nseleni interchange.

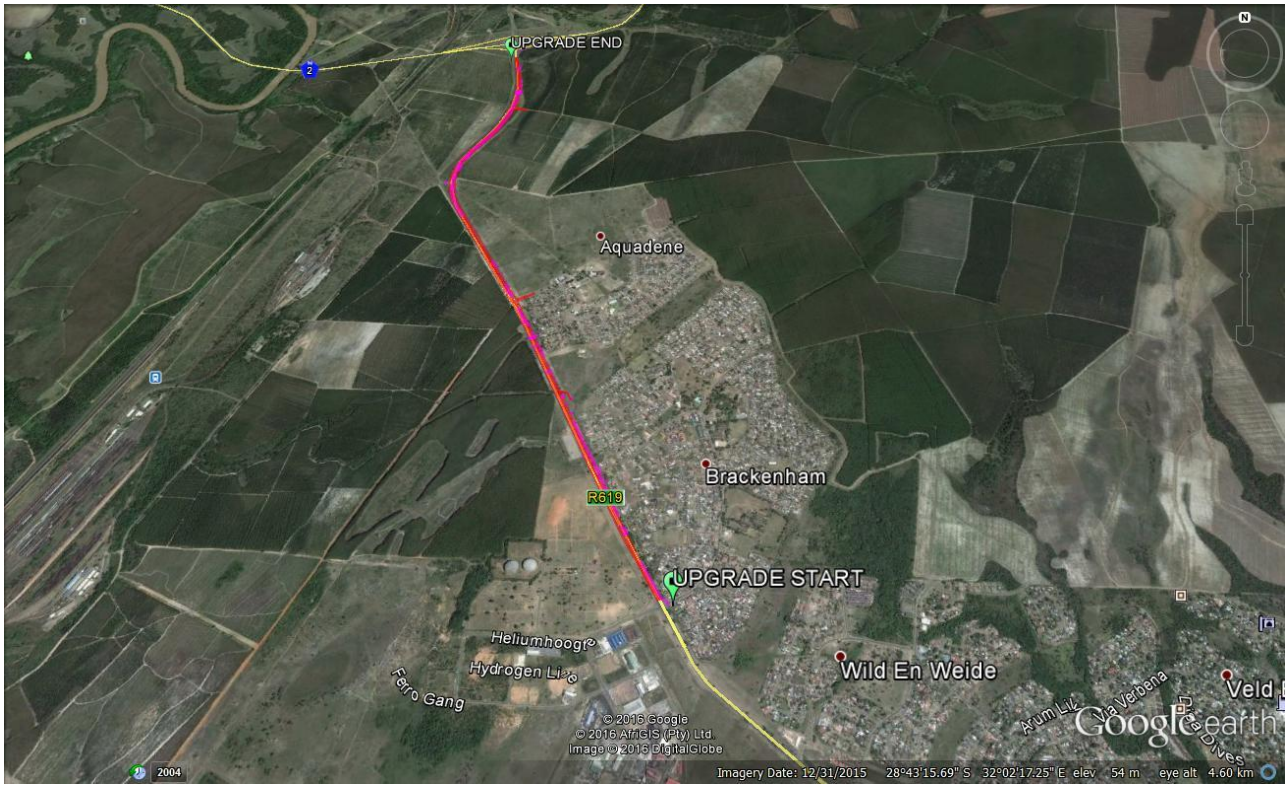
The entire extent of the study area falls within the boundaries of Ward 26 of the uMhlathuze Local Municipality, which is located north of the city's central business district.

From its junction with National Road 2-29 and Main Road 517 (Nseleni Interchange), MR 231 proceeds in a southerly then south-westerly direction over Erf No. 11472, changing to a south-easterly direction over Erf No. 11488 and Erf No. 11417 and terminates at the boundary of Reserve No. 6 of 15825 which coincides with the access road serving the local cemetery

Main Road 231 is predominantly straight with only two high standard left and right hand curves at the northern end near the N2 interchange. The terrain is relatively flat and it would not be necessary to improve the geometry of the road. Land has already been set aside for widening to take place on the eastern side of the road. The recommended alignment of the new carriageway therefore follows the geometry of the existing provincial road.

Storm water pipes under the existing single carriageway provincial road will need to be extended under the proposed new carriageway. The new carriageway will therefore need to be positioned higher than the existing carriageway.

MR 231 is to be designed as a four lane dual carriageway with additional lanes at intersections. A four lane dual carriageway has a daily traffic capacity in the region of 50 000 vehicles total flow both directions at a level of service LOS C. The initial upgrade as proposed in this project i.e. to a four lane urban arterial will have adequate capacity for the medium term.



Locality map indicating road upgrade

Image of a section of road that will be subject to upgrade. Note silviculture occuring in the vicinity.

1.2 BRIEF DESCRIPTION OF AFFECTED ENVIRONMENT

1.2.1 Description of socio-economic environment:

General overview:

The uMhlathuze Local Municipality (KZ 282) is situated on the north-eastern coast of KwaZulu-Natal and is one of six municipalities that form part of the uThungulu District Municipality. In 2002 Richards Bay and Empangeni as well as the surrounding rural and tribal areas merged to form the "City of uMhlathuze" covering an area of approximately 800 km² and supporting approximately 350 000 people (IDP review, 2014-15).

The main access into the municipal area is via the N2 in a north south direction and in an east west direction the R34 from Ntambanana. Other significant roads in the area include the MR431 (that provides a northerly entry into Richards Bay from the N2) as well as the Old Main Road that straddle the N2. Railway lines are prevalent in the municipal area but do not provide a passenger service. (IDP review, 2014-15).

The municipality has about 45km of coastline. Linked to its coastal locality is the Richards Bay port that has been instrumental in the spatial development of the area in the past, as well as in future planning (IDP review, 2014-15).

The municipal population has increased by, on average, 1.45% per annum from 2011. In 2001 there were 289 189 people in the Municipality and in 2011 the census indicated a population of 334 459. The number of households increased from 67 127 in 2001 to 86 609 in 2011 (IDP review, 2014-15).

The IDP review (2014-2015) states that the degradation of infrastructure has become a critical social problem. It is therefore critical that the municipality works towards managing its assets, work towards mitigating climate change, ensure life cycle management of infrastructure, thus ensuring value for money. Efficient and integrated infrastructure and services is also listed in the IDP as an objective/strategy. Provision of water, sanitation, transport and electrical infrastructure Promote pedestrian friendly environment.

Site overview:

The entire extent of the study area falls within the boundaries of Ward 26, Aquadene, which is located north of the city's central business district.

The affected road section begins roughly at the Via Davalia/R619 intersection (cemetery access road) at Aquadene/Brackenham and ends just before the N2 Nseleni interchange.

From its junction with National Road 2-29 and Main Road 517 (Nseleni Interchange), MR 231 proceeds in a southerly then south-westerly direction over Erf No. 11472, changing to a south-easterly direction

over Erf No. 11488 and Erf No. 11417 and terminates at the boundary of Reserve No. 6 of 15825 which coincides with the access road serving the local cemetery.

Implications/Impacts:
-All services and servitudes should be identified and relocated or protected as required
-A traffic control plan must be developed and implemented for the duration of the works
-Consultation with businesses and residents is important for a successful project construction

1.2.2 Heritage and cultural environment

General overview:
The City of uMhlathuze generally has potential for archaeological heritage resources of different classes of significance. Although a considerable amount of sites have been recorded, there remain gaps in availability of data on the local heritage. A desktop survey indicated a total of 125 recorded archaeological sites, which range from the Stone Age Period to the recent historic period. Most of the sites recorded indicated pressure from mining and infrastructure development within the municipal area. In terms of paleontological sensitivity, the area ranges from low to moderate sensitivity (IDP review, 2014-15).

Site overview:
The heritage study conducted for the road upgrade site found that no heritage resources and structures older than 60 years were identified within a 30m wide corridor of the study area and thus no further permitting processes are required.

However, caution must be taken during construction as there is an existing cemetery, although located beyond the 30m developmental corridor at A: 28°43’48.7’’S, 32°02’15.2’’E, B: 28° 43’49.9’’S; 32° 02’ 16.2’’E, C: 28°43’53.6’’S; 32°02’18.0’’E (cemetery fence coordinates) in Brackenham suburb, not to impact on the graves. However, this is a formal fenced cemetery with access control in place and the actual graves even much further away from the developmental corridor. The fence of the gravesite occurs over approximately 80m from the proposed developmental corridor of 30m from the existing road edge.

It is recommended that the proposed Road P231 Upgrade proceed from a heritage point of view as no heritage resources were identified within 30m of the proposed route upgrade, with acceptance of the following conditions:
Construction activities should be limited to the proposed construction corridor of 30m from the outer edge of the existing road edge. If the size of the construction corridor is increased at a later stage, a heritage specialist should be involved in order to assess how the increase in the corridor width will affect heritage resources

Impacts/Implications:

-No damage or destruction to heritage or paleontological resources

-Permits required prior to destruction of heritage resources or disturbance to graves

-Archaeological material, by its very nature, occurs below ground. The developer should therefore keep in mind that archaeological sites might be exposed during the construction phase. If anything is noticed, work in that area should be stopped and the occurrence should immediately be reported to the KwaZulu Natal Provincial Heritage Resources Authority (Amafa) at 033 394 6543 and the author at 083 375 4270. The find should then be investigated and evaluated by the author (in consultation with and permission from the client), who will provide recommendations on when construction activities in the area where the discovery was made can resume

-Construction activities should be limited to the proposed construction corridor of 30m from the outer edge of the existing road edge. If the size of the construction corridor is increased at a later stage, a heritage specialist should be involved in order to assess how the increase in the corridor width will affect heritage resources

1.2.3 Ecological/biophysical environment

General overview

The geomorphology of the landscape is generally described as a low-relief area that is bounded by a coastline and a high-relieve terrain on the landward side. Forming part of the Zululand Coastal Plain, the area indicates a history of erosion and sedimentation, and sea level fluctuations. Past geomorphologic processes have resulted in a unique landscape that supports complex hydrological systems, which in turn have resulted in high level of species diversity. The low level coastal floodplain is subject to natural flooding, climate change and sea level rise, and may increase flood risks over time Landscape features are therefore important factors for decision-making and development planning (IDP review, 2014-15).

The City of uMhlathuze is characterized by a warm to hot and humid subtropical climate, with warm moist winters. Average daily maximum temperatures range from 29ºC in January to 23ºC in July, and extremes can reach more than 40 ºC in summer. The average annual rainfall is 1228mm and most (80 %) of the rainfall occurs in the summer, from October to March (IDP review, 2014-15). However with climate change, these temperatures will be altered.

Site overview

The study area forms part of the Zululand coastal plain whose geological history follows the rise and fall of the sea levels. Along the coastal strip only sediments of the cretaceous, tertiary and quaternary age are present. These rocks lie unconformably on Baenet granite-gneiss of the Tugela complex. Overlying the cretaceous and Miocene sediments is the Port Durnford formation where sediments are made up of old dune, beach and swamp deposits laid down during the Pleistocene period (less than 2 million years ago). Recent unconsolidated dune sands unconformably overlie the Port Durnford formation. The dune

sand is recent in age and is mostly orange, yellowish brown and grey, and varies in thickness with the changes in topography. The Miocene strata include a lower coquina, a calcarenite and a sandy siltstone.

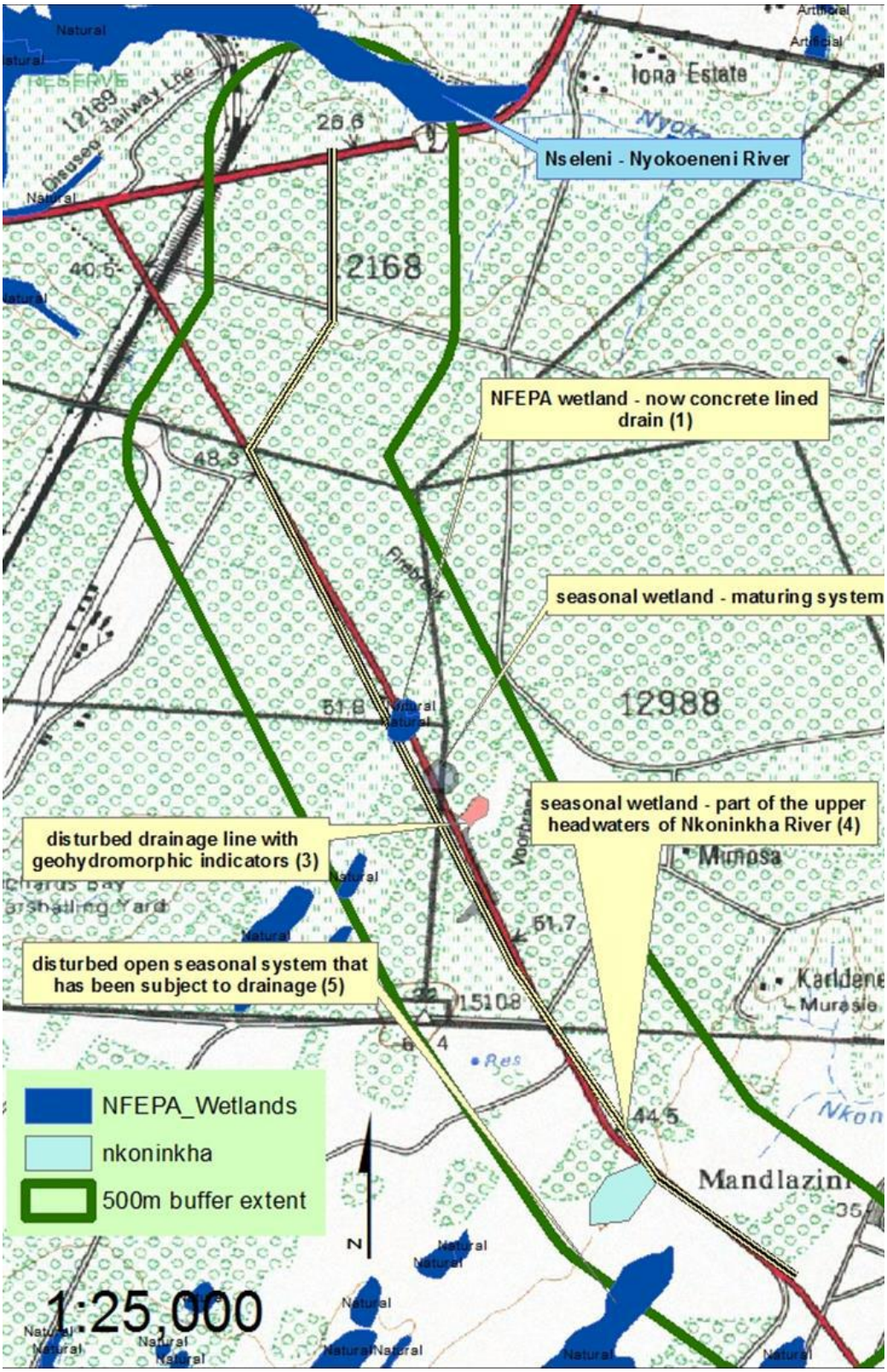
Due to the presence of the recent unconsolidated dune sands and its proximity to mean sea level the site is characterized by a relatively high water table. This high water table needs to be taken into consideration during the design and construction phases.

The study site falls within Quaternary catchment W 12J, a catchment which primarily serves the Mzingazi coastal lake system, and includes the Nkoninkha and Mzingazi systems. (Fig. 5). The catchment, according to www.dwaf/WAR/systems.html can be described as being of *moderate* ecological sensitivity, primarily on account of the presence of lakes Mzingazi and Nhlabane (DWAF 2013). Diederichs et al (2007) noted that the most significant land use on the Mzingazi catchment was plantation, with these forest products being primarily Eucalyptus spp and Pinus spp. 32% of the catchment was recorded in 2007 as being allocated to timber production. The next largest land use in the area was determined to be a combination of urban and peri-urban residential areas, which constitute 21% of the catchment. “Open space”, which is not generally defined in Diederichs et al, is seen to constitute 15% of the catchment.
Notably Diederichs et al identify the area as becoming water stressed, particularly in respect of water quality deterioration, while the generally level nature of the area, with high water table may give rise to increased flood risk. The same authors also identify the impact of forestry on surface and sub surface flows serving the lake system.

In terms of site ecology, the area under consideration, existing MR231 (R619) encompasses an aeolian derived sand, which was established during the last marine transgression. These sands have only recently been stabilized with the natural vegetation cover being a grassland - palmveld mosaic (the KwaMbonambi Grasslands), which has since been largely replaced by plantation and urban settlement. A more clayey Miocene sediment underlies these sands and this generally impermeable horizon is responsible for the maintenance of wetland environments, where it lies proximal to the natural ground level. The availability of groundwater in the area has however, been compromised by the planting of commercial timbers in the area, which have served to establish a lens depression in the area. The bio physical state of the Aquadene area which is traversed by the R619 can be considered to be highly transformed, primarily on account of silvicultural and urban expansion activities. One culvert will be upgraded, located over a tributary of the Nkonika stream. Note that five, largely extant or completely transformed and drained wetlands were identified within a 500m radius of the site, and as such, a water use licence will be applied for (SDP, 2016)
In summary, the bio physical state of the Aquadene area which is traversed by the R619 can be considered to be highly transformed, primarily on account of silvicultural and urban expansion activities.

The area is, however, of some hydrological significance on account of its proximity and connectivity with Lake Mzingazi, a major water resource serving the Richards Bay urban complex.

Five wetland environments were noted to lie within 500m of the proposed road upgrade. Four such wetland systems were identified as being traversed by the existing roadway, while a third system lay approximately 2050m from the roadway; wetlands shown below:



Implications/Impacts:

-The proposed upgrade route along the R619, indicates that the project area will intersect with four wetland systems. One such system has been transformed into a concrete sluice to facilitate drainage, while the three remaining systems have been subject to varying levels of disturbance and transformation.

-The Nseleni / Nyokoneni River to the north of the site is considered to not interface with the project area in any manner on account of topography and other factors.

-A further wetland system, lies to the south of the project area and has been subject to significant drainage and transformation.

-The wetland systems identified along the proposed route of the R619, that is subject to upgrade and expansion, are primarily closed, endoreic systems that have been transformed to effect improved drainage. The most functional system (wetland 2) is a relatively intact depression, that shows limited emergence of early seral species, following the cessation of silviculture practices on site.

-Wetlands 3 and 4 have been subject to excavation and ongoing maintenance and effectively act as drainage canals for infrastructure in and around the Aquadene area. These systems both score a "*moderately low*" functional state.

-Given the above, it is evident that some management of the roadway upgrade must be applied to site, particularly around wetland and general drainage systems. The placement of camps and mobile asphalt plants at site should take consideration of the presence of these various landscape components and take a risk averse approach to the operations of these facilities.

-Suitable sculpting and reinstatement of affected points around wetland systems should be undertaken immediately after construction. The management of flow, stabilization of embankments and other factors should be taken into account.

-Exotic weed control should be practiced along the roadway following construction/upgrade

-Implementation of rehab program compiled by SDP attached as annexure B of ecological study

-Protection of watercourses from sedimentation or erosion during construction, as well as exotic weed encroachment

-Removal of trees prior to construction may require a permit in terms of the National Forest Act, specifically for removing trees from a forest (as per NFA definition). Approximately 80 trees will need to be removed, amongst these Acacia (Xanthophloea, Sieberana) and Trema were noted, as well as silviculture species. The contractor should consult with the ECO (if he does not have his own specialist/EO) prior to disturbance/removal of these for guidance on which would require a permit from department of Forestry and Fisheries.

2. OBJECTIVES AND PHASES OF THE ENVIRONMENTAL MANAGEMENT PROGRAM

2.1 Interpretation, measurement and payment

The EMP is legally binding through NEMA 2008 and amendments, as well as the Environmental Authorisation (EA) that will be issued. The proponent is to ensure that through the project tender process, the EMP forms part of the Project Construction Contract Document to be incorporated in line with General project specifications; and SANS 1200 standards, as applicable. In addition, the EMP table as included in this report has the following aspects for implementation:

Mitigation Measure – denotes necessary mitigation measures for each impact/issue'.

Management objectives – shows what the management objectives to be achieved for each mitigation measures are.

Measurable targets – Denotes what evidence is to be used as an indication as to whether or not the 'Management objectives' have been implemented and hence achieved.

Frequency of action - time guideline for the Contractor to action or manage the required mitigation

Measurement and payment:

It is expected that items included in this EMP will have cost implications above the actual construction or civil costs. These shall include mitigation and rehabilitation, monitoring, auditing and reporting, environmental awareness training, corrective actions, emergency actions, specialists and maintenance. The applicant and contractor must ensure that a financial sum is available for these. Costing for management action should be done with inputs and advice from appropriate technical members of the project team who have knowledge of the management actions being recommended as well as practical experience in implementing similar measures and techniques. A lump sum should be allocated for the environmental specifications where it is not possible to accurately cost requirements of the EMP.

2.2 Objectives of the EMPr

This document is compiled in accordance with the Integrated Environmental Management (IEM) series which aims to achieve a desirable balance between conservation and development (DEAT, 1992), and is a key instrument of the National Environmental Management Act [NEMA] (Act No. 107 of 1998). NEMA promotes integrated environmental management of activities and the IEM principle prescribes a methodology for ensuring that sound environmental management are fully integrated into all stages of the development process. It promotes the use of several environmental management tools that are appropriate for the various levels of decision-making, including the EMP.

The IEM guidelines encourage a pro-active approach to sourcing, collating and presenting information in a manner that can be interpreted at all levels.

IEM principles are in line with NEMA, which has repealed a number of the provisions of the Environment Conservation Act, 1989 [ECA] (Act No. 73 of 1989), and is focused primarily on co-operative governance, public participation and sustainable development. The Environmental Impact Assessment Regulations that was promulgated in December 2014 regulate the procedures and criteria for the submission, processing, consideration and decision on applications for environmental authorization of listed activities.

This EMP document aims further to provide environmental management guidelines to address planning/ design, and operational mitigation measures with regards to the construction to be undertaken. It identifies specific role players who will perform specific tasks in order to ensure that potentially significant impacts on the environment are minimized during all phases of this construction project.

All the parties involved in the construction work must embrace the EMP, as it is a legal document. The person in charge of implementing the EMP on a daily basis (EO / Site Agent / Foremen) must ensure that this document is integrated with other routine management processes. Notwithstanding the above, all personnel directly involved in construction, must ensure that:

- Environmental management principles are considered from the onset of the construction activity
- Disturbance of the natural environment is minimized
- Measures are taken to prevent or minimize all forms of pollution, to both terrestrial and aquatic environments (land and water)
- Indigenous flora and fauna are protected
- Precautions against environmental damage and claims arising from such damage are taken timeously.
- Compliance with relevant legislation and guidelines
- Roles and responsibilities are identified
- Changes to project implementation and unforeseen events can be incorporated into the at any stage
- Monitoring and feedback mechanisms are in place to verify environmental performance
- All personnel working on site are legally compelled to implement the requirements or mitigation measures as presented within this EMPr.
- All site personnel are responsible for ensuring that environmental damage, pollution and loss of biodiversity is avoided, or where it cannot be avoided, is reduced.

It must be noted that this EMP is a guide document and can be updated to reflect changing site conditions and advancements in mitigation measures. In addition, the following objectives form the basis of the EMP:

Continuous improvement. The project proponent (or implementing organisation) must commit to review and to continually improve environmental management, with the objective of improving overall environmental performance.

Broad level of commitment. A broad level of commitment is required from all levels of management as well as the workforce in order for the development and implementation of this EMP to be successful and effective.

Flexible and responsive. The implementation of the EMP must respond to new and changing circumstances, i.e. rapid short-term responses to problems or incidents. The EMP is a dynamic "living" document and thus regular planned review and revision of the EMP should be carried out.

Integration across operations. This EMP must integrate across existing line functions and operational units such as health, safety and environmental departments in a company/project. This is done to change the redundant mindset of seeing environmental management as a single domain unit.

Legislation. It is understood that any development project during its construction phase is a dynamic activity within a dynamic environment. The Proponent, Engineer, and Contractor must therefore be aware that certain activities conducted during construction may require further licensing or environmental approval, e.g. river or stream diversions, bulk fuel storage, waste disposal, etc. The Contractor must consult the Engineer on a regular basis in this regard and should ideally have a legal register on hand to ensure compliance with all relevant laws and by laws.

2.2 Phases of the project

There are three key phases of the proposed project, as covered by the EMPr:

2.2.1 Planning Phase

This phase relates to the period of time leading up to and prior to commencement of construction activities. The EMPr offers an ideal opportunity to incorporate pro-active environmental management measures with the goal of attaining sustainable development. Pro-active environmental measures minimize the chance of impacts taking place during construction and operational phase. There is still the chance of accidental impacts taking place; however, through the incorporation of contingency plans (e.g. this EMPr) during the planning phase, the necessary corrective action can be taken to further limit potential impacts.

During the planning phase, aspects related to bridge design, contract drafting, the EIA, receipt of approvals and permits, identifying preliminary laws and requirements are considered.

2.2.2 Construction Phase

Construction phase relates to all construction and its operation-related activities that will occur within the approved area, until the project is completed. The EMP contains specific mitigation requirements and requested contractor method statements stipulated where required.

The bulk of the impacts during this phase will have immediate effect (e.g. noise, dust, surface and ground water quality). If the site is monitored on a continual basis during this phase, it is possible to identify these impacts as they occur. These impacts will then be mitigated through the contingency plans identified in the planning phase, together with a commitment to sound environmental management from the proponent.

2.2.3 Post Construction, Rehabilitation and operational phase

By taking pro-active measures during the planning and construction phases, potential environmental impacts emanating during the operational phase will be minimized. This in turn will minimize the risk and reduce the monitoring effort, but it does not make monitoring obsolete.

2.3 Project area and Set up of Site camp

The contractor must maintain baseline information upon moving to site. This will also include informing the local community of the arrival and impending work.

The Engineer and contractor must identify suitable sites for site camp set up. This must then be provided to the ECO for approval. A site plan must be drawn and provided to the ECO.

The contractor will take into consideration the position of residences and sensitive environments when designing the site layout in order to minimise nuisance impacts on the residents and undue biophysical impacts. Construction activities shall be limited to the area as shown on the available site plans.

All areas required to facilitate access, construction activities, construction camps or material storage areas, shall be negotiated with the affected landowners, and must form part of the site camp/workshop and shown on the layout.

All areas marked as “no-go” areas shall be treated with the utmost care and responsibility to ensure that no encroachment occurs in these areas. Appropriate fencing shall be used to prevent livestock and/or unauthorised people from entering all work areas as such. No work shall commence until permission is granted from the Engineer and/or Environmental Control Officer.

3 ROLES AND RESPONSIBILITIES

3.1 The Applicant:

The Applicant will appoint various role players in order to execute the project. These include the Engineers and Contractors etc. The Applicant is responsible for ensuring that sufficient resources (time, financial, human, technical etc) are available to efficiently perform the tasks in terms of the EMPr.

The Applicant shall:

❖Appoint an Environmental Control Officer (ECO) to monitor the contractors compliance with the EMP. The applicant shall also ensure that the ECO receives full support during the auditing period.

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3.2 The Contractor:

The contractor is bound to the EMP conditions through contract, and is responsible for ensuring adherence to all conditions of the EMPr. The Contractor must thoroughly study the EMPr requirements before establishing on site and must request clarification on any aspect of the document, should they be unclear.

❖The contractor must implement all the requirements of the EMPr on a daily basis.

❖The contractor must comply with all instructions (whether verbal or written) given by the Engineer and ECO, in terms of the EMP.

The contractor is also responsible for :

❖ Keeping a copy of the EMP and EA on site and implementing the EMP
❖ Appointing a qualified, full time EO to assist with daily compliance
❖Preventing negative impacts on the environment by responsible construction
❖ Maintaining a register of complaints and queries by members of the public at the site office. This register is forwarded to the ECO on a monthly basis.
❖ Maintaining all approved infrastructure in good working order to effectively fulfil its intended purpose and to prevent negative environmental impacts
❖ Immediately remedying any factors that contribute to negative environmental impacts
❖ Removing non-functional structures
❖ Ensuring waste disposal at a suitable, permitted waste disposal facility
❖Ensuring that suitable arrangements are made to protect the environment against long term negative impacts arising from construction
❖Minimizing negative visual impacts
❖Cleaning up contaminants of the environment immediately
❖Preventing erosion through regular monitoring and rehabilitation of degraded areas and implementation of erosion controls
❖Rehabilitating site and maintaining for a minimum of 6 months thereafter.

3.3 The Engineer:

The Engineer (or project manager) is the appointed role player responsible for coordinating and integrating activities across multiple, functional lines. The Engineer is responsible for ensuring that the contractor considers environmental matters seriously by compelling the contractor to comply.

The Engineer:
❖Keeps a copy of EA and EMP
❖Ensures that all designs and layout take consideration of sensitive areas and no go zones and that these are excluded from development where possible (including recommendations made in the EIA and EMP)
❖Arrange meetings or consults with IAPs about the impending construction activities and assists in communication throughout the project;
❖assessing the Contractor's environmental performance in consultation with the Environmental Officer from which a brief monthly statement of environmental performance is drawn up for record purposes;
❖Documenting in conjunction with the Contractor, the state of the site prior to construction activities commencing. This documentation will be in the form of photographs or video.
❖Negotiate with/community members as required.
❖May on the recommendation of the Environmental Control Officer order the Contractor to suspend any or all works on site if the Contractor or his Subcontractor/ supplier fails to comply with the Environmental Management Program;
❖Ensure that the ECO has their full backing regarding environmental matters
❖Is responsible for requesting amendments to the EMP when needed, on behalf of contractor or applicant
❖Ensure that all problems identified during environmental inspections, are addressed and rectified by the contractor as soon as possible.

3.4 Environmental Control Officer

The Environmental Control Officer will be appointed by the applicant as a monitor of the implementation of, and compliance with, the EMP. The ECO must be consulted on all aspects of the project that can influence environmental conditions on the site. The ECO will be responsible for auditing and reporting independently to DEDTEA on all findings against the EMPr and EA.

The ECO:
❖Is to be considered to be the representative of the DEDTEA
❖Monitors contractor and applicant compliance with the EMP and EA
❖Takes baseline photos of site
❖Reviews method statements from contractor for various aspects of work and environmental

components such as alien plant control and rehab plan

❖Liaise with all authorities and departments regarding environmental matters, especially the DEDTEA

❖ Liaise with the engineer and contractor regarding environmental management

❖Undertake monitoring and auditing as per prescribed period and frequency

❖Record all findings, non compliances and recommendations in an objective and transparent manner in an audit report, submitted to all parties

❖Make recommendation for additional mitigation and improvements to EMP as required;

❖Has the authority to stop work in emergency situations in conjunction with the engineer

3.5 Environmental Officer

The contractor must appoint an internal Environmental Officer (EO) to assist with day-to-day monitoring of construction activities. The EO shall ensure and enforce the implementation of the EMPr and EA and specialist studies on a daily basis, which would extend to identification, protection and documentation of biodiversity on the site and their preservation, as well as application for permits. Any issues raised by the ECO will be routed to the Engineer and EO for the contractors' attention. The EO shall be permanently on site during the construction phase to ensure daily environmental compliance with the EMP and should ideally be a senior and respected member of the construction crew, with a suitable environmental management qualification and experience. Past experience has revealed that EO's that can relate to the work force are the most effective for information transfer and ensuring compliance with the EMP. However, the EO must have a full qualification and some experience in onsite environmental management.

The EO:

❖Opens an environmental file and maintains this on site

❖Open and maintains incident register (complaints, non compliances etc)

❖Keeps EA and EMP and reports on site and on company website

❖Remain full time on site during construction and rehab

❖Ensures, implements and enforces contractors daily compliance with the EMP and EA

❖Takes baseline photos of site

❖Provides method statements as requested by the ECO

❖Applies for permits when required, may request assistance of the ECO

❖ Identify, protect and document biodiversity on the site and ensure their preservation. May request assistance from ECO

❖Undertake daily monitoring and auditing

❖Record all findings, non compliances and recommendations in a daily checklist and weekly report, which is also sent to ECO.

❖Consults with ECO in conjunction with Engineer before an aspect of work can proceed

❖Follows all instructions from the ECO and closes out all items

General Items:

- Proper and continuous liaison between all parties is required to ensure that everyone is informed at all times.
- The IAPs shall be informed of the starting date of construction as well as the phases in which the construction shall take place, by the contractor and engineer, or through use of sign boards
- The Contractors must adhere to all conditions of contract, including the EMP and landowner/IAP special conditions.
- The work must be confined to demarcated areas and the approved location and no encroachment beyond will be permitted
- The natural environment must be protected and damage rectified
- All manmade structures and natural environments shall be protected against damage at all times and any damage shall be rectified immediately.
- The Contractor shall ensure that all damaged areas are rehabilitated to the satisfaction of the ECO. This includes rehabilitation of the camp sites etc, as applicable.
- Effective document management and record keeping of all complaints and steps taken must be undertaken.
- Regular site inspections and good control over the construction process throughout the construction period.
- Effective environmental control on site
- Environmental audits are to be carried out monthly during the construction phase, upon completion of the works for a period as prescribed by the DEDTEA.

4. MONITORING, COMMUNICATION AND REPORTING

4.1 Responsibilities for Environmental Management

The Contractor and / or its agents will be responsible for environmental management on site during the construction period. A pre-construction meeting is recommended in order to reach agreement on specific roles of the various parties and penalties for non-compliances with the EMP. In addition, surrounding residents must be notified in advance of any potentially disturbing activities.

4.2 Environmental Awareness Training for Site Personnel

The EMP shall be part of the Terms of Reference (ToR) for all Contractors, Sub-contractors and Suppliers. All the people involved in this project are to be briefed on their obligations towards environmental controls and methodologies in terms of this EMPR prior to work commencing. The briefing will take the form of an on-site presentation by the ECO. The education / awareness program should be aimed at all levels of the contractor team. New site personnel must attend an environmental awareness presentation. The EO must also conduct daily toolbox talks.

4.3 Complaints Register and Environmental Incident Register

Any complaints received from the community must be registered and recorded by the contractor on site. The complaint must be brought to the attention of the engineer and contractor, who will respond accordingly. The following information will be recorded:

- Time, date and nature of the complaint;
- Response and investigation undertaken; and
- Close Actions taken, sucess and closure date.

All complaints received will be investigated and a response (even if pending further investigation) is to be given to the complainant within 7 days.

Incidents

Within 8 hours the EO will report to the Engineer and ECO the occurrence or detection of any incident at the site, or incidental to the operation of the site which has the potential to cause, or has caused, water pollution, damage to the environment, health risks or nuisance conditions, or which is a contravention of the Environmental Management Plan. Within 5 days (or shorter period of time) from the occurrence or detection of any incident, an action plan must be submitted with a detailed time schedule for implementation:

- To correct the impacts of the incident,
- To prevent the incident from causing any further impacts and
- To prevent the recurrence of a similar incident.

The non-compliance forms and complaints register, together with actions taken or to be taken, are to be kept on file by the EO and made available to the ECO and engineer.

4.4 Site Instruction Entries

The site instruction book entries will be used for the recording of general site instructions as they relate to the construction/ upgrade works. It will also be used for the issuing of stop work orders for the purposes of immediately halting any particular activity of the contractor in lieu of the environmental risk that these may pose.

4.5 EO Diary Entries

The purpose of these entries will be to record the comments of the EO as they relate to activities on the site. This diary may take the format of a register. These books should be available to the authorities for inspection or on request. Minutes of all the meetings that reflect environmental queries, agreed actions and dates of eventual compliance must be available and form part of the official environmental record.

4.6 Method Statements

Method statements from the contractor will be required for specific sensitive actions on request of the authorities or ECO and Engineer.

A method statement forms the base line information on which sensitive area work takes place and is a "live document" in that modifications are negotiated between the Engineer, contractor and ECO as circumstances unfold.

All method statements will include items from the EMP. A method statement describes the scope of the intended work in a step by step description in order for the ECO to understand a contractor's intentions.

This will enable them to assist in devising any mitigation measures, which would minimize environmental impact during these tasks. For each instance wherein it is requested that the contractor submit a method statement to the satisfaction of the ECO, the format should clearly indicate the following:

What -	**a brief description of the work to be undertaken;**
How -	a detailed description of the process of work, methods and materials; as well proposed controls and mitigation
Where -	a description/sketch map of the locality of work (if applicable); and
When -	the sequencing of actions with due commencement dates and completion date estimates.

The contractor must submit method statements before any particular construction activity is due to start. Work may not commence until the method statement has been approved by the ECO and engineer. Allow a minimum of 14 days for approval of method statements.

The following detailed and comprehensive method statements are likely to be required as relevent:

- ❖ Working within watercourses and method of construction

- Plant search and rescue
- Erosion and sedimentation control
- Run off control (storm water control);
- Erosion rehabilitation
- Materials management
- Alien plant control and eradication
- Waste management, storage, handling and disposal
- Noise and Dust control
- Social control and traffic plan
- Spill Contingency and Emergency Response
- Rehabilitation

Should changes to the above occur, the ECO and engineer will then need to be reapproved.

4.7 Record Keeping

All records related to the implementation of this management plan (e.g. complaints register and incident book, site instruction book; EO diary; method statements) must be kept together in an office where it is safe and can be retrieved easily. These records should be available for scrutiny by any relevant authorities at any time.

4.8 Photographs

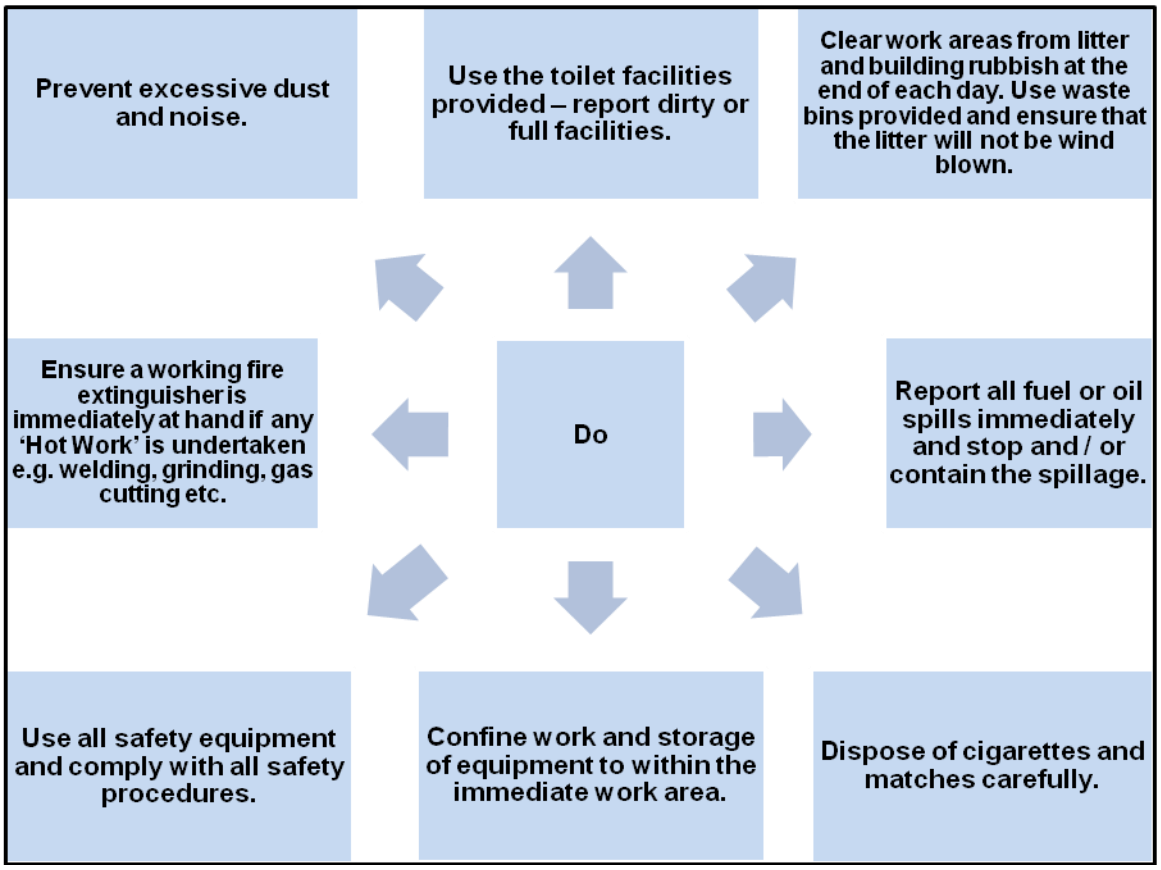
Photographs must be taken of the site prior to, during and immediately after construction as a visual reference, by the contractor. These photographs should be stored with other records related to this EMPr. If captured in digital format, hard copies must be kept with all other records relevant to the implementation of this EMPr.

4.9 Environmental Close Out Report

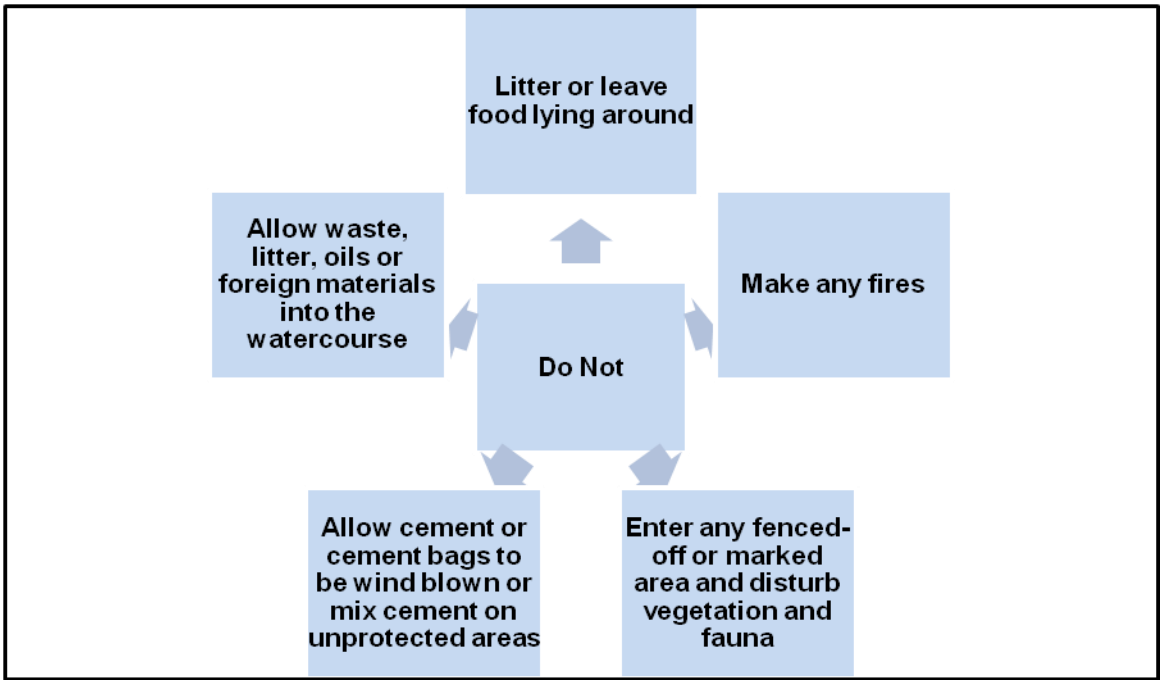
An environmental close out report is a report by the ECO to the relevant authorities stating completion of the project and overall compliance levels. This report will also comment on the impacts arisen during construction vs impacts predicted at EIA stage.

4.10 Basic Rules of Conduct

The following figures represent the do's and don'ts towards environmental awareness that all participants in this project must consider whilst carrying out their tasks. These are not exhaustive and serve as a quick reference aid:



Basic Rules of Conduct on Site (Do's)



Basic Rules of Conduct on Site (Dont's)

4.11 Environmental Monitoring, Auditing, Measurement and Reporting Mechanism

Environmental monitoring will be undertaken by the Environmental Control Officer (ECO) at the frequency stipulated by the DEDTEA. The audits will verify compliance with the EMP and EA. Audits will be done physically with the ECO and the contractor / Engineer being present during the construction site inspections. All findings will be presented in a written report and distributed to all parties, including the DEDTEA.

Key performance indicators, as stated as a guide below, should be included in the audit report as relevant or when required:

- Social complaints
- Environmental incidents, such as oil spills, cement spills, and actions taken
- Environmental damage requiring rehab

- ❖ The audit report should also comment briefly on the various aspects on the affected environment including effectiveness of mitigation measures, method statements and plans.
- ❖ The Environmental Compliance Audit report should also recommend additional measures and opportunities for improvement on site management, including possible additions to the EMP mitigation measures.

Work progress:

Details of construction progress and monitoring results, if relevant, should also be reported on.

Communication:

In order to facilitate communication between the ECO, Engineer and Contractor, it is important that a suitable chain of command is structured that will ensure that the ECO's recommendations have the full backing of the project team before being conveyed to the Contractor. In this way, penalties as a result of non-compliances with the EMP may be justified as a failure to comply with instruction from the highest authority. It is recommended that communication be via the Engineer.

Time periods for implementing mitigation measures

In general, findings close out will be required at the timeframe stipulated by the ECO.

Classification of Audit Findings

Issues identified may be classified as either regulatory issues, or those which address good Environmental Management Practices. Each finding is further categorized as either, Category I, II or III and a time-frame in terms of corrective action is indicated as per the classification system outlined below:

Significance

The significance of the audit findings are classified as either;

Regulatory (R): a finding resulting from potential deviation with the regulation or the project specification.

Good Management Practice (GMP): a finding resulting from adherence with company policies and regulatory standards or good management practices.

Category

CATEGORY I: An incident/issue which has a potentially high environmental impairment on the public, employees, the Company and its reputation. An incident that can further be classified as a major deviation from regulatory requirements as per the project specific documents

CATEGORY II: An incident/issue which has a potentially moderate environmental impairment on the public, employees, the Company and its reputation. An incident that can further be classified as an intermediate deviation from regulatory requirements as per the project specific documents

CATEGORY III: Procedural matter with no environmental impact or incident/issue with low potential for impairment on people or the environment. An incident that can further be classified as a minor deviation from regulatory requirements as per the project specific documents

Timeframe

For each recommendation a priority is assigned as follows; which indicates the timeframe within which action should commence and be completed:

Immediate (within 24 hours)

Short term (1-7 days)

Medium term (1-4 weeks)

Long term (4 or more weeks)

This enables the project team to assess the period in which a response is required

Non-Compliance with the EMPR

Difficulties may be encountered with carrying out mitigation measures that could result in future non-compliance. The Contractor shall put in place procedures to motivate staff members to comply with the EMPr, and to deal with acts of non-compliance, or malicious damage to the environment.

Penalties for non-compliance need to be discussed with the Contractor at the earliest stage (during the Pre-Construction Meeting).

The Contractor is deemed not to have complied with the Environmental Management Plan if:

- within or without the boundaries of the site, site extensions and haul/ access roads there is evidence of contravention of clauses;

- if environmental damage ensues due to negligence or otherwise;

the Contractor fails to comply with corrective or other instructions issued by the Engineer within a specified time,

-The Contractor fails to respond adequately to complaints from the public and calls for environmental mitigation.

Amendments / Instructions

No EMPr amendments (relaxation or revision of any mitigation measure) shall be allowed without approval from the relevant authority (DEDTEA). Motivations for amendments to the EMPr may be discussed with ECO. However the ECO may provide onsite input where required with regard to the mitigation measures required as per EMPr.

Consultation with Land Owners or Community

Representation- Negotiations will be undertaken by the Engineer, and contractor as available.

Documentation- All meetings with landowners, residents, stakeholders and affected parties are to be minuted. A copy is to be distributed to all parties thereafter.

Consultation will start during the detailed design phase and continue throughout the construction phase.

5. ENVIRONMENTAL MANAGEMENT OBJECTIVES AND MEASURABLE TARGETS

This section outlines management measures, objectives and measurable targets:

5.1 Guiding Laws:

Title of legislation, policy or guideline	Applicability to the project	Administering authority	Date
National Environmental Management Act (No 107 0f 1998; as amended)	The eia regulations are under nema and give rise to the need for an eia for specific projects. The listed activities under here are subject to eia.	Provincial and national	1998
EIA regulations of 2014	Listed activities herein are triggered	National and provincial	2014
NEMA: Biodiversity Act (10 of 2004)	Protection of any chance biodiversity features, permitting requirements.	Provincial and national	1998
National Water Act (No 36 of 1998)	Protection of watercourses and permit requirements before working in/near watercourses as well as for taking water from a watercourse	Provincial and national	1998
National Heritage Resources Act (Act 25 of 1999)	Should archaeological, heritage or paleontological artefacts be uncovered accidentally, then the contractor must stop work and inform amafa, so that these may be preserved.	Provincial and national	1999
Mineral and Petroleum Resources Development Act (No. 28 of 2002) and amendments	Requires an authorisation before a burrow pit or sand mining or winning activity can occur or exemption from such authorisation	national	2008
NEMA : Waste Act (Act 59 of 2008 as amended)	Safe and correct, legal disposal of waste generated on site, by the generator of waste-contractor	Provincial and national	2008
Conservation of Agricultural Resources Act (Act 43 of 1983)	The project must implement erosion controls to stabilize soil and measures to control loss of topsoil and conservation of topsoil. Eradication and control of alien invasive species on and near site including	Provincial and national	1983

Hazardous Substances Act (Act 15 of 1973)	The contractor may be storing chemicals and fuels on site.	National and provincial	1973
National Spatial Biodiversity Assessment (2011)	This assessment hopes to inform all private and public sector activities and provides tools for use in planning	National (Sanbi)	2011
EMF and SDF for Umhlathuze and Uthungulu as available	All projects to be guided by these documents.	Local	Current
All local and provincial regulations and by municipality by laws	The contract must identify, consider and adhere to all relevant laws (possibly via a legal register)	Local and provincial	Current
Construction Regulations	The contractor will construct according to these laws	Provincial and national	2003
Occupational Health and Safety Act	The contractor will comply with all requirements of the OHSACT.	Provincial and national	1993

5.2. TABLE - IMPACT MANAGEMENT : ENVIRONMENTAL MANAGEMENT PROGRAM

IMPACT #	ASPECT	MITIGATION	MANAGEMENT OBJECTIVE	MEASURABLE TARGET	FREQUENCY OF ACTION
A: PLANNING & PRE CONSTRUCTION					
A1	➢ **Contractual matters and construction program**	▪ The EMP must be included as part of the tender documentation, enforceable under the general conditions of contract. ▪ A copy of the EMP must be held on site. The contractor must ensure that all the personnel on site, sub-contractors and their team, suppliers, etc. are familiar with and understand the specifications contained in the EMP. ▪ Contractors shall prepare a source statement indicating the sources of all materials (including topsoil, sands, natural gravels, crushed stone, asphalt, clay liners etc), and submit these to the Engineer for approval prior to commencement of any work. This must also be filed. ▪ Where possible, a signed document from the supplier of natural materials should be	-Contingencies for minimizing negative impacts -Ensuring environmental awareness and formalising environmental responsibilities	-Contract documents -Permits for materials	Contractor appointment, site establishment and ongoing as required

		obtained confirming that they have been obtained in a sustainable manner and in compliance with relevant legislation or permits. ▪ Work near or within the watercourses may not commence without a Water Use License from Department of Water and Sanitation, as is taking water from a water resource. ▪ Natural materials (soil) should be from a commercial source. Should burrow or quarry areas need to be created, an authorization from DEDTEA may be required first, and an exemption or permit must be obtained from DMR ▪ A pre site assessment must be undertaken by the contractor to determine DAFF or EKZW permit requirements; and to conduct a tree count to determine how many trees will need to be removed. This exercise may be done with a specialist and/or the ECO. However the responsibility for permits will rest with the contractor. The assessment must be conducted a few months in			

		advance to avoid delays in receiving permits.			
A2	➢ **Method statements**	▪ Method statements as stated in this EMP or as directed by the ECO must be provided by the contractor. All activities which require method statements may only commence once the method statements have been approved by the engineer and or ECO as applicable. ▪ It is vital that detailed construction method statements be compiled and submitted to the engineer and ECO for review, detailing method of working in the watercourses, and mitigation for this; as well as method statements for road construction upgrade, spill contingency and emergency response. ▪ A traffic control plan is to be compiled by the contractor for the project.	-Contingencies for minimizing negative impacts -Ensuring environmental awareness and formalising environmental responsibilities	-Approved method statements and proof of training	-Site establishment and as required
A3	➢ **Emergencies**	▪ The contractor must provide method statements on the protocols to be followed, and contingencies to be put in place for the following potential incidents before construction may begin: Contamination of natural water resources from spills;	-Contingencies for minimizing negative impacts	-Method statements, response plans	Site establishment and as required

		contamination of soils from spills; and fire.			
B: CONSTRUCTION PHASE					
B1	➢ **Site set up and location of project**	▪ Preconstruction site photographs (photos prior to any disturbance of site) must be taken and maintained throughout contract ▪ 'Site' shall be deemed to be all areas disturbed by construction or construction related activity (e.g. haulage), intentionally or unintentionally, and must be rehabilitated post construction. ▪ The camp site, parking and storage areas must be determined in conjunction with the Engineer and approved by the ECO. ▪ Cut and fill must be avoided where possible during the set up of the construction camp. ▪ The size of the construction camp should be minimized where possible. ▪ Should private property be used to set up camp, negotiations must be undertaken with the landowners and documented, including rehab/restoration requirements and preconstruction states.	-Compliance with EA and EMP -Minimize the damaging of terrestrial and aquatic -no undue pollution to watercourse	-Method statements and plans -Demarcated or pegged site extent -Layout plan and site plan -No set up or undue encroachment in sensitive areas -reduced impacts to watercourses -Records of negotiations	Site establishment and as required construction

		▪ Site set up will not be permitted within 32m of a watercourse or within the 1:100yr flood line, or unless specified by the ECO. ▪ The findings of the specialist report must be adhered to. ▪ A site and layout plan must be submitted to the ECO and engineer for review, and all amenities shall be installed before the staff moves onto site. The contractor shall ensure that all basic conditions in the EMP are fulfilled before the contractor occupies the site; this can be verified by the engineer. ▪ The surveys for the project work area and construction footprint as approved must be completed and clearly demarcated and/or fenced before the contractor sets up site camp or begins construction. ▪ 'No-go' areas such as sensitive areas identified during the EIA process, must be clearly demarcated (e.g. barricading/ red tape/coloured pegs) ▪ All work is to be confined to pre-agreed demarcated working areas. ▪ The Contractor must take into consideration that the construction works are being conducted near a populated social		

		environment as well as over a watercourse (albeit transformed and of low ecological value), and should ensure that such areas are not adversely affected by construction activities. ▪ All municipal by-laws pertaining to working in this area must be strictly adhered to. ▪ The camp site must be fenced with all relevant signage. ▪ All gates must be fitted with locks and be kept locked at all times and preferably manned by security. A rapid response plan should be formulated by the contractor to deal with urgent matters pertaining to security. ▪ Lighting, if required, is to be set out to provide security, without creating a visual nuisance. ▪ All services are to be identified and demarcated or relocated before construction commences. Removal/upgrade/re-alignment of existing structures: ▪ Mitigation/management measures (as per			

		the construction phase below) should be adhered to during realignment/upgrading/construction of culverts.			
B2	➢ **Ecology- Flora (vegetation)**	▪ The site must be assessed prior to disturbance to determine if there are any plants of conservation value that will need to be rescued or removed. Permits may be required from EKZNW prior to removal or relocation. The contractor may request the assistance of the ECO or a vegetation specialist for this if the ECO or contractors EO does not have the specialist skills ▪ Removal of trees prior to construction may require a permit in terms of the National Forest Act, specifically for removing trees from a forest (as per NFA definition). Approximately 80 trees will need to be removed, amongst these Acacia (Xanthophloea, Sieberana) and Trema were noted, as well as silviculture species. The contractor should consult with the ECO (if he does not have his own specialist/EO) prior to disturbance/removal of these for guidance on which would require a permit from	Compliance with EA, EMP	Method statements	Site establishment and ongoing as required

		department of Forestry and Fisheries. ▪ Should any protected tree need to be removed, pruned or disturbed, a permit must be obtained from DAFF prior to any such activity. Should any indigenous tree or protected need to be removed, a replacement off set of replanting three trees for each tree removed is encouraged, provided there are funds available for this. These trees can be used to line the road verge (provided the specific species will not impact on the road integrity via the root system in future). In addition, species such as the Acacia are easily propagated via seed and this option can be adopted with seed being collected at the outset, depending on the ECO requirements. The ECO can additionally recommend species to be replanted to enhance species diversity whilst maintaining the indigenous species profile of the area. ▪ No shrubs may be removed without the prior permission of the Engineer. A method statement for clear and grub, topsoil management and site preparation is required as directed by the ECO.			

		▪ Areas are to be cleared of vegetation in accordance with the design of structures and construction of roadway as specified. ▪ Where possible and as applicable, all removed vegetation must be transplanted to a location outside the construction footprint or retained for replanting in a nursery during landscaping. ▪ The special conditions of contract must make provision for the removal and appropriate storage of topsoil for rehabilitation purposes. Topsoil is considered to be the top 300 mm of the natural soil surface and includes grass, roots and organic matter. All existing vegetation that fall outside the construction area must be retained. ▪ Care to be taken not to introduce alien plant species to site. ▪ Bio piracy is forbidden (stealing of plants and animals from site for any purpose) ▪ No burning or uncontained fires are allowed on site ▪ A rehabilitation method statement must be drawn up by the contractor			

		Alien plants ▪ An alien plant control method statement is required from the contractor. ▪ Exotics and invasive plants to be eradicated. Control involves killing the plants present, killing the seedlings which emerge, and establishing and managing an alternative plant cover to limit re-growth and re-invasion. ▪ All sites disturbed by construction activities must be monitored for colonisation of exotics or invasive plants and control these as they emerge or re-establish. ▪ Follow manufacturer's instructions when using chemical methods, especially in terms of quantities, time of application etc. ▪ Ensure that only properly trained people handle and make use of chemicals. ▪ Dispose of the eradicated alien plant material at an approved solid waste disposal site. ▪ Ensure that weeds are removed from site and all areas where seed has spread out of site. Remove weeds/aliens from topsoil and subsoil.			

		▪ Immediate re-vegetation of stripped areas and the removal of alien plant species by regular weeding must take place. This significantly reduces the amount of time and money that must be spent on alien plant management during rehabilitation. ▪ Topsoil that is suspected to be contaminated with the seed of alien vegetation should not be used on site. Alternatively, the soil is to be treated with specified herbicides by suitably trained personnel.			
B3	**Ecology- Fauna**	▪ The site must be inspected for smaller fauna or nesting/brooding activity prior to any site establishment or disturbance. Fauna that cannot relocate themselves must be rescued. ▪ The hunting/poaching, capturing or disturbance to fauna is forbidden, as is the setting up of traps or snares or killing of reptiles, sedentary species or any fauna in general ▪ Bio piracy is forbidden (stealing of plants and animals from site for any purpose) ▪ No burning or uncontained fires are allowed	-Compliance with EA/EMP -No loss of or injury to wildlife or undue disturbance to habitat	-Rehab method statement	Site establishment and as required

		on site			
B4	➢ **Watercourses**	▪ The contractor must compile a method statement for working in watercourses (wetland or drainage channel) ▪ No blockage of water flow is permitted and the contractor shall ensure a continuous through flow ▪ Spill prevention measures must be put in place where construction is to occur prior to any activities taking place. ▪ Siltation/erosion prevention measures must be put in place at the area where construction is to occur prior to any activities taking place and immediately after. This shall extend to sandbags, gabions, reno mattresses, riprap, geotextiles, hessian, hay bales, silt nets or anu other effective temporary or permanent measure. ▪ The works must be demarcated in the vicinity of the wetland areas and no access beyond demarcation is permitted (vehicular or pedestrian, storage of plant or effects)	Compliance with EA and EMP No disruptions to wetland functionality Reduced impacts on watercourse	-Method statements -Full implementation of mitigation	Site establishment Duration of work in watercourse
B5					Site

	➢ **Socio economic**	▪ Communication and meetings must be undertaken with affected residents by the contractor and engineer. ▪ Concerns of residents must be documented and closed out from the project outset to the satisfaction of all parties. In general, complaints from the public must be closed out within 14 days. ▪ A complaints and incidents register must be opened to document complaints and actions taken, and must be maintained for the duration of the project. I&AP's need to be made aware of the existence of the complaints book. ▪ Job opportunities must be set aside for locals as per conditions of contract. ▪ A general regard for the social and ecological well-being of the site and adjacent areas is expected of the site staff. Workers need to be made aware of the following general rules: *-No alcohol/drugs to be present on site.* *-No firearms allowed on site or in vehicles transporting staff to/from site (unless used by security personnel)*	▪ Compliance with EA and EMP	-Meeting / negotiation records -Incidents register	establishment and as required

		-Prevent excessive noise. *-Prevent unsocial behavior especially criminal behavior* *-Construction staff are to make use of the facilities provided for them* *-Staff may not approach community members unnecessarily and without the permission of the Engineer and must be courteous* *-no littering on or degrading of site and no urinating in public*			
B6	➢ **Soil**	**Stockpiles management** ▪ A method statement is required for materials management which also includes topsoil management ▪ Topsoil stockpiles should not exceed 2m in height and must be stored in a designated area further than 32m away from the watercourse or out of the 1:100 yr floodline, on a flat area. ▪ Topsoil stockpiles should be covered by vegetation or cloth or lined by berms. ▪ Stockpiles should not be situated such that they obstruct natural water pathways. ▪ All materials should have signed designated	-Compliance with EA and EMP -Reduced sediment load to watercourse -Prevention of soil loss	-Method statements -Designated storage areas -Conserved topsoil -Erosion and sediment control structures	Site establishment and as required

		areas to ensure that stockpiles are in their demarcated areas. ▪ Stockpiles are to be stabilised if signs of erosion are visible. ▪ Soils from different horizons must be stockpiled such that topsoil stockpiles do not get contaminated by sub-soil material. ▪ Topsoil stockpiles must be monitored for invasive exotic vegetation growth. Contractors must remediate as and when required in consultation with the Engineer and ECO. ▪ No plant, workforce or any construction related activities may be allowed onto the topsoil stockpiles. ▪ Topsoil stockpiles must be clearly demarcated as no-go areas ▪ No stockpiles are to be located within or near the watercourse edge or edges of slopes, or stored within 15m of wetlands/channels ▪ Topsoil stockpiles standing on site for longer than one month must be seeded (grassed). ▪ Care to be taken to prevent the establishment and spread of alien invasive species			

		Erosion and sedimentation ▪ A method statement is required for sediment and erosion control and remediation ▪ The time that stripped areas are left open to exposure should be minimized wherever possible. Care should be taken to ensure that these times are not excessive. ▪ Soil erosion on site must be prevented. ▪ Wind screening and storm water control should be undertaken to prevent soil loss from the site. ▪ The use of silt traps / fences, hessian or sandbags may be employed as required to reduce sedimentation and to line the periphery of the wetland areas and embankments of channels and elsewhere as required on site. ▪ All embankments shall be protected by a cut-off drain to prevent water from cascading down the face and causing soil erosion. ▪ Monitor access roads and the site for signs of erosion and potholes and remedy this as soon as possible.			

		▪ All disturbed areas/embankments that are no longer required for work to proceed must be immediately stabilised to prevent erosion ▪ No side tipping of material is allowed. ▪ Areas with potential for soil erosion must be rehabilitated with indigenous vegetation to minimize future impacts of soil erosion and other human activities ▪ Water from excavations (during dewatering) must be pumped out responsibility on a grassed/vegetated area or suitably protected area. Silt fences should also be used to contain sediment as applicable. ▪ Avoid over-wetting, saturation and unnecessary runoff during dust control activities and irrigation. ▪ Do not allow surface water or stormwater to be concentrated, or to flow down cut or fill slopes without erosion protection measures being in place. ▪ Line overflow and scour channels with stone pitching along their length and at their points of discharge to prevent soil erosion. The point of discharge must be at a point where there is dense grass cover. ▪ Ensure that channels do not discharge			

		straight down the contours. These must be aligned at such an angle to the contours that they have the least possible gradient. ▪ Ensure that overland discharge occurs over areas that have a minimum cover of 90% grass cover at a minimum height of 150mm. This applies to areas down slope of the discharge point as well. ▪ Do not allow erosion to develop on a large scale before effecting repairs. ▪ Repair all erosion damage as soon as possible and in any case not later than six months before the termination of the Maintenance Period to allow for sufficient rehabilitation growth **Storm water & runoff control** ▪ A method statement for storm water management is required from the contractor ▪ Construction will be planned, designed and undertaken according to design and contract specifications to allow for the natural flow of water, where required. ▪ Where gabions and other suitable erosion control measures are installed, temporarily			

		or permanently, the outflow will be suitably managed to prevent future erosion. ▪ Do not allow surface water or storm water to be concentrated, or to flow down cut or fill slopes or along pipeline routes without erosion protection measures being in place. ▪ Temporary cut off drains and berms may be required to capture storm water and promote infiltration. ▪ Earth, stone and rubble is to be properly disposed of so as not to obstruct natural water pathways over the site. These materials must not be placed in storm water channels, drainage lines or rivers. ▪ No temporary works, stockpiles or other circumstances may exist that impede natural water movements or act to concentrate run-off. ▪ There should be periodic checking of the site's drainage system to ensure that the water flow is unobstructed. ▪ Storm water outfalls should be designed to reduce flow velocity in order to reduce and avoid soil erosion ▪ The Contractor must monitor and manage drainage of the site to avoid standing water			

		and soil erosion. ▪ Excavations/earthworks should be undertaken carefully incorporating appropriate drainage or dewatering. ▪ Programme excavations to take place once the required materials are on site. ▪ Earthworks/layerwork activities must be limited to areas of immediate work site to reduce soil erosion.			
B7	**Heritage resources**	▪ Construction activities should be limited to the proposed construction corridor of 30m from the outer edge of the existing road edge. If the size of the construction corridor is increased at a later stage, a heritage specialist should be involved in order to assess how the increase in the corridor width will affect heritage resources ▪ However, caution must be taken during construction as there is an existing cemetery although located beyond the 30m developmental corridor at A: 28°43'48.7''S, 32°02'15.2''E, B: 28° 43'49.9''S; 32° 02' 16.2''E, C: 28°43'53.6''S; 32°02'18.0''E (cemetery fence coordinates) in Brackenham suburb not to impact on the	-Compliance with EA and EMP -Avoid damage to heritage resources	-No damage or destruction to heritage, cultural and paleontological resources during earthworks	Site establishment and as required

		graves. However this is a formal fenced cemetery with access control in place and the actual graves even much further away from the developmental corridor. The fence of the gravesite occurs over approximately 80m from the proposed developmental corridor of 30m from the existing road edge ▪ Archaeological material, by its very nature, occurs below ground. The developer should therefore keep in mind that archaeological sites might be exposed during the construction phase. If anything is noticed, work in that area should be stopped and the occurrence should immediately be reported to the KwaZulu Natal Provincial Heritage Resources Authority (Amafa) at 033 394 6543 and the author at 083 375 4270. The find should then be investigated and evaluated by the author (in consultation with and permission from the client), who will provide recommendations on when construction activities in the area where the discovery was made can resume ▪ Construction workers should be cautious especially during the vegetation clearance			

		and earthwork/layerwork/excavation so as not to disturb any possible resource. Work must strictly fall within the approved boundaries ▪ Should a grave be detected, construction at that area must cease immediately, the grave site must be cordoned off with red danger tape at a radius of 2m by the contractor; and Amafa must be informed. A heritage specialist/archaeologist may be requested to investigate. ▪ Should any subsurface heritage/cultural/paleontological resource be unearthed, work must stop, and Amafa KZN must be notified. The contractor must also appoint a heritage or grave specialist or archaeologist to conduct a study for submission to Amafa, and this will also be the case in the event of a paleontological resource being found in which case a paleontological specialist will need to be sourced by the contractor. – No structures older than 60 years or parts there-of are allowed to be demolished, altered, extended without a permit form			

		Amafa ▪ No activities are allowed within 50m of a site which contains rock art.			
B4	➢ **Safety and security**	▪ Lighting on site is to be set out to provide maximum security and to enable easier surveillance of the site, without creating a visual nuisance to locals or fauna ▪ The site camp and work areas must be fenced or securely barricaded and access controlled. ▪ Potentially hazardous areas such as open excavations are to be demarcated and clearly marked in areas where cattle or pedestrians are likely, unless these fall within a broader barricaded or access controlled area ▪ Proper project and cautionary signage to be used throughout construction ▪ Material stockpiles or stacks must be stable and secured to prevent collapse ▪ Obstruction to drivers' line of site due to stockpiles and stacked materials must be avoided, especially at intersections and	-Compliance with EA and EMP -No incidences regarding safety and security	-Barricading and signage on site	Site establishment and ongoing as required

		sharp corners. ▪ No materials are to be stored in unstable or high-risk areas. ▪ All I&AP's should be notified in advance of any potential risks associated with the construction site and the activities. ▪ No burning is allowed on site			
B8	➢ **Access and traffic control**	▪ The location of all underground services and servitude (if any) must be identified and confirmed. ▪ Also inform the residents/businesses should there be any disruptions to services. ▪ Appropriate temporary traffic control and warning signage must be erected and implemented on the affected road / crossing ▪ A traffic control plan must be developed ▪ Construction workers / construction vehicles must take heed of normal road safety regulations. ▪ A courteous and respectful driving manner should be enforced and maintained so as	-Compliance with EA and EMP	-Records as applicable -Traffic control plan	Site establishment and as required

		not to cause harm to any individual ▪ Any damage to surrounding roads should be repaired as soon as possible to prevent further deterioration to the road surface. ▪ Contractors should ensure that access roads are maintained in good condition by attending to corrugations and storm water damage as soon as these develop. ▪ Construction vehicles must be restricted to demarcated access, haulage routes and turning areas.			
B9	➢ **Surface water, Groundwater and soil**	▪ Method statements are required for waste management, hazardous material/waste management, spill contingency and protection, surface and groundwater protection ▪ Disposing of hazardous materials or any other type of material or waste stream into the watercourse, near the watercourse or riparian area, in the open/natural environment, (including all types of rubble, spoil, waste rock, spills, waste, litter, garbage, plastics, excess	-Compliance with EA and EMP -No pollution to soil, surface and groundwater	-Method statements -Spill kits -Response plans -Proof of safe disposal of waste	Site establishment and duration of contract

		material from blasts etc) is strictly prohibited. ▪ Treat oil and chemical spills/residues immediately with an absorbent ▪ Contractor must ensure that spill kits and drip drays are available on site ▪ Contractor must ensure that emergency response plan is available ▪ Contractor must ensure that disposal slips are obtained after waste disposal has taken place at registered, legal disposal sites. These slips/receipts must be filed. **Ablutions** ▪ Chemical toilets must be provided and are to be maintained in a clean state and should be sufficient in number to ensure that they adequately service the length of the work area. ▪ If chemical toilets are used then the waste should be serviced regularly with proof of servicing being retained on file. Care must be taken during servicing to avoid contamination of soils and water pollution and nuisance to adjoining			

		areas. ▪ A registered chemical waste company is to be used to remove waste from chemical toilets. Servicing slips are required. ▪ If a serviceable conservancy tank will be used, this must be located at least 100m away from the watercourse, and encased in an impermeable liner and bunded area. ▪ The Contractor is to ensure that open areas, the surrounding areas, and especially the watercourses are not being used as a toilet facility. ▪ Under no circumstance may sewage/waste from toilets be disposed of in the watercourse or surrounding environment. **Hazardous materials** ▪ The contractor must provide and maintain a method statement for cement and concrete handling. The method statement must provide information on proposed storage, washing & disposal of			

		cement, packaging, tools and plant. ▪ Mixing of concrete on site is not recommended, however if unavoidable, it must be conducted only in specifically selected sites on mortar boards or similar structures, on a designated, impermeable and bunded surface or on a metal drip tray and must occur out of the floodline or further than 32m away from watercourses. ▪ Cleaning of cement mixing and handling equipment must be done on proper cleaning trays/washbay area or preferably off site at a commercial facility. ▪ All empty cement bags are to be treated as hazardous waste and must not be discarded on the ground and the wetlands; and must not be allowed to become windblown ▪ All empty containers must be stored in a dedicated area and later removed from the site for appropriate disposal at a licensed facility. ▪ Any spillage of cement that may occur must be investigated and immediate			

		remedial action must be taken. ▪ The visible remains of concrete, either solid, or from washings, must be physically removed upon discovery (or at the close of each day, as per discretion of ECO) and disposed of as waste to a registered landfill site or stored in a designated area pending safe disposal ▪ No vehicle transporting concrete may be washed on site ▪ Vehicle servicing must occur in a bunded area or workshop area, further than 100m from site ▪ All substances required for vehicle maintenance and repair must be stored in sealed containers, preferably undercover, until they can be removed from site. ▪ Storage of hazardous substances within bunded area, and away from buffer areas. ▪ Hazardous waste disposal must be carried out by an approved waste contractor. ▪ Storage areas that contain hazardous			

		substances must be bunded with an approved impermeable layer. ▪ A sump (earth or other) must be created for concrete waste. This is to be de-sludged regularly and the cement waste is to be removed to a legal tip site as approved, by the local solid waste company that is in charge of that particular area. ▪ Disposing of hazardous materials or any other type of waste into the watercourse, near the watercourse or riparian area, in the open/natural environment, (including all types of rubble, spoil, waste rock, spills, waste, litter, garbage, plastics, excess material from blasts etc) is strictly prohibited. **Waste water management** ▪ All concrete mixing must take place on a designated, impermeable or bunded surface ▪ A designated, bunded area or workshop washbay is to be set aside for vehicle washing and maintenance.			

		▪ No polluted runoff or stormwater must be allowed to enter the watercourse ▪ Provision should be for all polluted runoff to be treated to the Engineer's approval before being discharged. ▪ No form of secondary pollution should arise from the disposal of sewage, waste and refuse. If any problems should arise, these must be addressed immediately. **Surface water management** ▪ No vehicle transporting concrete may be washed on site ▪ Treat oil and chemical spills/residues immediately with an absorbent to prevent seepage into the soil, groundwater or being washed into the watercourse ▪ Care must be taken to ensure that run-off from vehicle or plant washing does not enter the groundwater. ▪ Should any pollution of groundwater or surface water occur then the regional DWS office should be contacted urgently.			

		Hazardous substances, handling, storage, and incident response ▪ Storage areas for hazardous substances, materials and chemicals must be located at least 100m away from watercourse, under lock and key in a ventilated store, or a fenced, secure, bunded area which is adequately labeled. ▪ Store potential contaminants appropriately within the site camp area. ▪ Hazardous storage areas must be bunded with an impermeable liner to protect soil, surface and groundwater quality. ▪ Preparation of shutter boards or other required construction effects must be done on an impermeable surface. ▪ Storage areas containing hazardous substances/materials must be clearly signed. ▪ Safety Data Sheets (SDSs) should be readily available on site for all chemicals and hazardous substances to be used			

		on site. Where possible and available, SDSs should additionally include information on ecological impacts and measures to minimise negative environmental impacts during accidental spill releases or escapes. ▪ Emergency numbers should be put up on site and consulted should any accidents / spillages of hazardous substances and / or materials take place. The Contractor is to outline a method statement for the dealing of accidents / spillages of hazardous materials or substances. This statement must be handed to the Engineer as well as to DWS should the incident occur near a watercourse ▪ Treat oil and chemical spills/residues immediately with an absorbent ▪ Spills in bunded areas must be cleaned up, removed and disposed of safely from the bunded areas as soon as possible after detection in order to minimise the risk of pollution and reduced bunding capacity. ▪ A designated bunded area is to be set			

		aside for vehicle washing and maintenance. Materials in this bunded area must be disposed of to a suitable waste site or as directed by the engineer. ▪ Provision should be made during set up for all polluted runoff to be treated to the Engineer's approval before being discharged into the stormwater system **Chemical spills** ▪ Contain chemical spills immediately and arrange for clean up / control by the supplier or by professional pollution control personnel or use of a spill kit by trained personnel **Oil and Fuel spills** ▪ No vehicle transporting concrete may be washed on site ▪ A spill kit must be held on site. ▪ Store potential contaminants appropriately within the site camp area. Drip trays are required for all plant / machinery / equipment that uses hydrocarbons.			

		▪ Check vehicles for leaks regularly. If left standing near the river over night or for more than 8 hours ensure a drip tray is placed under the vehicle's engine ▪ Servicing should be done ideally off site, but if unavoidable ▪ The area that houses the construction camp is to be checked for spills of substances such as oil, paint etc. and these should be cleaned up. ▪ Immediately clean up any accidental oil or fuel spills or leakages. ▪ Do not hose oil or fuel spills into the surrounding natural environment or watercourse ▪ Clean small oil or fuel spills with an approved absorbent material, such as 'Drizit' or 'Spill-sorb'. ▪ Contain oil or fuel spills in water using an approved oil absorbent fibre. ▪ Treat soil contaminated by oil or fuel using one of the following approved methods, as per instruction of the Engineer: ▪ *Remove the soil to the depth of the contamination and dispose of it at a*			

		registered Hazardous Waste Disposal Site. ▪ *Remove the soil to the depth of the contamination, and regenerate it by using approved bio-remediation methods.* In the event of a spillage/incident that cannot be contained and which poses a serious threat to the local environment, and human health, the following Departments must be informed of the incident in accordance with Section 30 of NEMA, 1998: to the Local Authority; DWS; KZN DEDTEA and the local Fire Department.			
B10	➢ **Waste management**	▪ A method statement is required from the contractor on the handling, management, storage and disposal of waste, and must include housekeeping and daily litter collection program ▪ Bins/skips with lids shall be provided for disposal of waste. the provision of separate waste receptacles for different types of waste is required; these	▪ Compliance with EMP/EA ▪ No pollution or degradation resulting from work	Method statements	

		receptacles must be labeled ▪ There must be no mixing of hazardous waste and general waste ▪ A demarcated, designated area is required for waste management, storage, sorting ▪ Bins should have liner bags for efficient control and safe disposal of waste. ▪ Recycling should be encouraged. ▪ Bins and/or skips should be emptied regularly and waste should be disposed of at a registered landfill site. ▪ Waste must be placed in designated skips or bins. ▪ Littering on site is not allowed, however the site should be cleared of all litter at the end of each working day as part of a daily site cleanup and litter collection program. ▪ Where feasible, collect waste paper, glass and metal waste separately and arrange for collection by recycling contractors. ▪ Bins must be equipped with a closing mechanism to prevent their contents from blowing out. Bins to be scavenger			

		proof. ▪ Bins should be emptied on a weekly basis, depending on the quantity. ▪ Rubble should be recycled (re-used) on site if possible. ▪ Concrete rubble must be cleared daily and stored in a designated area, pending removal ▪ All waste must be removed from the site and transported to a Registered, permitted landfill site. ▪ Ensure that solid waste disposal is transported properly in order to avoid waste spills en-route. ▪ Construction spoil can be disposed off in a pre-agreed demarcated spoil area that have been approved by the Engineer; or used to fill in dongas or gullies on in the area ▪ No form of secondary pollution should arise from the disposal of sewage and refuse. If any problems should arise, the contractor should address these immediately. ▪ In the case of waste rock, subject to the approval by the Engineer, certain borrow			

		pits and / or quarries, as well as dongas or gullies, may be utilized for the disposal of waste rock. Note that no random dumping of waste is permitted, no should waste be dumped in 'back' areas. ▪ No waste of any type may be burned on site. ▪ The excavation and use of rubbish pits on site is forbidden. ▪ Eating areas provided should be regularly serviced, and cleaned to ensure the highest possible hygiene and cleanliness levels. ▪ The contractor shall ensure that his camp and working areas are kept clean and tidy at all times, as far as is feasible, and that housekeeping is practiced daily.			
B11	➢ **Air Quality: Dust and emissions**	▪ Vehicles traveling along the road must adhere to speed limits to avoid creating excessive dust. ▪ Construction areas that have been stripped or layer works must be lightly dampened	-Compliance with EMP and EA	-No complaints from IAPs surrounding dust	As required

		periodically to avoid dust. Increase frequency of dampening on windier days or when dust emissions are visibly higher.			
B12	➢ **Air Quality: Noise**	▪ Noisy activities must be restricted to the times given in the Project Specification or General Conditions of Contract. ▪ No speeding on roads will be permitted. ▪ Vehicles that are excessively noisy may be fitted with silencing devices ▪ Inform IAPs of blast activity, if blasts are required, at least one week in advance and then again on the day of the blast. Avoid blasts during weekends and school commuting times. Where blasting is a requirement, proof of informing IAPs prior must be available.	-Compliance with EMP and EA	-No complaints from IAPs surrounding noise	As required
C: POST CONSTRUCTION AND REHABILITATION					
C1	➢ **Post construction activities, site de-**	▪ Clear and completely remove from site all construction plant, equipment, storage containers, temporary fencing, temporary	-Compliance with EMP and EA	-No residual construction effects	Completion of construction

	establishment	services, fixtures, implements and any other temporary works. ▪ Stockpiles can be rehabilitated to blend in with the surrounding landscape. ▪ All access roads that where utilised during the construction phase should be returned to a usable state and / or a state no worse than prior to construction. ▪ The contractor must repair the damages that may have been caused to property and both public and private roads, during the construction phase. ▪ The contractor must identify and fix all erosion evident on site ▪ The site should be cleared of all inert rubble, including surplus rock, foundations and aggregates. ▪ All waste must be removed from the site and disposed of in an approved manner at a registered waste disposal site. ▪ Subject to the approval by the Engineer, certain borrow pits and / or quarries or dongas may be utilised for the disposal of waste rock. ▪ No temporary works, stockpiles or other			

		circumstances may be left to exist that will impede natural water movements or act to concentrate run-off. **Hazardous waste and pollution control** ▪ The site should be cleared of all inert rubble, including surplus rock, foundations and aggregates. ▪ All pollution containment structures must be removed from the site. Materials that will not be used again must be disposed off as hazardous waste. ▪ All temporary sanitary infrastructure and waste water disposal systems must be removed from the site. Care should be taken to avoid leaks, overflows and spills. The disposal of any waste should be conducted in an approved manner by a registered company. ▪ Bunded areas must be removed taken to a suitable legal waste site. **Final shaping** ▪ The site should be cleared of all inert rubble, including surplus rock, foundations and			

		aggregates. ▪ All prospecting boreholes, excavations and/or test pits must be backfilled with in-situ material. ▪ No excavated material or stockpiles should be left on site after construction has been completed. All materials remaining after the backfill should be smoothed over the site to blend in with the surrounding landscape. ▪ A deficiency of backfill may not be made up by excavating indiscriminately within the site. Additional fill may only be imported from approved areas as indicated by the Engineer. ▪ Backfill areas must be monitored for subsidence (as backfill settles) and fill the depressions using available material. ▪ All disturbed areas should be shaped in order to fit in with the surrounding environment.			
C2	➢ **Rehabilitation and post construction aspects**	▪ The rehabilitation program included in Annexure B of the ecological specialist study must be adopted. ▪ The contractor must submit a method	-Compliance with EMP/EA -restoration of site and reversing of impacts	-No soil erosion evident -Minimum 80% grass cover established -site is aesthetically	Post contraction/ rehab

		statement for rehabilitation incorporating specialist recommendations. ▪ The engineer or contractor shall identify areas in need of berms, geojute, stone pitching, soilcrete, riprap etc. to protect soils at the site of the road and culverts from erosion impacts. These must be installed prior to contractor leaving site. ▪ Suitable sculpting and reinstatement of affected points around wetland systems should be undertaken immediately after construction. The management of flow, stabilization of embankments and other factors should be taken into account. ▪ Exotic weed control should be practiced along the roadway following construction/upgrade ▪ The roadway verges should be grassed ▪ All cleared surfaces must be prepared, top soiled and re-vegetated ▪ All disturbed areas of the construction site, and compacted during the execution of the works, must be ripped and / or scarified. **Topsoil replacement and soil amelioration**		pleasing	

		▪ Execute top soiling activity prior to the rainy season or any expected wet weather conditions. ▪ Replace and redistribute stockpiled topsoil together with herbaceous vegetation, overlying grass and other fine organic matter in all disturbed areas of the construction site. Topsoil should be replaced to original depth (i.e. as much as was removed prior to the commencement of the construction activities). ▪ Place topsoil in the same area where it was stripped. ▪ Topsoil that is suspected to be contaminated with the seed of alien vegetation should not be used. Alternatively, the soil is to be sprayed with specified herbicides. ▪ Rip and / or scarify areas following the application of topsoil to facilitate mixing of the upper most layers ▪ Rip and / or scarify along the contours to prevent the creation of down-slope channels.			

		▪ Do not rip and / or scarify areas under wet conditions, as the soil will not break up ▪ After topsoil placement has been completed and re-vegetation has been implemented, available stripped vegetation must be spread randomly by hand over the top soiled area. Sods may also be planted onto top soiled areas. **Rehab monitoring** ▪ A visual assessment should be undertaken once construction and rehabilitation is complete to identify any concerns or long term threats to the road or watercourse systems. If no concerns are noted, no further monitoring is recommended			

Rehabilitation program as per ecological study: (Please refer to ecological report)

	Action	Description	Rate (if applicable)	Timing	Legal issues	Biodiversity issues
1	Review surface state			Upon completion		
2	Contour and sculpt to mimic prevailing landform	Using plant (TLB) area to be sculpted to appropriate level to align with prevailing land form. No stockpiles to remain and large stony material to be removed		1 - 2 days after infill of trench		
3	Establish silt traps and geo fabric on slopes >8 °			1 -2 days after infill of trench	Control of surface erosion under CARA and NEMA required, while National Water Act stipulates that surface erosion must be controlled	
4	Remove exotic weed established on site	Glyphosphate or Triclopyr herbicide applied by hand	R2500/ha	1 - 2 days after infill of trench		
5	Confirm nature of site with land owner for hand over	Landowner may wish to re-establish / cane or timber		Prior to project commencement	Written agreement with landowner as to final state of land must be confirmed prior to handing site back to landowner. Farmer should be compensated for crop loss PRIOR to commencement of project	
6	Till or scarify to tolerance of 100 to 150mm			within 7 days of infill of trench		
7	Apply turf 300mm width across slopes >18 °					
8	Apply seed mix Cynodon dactylon / Chloris gayana / Eragrostic curvula	Alternative mix may be considered (Digitaria erlantha, depending upon final state of affected portion of route		within 7 days of infill of trench		Possible reapplication of grasses arising from adjacent lands where applicable.
9	Apply organic based fertilizer at identified rate 2:3:2.		rate to be confirmed			
10	Compact soils	Using hand stamp				
11	General irrigation using "bakkie sakkie"	General irrigation at set down of seed.				
12	Follow up irrigation within 3 days of seeding					
13	Follow up herbicide application by hand approximately 21 days after germination of seed	Spot spray any emergent weeds within rehabilitated area				

6. CONCLUSION

In order to mitigate impacts on the environment to a level of low significance, it is vital that all mitigation measures listed within this EMP are adhered to. Key recommendations are summarised as follows:

1. All management measures made in this report must be strictly adhered to.
2. This EMP addresses the key core issues of social, waste management; fauna and flora, surface, groundwater and soil protection.
3. A rehabilitation plan must be drawn up by the contractor, approved by the ECO and engineer prior to implementation and must include the specialist study recommendations.

This project and activities could potentially result in negative impacts on the receiving environment. These significant negative impacts have been identified and assessed. These impacts can be effectively mitigated thus reducing the risk to the environment. This can be achieved by effective implementation of the necessary mitigation measures as stipulated in the EMP.