REALIGNMENT OF A SECTION OF THE MN73 TO ACCOMMODATE SOLAR ENERGY FACILITIES NEAR PAULPUTS SUBSTATION, NORTHERN CAPE

ENVIRONMENTAL MANAGEMENT PROGRAMME

Submitted as part of the Basic Assessment Report

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Prepared for:
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PROJECT DETAILS

Title	:	Environmental Management Programme for the Realignment of a section of the MN73 to accommodate Solar Energy Facilities near Paulputs Substation, Northern Cape.
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Applicant	:	Northern Cape Department of Roads and Public Works
Client	:	Abengoa Solar South Africa Pty Ltd
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DEFINITIONS AND TERMINOLOGY

Alien species: A species that is not indigenous to the area or out of its natural distribution range.

Alternatives: Alternatives are different means of meeting the general purpose and need of a proposed activity. Alternatives may include location or site alternatives, activity alternatives, process or technology alternatives, temporal alternatives or the 'do nothing' alternative.

Assessment: The process of collecting, organising, analysing, interpreting and communicating information which is relevant.

Biological diversity: The variables among living organisms from all sources including, terrestrial, marine and other aquatic ecosystems and the ecological complexes they belong to.

Commence: The start of any physical activity, including site preparation and any other activity on site furtherance of a listed activity or specified activity, but does not include any activity required for the purposes of an investigation or feasibility study as long as such investigation or feasibility study does not constitute a listed activity or specified activity.

Construction: Construction means the building, erection or establishment of a facility, structure or infrastructure that is necessary for the undertaking of a listed or specified activity as per Regulations GNR 983, 984 and 985 of December 2014. Construction begins with any activity which requires Environmental Authorisation.

Cumulative impacts: Impacts that result from the incremental impact of the proposed activity on a common resource when added to the impacts of other past, present or reasonably foreseeable future activities (e.g. discharges of nutrients and heated water to a river that combine to cause algal bloom and subsequent loss of dissolved oxygen that is greater than the additive impacts of each pollutant). Cumulative impacts can occur from the collective impacts of individual minor actions over a period of time and can include both direct and indirect impacts.

Decommissioning: To take out of active service permanently or dismantle partly or wholly, or closure of a facility to the extent that it cannot be readily re-commissioned. This usually occurs at the end of the life of a facility.

Direct impacts: Impacts that are caused directly by the activity and generally occur at the same time and at the place of the activity (e.g. noise generated by blasting

operations on the site of the activity). These impacts are usually associated with the construction, operation or maintenance of an activity and are generally obvious and quantifiable.

'Do nothing' alternative: The 'do nothing' alternative is the option of not undertaking the proposed activity or any of its alternatives. The 'do nothing' alternative also provides the baseline against which the impacts of other alternatives should be compared.

Ecosystem: A dynamic system of plant, animal and micro-organism communities and their non-living environment interacting as a functional unit.

Endangered species: Taxa in danger of extinction and whose survival is unlikely if the causal factors continue operating. Included here are taxa whose numbers of individuals have been reduced to a critical level or whose habitats have been so drastically reduced that they are deemed to be in immediate danger of extinction.

Endemic: An "endemic" is a species that grows in a particular area (is endemic to that region) and has a restricted distribution. It is only found in a particular place. Whether something is endemic or not depends on the geographical boundaries of the area in question and the area can be defined at different scales.

Environment: the surroundings within which humans exist and that are made up of:

i. the land, water and atmosphere of the earth;
ii. micro-organisms, plant and animal life;
iii. any part or combination of (i) and (ii) and the interrelationships among and between them; and
iv. the physical, chemical, aesthetic and cultural properties and conditions of the foregoing that influence human health and well-being.

Environmental Impact: An action or series of actions that have an effect on the environment.

Environmental impact assessment: Environmental Impact Assessment (EIA), as defined in the NEMA EIA Regulations and in relation to an application to which scoping must be applied, means the process of collecting, organising, analysing, interpreting and communicating information that is relevant to the consideration of that application.

Environmental management: Ensuring that environmental concerns are included in all stages of development, so that development is sustainable and does not exceed the carrying capacity of the environment.

Environmental Management Programme: A plan that organises and co-ordinates mitigation, rehabilitation and monitoring measures in order to guide the implementation of a proposal and its on-going maintenance after implementation.

Environmental assessment practitioner: An individual responsible for the planning, management and coordinating of environmental management plan or any other appropriate environmental instruments introduced by legislation.

Habitat: The place in which a species or ecological community occurs naturally.

Hazardous waste: Any waste that contains organic or inorganic elements or compounds that may, owing to the inherent physical, chemical or toxicological characteristics of that waste, have a detrimental impact on health and the environment.

Indigenous: All biological organisms that occurred naturally within the study area prior to 1800.

Indirect impacts: Indirect or induced changes that may occur as a result of the activity (e.g. the reduction of water in a stream that supply water to a reservoir that supply water to the activity). These types of impacts include all the potential impacts that do not manifest immediately when the activity is undertaken or which occur at a different place as a result of the activity.

Interested and Affected Party: Individuals or groups concerned with or affected by an activity and its consequences. These include the authorities, local communities, investors, work force, consumers, environmental interest groups and the general public.

Pollution: A change in the environment caused by substances (radio-active or other waves, noise, odours, dust or heat emitted from any activity, including the storage or treatment or waste or substances.

Pre-construction: The period prior to the commencement of construction, which may include activities which do not require Environmental Authorisation (e.g. geotechnical surveys).

Rare species: Taxa with small world populations that are not at present Endangered or Vulnerable, but are at risk as some unexpected threat could easily cause a critical decline. These taxa are usually localised within restricted geographical areas or habitats or are thinly scattered over a more extensive range. This category was termed Critically Rare by Hall and Veldhuis (1985) to distinguish it from the more generally used word "rare".

Red data species: Species listed in terms of the International Union for Conservation of Nature and Natural Resources (IUCN) Red List of Threatened Species, and/or in terms of the South African Red Data list. In terms of the South African Red Data list, species are classified as being extinct, endangered, vulnerable, rare, indeterminate, insufficiently known or not threatened (see other definitions within this glossary).

Significant impact: An impact that by its magnitude, duration, intensity or probability of occurrence may have a notable effect on one or more aspects of the environment.

Waste: Any substance, material or object, that is unwanted, rejected, abandoned, discarded or disposed of, or that is intended or required to be discarded or disposed of, by the holder of that substance, material or object, whether or not such substance, material or object can be re-used, recycled or recovered and includes all wastes as defined in Schedule 3 to the Waste Amendment Act (as amended on June 2014); or any other substance, material or object that is not included in Schedule 3 that may be defined as a waste by the Minister.

TABLE OF CONTENTS

..... PAGE

APPENDICES:

INTRODUCTION CHAPTER 1

This Environmental Management Programme has been compiled for the realignment of a section of the MN73. The realignment of the section of the MN73 road is located on Portion 4 of the Farm Scuitklip 92 in the Northern Cape Province. The MN73 realignment is proposed to be developed to accommodate solar energy facilities near the Paulputs Substation, and specifically the Paulputs CSP Facility while ensuring safe road use for the surrounding landowners currently utilising the MN73. The section to be realigned will be approximately 4km in length, 7m wide with a road reserve of 20m.

The realignment is proposed to facilitate safe access and safe road use associated with the construction and operation of the Paulputs CSP facility. Although the project is funded and is to be constructed by Abengoa Solar Power South Africa (Pty) Ltd, the road will ultimately be an asset of the Northern Cape Department of Roads and Public Works (NC DR&PW) and will be constructed in terms of the Advertising on Roads and Ribbon Development Act 21 of 1940 and the Road Ordinance, 19 of 1976 specifications.

The EMPr has been developed on the basis of the findings of the Basic Assessment (BA), and must be implemented to protect sensitive on-site and off-site features through controlling construction, operation and decommissioning activities that could have a detrimental effect on the environment, and through avoiding or minimising potential impacts. This EMPr is applicable to all employees and contractors working on the pre-construction, construction and maintenance phases of the Project. The document will be adhered to, updated as relevant throughout the project life cycle. This document fulfils the requirement of the EIA Regulations and forms part of the BA Report for the project.

PROJECT DETAILS CHAPTER 2

The area immediately surrounding the Paulputs Substation (located approximately 45km north-east of Pofadder), and specifically Portion 4 of the Farm Scuitklip 92 has become a node for solar energy facility development. Two Concentrated Solar Power (CSP) facilities and one photovoltaic (PV) facility have already been constructed in this area. These are known as the Kaxu Solar One, Xina Solar One and Konkoonsies I PV plants respectively. Another PV facility (known as Konkoonsies II PV) is to be constructed during 2017, and a third CSP facility (known as the Paulputs CSP project) received an environmental authorisation on 16 November 2016.

The development of the solar energy facilities are in response to the requirement for additional electricity generation capacity at a national level and in response to identified objectives of the national, provincial, local and district municipalities to develop renewable energy facilities. In order to facilitate the construction of the Paulputs CSP Facility, the NC DR&PW propose that a section of the MN73 road traversing Portion 4 of the Farm Scuitklip 92 is to be realigned (refer to **Figure 2.1** and **Table 2.1**). The construction and commissioning will be undertaken by Abengoa Solar Power South Africa (Pty) Ltd.

The MN73 road is proposed to be realignment in order to accommodate the Paulputs CSP Facility while ensuring safe road use for the surrounding landowners currently utilising the MN73. The realignment of the road will entail the following:

» the construction of a new section of road ~4km in length and ~7m wide (with a road reserve of 20m) according to approved Northern Cape Department of Roads and Public Works (NC DR&PW) plans and standards; and
» the decommissioning of ~3km of the existing MN73 road as and where required after the construction of the realigned section has ceased. Portions of the decommissioned section of the MN73 road will not be rehabilitated where these are used to provide internal access for the Paulputs CSP Facility.

No alternative routes were assessed due to environmental and technical constraints identified during this BA process. A 40m wide corridor was assessed for the proposed realignment. The final placement of the road realignment within a 40m corridor will depend on local geotechnical, topographical conditions and potential environmental sensitivities.

Table 2.1: Detailed description of the location project site[1].

Province	**Northern Cape Province**
District Municipality	Namakwa District Municipality
Local Municipality	Khai-Ma Local Municipality
Ward number(s)	1
Nearest town(s)	Onseepkans (~30km north west) and Pofadder (~35km south west)
Farm name(s) and number(s)	Farm Scuitklip 92
Portion number(s)	Portion 4
SG 21 Digit Code	C03600000000009200004
Current Landowner	KaXu CSP South Africa (Pty) Ltd
Current zoning	The site for the proposed project is zoned for Agricultural use. A re-zoning process will be undertaken for the Abengoa Solar Power South Africa (Pty) Ltd project site for the Paulputs CSP Facility, which includes the section of the MN73 road to be realigned.
Current land use and land use activities	There is no cultivated agricultural land or other commercial agricultural activities within the farm portion which could be impacted upon by the proposed development. Two CSP facilities, KaXu Solar One and Xina Solar One are located in the southern portion of the site. The Paulputs CSP Facility has been authorised on the northern portion of the project site, adjacent to the 40m corridor proposed for the MN73 road realignment.

This Environmental Management Programme (EMPr) has been prepared as part of the Basic Assessment process for the proposed realignment of a section of the MN73 to accommodate solar energy facilities near the Paulputs Substation, Northern Cape.

[1] The project site is defined as Portion 4 of the Farm Scuitklip 92, which has an extent of ~3518ha.

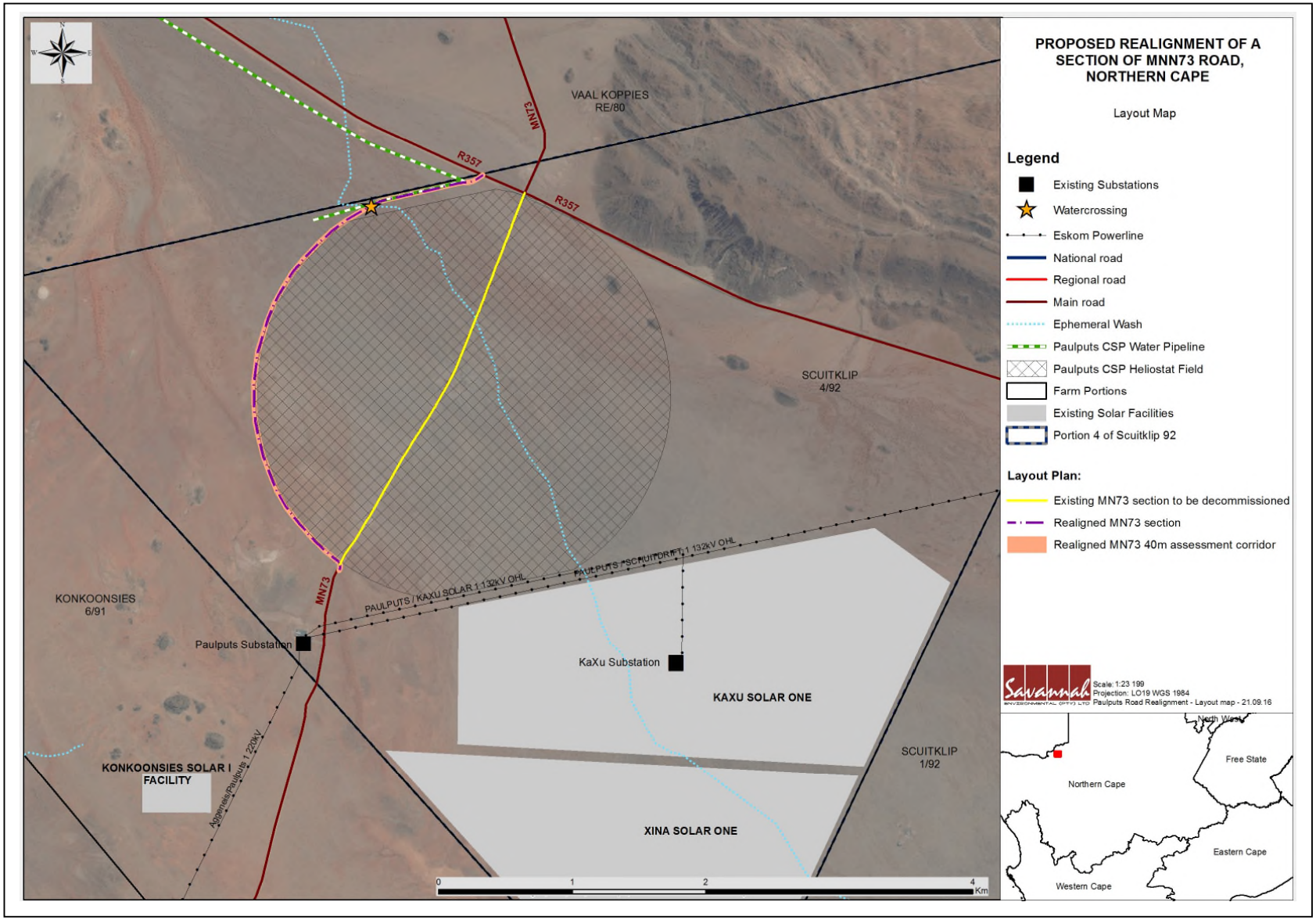


Figure 2.1: Locality Map indicating the proposed layout and routing of the road realignment.

2.1. Summary of Impacts

This section provides a summary of the Basic Assessment (BA) and conclusions drawn for the proposed realignment of a section of the MN73 to accommodate the authorised Paulputs CSP Facility which will connect to the national electricity grid, as well as other solar energy facilities near the Paulputs Substation. In doing so, it draws on the information gathered as part of the Basic Assessment process and the knowledge gained by the environmental consultants during the course of the process, and presents an informed opinion of the environmental impacts associated with the proposed project.

Based on the information contained in the Impact Assessment, it is evident that there are no High Negative Impacts post mitigation which should warrant the Project from not proceeding or should warrant further specialist investigation. Furthermore, all impacts associated with the preferred development footprint can be easily mitigated to acceptable standards. No environmental fatal flaws were identified to be associated with the proposed facility. All identified no-go areas were excluded from the proposed 40m assessment corridor. However, the following potentially significant environmental impacts have been identified:

Ecology: Short term impacts (vegetation clearing, dust and vibration and noise) are likely to have a short term increase in negative impacts. The longer term impacts are however likely to be negligible in comparison with the current ecological status quo, as these impacts already exist due to the existing road and its associated impacts. Overall the ecological impact is therefore likely to be of **low significance** and, from an ecological point of view, no fatal flaws are associated with the road realignment within the identified corridor. All impacts that may to occur project can be mitigated to an acceptable level.

Drainage Systems: The impact on the hydrological nature of the area will be localised, as a large portion of the remaining farm and the downstream catchment would remain intact. Only one ephemeral drainage line occur within the proposed 40m assessment corridor. This system was highly fragmented by the roads and farming practices in the past while the adjacent projects have now disrupted any flows within these systems. The significance of this impact at the time of assessing the adjacent projects was **low**, due to the impacts and high degree of fragmentation coupled to the general lack of any important/visible aquatic habitat (Scherman Colloty and Associates, 2016)[2]. No fatal flaws are associated with the road realignment within the identified corridor. All impacts that may to occur project can be mitigated to an acceptable level.

[2] Scherman Colloty and Associates. 2012. Water Resources Assessment: Paulputs Concentrated Solar Plant, Northern Cape Province.

Heritage: The destructive impacts that are possible in terms of heritage resources would tend to be direct, once-off events occurring during the initial construction period. From a heritage perspective, the construction of the proposed road realignment are considered acceptable. The impact on heritage resources is therefore likely to be of **low significance** and no fatal flaws are associated with the road realignment within the identified corridor. All impacts that may to occur project can be mitigated to an acceptable level.

Social Impact: Social impacts are expected during all phases of the development and are expected to be both positive and negative. Positive impacts are expected to be of **low - medium significance**. Negative impacts associated with the road realignment are expected to be of **low significance**. Impacts can be minimised or enhanced through the implementation of the recommended management measures. From a social perspective, the construction of the proposed road realignment is considered acceptable. No fatal flaws are associated with the road realignment within the identified corridor. All impacts that may to occur project can be mitigated to an acceptable level.

Cumulative Impacts: Cumulative impacts from the proposed road realignment will result from impacts arising from multiple renewable energy facilities (including the construction of access roads) being constructed in the area. Considering the nature and extent of the planned infrastructure, the contribution of this infrastructure to the cumulative impacts in the area are considered to be **low and acceptable**.

The sensitivity map (refer to **Figure 2.2**) is the result of a composite overlay based on the findings of the BA studies undertaken for the proposed Project. The proposed Project was concluded to be acceptable from an environmental perspective within the context of the receiving environment as it avoids any potentially sensitive areas.

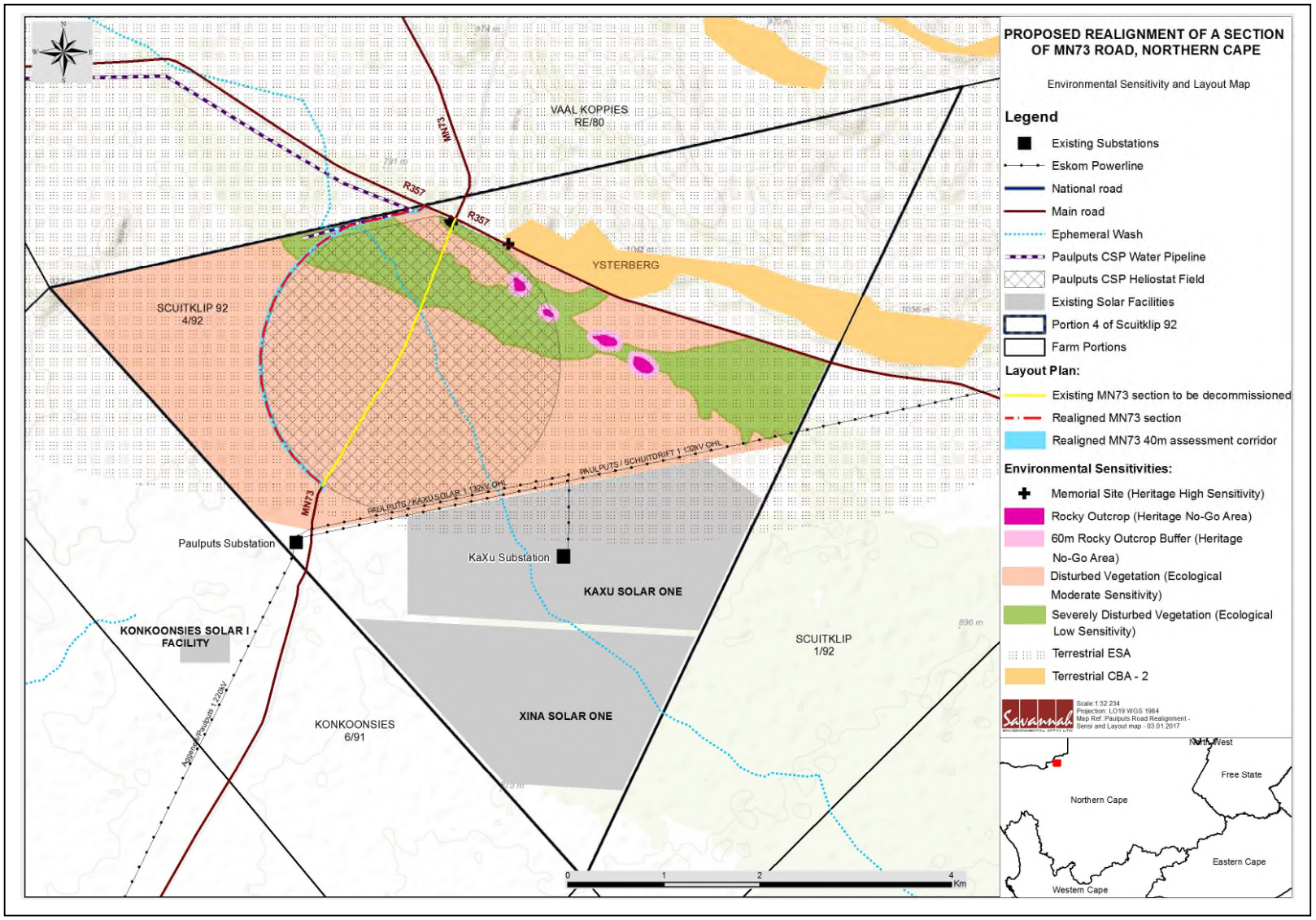


Figure 2.2: Sensitivity map indicating the environmental sensitivities identifies as well as the proposed road realignment and 40m assessment corridor.

2.2. Activities and Components associated with the Development

The proposed road realignment will be approximately 4km in length and would be located within the assessed 40m assessment corridor. The main activities associated with the pre-construction and construction of the MN73 road realignment are detailed in the table that follows.

PRE-CONSTRUCTION AND CONSTRUCTION

» *Construction materials and equipment requirements* **-** All the construction material and equipment may be sourced locally (i.e. within South Africa). The materials and equipment will be transported to site by road.
» *Length of the construction phase* - commencement of the construction phase is dependent on the project being approved by Northern Cape Department of Environment and Nature Conservation (DENC). However, should approvals be issued, it is expected that construction of the MN73 road realignment will commence concurrently with the construction of the Paulputs CSP Facility. Thereafter, the construction phase is expected to take approximately 3 - 4 months to complete.

Activity	Detailed description
Pre-construction surveys	Prior to initiating construction, a number of detailed surveys will be required including, but not limited to: » *Geotechnical survey* – The geotechnical study will look at the availability of natural construction materials. This study will serve to inform the extent of earthworks and compaction required as well as the final micro-sitting of the realigned road which includes a 20m road reserve. » *Site survey* - in order to finalise the design layout of the road. The finalisation will need to be confirmed in line with the Environmental Authorisation issued for the road realignment.
Undertake site preparation	» Site preparation activities will include: * Clearance of vegetation within the footprint of the road realignment * Levelling of site (as necessary) * The development of stormwater control management systems which will divert water from construction areas and can be used during the operation phase of the road. » These activities will require the stripping of topsoil which will be needed for future rehabilitation.
Establishment of the road	» Construction of a 4km long and 7m wide road with a maximum road reserve of 20m.

Activity	Detailed description
Undertake site rehabilitation and the establishment of the stormwater management plan	» Areas requiring rehabilitation will include those areas disturbed during the construction phase which are not required for operation. Rehabilitation should be undertaken in an area as soon as possible after the completion of construction activities within that area. » Re-vegetated areas may have to be protected from wind erosion and maintained until an acceptable plant cover has been achieved. » All temporary facilities, temporary equipment, and waste materials must be removed from site. » Erosion control measures (i.e. drainage works and anti-erosion measures) should be used in sensitive areas (i.e. steep slopes, hills, and drainage lines) to minimise loss of topsoil and control erosion. » All temporary facilities, temporary equipment, and waste materials must be removed from site. » Any access points and/or access roads which are not required during the operational phase must be closed as part of the post-construction rehabilitation.

The decommissioned section of the MN73 road will not be rehabilitated so that the road can be used as an internal access road for the authorised Paulputs CSP Facility. Following completion of construction and commissioning, this infrastructure will be maintained by the Northern Cape Department of Roads and Public Works (NC DR&PW).

PURPOSE AND OBJECTIVES OF THE EMPR CHAPTER 3

An Environmental Management Programme (EMPr) is defined as "an environmental management tool used to ensure that undue or reasonably avoidable adverse impacts associated with the planning, construction and operation of a project are avoided or mitigated, and that the positive benefits of the projects are enhanced". The objective of this EMPr is to provide consistent information and guidance for implementing the management and monitoring measures established in the permitting process and help achieve environmental policy goals. The purpose of an EMPr is to ensure continuous improvement of environmental performance, reducing negative impacts and enhancing positive effects during the construction and operation of the facility. An effective EMPr is concerned with both the immediate outcome as well as the long-term impacts of the project.

The EMPr provides specific environmental guidance for the construction and operation phases of a project, and is intended to manage and mitigate activities so that unnecessary or preventable environmental impacts do not result. The impacts considered by the EMPr during construction and operation/maintenance of the road relate to loss of floral biodiversity, loss of heritage resources, stormwater management, soil erosion and siltation of water resources, waste management, and invasion by alien species.

This EMPr is applicable to all employees and contractors working on the pre-construction, construction, and operation and maintenance phases of the project. The document will be adhered to, updated as relevant throughout the project life cycle.

This EMPr has been compiled in accordance with Appendix 4 of the EIA Regulations of December 2014. This document is a dynamic document and will be further developed in terms of specific requirements listed in any authorisations issued for the proposed project and/or as the project develops. The EMPr has been developed as a set of environmental specifications (i.e. principles of environmental management), which are appropriately contextualised to provide clear guidance in terms of the on-site implementation of these specifications (i.e. on-site contextualisation is provided through the inclusion of various monitoring and implementation tools).

This EMPr has the following objectives:

» Outline impact management objectives and environmental specifications which are required to be implemented for the planning, construction and rehabilitation, operation, and decommissioning phases of the Project in order to manage and minimise the extent of potential environmental impacts associated with the Project.

- Ensure that all the phases of the Project do not result in undue or reasonably avoidable adverse environmental impacts, and ensure that any potential positive environmental benefits are enhanced.
- Identify entities responsible for the implementation of the measures and outline functions and responsibilities.
- Propose mechanisms and frequency for monitoring compliance, and preventing long-term or permanent environmental degradation.
- Facilitate appropriate and proactive responses to unforeseen events or changes in project implementation that was not considered in the BA process.

The management and mitigation measures identified within the Basic Assessment Assessment (BA) process are systematically addressed in this EMPr, and ensure the minimisation of adverse environmental impacts during the operation of the road to an acceptable level.

The Northern Cape Department of Roads and Public Works must ensure that the implementation of the project complies with the requirements of all environmental authorisations, permits, and obligations emanating from relevant environmental legislation. This obligation is partly met through the development and the implementation of this EMPr and through its integration into the contract documentation. Since this EMPr is part of the BA process for the proposed MN73 road realignment, it is important that this document be read in conjunction with the BA Report compiled for this project. This will contextualise the EMPr and enable a thorough understanding of its role and purpose in the integrated environmental management process. Should there be a conflict of interpretation between this EMPr and the environmental authorisation, the stipulations in the environmental authorisation shall prevail over that of the EMPr, unless otherwise agreed by the authorities in writing. Similarly, any provisions in legislation overrule any provisions or interpretations within this EMPr.

STRUCTURE OF THIS EMPR CHAPTER 4

The first three chapters provide background to the EMPr and the proposed project, while the chapters which follow consider the following:

» Planning and design activities;
» Construction activities; and
» Operation activities.

These chapters set out the procedures necessary for the construction and operation of the proposed road realignment in order to minimise environmental impacts and achieve environmental compliance. For each of the phases of implementation, an over-arching environmental **goal** is stated. In order to meet this goal, a number of **objectives** are listed. The EMPr has been structured in a table format in order to show the links between the goals for each phase and their associated impact management objectives, activities/risk sources, mitigation actions and management statements, monitoring requirements and performance indicators. A specific EMPr table has been established for each environmental impact management objective. The information provided within the EMPr table for each objective is illustrated below:

OBJECTIVE: Description of the objective, which is necessary to meet the overall goals; which take into account the findings of the BA specialist studies

Project Component/s	» List of project components affecting the objective.
Potential Impact	» Description of the potential environmental impact if objective is not met.
Activity/Risk Source	» Description of activities which could affect achieving the objective.
Mitigation: Target/Objective	» Description of the target and/or desired outcomes of mitigation.

Mitigation: Action/Control	**Responsibility**	**Timeframe**
Lists specific action(s) required to meet the mitigation target/objective described above.	Who is responsible for the measures?	Periods for implementation.

Performance Indicator	Description of key indicator(s) that track progress/indicate the effectiveness of the EMPr.
Monitoring	Mechanisms for monitoring compliance; the key monitoring actions required to check whether the objectives are being achieved, taking into

	consideration responsibility, frequency, methods, and reporting.

The objectives and EMPr tables are required to be reviewed and possibly modified whenever changes, such as the following, occur:

» Planned activities change (i.e. in terms of the components and/or layout);
» Modification to or addition to environmental objectives and targets;
» Relevant legal or other requirements are changed or introduced; and
» Significant progress has been made on achieving an objective or target such that it should be re-examined to determine if it is still relevant or should be modified.

4.1. Content of the EMPr: Legislated and DEA Requirements

Table 4.1: Content of this EMPr in terms of NEMA and Appendix 4 of the EIA Regulations of December 2014

Requirement	EMP Reference
EMP REQUIREMENTS IN TERMS OF APPENDIX 4 OF EIA REGULATIONS	
(a) details of— (i) the EAP who prepared the EMPr; and (ii) the expertise of the EAP to prepare an EMPr	Section 4.2
(b) a detailed description of the aspects of the activity that are covered by the EMPr as identified by the project description;	Chapter 2 – Project Details
(c) a description of the impact management objectives, including management statements, identifying the impacts that need to be avoided, managed and/or mitigated as identified through the environmental impact assessment process for all phases of the development including— (i) planning and design; (ii) pre-construction activities; (iii) construction activities; (iii) where relevant operation activities; and (iv) rehabilitation of the environment after construction and where applicable post closure;	Chapter 5 – Preconstruction and planning Chapter 6 – Construction activities Chapter 7 – Rehabilitation Chapter 8 – Operation activities
(d) a description of impact management outcomes, identifying the standard of impact management required for the aspects contemplated in paragraph (c);	Chapters 6-8
(e) a description of impact management actions, identifying the manner in which the impact management objectives and outcomes contemplated in paragraphs (c) and (d) will be achieved, and may include actions to — (i) modify, remedy, control or stop any action, activity or process which causes pollution or environmental degradation; (ii) remedy the cause of pollution or degradation and	Actions listed in terms of each Objective detailed in Chapters 6-8

Requirement	EMP Reference
migration of pollutants; (iii) comply with any prescribed environmental management standards or practices; (iv) comply with any applicable provisions of the Act regarding closure, where applicable; (v) comply with any provisions of the Act regarding financial provisions for rehabilitation, where applicable	
(f) the method of monitoring the implementation of the impact management actions contemplated in paragraph (e);	Monitoring requirements listed under each Objective detailed in Chapters 6-8
(g) the frequency of monitoring the implementation of the impact management actions contemplated in paragraph (e);	Monitoring requirements and timeframes listed under each Objective detailed in Chapters 6-8
(h) an indication of the persons who will be responsible for the implementation of the impact management actions;	Responsibility listed for each management action under each Objective detailed in Chapters 6-8
(i) the time periods within which the impact management actions contemplated in paragraph (e) must be implemented;	Timeframes listed for each management action under each Objective detailed in Chapters 6-8
(j) the mechanism for monitoring compliance with the impact management actions contemplated in paragraph (e);	Monitoring requirements listed under each Objective detailed in Chapters 5-7
(k) a program for reporting on compliance, taking into account the requirements as prescribed by these Regulations; and	Section 6.5
(l) an environmental awareness plan describing the manner in which— (i) the applicant intends to inform his or her employees of any environmental risk which may result from their work; and (ii) risks must be dealt with in order to avoid pollution or the degradation of the environment.	Section 6.4

4.2. Project Team

This draft EMPr was compiled by:

	Name	Company
EMPr Compilers:	Thalita Botha Karen Jodas Pamela Sidambe (with external review from Neville Bews)	Savannah Environmental

Ecological Impact assessment	Adrian Hudson	Hudson Ecology
Heritage Impact assessment	David Morris	McGregor Museum Department of Archaeology
Traffic Assessment	Stephen Fautley	Techso

The Savannah Environmental team has extensive knowledge and experience in EIAs and environmental management. The team has managed and drafted EMPrs for similar projects throughout South Africa, including the realignment of the N10 east of Upington. Refer to **Appendix I** for CVs of project team.

4.3. Details of the EAP

Environmental Assessment Practitioners (EAPs) and Public Participation consultants from Savannah Environmental who are responsible for this project are:

» *Thalita Botha,* the principle author of this report holds a BSc degree with Honours in Environmental Management and has one year of experience in environmental consulting. Her key focus is on environmental impact assessments, public participation, mapping (using ArcGIS), environmental management plans and programmes.
» *Karen Jodas* is a registered Professional Natural Scientist and holds a Master of Science degree and has more than 20 years of experience consulting in the environmental field. Her key focus is on strategic environmental assessment and advice; management and co-ordination of environmental projects, which includes integration of environmental studies and environmental processes into larger engineering-based projects and ensuring compliance to legislation and guidelines; compliance reporting; the identification of environmental management solutions and mitigation/risk minimising measures; and strategy and guideline development. She is familiar with the local environment and specifically Portion 4 of the Farm Scuitklip 92, due to her prior involvement in the impact assessments undertaken for the CSP projects located on this farm.
» *Pamela Sidambe* is a social specialist with a Master's degree in Social Impact Assessment from the University of Johannesburg, an Honours in Development Studies and a Bachelor's degree in Community Development both from the University of South Africa (UNISA). Specific experience lies in field social research; the management and analysis of socio-economic baseline data; policy and programme analysis, undertaking stakeholder engagement; and conducting general social research for a variety of projects.

Curricula vitae for the Savannah Environmental project team and specialist consultants are included in **Appendix I.**

MANAGEMENT PROGRAMME: PRE-CONSTRUCTION CHAPTER 5

Overall Goal: undertake the pre-construction (planning and design) activities in a way that:

» Ensures that the design of the road responds to the identified environmental constraints and opportunities.
» Ensures that pre-construction activities are undertaken in accordance with all relevant legislative requirements.
» Enables the construction activities to be undertaken without significant disruption to other land uses and activities in the area.

In order to meet this goal, the following objectives have been identified, together with necessary actions and monitoring requirements.

5.1. Objectives

OBJECTIVE 1: Ensure the design responds to identified environmental constraints and opportunities

The major impact associated with the construction activities is likely to result from vegetation clearing that will be required. A sensitivity map has been prepared from the findings of the BA studies undertaken (refer to **Figure 1.2**).

The study area[3] falls within the Karoo Biome and the 40m assessment corridor proposed for the road realignment consists solely of one vegetation type, namely Bushmanland Arid Grassland (i.e. the plains within the Portion 4 of the Farm Scuitklip 42). This vegetation type is classified as Least Threatened. Bushmanland Arid Grassland occurs on extensive, relatively flat plains and is sparsely vegetated by tussock grasses as well as abundant displays of annual herbs following heavy rain. This vegetation type contains endemic species belonging to the Griqualand West or Gariep Centres of Endemism. At a national scale this vegetation type has been transformed to a slight degree and only small patches are statutorily conserved in Augrabies Falls National Park and Goegab Nature Reserve.

[3] The study area is defined as the area west of the MN73 to be decommissioned and north of the existing Paulputs/Scuitdrift 1 132kV and Paulputs/Kaxu Solar 1 132kV power lines and includes the 40m assessment corridor.

No absolute 'no go' areas or areas of high sensitivity within the 40m assessment corridor were identified by the specialists during the Basic Assessment. However, potentially sensitive areas were identified to be associated with Portion 4 of the Farm Scuitklip 92 and are listed below:

» **Ecology:**

The majority of the realignment corridor occurs within an area of moderate ecological sensitivity. Areas of moderate and low ecological sensitivity within Portion 4 of Farm Scuitklip 92 refer to areas where a great amount of disturbance has already occurred and species of concern are less likely to be present. Areas that have been severely disturbed are considered of low conservation importance. Areas that have been disturbed by farming are considered to be of moderate ecological sensitivity. These areas are disturbed mostly by overgrazing as well as denudation of some areas around watering holes and roads. Ecological integrity and conservation importance of the areas that will be affected by the clearing of vegetation are low to moderate, however species of concern (such as *Hoodia gordonii* and *Boscia foetida*) may be impacted upon. *Boscia foetida* have been identified within the assessment corridor, while *Hoodia gordonii* have not been identified. However, since the *Hoodia gordonii* is not a large conspicuous species, the likelihood that isolated species or colonies occurring in the area can be high.

An ephemeral drainage line (wash) bisects the northern section of the study area[4] from east to west, gradually narrowing towards the east. This system is highly fragmented by the roads and past land use practices, and the adjacent facilities have disrupted any flows within this system. Therefore, the wash (drainage line) is considered to be of low ecological significance.

Although the realignment is situated within an Ecological Support Area (ESA), which is listed as a migration route, the consideration of this area as a migration route does seem to be counter-intuitive as it seems to start in the lowlands of the Gariep River, crosses over rocky mountainous areas only to return to the lowlands of the Gariep River again. Regardless, the realignment of the MN73 will not impact the migration route and would have very little impact on species using this route.

» **Heritage:**

Areas of heritage sensitivity on Portion 4 of the Farm Scuitklip 92 include terrain close to hills or rocky features and the memorial sites below Ysterberg. The rocky outcrops that occur to the north east of the Paulputs CSP project footprint are regarded as no go areas and a 60m buffer around each outcrop has been considered. These sites and others like them in the broader landscape provided shelter and a variety of resources that attracted human activity through Stone Age times. All these rocky outcrops fall outside of the 40m assessment corridor and is therefore avoided by the road realignment. The

[4] The study area is defined as the area west of the MN73 to be decommissioned and north of the existing Paulputs/Scuitdrift 1 132kV and Paulputs/Kaxu Solar 1 132kV power lines and includes the 40m corridor.

memorial sites located below Ysterberg are regarded as high sensitivity and it is recommended that these memorial markers be respected by way of a 10m buffer zone, or if this is not possible, an agreed-upon protective measure, with family members also being consulted in this connection. If not possible to avoid, these memorials should be relocated in consultation with the affected families, following the correct procedures. The open plains have been found to have sparsely scattered artefacts of which none are located within the 40m assessment corridor. These memorial sites, rocky features and scattered artefacts have been considered and will not be impacted be the realignment.

A desktop Palaeontological Impact Assessment (PIA) of the full extent of Portion 4 of the Farm Scuitklip 92 has previously been undertaken by John Pether in 2010[5]. The section of the MN73 road realignment entails shallow disturbance of superficial, geologically young (Quaternary) deposits which have low fossil potential and sensitivity.

Project Component/s	» Road alignment
Potential Impact	» Soil erosion » Impacts on flora, fauna and avifauna » Impacts on heritage resources » Loss of protected plant species » Impacts on sensitive habitats » Impact on drainage line
Activities/Risk Sources	» Construction of culverts at crossing
Mitigation: Target/Objective	» The design responds to the identified environmental constraints and opportunities

Mitigation: Action/Control	Responsibility	Timeframe
Plan and conduct pre-construction activities in an environmentally acceptable manner	Proponent and Contractor/s	Pre-construction
Undertake a geotechnical pre-construction survey to inform the final design of the road.	Geotechnical specialist	Pre-construction
Obtain any additional environmental permits required (biodiversity permits, Water Use Licence or General Authorisation etc.) based on final realignment.	Proponent and/or Contractor	Project planning
An alien plant management must be compiled and implemented (refer to **Appendix D**).	Contractor	Pre-construction
A plant rescue and protection plan must be compiled and implemented (refer to **Appendix E**).	Contractor	Pre-construction
Develop a comprehensive rehabilitation plan for the site (**refer to Appendix F**).	Contractor	Pre-construction

[5] Pether, J. 2010. Brief Palaeontological Impact Assessment (Desktop Study). Proposed Pofadder Solar Thermal Plant. Portion 4 of the Farm Scuit-Klip 92, Kenhardt District, Northern Cape. 3 December 2010.

Mitigation: Action/Control	Responsibility	Timeframe
The realigned road is required to be carefully planned and constructed to minimise the impacted area and prevent unnecessary excavation, placement, and compaction of soil. Construction vehicles also need to consider the load carrying capacity of road surfaces and adhere to all other prescriptive regulations regarding the use of public roads by construction vehicles.	Engineer/ Contractor	Planning/Design Phase
Compile an appropriate erosion and stormwater management plan (refer to **Appendix G**).	Contractor	Pre-construction
The engineering team must provide effective means to minimise the potential downstream effects of sedimentation and erosion (erosion protection) as well as minimise the loss of vegetation responsible of stabilising the soil and potentially increase flow conditions.	EPC Contractor Engineer	Pre-construction

Performance Indicator	» The design meets the objectives and does not degrade the environment to unsatisfactory levels. » Design and layouts respond to the mitigation measures and recommendations in the BAR. » Final site layout accommodates identified environmental sensitivities and constraints.
Monitoring	» Review of the design by the Project Manager and the Environmental specialist prior to the commencement of construction.

OBJECTIVE 2: To ensure effective communication mechanisms

On-going communication with affected and surrounding landowners is important to maintain during the construction and operational phases of the Project. Any issues and concerns raised should be addressed as far as possible in as short a timeframe as possible.

Project component/s	» Road realignment
Potential Impact	» Impacts on surrounding landowners, road users and land users
Activity/risk source	» Activities associated with the construction of the Project
Mitigation: Target/Objective	» Effective communication with surrounding landowners » Addressing of any issues and concerns raised as far as possible in as

	short a timeframe as possible

Mitigation: Action/control	Responsibility	Timeframe
Compile and implement a grievance mechanism procedure for the public (following the guidelines of the grievance mechanism in **Appendix B**) to be implemented during both the construction and operation phases. This procedure should include details of the contact person who will be receiving issues raised by interested and affected parties, and the process that will be followed to address issues. Develop and implement a grievance mechanism for the construction phase of the project for all employees, contractors, subcontractors and site personnel. This procedure should be in line with the South African Labour Law.	Owner EPC Contractor O&M Contractor	Pre-construction (construction procedure) Pre-operation (operation procedure)

Performance Indicator	» Effective communication procedures in place.
Monitoring	» An incident reporting system should be used to record non-conformances to the EMPr. » A Public Complaints register must be maintained by the Contractor and monitored by the ECO, to record all complaints and queries relating to the project and the action taken to resolve the issue. » All correspondence should be recorded in writing.

MANAGEMENT PROGRAMME: CONSTRUCTION CHAPTER 6

Overall Goal: To ensure that the construction of the MN73 realignment does not have unforeseen impacts on the environment and to ensure that all impacts are monitored and the necessary corrective action taken in all cases. In order to address this goal, it is necessary to construct to road in a way that:

» Ensures that construction activities are appropriately managed in respect of environmental aspects and impacts.
» Enables construction activities to be undertaken without significant disruption to other land uses and activities in the area.
» Minimises the impact on the indigenous natural vegetation, and habitats of ecological value.
» Minimises impacts on fauna using the site.
» Minimises the impact on heritage sites should they be uncovered.

6.1. Institutional Arrangements: Roles and Responsibilities for the Construction Phase

The Proponent must ensure that the implementation of the road realignment complies with the requirements of all environmental authorisations and permits, and obligations emanating from other relevant environmental legislation. This obligation is partly met through the development of the EMPr, and the implementation of the EMPr through its integration into the contract documentation. The Proponent will retain various key roles and responsibilities during the construction of the road realignment.

OBJECTIVE 1: Establish clear reporting, communication, and responsibilities in relation to overall implementation of environmental management programme during construction

Formal responsibilities are necessary to ensure that key procedures are executed. Specific responsibilities of the Technical Director/Manager; Site Manager; Safety, Environmental Officer (EO)/ Health and Environment Representative; Environmental Control Officer (ECO) and Contractor for the construction phase of this project are as detailed below. Formal responsibilities are necessary to ensure that key procedures are executed. **Figure 6.1** provides an organogram indicating the organisational structure for the implementation of the EMPr.

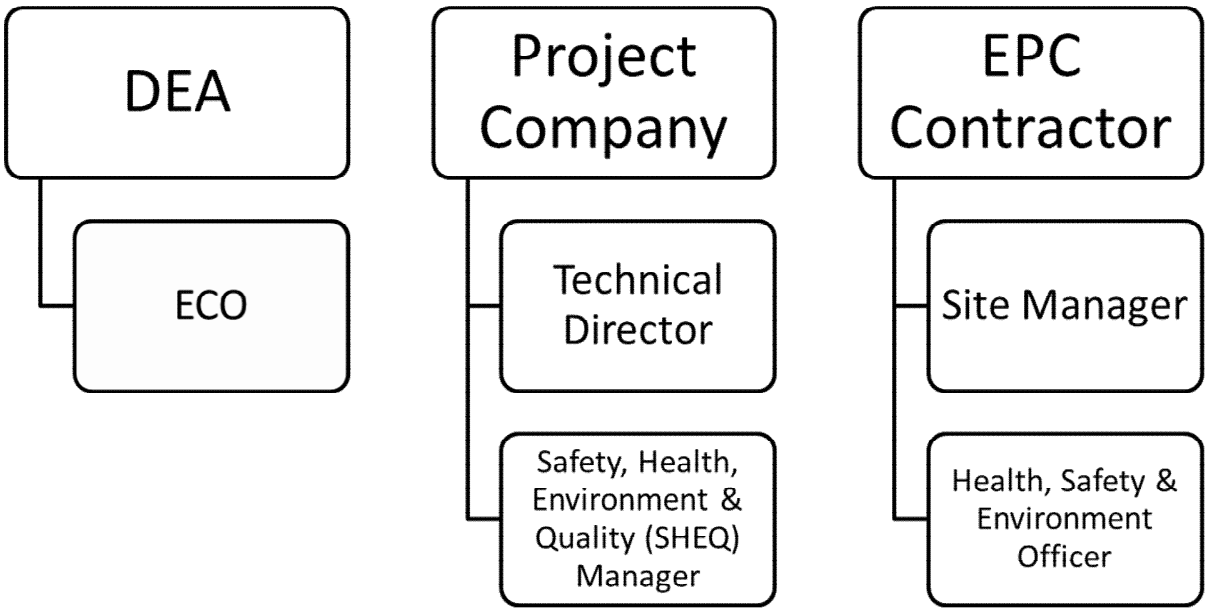


Figure 6.1: Organisational structure for the implementation of the EMPr

Technical Director will:

» Ensure all specifications and legal constraints specifically with regards to the environment are highlighted to the Contractor(s) so that they are aware of these.
» Ensure that the Proponent and Contractor(s) are made aware of all stipulations within the EMPr.
» Ensure that the EMPr is correctly implemented throughout the project by means of site inspections and meetings. This will be documented as part of the site meeting minutes.
» Be fully conversant with the BA for the project, the EMPr, the conditions of the Environmental Authorisation (once issued), and all relevant environmental legislation.
» Be fully knowledgeable with the contents of all relevant licences and permits.

Site Manager (Contractor's or Proponent's on-site Representative) will:

» Be fully knowledgeable with the contents of the BA and risk management.
» Monitor site activities on a daily basis for compliance.
» Be fully knowledgeable with the contents and conditions of the Environmental Authorisation (once issued).
» Be fully knowledgeable with the contents of the EMPr.
» Be fully knowledgeable with the contents of all relevant environmental legislation, and ensure compliance with these.

- Have overall responsibility of the EMPr and its implementation.
- Conduct audits to ensure compliance to the EMPr.
- Ensure there is communication with the Technical Director, the ECO, and relevant discipline engineers on matters concerning the environment.
- Be fully knowledgeable with the contents of all relevant licences and permits.
- Ensure that no actions are taken which will harm or may indirectly cause harm to the environment, and take steps to prevent pollution on the site.
- Confine activities to the demarcated construction site.

An independent **Environmental Control Officer (ECO)** must be appointed by the project Proponent prior to the commencement of any authorised activities and will be responsible for monitoring, reviewing and verifying compliance by the EPC Contractor with the environmental specifications of the EMP and the conditions of the Environmental Authorisation. Accordingly, the ECO will:

- Be fully knowledgeable with the contents with the BA.
- Be fully knowledgeable with the contents with the conditions of the Environmental Authorisation (once issued).
- Be fully knowledgeable with the contents with the EMPr.
- Be fully knowledgeable of all the licences and permits issued to the site.
- Be fully knowledgeable with the contents with all relevant environmental legislation, and ensure compliance with them.
- Ensure that the contents of this document are communicated to the Contractor site staff and that the Site Manager and Contractor are constantly made aware of the contents through discussion.
- Ensure that the compliance of the EMPr, EA and the legislation is monitored through regular and comprehensive inspection of the site and surrounding areas.
- Ensure that if the EMPr, EA and/or the legislation conditions, regulations or specifications are not followed then appropriate measures are undertaken to address any non-compliances (for example an ECO may cease construction or an activity to prevent a non-compliance from continuing, if reasonable).
- Monitoring and verification must be implemented to ensure that environmental impacts are kept to a minimum, as far as possible.
- Ensure that the Site Manager has input into the review and acceptance of construction methods and method statements.
- Ensure that activities on site comply with all relevant environmental legislation.
- Ensure that a removal is ordered of any person(s) and/or equipment responsible for any contravention of the specifications of the EMPr.
- Keep record of all activities on site, problems identified, transgressions noted and a task schedule of tasks undertaken by the ECO.
- Ensure that the compilation of progress reports for submission to the Technical Director, with input from the Site Manager, takes place on a regular basis, including a final post-construction audit.

» Ensure that there is communication with the Site Manager regarding the monitoring of the site.
» Ensure that any non-compliance or remedial measures that need to be applied are reported.
» Keep record of all activities on site, problems identified, transgressions noted and a task schedule of tasks undertaken by the ECO.
» Submit independent reports to the DENC and other regulating authorities regarding compliance with the requirements of the EMPr, EA and other environmental permits.

The Environmental Control Officer (ECO) should be present for the site preparation and initial clearing activities to ensure the correct demarcation of no-go areas, facilitate environmental induction with construction staff and supervise any flora relocation and faunal rescue activities that may need to take place during the site clearing (i.e. during site establishment, and excavation of foundations). Thereafter weekly site compliance inspections would probably be sufficient. However, in the absence of the ECO there should be a designated environmental officer present to deal with any environmental issues that may arise such as fuel or oil spills. The ECO shall remain employed until all rehabilitation measures, as required for implementation due to construction damage, are completed and the site handed over for operation.

Contractors and Service Providers: It is important that contractors are aware of the responsibilities in terms of the relevant environmental legislation and the contents of this EMP. The contractor is responsible for informing employees and sub-contractors of their environmental obligations in terms of the environmental specifications, and for ensuring that employees are adequately experienced and properly trained in order to execute the works in a manner that will minimise environmental impacts. The contractor's obligations in this regard include the following:

» Employees must have a basic understanding of the key environmental features of the construction site and the surrounding environment.
» A copy of the EMPr must be easily accessible to all on-site staff members.
» Employees must be familiar with the requirements of this EMPr and the environmental specifications as they apply to the construction of the proposed facility.
» Prior to commencing any site works, all employees and sub-contractors must have attended an environmental awareness training course which must provide staff with an appreciation of the project's environmental requirements, and how they are to be implemented.
» Staff will be informed of environmental issues as deemed necessary by the ECO.

All contractors (including sub-contractors and staff) and service providers are ultimately responsible for:

- Ensuring adherence to the environmental management specifications
- Ensuring that Method Statements are submitted to the Site Manager (and ECO) for approval before any work is undertaken
- Any lack of adherence to the above will be considered as non-compliance to the specifications of the EMPr
- Ensuring that any instructions issued by the Site Manager on the advice of the ECO are adhered to
- Ensuring that a report is tabled at each site meeting, which will document all incidents that have occurred during the period before the site meeting
- Ensuring that a register is kept in the site office, which lists all transgressions issued by the ECO
- Ensuring that a register of all public complaints is maintained
- Ensuring that all employees, including those of sub-contractors receive training before the commencement of construction in order that they can constructively contribute towards the successful implementation of the EMPr (i.e. ensure their staff are appropriately trained as to the environmental obligations)

Contractor's Safety, Health and Environment Representative: The Contractor's Safety, Health and Environment (SHE) Representative, employed by the Contractor, is responsible for managing the day-to-day on-site implementation of this EMPr, and for the compilation of regular (usually weekly) Monitoring Reports. In addition, the SHE must act as liaison and advisor on all environmental and related issues and ensure that any complaints received from the public are duly recorded and forwarded to the Site Manager and Contractor. In some instances, a separate Environmental Officer (EO) may be appointed to support this function.

The Contractor's Safety, Health and Environment Representative and/or Environmental Officer should:

- Be well versed in environmental matters.
- Understand the relevant environmental legislation and processes.
- Understand the hierarchy of Environmental Compliance Reporting, and the implications of Non-Compliance.
- Know the background of the project and understand the implementation programme.
- Be able to resolve conflicts and make recommendations on site in terms of the requirements of this Specification.
- Keep accurate and detailed records of all EMPr-related activities on site.

6.2. Objectives

In order to meet the overall goal for construction, the following objectives, actions, and monitoring requirements have been identified.

OBJECTIVE 2: Minimise impacts related to inappropriate site establishment

The Contractor must take all reasonable measures to ensure the safety of the public in the surrounding area.

Project Component/s	» Road realignment
Potential Impact	» Hazards to landowners and public » Damage to indigenous natural vegetation, due largely to ignorance of where such areas are located » Loss of species of conservation concern
Activities/Risk Sources	» Open excavations » Movement of construction vehicles in the area and on-site
Mitigation: Target/Objective	» To secure the site against unauthorised entry » To protect members of the public/landowners/residents » No loss of or damage to sensitive vegetation in areas outside the immediate development footprint

Mitigation: Action/Control	Responsibility	Timeframe
Secure site, working areas and excavations in an appropriate manner, as agreed with the Site Manager and EO.	EPC Contractor	Site establishment, and duration of construction
Where necessary control access, fence, and secure area.	EPC Contractor	Site establishment, and duration of construction
Fence, clearly demarcated and secure contractor's equipment camp/ laydown area	EPC Contractor	Site establishment, and duration of construction
Establish SABS 089: 1999 Part 1 approved bunded areas for storage of hazardous materials and hazardous waste.	EPC Contractor	Site establishment
Where the public could be exposed to danger by any of the works or site activities, the contractor must, as appropriate, provide suitable flagmen, barriers and/or warning signs in English, Afrikaans and any other relevant local languages, all to the approval of the Site Manager	EPC Contractor	Site establishment and duration of construction
Establish the necessary ablution facilities with chemical toilets and provide adequate sanitation facilities and ablutions for construction workers (1 toilet per every 15 workers) at appropriate walking distance. Provide sanitary bins for female workers.	EPC Contractor	Site establishment, and duration of construction
Supply adequate (closable, tamper proof) waste	EPC Contractor	Site establishment,

Mitigation: Action/Control	Responsibility	Timeframe
collection bins at site where construction is being undertaken.		and duration of construction
Separate bins should be provided for general and hazardous waste.	EPC Contractor	Site establishment, and duration of construction
As far as possible, provision should be made for separation of waste for recycling.	EPC Contractor	Site establishment, and duration of construction
Minimise vegetation clearance or removal associated with site establishment activities under supervision. Compile a method statement specific to vegetation clearance.	EPC Contractor	Site establishment

Performance Indicator	» Site is secure and there is no unauthorised entry. » No members of the public/ landowners injured as a result of the construction activities. » Appropriate and adequate waste management and sanitation facilities provided at construction site. » An incident reporting system must be used to record non-conformances to the EMPr » No unnecessary disturbance to vegetation outside of demarcated construction areas.
Monitoring	» An incident reporting system must be used to record non-conformances to the EMPr. » ECO and EO to monitor all construction areas on a continuous basis until all construction is completed. Non-conformances must be immediately reported to the site manager.

OBJECTIVE 3: Appropriate management of the construction site and construction workers

In order to minimise impacts on the surrounding environment, contractors must be required to adopt a certain Code of Conduct and commit to restricting construction activities to areas within the development footprint. Contractors and their sub-contractors must be familiar with the conditions of the Environmental Authorisation, the BA Report, and this EMPr, as well as the requirements of all relevant environmental legislation.

Project Component/s	» Road realignment
Potential Impact	» Damage to indigenous natural vegetation and sensitive areas » Damage to and/or loss of topsoil (i.e. pollution, soil compaction etc.)

	» Impacts on the surrounding environment due to inadequate sanitation and waste removal facilities » Pollution/contamination of the environment
Activities/Risk Sources	» Vegetation clearing and levelling of equipment storage area/s » Access to and from the equipment storage area/s » Ablution facilities » Contractors not aware of the requirements of the EMPr, leading to unnecessary impacts on the surrounding environment
Mitigation: Target/Objective	» Limit equipment storage to within demarcated designated areas. » Ensure adequate sanitation facilities and waste management practices » Ensure appropriate management of actions by on-site personnel in order to minimise impacts to the surrounding environment

Mitigation: Action/Control	Responsibility	Timeframe
The siting of the construction camp/s must take cognisance of any identified sensitive areas.	EPC Contractor	Pre-construction
As far as possible, minimise vegetation clearing and levelling for equipment storage area(s).	EPC Contractor	Site establishment, and during construction
Safety representatives, managers and workers must be trained in workplace safety. The construction process must be compliant with all safety and health measures as prescribed by the relevant Act.	EPC Contractor and sub-contractor/s	Duration of contract
Rehabilitate all disturbed areas as soon as construction is complete within an area, if practically possible.	EPC Contractor	Construction
All work sites must be kept free of waste. No solid waste may be burned or buried on site or disposed of by any other method on site or within quarries or borrows pits. Solid waste (general waste) to be disposed of at the nearest appropriately permitted waste disposal facility.	EPC Contractor	Duration of construction
Contractors must use chemical toilets/ablution facilities provided on site; no ablution facilities will be permitted outside the designated areas. A minimum of one toilet shall be provided per 15 persons or less at each working area such as the Contractor's camp. Ablution or sanitation facilities should not be located within 100 m from a 1:100 year flood line including drainage lines or within 32m of a watercourse, whichever is greatest.	EPC Contractor and sub-contractor/s	Duration of contract
Ensure ablution facilities are appropriately maintained. Ablution facilities must be cleaned regularly and associated waste disposed of at a registered/permitted waste disposal site. The ablution facilities must be removed from site when construction is completed.	EPC Contractor	Duration of construction

Mitigation: Action/Control	Responsibility	Timeframe
Cooking and eating of meals must take place in a designated area.	EPC Contractor and sub-contractor/s	Duration of contract
No open fires are permitted on site and construction personnel must be made aware of the consequences of starting a fire on site to avoid damage to neighbouring farms.	EPC Contractor and sub-contractor/s	Duration of contract
All litter must be deposited in a clearly marked, closed, animal-proof disposal bin in the construction area. Particular attention needs to be paid to food waste.	EPC Contractor and sub-contractor/s	Duration of contract
No one may disturb flora or fauna outside of the demarcated construction area/s.	EPC Contractor and sub-contractor/s	Duration of contract
Fire-fighting equipment and training must be provided before the construction phase commences.	EPC Contractor and sub-contractor/s	Duration of contract
A Code of conduct for construction workers should be implemented.	EPC Contractor and sub-contractor/s	Construction
Contractors must ensure that all workers are informed of the conditions contained in the EMPr before commencing work, specifically consequences of stock theft and trespassing on adjacent farms.	EPC Contractor and sub-contractor/s	Construction
Construction workers, except for security personnel – if required, are not allowed to reside on site outside of working hours or without proper supervision.	EPC Contractor and sub-contractor/s	Duration of contract
No one may disturb flora or fauna outside of the demarcated construction area/s.	EPC Contractor and sub-contractor/s	Duration of contract
Contractors appointed by the Contractor must ensure that all workers are informed at the outset of the construction phase of the conditions contained on the Code of Conduct, specifically consequences of stock theft and trespassing on adjacent properties.	EPC Contractor and sub-contractor/s	Construction

Performance Indicator	» The construction equipment camps have avoided sensitive areas. » Ablutions and waste removal facilities are in a good working order and do not pollute the environment. » All areas are rehabilitated promptly after construction in an area that has been completed. » Excess vegetation clearing and levelling is not undertaken. » No complaints regarding contractor behaviour or habits. » Appropriate training of all staff is undertaken prior to them commencing work on the construction site. » Contractors' Code of Conduct drafted before commencement of construction phase.
Monitoring	» Regular audits of the construction camps and areas of construction on site by the Contractor's SHE Officer and the ECO.

	» Proof of disposal of sewage at an appropriate wastewater treatment works or proof of service slips from a relevant contractor. » An incident reporting system should be used to record non-conformances to the EMPr » Observation and supervision of Contractor practices throughout construction phase by the Contractor's SHE Officer and the ECO. » Complaints must be investigated and, if appropriate, acted upon

OBJECTIVE 4: Minimise impacts related to traffic management and transportation of equipment and materials to site

The construction phase of the project will be the most significant in terms of generating potential traffic impacts; resulting from the transport of equipment, materials and construction crew to the site.

Project Component/s	» Construction vehicles moving on site and in surrounding areas » Construction of new road section
Potential Impact	» Impact of construction vehicles on road surfaces, and possible increased risk in accidents involving people and animals » Increase in traffic disruptions and heavy vehicles. » Deterioration of road pavement conditions (both surfaced and gravel road) due to increased traffic
Activities/Risk Sources	» Construction vehicle movement » Speeding on local roads » Degradation of local road conditions » Site preparation and earthworks » Construction vehicle movement » Mobile construction equipment movement on-site.
Mitigation: Target/Objective	» Minimise impact of traffic on local traffic volume, existing infrastructure, property owners, animals, and road users » To minimise potential for negative interaction between pedestrians or sensitive users and traffic associated with the facility construction. » To ensure all vehicles are roadworthy and all materials/ equipment are transported appropriately and within any imposed permit/licence conditions

Mitigation: Action/Control	Responsibility	Timeframe
Appropriate dust suppression measures should be implemented to limit dust within the construction area	Developer/Owner EPC Contractor	Construction phase
A designated access to the proposed site must be created to ensure safe entry and exit	EPC Contractor	Pre-construction
All employees and contractors required to abide by standard road and safety procedures	EPC Contractor	Pre-construction

Mitigation: Action/Control	Responsibility	Timeframe
The developer and engineering, procurement and construction (EPC) contractors must ensure that there is a dedicated access and an access control point.	EPC Contractor	Construction phase
Strict vehicle safety standards should be implemented and monitored.	Transport Contractor	Construction phase
Signage must be established at appropriate points warning of turning traffic and the construction site (all signage to be in accordance with prescribed standards)	EPC Contractor	Duration of contract
Signs must be placed along construction roads to identify speed limits, travel restrictions, and other standard traffic control information. Signage must be appropriately maintained for the duration of the construction period	EPC Contractor	Duration of contract
A speed limit of 40km/h should be implemented for vehicles travelling on site in order to ensure safety of personnel and the environment and lessen environmental degradation	EPC Contractor	Duration of contract
All vehicles of the contractor travelling on public roads must adhere to the specified speed limits and all drivers must be in possession of an appropriate valid driver's license.	EPC Contractor	Duration of contract
All relevant permits for abnormal loads must be applied for from the relevant authority	EPC Contractor (or appointed transportation contractor)	Pre-construction

Performance Indicator	» Vehicles keeping to the speed limits. » Vehicles are in good working order and safety standards are implemented. » Local residents and road users are aware of vehicle movements and schedules. » No construction traffic related accidents are experienced. » Local road conditions and road surfaces are up to standard. » Complaints of residents are not received (e.g. concerning the speeding of heavy vehicles). » Drivers made aware of the potential safety issues and enforcement of strict speed limits when they are employed.
Monitoring	» The Owner and or appointed ECO must monitor indicators listed above to ensure that they have been implemented.

OBJECTIVE 5: Management of dust and other air emissions

During the construction phase, limited gaseous or particulate emissions are anticipated from exhaust emissions from construction vehicles and equipment on-site, as well as vehicle entrained dust from the movement of vehicles on the main and internal access roads

Project Component/s	» Road realignment
Potential Impact	» Dust and particulates from vehicle movement to and on-site, foundation excavation, road construction activities, road maintenance activities, temporary stockpiles, and vegetation clearing affecting the surrounding residents and visibility. » Release of minor amounts of air pollutants (for example NO_2, CO_2 and SO_2) from vehicles and construction equipment.
Activities/Risk Sources	» Clearing of vegetation and topsoil. » Excavation, grading, scraping, levelling, digging, drilling. » Transport of materials, equipment, and components on internal access roads/ tracks. » Re-entrainment of deposited dust by vehicle movements. » Wind erosion from topsoil and spoil stockpiles and unsealed roads and surfaces. » Fuel burning from construction vehicles with combustion engines.
Mitigation: Target/Objective	» To ensure emissions from all construction vehicles with combustion engines are minimised, where possible, for the duration of the construction phase. » To minimise nuisance to the community from dust emissions and to comply with workplace health and safety requirements for the duration of the construction phase. » Suppression of dust, pollution control and minimise dust generation.

Mitigation: Action/Control	Responsibility	Timeframe
A comprehensive employee induction programme to be developed and utilised to cover land access protocols, fire management and road safety.	EPC Contractor	Pre-construction & Construction
Road must be maintained in a manner that will ensure that nuisance from dust emissions from road or vehicle sources are not visibly excessive.	EPC Contractor	Construction
Appropriate dust suppressant must be applied on all exposed areas, stockpiles and gravel roads as required to minimise/control airborne dust.	EPC Contractor	Duration of contract
Haul vehicles moving outside the construction site carrying material that can be wind-blown must be	EPC Contractor	Duration of contract

Mitigation: Action/Control	Responsibility	Timeframe
covered with tarpaulins.		
A speed limit of 40km/h should be implemented for vehicles travelling on site in order to minimise dust generation and ensure safety of personnel and the environment.	EPC Contractor	Duration of contract

Performance Indicator	» No complaints from affected residents or community regarding dust or vehicle emissions. » Dust suppression measures implemented » Road worthy certificates in place for all heavy vehicles at outset of construction phase
Monitoring	» The ECO must monitor indicators listed above to ensure that they have been met for the construction phase. » Immediate reporting by personnel of any potential or actual issues with nuisance dust or emissions to the Site Manager. » An incident reporting system must be used to record non-conformances to the EMPr. » Public complaints register must be developed and maintained on site.

OBJECTIVE 6: Minimisation of development footprint and disturbance to topsoil

Topsoil conservation is an integral part of rehabilitation efforts and helps to maintain the productive capability and ecological functionality of rangelands.

Removal of topsoil should be done where:

» Areas will be excavated;
» Areas will be severely compacted;
» Areas will be buried with excavated material; and
» Areas will be permanently covered with altered surfaces.

Topsoil must at all times be treated as a valuable natural resource, and may therefore not be discarded or degraded.

Project Component/s	» Road realignment
Potential Impact	» Impacts on natural vegetation and faunal habitats » Impacts on soil » Loss of topsoil
Activity/Risk Source	» Site preparation and earthworks » Stockpiling of topsoil, subsoil and spoil material

Mitigation: Target/Objective	» To retain full biological activity and functionality of topsoil. » To retain natural vegetation, where possible » To minimise footprints of disturbance of vegetation/habitats » Remove and store all topsoil on areas that are to be excavated; and use this topsoil in subsequent rehabilitation of disturbed areas » Minimise spoil material

Mitigation: Action/Control	Responsibility	Timeframe
Stockpiled topsoil should be covered to prevent erosion if deemed necessary by the ECO/EO.	EPC Contractor	Site establishment & duration of contract
Areas to be cleared must be clearly marked on-site to eliminate the potential for unnecessary clearing.	EPC Contractor	Pre-construction
No activities must take place out of the demarcated construction area.	EPC Contractor	Site establishment & duration of contract
Topsoil must be stockpiled and managed in terms of the revegetation and habitat rehabilitation management plan (**refer to Appendix F**).	EPC Contractor	Duration of contract
Excavated topsoil must be stockpiled in designated areas separate from base material at a maximum height of 2m and covered (during windy conditions) or vegetated until replaced during rehabilitation	EPC Contractor	Site establishment & duration of contract
Topsoil should be stockpiled for revegetation once construction is completed.	EPC Contractor	Construction
Minimise removal of vegetation which adds stability to soil.	EPC Contractor	Construction
Storing topsoil: » Viability of stored topsoil depends on moisture, temperature, oxygen, nutrients and time stored. » Rapid decomposition of organic material in warm, moist topsoil rapidly decreases microbial activity necessary for nutrient cycling, and reduces the amount of beneficial micro-organisms in the soil. » Stockpile location if not adjacent to a linear development: * At least 100 m from any wetland or ephemeral stream * Ideally a disturbed but weed-free area » Topsoil is typically stored in berms * Place berms along contours or perpendicular to the prevailing wind direction * Adhere to the following general rule: the larger the pile of topsoil storage needs to be, the shorter should be the time it is stored » Topsoil handling should be reduced to stripping,	EPC Contractor	Pre-construction/ Construction

Mitigation: Action/Control	Responsibility	Timeframe
piling (once), and re-application. Between the stockpiling and reapplication, stored topsoil should not undergo any further handling except control of erosion and (alien) invasive vegetation » Where topsoil can be reapplied within six months to one year after excavation, it will be useful to store the topsoil as close as possible to the area of excavation and re-application ∗ In such case, use one side of the linear development for machinery and access only ∗ Place topsoil on the other/far side of this development, followed by the subsoil (also on geotextile) ∗ If there will be a need for long-term storage of topsoil in specified stockpiles, this must be indicated in the design phase already and accompanied by a detailed topsoil stockpile management plan » In cases where topsoil has to be stored longer than 6 months or during the rainy season, soils should be kept as dry as possible and protected from erosion and degradation by: ∗ Preventing ponding on or between heaps of topsoil ∗ Or covering topsoil berms ∗ Preventing all forms of contamination or pollution ∗ Preventing any form of compaction ∗ Monitoring establishment of all invasive vegetation and removing such if it appears ∗ Keeping slopes of topsoil at a maximal 2:1 ratio ∗ Monitoring and mitigating erosion where it appears » Where topsoil needs to be stored in excess of one year, it is recommended to either cover the topsoil or allow an indigenous grass cover to grow on it – if this does not happen spontaneously, seeding should be considered.		

Performance Indicator	» Minimal disturbance outside of designated work areas. » Minimise clearing of existing vegetation. » Topsoil appropriately stored.
Monitoring	» Observation of vegetation clearing and soil management activities by ECO/EO throughout construction phase. » Supervision of all clearing and earthworks. » An incident reporting system must be used to record non-conformances

	to the EMPr.

OBJECTIVE 7: Minimise the impacts on and loss of indigenous vegetation and faunal habitat and fauna

A total of 11 species were determined to possibly be occurring in the study area (SANBI database). The species, listed as possibly occurring in the study area, were evaluated to determine the probability of occurrence in the study area based on habitat suitability. Of the species that are considered to occur within the area under investigation, there were five species that could occur in habitats that are available in the study area. According to IUCN (IUCN, 2013) two of these are listed as Vulnerable, one as Near Threatened and two as Declining. One of the vulnerable species, *Aloe dichotoma*, was recorded in the Portion 4 of the Farm Scuitklip 92. All individuals of this species were recorded outside of the corridor footprint of the MN73 road realignment.

Project component/s	» Road realignment
Potential Impact	» Loss of vegetation » Possible distribution and increased establishment of alien invasive species » Possible loss of protected species (i.e. *Hoodia gordonii* and *Boscia foetida*) » Interference with fauna » Possible exposure of fauna and flora to contaminants
Activity/risk source	» Site preparation and earthworks » Construction activities » Dumping or damage by construction equipment outside of demarcated construction areas
Mitigation: Target/Objective	» To retain natural vegetation in the moderate to high sensitive areas on the site » To minimise footprints of disturbance of vegetation/habitats on-site » To protect fauna

Mitigation: Action/control	Responsibility	Timeframe
Species of concern to be relocated and conserved in situ should be marked. Identification of suitable relocation sites for each species should be identified.	EPC Contractor in consultation with Specialist	Pre-construction and construction
Areas containing protected plant species must be noted and every effort made to reduce the impacts of construction on these areas. Protected plant species in any area to be cleared should be identified and rescued. Permits will be required from NC DENC to	EPC Contractor in consultation with Specialist	Pre-construction and construction

Mitigation: Action/control	Responsibility	Timeframe
remove or translocate protected plant or animal species, if they are to be affected (refer **Appendix E** of this EMPr for general measures relating to plant rescue and protection).		
Should any species be relocated, suitable relocation sites should be identified.	EPC Contractor in consultation with Specialist	Pre-construction and construction
Areas to be cleared must be clearly marked in the field to eliminate unnecessary clearing. In this regard, staff/ employees must be educated to keep construction activities within the demarcated areas.	EPC Contractor	Pre-construction and construction
A site rehabilitation programme must be implemented.	EPC Contractor in consultation with Specialist	Duration of contract
Protected plants identified within the development footprint must not be disturbed or removed prior to a relevant permit being granted. Protected species to be conserved in situ should be marked.	EPC Contractor	Construction
Employees must be prohibited from harvesting wild plants for any purpose, except for approved botanical search-and-rescue operations performed under the guidance of an ecologist or other appropriately qualified person (and subject to the necessary permits).	EPC Contractor	Duration of contract
Enforce speed limits of 40km/h within the construction site	EPC Contractor	Construction
ECO and EO must inspect the immediate vegetation for evidence of snares.	EPC Contractor /ECO/EO	Construction
Any fauna directly threatened by the construction activities should be removed to a safe location, of similar environment or 1km away from worksite by the ECO or other suitably qualified person, e.g. the EO.	EPC Contractor /ECO/EO	Pre-construction and construction
Construction staff should undergo an environmental induction at the start of the project to ensure that they are aware of the appropriate response to the presence of fauna at the site and do not kill or harm fauna such as snakes or other reptiles which are often feared.	EPC Contractor /ECO/EO	Pre-construction and construction

Performance Indicator	» No disturbance outside of designated work areas. » Rescue of species of conservation concern. » Minimised clearing of existing/natural vegetation. » Limited impacts on areas of identified and demarcated sensitive

	habitats/vegetation. » 90% or more species of concern protected in situ and/or by relocation. » No trapping or killing of fauna illegally.
Monitoring	» Observation of vegetation clearing activities by ECO or the Contractor's EO throughout construction phase. » Supervision of all clearing and earthworks by ECO or the Contractor's EO. » Number of trees to be conserved in situ to be checked, cross checked against the trees marked for in situ conservation after ground clearing is completed. » An incident reporting system must be used to record non-conformances to the EMPr.

OBJECTIVE 8: Limit impacts on ephemeral drainage feature

An ephemeral wash (drainage line) bisects the northern section of the study area from east to west, gradually narrowing towards the east. This system is highly fragmented by the roads and farming practices in the past while the adjacent projects have now disrupted any flows within this system. Therefore, the drainage line is considered to be of low sensitivity and impacts on the system of low significance.

The construction of the culverts on the realigned road section has the potential to increase soil erosion or siltation at times of flow.

Project component/s	» Road realignment
Potential Impact	» Damage to the ephemeral wash (such as erosion, siltation, dumping of waste) that will impact on ecosystem functioning.
Activity/risk source	» Construction of culverts at crossing
Mitigation: Target/Objective	Limit erosion potential to the ephemeral wash within Portion 4 of the Farm Scuitklip 92.

Mitigation: Action/control	Responsibility	Timeframe
A comprehensive stormwater management plan must be compiled for bridge construction. This plan should also detail how stormwater will be managed to reduce velocities and volumes of water that could lead to erosion of surfaces (refer to **Appendix G**).	EPC Contractor(s)	Design phase and pre-construction
Disturbed areas should be rehabilitated and re-vegetated as soon as possible.	EPC Contractor Engineer	Duration of construction

Installed culvert bases must be placed as close as possible with natural levels so that these do not form additional steps / barriers.	EPC Contractor Engineer	Duration of construction
Implement silt traps in areas of high erosion potential.	Contractor	Construction

Performance Indicator	» No disturbance outside of designated work areas. » No increased siltation in drainage lines as a result of construction activities.
Monitoring	» On-going inspections of sediment control devices by SHE and ECO. » Immediate reporting of ineffective sediment control systems. » An incident reporting system must be implemented to record non-conformances.

OBJECTIVE 9: Minimise the establishment and spread of alien invasive plants

On-going alien plant monitoring and removal should be undertaken on all areas of natural vegetation on an annual basis. Some alien invasive plant species occur in the study area and there is a potential for alien plants to spread or become established following disturbance on site.

Project Component/s	» Road realignment
Potential Impact	» Invasion of natural vegetation surrounding the site by declared weeds or invasive alien species
Activities/Risk Sources	» Construction
Mitigation: Target/Objective	» No alien plants within project control area during the construction and operation phases

Mitigation: Action/Control	Responsibility	Timeframe
Avoid creating conditions in which alien plants may become established: » Keep disturbance of indigenous vegetation to a minimum. » Rehabilitate disturbed areas as quickly as possible. » Do not import soil from areas with alien plants.	EPC Contractor	Construction
Establish an on-going monitoring programme to detect and quantify any alien species that may become established and identify the problem species (as per Conservation of Agricultural Resources Act and	EPC Contractor	Construction

Mitigation: Action/Control	Responsibility	Timeframe
Biodiversity Act).		
Immediately control any alien plants that become established using registered control methods.	EPC Contractor	Construction

Performance Indicator	» Site free of erosion and alien invasive plants. » No establishment of additional alien invasive species.
Monitoring	» Ongoing monitoring of area by Contractor's SHE Officer and the ECO during construction. » If any alien invasive species are detected then the distribution of these should be mapped and investigated. » The results should be interpreted in terms of the risk posed to sensitive habitats within and surrounding the project area. » Reporting frequency depends on legal compliance framework

OBJECTIVE 10: Protection of heritage resources

Areas of heritage sensitivity on Portion 4 of the Farm Scuitklip 92 include terrain close to hills or rocky features and the memorial sites below Ysterberg. The rocky outcrops that occur to the north east of the Paulputs CSP project footprint are regarded as no go areas and a 60m buffer around each outcrop has been considered. These sites and others like them in the broader landscape provided shelter and a variety of resources that attracted human activity through Stone Age times.

The memorial sites located below Ysterberg are regarded as high sensitivity and it is recommended that these memorial markers be respected by way of a 10m buffer zone. The open plains have been found to have sparsely scattered artefacts. None of these artefacts were identified within the 40m assessment corridor. These memorial sites, rocky features and scattered artefacts have been considered and will not be impacted be the realignment.

Portion 4 of the Farm Scuitklip 92 consists of a sediment-choked drainage plain crossed by ephemeral, braided stream flows produced in a sheetflood and flashflood sediment-transport regime. Colluvial and aeolian deposits occur along the drainage-plain margins. The road realignment entails shallow disturbance of these superficial, geologically young (Quaternary) deposits which have low palaeontological potential and sensitivity. Very few fossils have been found in this context in the Northern Cape.

Project Component/s	» Road realignment

Potential Impact	» Destruction or partial destruction of heritage artefacts by chance encounter
Activity/Risk Source	» Site preparation » Earthworks
Mitigation: Target/Objective	» Preservation of chance finds of heritage material to ensure that any heritage objects found on site are treated appropriately and in accordance with the relevant legislation

Mitigation: Action/control	Responsibility	Timeframe
Chance finds procedure framework If during the construction, operations or closure phases of this project, any person employed by the developer, one of its subsidiaries, contractors and subcontractors, or service provider, finds any artefact of cultural significance, this person must cease work at the site of the find and report this find to their immediate supervisor, and through their supervisor to the senior on-site manager. It is the responsibility of the SHE to make an initial assessment of the extent of the find, and confirm the extent of the work stoppage in that area. The ECO must be informed of the chance find and the ECO must then contact a professional archaeologist/palaeontologist for an assessment of the finds who will notify the SAHRA.	SHE ECO Specialist	Construction
If any evidence of archaeological sites or remains (e.g. remnants of stone-made structures, indigenous ceramics, bones, stone artefacts, ostrich eggshell fragments, charcoal and ash concentrations), fossils or other categories of heritage resources are found during the proposed development, SAHRA APM Unit (Natasha Higgitt/John Gribble 021 462 5402) must be alerted. If unmarked human burials are uncovered, the SAHRA Burial Grounds and Graves (BGG) Unit (Mimi Seetelo 012 320 8490), must be alerted immediately. A professional archaeologist or palaeontologist, depending on the nature of the finds, must be contracted as soon as possible to inspect the findings. If the newly discovered heritage resources prove to	SHE ECO Specialist	Construction

Mitigation: Action/control	Responsibility	Timeframe
be of archaeological or palaeontological significance, a Phase 2 rescue operation may be required subject to permits issued by SAHRA.		
A Heritage Monitoring Programme must be compiled and implemented (refer to **Appendix H**).	Contractor	Pre-construction & Construction

Performance Indicator	» Chance find dealt with according to chance find procedure.
Monitoring	» None required

OBJECTIVE 11: Appropriate handling and management of waste, and minimisation of environmental pollution

The construction of the road section will involve the generation of various wastes. In order to manage the wastes effectively, guidelines for the assessment, classification, and management of wastes, along with industry principles for minimising construction wastes must be implemented. The main wastes expected to be generated by the construction phase will include:

» general solid waste;
» building rubble;
» hazardous waste (i.e. oil, fuel); and
» liquid waste (including grey water and sewage).

Project Component/s	» Road realignment
Potential Impact	» Inefficient use of resources resulting in excessive waste generation. » Litter or contamination of the site or water through poor waste management practices.
Activity/Risk Source	» Packaging » Other construction wastes » Hydrocarbon use and storage » Spoil material from excavation, earthworks, and site preparation.
Mitigation: Target/Objective	» To comply with waste management legislation » To minimise production of waste » To ensure appropriate waste storage and disposal » To avoid environmental degradation from waste disposal » A waste manifest should be developed for the ablutions showing proof of disposal of sewage at appropriate wastewater treatment works

Mitigation: Action/control	Responsibility	Timeframe
Construction contractors must provide specific detailed waste management plans to deal with all waste streams.	Contractor	Duration of contract
Disposal of waste must be in accordance with relevant legislative requirements, including the use of licensed contractors and licensed waste disposal sites.	Contractor	Duration of contract
Any waste storage and disposal permits/approvals which may be required must be obtained, and the conditions attached to such permits and approvals will be complied with.	Contractor	Duration of contract
Specific areas must be designated on-site for the temporary management of various waste streams, i.e. general refuse, construction waste (wood and metal scrap) and contaminated waste. Location of such areas must seek to minimise the potential for impact on the surrounding environment, including prevention of contaminated runoff, seepage and vermin control.	Contractor	Duration of contract
Where possible, construction and general wastes on-site must be reused or recycled. Bins and skips must be available on-site for collection, separation and storage of waste streams (such as wood, metals, general refuse etc.)	Contractor	Duration of contract
Hazardous and non-hazardous waste must be separated at source. Separate waste collection bins must be provided for this purpose. These bins must be clearly marked and appropriately covered.	Contractors	Erection: during site establishment Maintenance: for duration of Contract within a particular area
Transport of all hazardous substances must be in accordance with the relevant legislation and regulations.	Contractor	Duration of contract
Hydrocarbon waste must be contained and stored in sealed containers within an appropriately bunded area.	Contractor	Duration of contract
Waste and surplus dangerous goods must be kept to a minimum and must be transported by approved waste contractors to sites designated for their disposal.	Contractor	Duration of contract
Documentation (waste manifest) must be maintained detailing the quantity, nature and fate of any hazardous waste.	Contractor	Duration of contract
All solid waste collected must be disposed of at a registered waste disposal site. A certificate of disposal must be obtained and kept on file. The disposal of waste must be in accordance with all relevant legislation. Under no circumstances may solid waste be burnt or buried on site.	Contractors	Erection: during site establishment Maintenance: for duration of Contract within a particular area

Mitigation: Action/control	Responsibility	Timeframe
Construction equipment must be refuelled within designated refuelling locations, or where remote refuelling is required, appropriate drip trays must be utilised.	Contractor	Duration of contract
Corrective action must be undertaken immediately if a complaint is made, or potential/actual leak or spill of polluting substance identified. This includes stopping the contaminant from further escaping, cleaning up the affected environment as much as practically possible and implementing preventive measures.	Contractor	Duration of contract
In the event of a major spill or leak of contaminants, the relevant administering authority must be immediately notified as per the notification of emergencies/incidents.	Contractor	Duration of contract
Any contaminated/polluted soil removed from the site must be disposed of at a licensed hazardous waste disposal facility.	Contractor	Duration of contract
Upon the completion of construction, the area will be cleared of potentially polluting materials.	Contractor	Completion of construction

Performance Indicator	» No complaints received regarding waste on site or indiscriminate dumping. » Availability of all appropriate waste manifests for all waste streams.
Monitoring	» Observation of waste management practices throughout construction phase by EO and contractor. » Supervision of waste management practices throughout construction phase by EO and contractor. » A complaints register must be maintained, in which any complaints from the community will be logged. Complaints will be investigated and, if appropriate, acted upon. » An incident reporting system must be used to record non-conformances to the EMPr.

OBJECTIVE 12: Appropriate handling and storage of chemicals, hazardous substances and dangerous goods

The construction phase will involve the storage and handling of a variety of chemicals including adhesives, abrasives, oils and lubricants, paints and solvents.

Project	» Road realignment

Component/s	
Potential Impact	» Release of contaminated water from contact with spilled chemicals » Generation of contaminated wastes from used chemical containers » Spills/ leaks of hydrocarbons, fuels and other hazardous substances may contaminate soil and/or water resources
Activity/Risk Source	» Vehicles associated with site preparation and earthworks » Construction activities of area and linear infrastructure » Hydrocarbon use and storage
Mitigation: Target/Objective	» To ensure that the storage and handling of chemicals and hydrocarbons on-site does not cause pollution to the environment or harm to persons or animals » To ensure that the storage and maintenance of machinery on-site does not cause pollution of the environment or harm to persons or animals

Mitigation: Action/Control	**Responsibility**	**Timeframe**
All chemicals, fuels and other hazardous materials are to be stored in designated and bunded areas, where the bunded area is impermeable and is impervious to the stored substance as per the requirements of SABS 089:1999 Part 1. The bunded area will contain 110% volume of the largest container stored.	Contractor	Construction
Bunds and service area platforms to be cleaned and maintained regularly.	Contractor	Construction
SABS approved Spill kits must be made available on-site for the clean-up of spills and leaks of contaminants.	Contractor	Construction
Corrective action must be undertaken immediately if a complaint is made, or potential/actual leak or spill of polluting substance identified. This includes stopping the contaminant from further escaping, cleaning up the affected environment as much as practically possible and implementing preventive measures.	Contractor	Construction
In the event of a major spill or leak of contaminants, the relevant administering authority must be immediately notified as per the notification of emergencies/incidents.	Contractor	Construction
Any contaminated/polluted soil must be removed, stored as hazardous waste and disposed of at a licensed hazardous waste disposal facility.	Contractor	Construction
Routine servicing and maintenance of vehicles must not to take place on-site (except for emergencies). If repairs of vehicles must take place, an appropriate drip tray must be used to contain any fuel or oils.	Contractor	Construction
Fuel storage areas must be inspected regularly to ensure bund stability, integrity, and function.	Contractor	Construction
Keep a record of all hazardous substances stored on	Contractor	Construction

Mitigation: Action/Control	Responsibility	Timeframe
site. Clearly label all the containers storing hazardous waste.		
Any water that collects in bunds must not be allowed to stand. Should the water be contaminated, it is to be removed and treated prior to discharge, or disposed of as hazardous waste. Clean stormwater contained within the bunds may be reused.	Contractor	Construction
Oily water from bunds at the substation must be removed from site by licensed contractors.	Contractor	Construction
Construction machinery must be stored in an appropriately sealed area. If machinery cannot be stored in a sealed area then a drip tray must be used to prevent spillage from any leaks.	Contractor	Construction
All generators on site, including generators that are not in use should be located in a bunded area or on a drip tray. Bunded areas and drip trays must be maintained on a regular basis.	Contractor	Construction
No chemicals must be stored or vehicle maintenance undertaken within 350m of a water resource.	Contractor	Construction
The storage of flammable and combustible liquids such as oils will be in designated areas which are appropriately bunded, and stored in compliance with Material Safety Data Sheets (MSDS) files and applicable regulations and safety instructions.	Contractor	Construction
Any storage and disposal permits/approvals which may be required must be obtained, and the conditions attached to such permits and approvals will be compiled with.	Contractor	Construction
Transport of all hazardous substances must be in accordance with the relevant legislation and regulations	Contractor	Construction
An effective monitoring system must be put in place to detect any leakage or spillage of all hazardous substances during their transportation, handling, installation and storage.	Contractor	Construction
Small construction machineries (i.e. stumpers, generators etc.) must be stored in an appropriately sealed area.	EPC Contractor	Duration of contract

Performance Indicator	» No chemical spills outside of designated bunded storage areas » No unattended water or soil contamination by spills » No complaints received regarding the storage or handling of hazardous substances.
Monitoring	» Supervision of the storage and handling of hazardous substances throughout construction phase by EO and contractor.

	» A complaints register must be maintained, in which any complaints from the community will be logged. » An incident reporting system must be used to record non-conformances to the EMPr.

6.3. Detailing Method Statements

The environmental specifications are required to be underpinned by a series of Method Statements, within which the Contractors and Service Providers are required to outline how any identified environmental risks will be practically mitigated and managed for the duration of the contract, or for the time period in which that risk will exist, and how specifications within this EMPr will be met. That is, the Contractor will be required to describe how specified requirements will be achieved through the submission of written Method Statements to the Site Manager and ECO.

A Method Statement is defined as "*a written submission by the Contractor in response to the environmental specification or a request by the Site Manager and ECO, setting out the plant, materials, labour and method the Contractor proposes using to conduct an activity, in such detail that the Site Manager and ECO is able to assess whether the Contractor's proposal is in accordance with the Specifications and/or will produce results in accordance with the Specifications*".

The Method Statement must cover applicable details with regard to:
» Details of the responsible person/s;
» Construction procedures;
» Materials and equipment to be used;
» Getting the equipment to and from site;
» How the equipment/material will be moved while on-site;
» How and where material will be stored;
» The containment (or action to be taken if containment is not possible) of leaks or spills of any liquid or material that may occur;
» Timing and location of activities;
» Compliance/non-compliance with the Specifications; and
» Any other information deemed necessary by the Site Manager and/or ECO.

Specific method statements required may include, *inter alia*:
» Site establishment.
» Preparation of the site.
» Soil management/stockpiling and erosion control.
» Excavations and backfilling procedure.
» Stipulate norms and standards for water supply and usage (i.e.: comply strictly to licence and legislation requirements and restrictions, if applicable).
» Stormwater management procedures.

» Ablution facilities (placement, maintenance, management and servicing).
» Solid waste management.
» Liquid waste management.
» Dust and noise pollution management.
» Hazardous substance storage (Ensure compliance with all national, regional and local legislation with regard to the storage of oils, fuels, lubricants, solvents, wood treatments, bitumen, cement, pesticides and any other harmful and hazardous substances and materials. South African National Standards apply).
» Fire prevention and management measures on site.
» Fauna and flora protection process on and off site (i.e. removal to reintroduction or replanting, if necessary).
» Incident and accident reporting protocol.
» General administration.

The Site Manager and/or ECO may request additional Method Statements or dispense with the requirement for a Method Statement pertaining to one or more of the above activities, as appropriate.

The Contractor may not commence the activity covered by the Method Statement until the Method Statement has been provided to, reviewed and accepted by the Site Manager and/or ECO, except in the case of emergencies and then only with the consent of the Site Manager. Review and acceptance (or approval where required) of the Method Statement will not absolve the Contractor from their obligations or responsibilities in terms of their contract.

Failure to submit a method statement may result in suspension of the activity concerned until such time as a method statement has been submitted and approved. The ECO must monitor the construction activities to ensure that these are undertaken in accordance with the approved Method Statement(s).

6.4. Environmental Awareness and Competence: Construction Phase

To achieve effective environmental management, it is important that Contractors are aware of the responsibilities in terms of the relevant environmental legislation and the contents of this EMPr. The Contractor is responsible for informing employees and sub-contractors of their environmental obligations in terms of the environmental specifications, and for ensuring that employees are adequately experienced and properly trained in order to execute the works in a manner that will minimise environmental impacts.

The Contractors obligations in this regard include the following:

» Employees must have a basic understanding of the key environmental features of the construction site and the surrounding environment.
» Ensuring that a copy of the EMPr is readily available on-site, and that all site employees are aware of the location and have access to the document.
» Employees shall be familiar with the requirements of the EMPr and the environmental specifications as they apply to the construction of the Project.
» Ensuring that, prior to commencing any site works, all employees and sub-contractors have received Environmental Awareness and Induction Training (refer to section 6.4.1 and 6.4.2 below).
» Training should be sufficient to provide the site staff with an appreciation of the project's environmental requirements, and how they are to be implemented.
» Training should be done either in a written or verbal format but must be appropriate for the receiving audience.
» Awareness of any other relevant environmental matters, which are deemed necessary by the ECO.
» Ensure that construction workers have received basic training in environmental management, including the storage and handling of hazardous substances, minimisation of disturbance to sensitive areas, management of waste, fire prevention & control, and prevention of water pollution.
» Ensuring that employee information posters, outlining the environmental "do's" and "don'ts" are erected at prominent locations throughout the site, as appropriate.
» Records must be kept of those that have completed the relevant training.

Therefore, prior to the commencement of construction activities on site and before any person commences with work on site thereafter, adequate environmental awareness and responsibility are to be appropriately presented to all staff present on-site, clearly describing their obligations towards environmental controls and methodologies in terms of this EMPr. This training and awareness will be achieved in the following ways:

6.4.1 Environmental Awareness Training

Environmental induction training must be presented to all persons who are to work on the site; Contractor's or Engineer's staff; administrative or site staff; sub-contractors or visitors to the site. Environmental Awareness Training must take the form of an on-site talk and demonstration by the ECO and Contractor's EO before the commencement of site establishment and construction on site.

6.4.2 Induction Training

Environmental induction training must be presented to all persons who are to work on the site – be it for short or long-term; Contractor's or Engineer's staff; administrative or site staff; sub-contractors or visitors to site.

This induction training should be undertaken by the Contractor's SHE Officer and should include discussing the developer's environmental policy and values, the function of the EMPr and Contract Specifications and the importance and reasons for compliance to these. The induction training must highlight overall do's and don'ts on site and clarify the repercussions of not complying with these. The non-conformance reporting system must be explained during the induction as well. Opportunity for questions and clarifications must form part of this training. A record of attendance of this training must be maintained by the SHE Officer on site.

6.4.3 Toolbox Talks

Toolbox talks should be held on a scheduled and regular basis (at least twice a month or if/when necessary) where foremen, environmental and safety representatives of different components of the Works and sub-consultants hold talks relating to environmental practices and safety awareness on site. These talks should also include discussions on possible common incidents occurring on site and ones recommended by the on-site ECO/EO and the prevention of reoccurrence thereof. Records of attendance and the awareness talk subject must be kept on file.

6.5. Monitoring Schedule: Construction Phase

A monitoring schedule must be in place internally not only to ensure conformance with the conditions of the EMPr, but also to monitor any environmental issues and impacts which have not been accounted for in the EMPr that are, or could result in significant environmental impacts for which corrective action is required. The independent ECO will be responsible for monitoring for the most part although will include others on a needs basis (also refer to section 7.5.2 below). The Project Manager will ensure that the internal monitoring is conducted and reported.

The aim of the monitoring and auditing process would be to monitor the implementation of the specified environmental specifications, in order to:

» Monitor and audit compliance with the prescriptive and procedural terms of the environmental specifications.
» Ensure adequate and appropriate interventions to address non-compliance.
» Ensure adequate and appropriate interventions to address environmental degradation.
» Provide a mechanism for the lodging and resolution of public complaints.
» Determine the effectiveness of the environmental specifications and recommend the requisite changes and updates based on audit outcomes, in order to enhance the efficacy of environmental management on site.
» Ensure appropriate and adequate record keeping related to environmental compliance.

6.5.1. Non-Conformance Reports

All supervisory staff including Foremen, Engineers, ECO and EO must be provided the means to be able to submit non-conformance reports to the Site Manager. Non-conformance reports will describe, in detail, the cause, nature and effects of any environmental non-conformance by the Contractor. Records of penalties imposed may be required by the relevant authority within 48 (forty eight) hours.

The non-conformance report will be updated on completion of the corrective measures indicated on the finding sheet. The report must indicate that the remediation measures have been implemented timeously and that the non-conformance can be closed-out to the satisfaction of the Site Manager and ECO.

6.5.2. Monitoring Reports

Monitoring reports will be compiled by the ECO on a monthly basis and, if requested, must be submitted to DENC for their records. This report should include details of the activities undertaken in the reporting period, any non-conformances or incidents recorded if any, corrective action required, and details of those non-conformances or incidents which have been closed out. The EPC contractor must ensure that all waste manifests are provided to the ECO on a monthly basis in order to inform and update the Authority regarding waste-related activities.

6.5.3. Final Audit Report

A final environmental audit report must be compiled by the independent ECO and be submitted to DENC upon completion of the construction and rehabilitation activities (within 30 days of completion of the construction phase i.e. within 30 days of site handover) and within 30 days of completion of rehabilitation activities. This report must indicate the date of the audit, the name of the auditor and the outcome of the audit in terms of compliance with the environmental authorisation conditions and the requirements of the EMPr.

MANAGEMENT PROGRAMME: REHABILITATION CHAPTER 7

Overall Goal: Undertake the rehabilitation measures in a way that:

» Ensures rehabilitation of disturbed areas following the execution of the works, such that residual environmental impacts are remediated or curtailed.

7.1. Objectives

In order to meet this goal, the following objective, actions and monitoring requirements are relevant:

OBJECTIVE 1: Ensure appropriate rehabilitation of disturbed areas such that residual environmental impacts are remediated or curtailed

Areas requiring rehabilitation will include all areas disturbed during the construction phase and that are not required for regular operation and maintenance operations. Rehabilitation should be undertaken in an area as soon as possible after the completion of construction activities within that area.

Project Component/s	» Realigned road section » Demolition of existing road section.
Potential Impact	» Environmental integrity of the site undermined resulting in reduced visual aesthetics, erosion and increased runoff, and the requirement for on-going management intervention
Activity/Risk Source	» Temporary construction areas » Other disturbed areas/footprints
Mitigation: Target/Objective	» Ensure and encourage site rehabilitation of disturbed areas » Ensure that the site is appropriately rehabilitated following the execution of the works, such that residual environmental impacts (including erosion) are remediated or curtailed

Mitigation: Action/Control	Responsibility	Timeframe
Compile and implement a rehabilitation and revegetation plan	Contractor	Pre-construction
Rehabilitation must be undertaken as soon as possible after completion of construction activities in an area in order to reduce the area of habitat converted at any one time and to speed up recovery of natural habitats.	Contractor	Construction

Mitigation: Action/Control	Responsibility	Timeframe
All temporary facilities, equipment, and waste materials (including spoil material) must be removed from site.	EPC Contractor	Following execution of the works
The area that previously housed the construction equipment camp is to be checked for spills of substances such as oil, paint, etc. and these should be cleaned up.	EPC Contractor	Following completion of construction activities in an area
All hardened surfaces within the construction equipment camp area, should be ripped, all imported materials removed, and the area shall be top soiled and re-vegetated.	EPC Contractor	Following completion of construction activities in an area
Necessary drainage works and anti-erosion measures must be installed, where required, to minimise loss of topsoil and control erosion.	EPC Contractor	Following completion of construction activities in an area
Re-vegetated areas may have to be protected from wind and water erosion and maintained until an acceptable plant cover has been achieved.	EPC Contractor in consultation with rehabilitation specialist	Post-rehabilitation
Erosion control measures should be used in sensitive areas such as along drainage features, as necessary.	EPC Contractor in consultation with rehabilitation specialist (if required)	Post-rehabilitation
Alien plant management must be undertaken as per the alien management and monitoring plan to be developed pre-construction.	EPC Contractor	Post-rehabilitation
Topsoil must be replaced on all areas from which it was removed and stabilised where practicable.	EPC Contractor	Rehabilitation

Performance Indicator	» All areas of site, including construction equipment camp and working areas, are cleared of equipment & temporary facilities. » Topsoil replaced on all areas disturbed by construction and stabilised where practicable or required after construction. » Disturbed areas rehabilitated and acceptable plant cover achieved on rehabilitated sites. » Appropriate vegetation utilised in rehabilitation activities. » The site, including all disturbed and rehabilitated areas are free of alien invasive plants.
Monitoring	» On-going inspection of rehabilitated areas in order to determine effectiveness of rehabilitation measures implemented. » On-going alien plant monitoring and removal should be undertaken on an annual basis as per the alien monitoring and management plan to be developed pre-construction. » An incident reporting system must be used to record non-conformances to the EMPr.

MANAGEMENT PROGRAMME: OPERATION CHAPTER 8

Following completion of construction and commissioning, this infrastructure will be maintained by the Northern Cape Department of Roads and Public Works (NC DR&PW), as required.

Overall Goal: To ensure that the operation of the proposed infrastructure does not have unforeseen impacts on the environment and to ensure that all impacts are monitored and the necessary corrective action taken in all cases.

8.1. Objectives

In order to meet this goal, the following objectives have been identified, together with necessary actions and monitoring requirements.

OBJECTIVE 1: Minimise the establishment and spread of alien invasive plants in the road reserve

The unintentional propagation of invasive species from other sites, maintenance activities and the movement of people and vehicles within the road reserve could result in increased occurrence of alien invasive vegetation within the road reserve. In order to ensure the long-term environmental integrity within the road reserve following construction and rehabilitation, on-going monitoring and removal of alien invasive species will be required.

Project component/s	» Road reserve » Areas disturbed during the construction phase and subsequent rehabilitation at its completion.
Potential Impact	» Alien vegetation invasion.
Activity/Risk Source	» Propagation of alien invasive species within the road reserve » Maintenance and re-planting of the landscaped areas.
Mitigation: Target/Objective	» Minimise footprints of disturbance of vegetation/habitats. » A well maintained and safe road servitude.

Mitigation: Action/Control	Responsibility	Timeframe
No unnecessary disturbance of indigenous vegetation outside of the road reserve must occur.	NC DR&PW	Operation
An on-going invasive and alien plant monitoring and eradication programme must be implemented.	NC DR&PW	Operation

Mitigation: Action/Control	Responsibility	Timeframe
Eradication methods should be implemented in accordance with best practice guidelines.		
The success of rehabilitation and alien plant removal within the road reserve should be monitored (visual inspections) on an ongoing basis.	NC DR&PW	Annual monitoring

Performance Indicator	» No invasive vegetation and weeds on site.
Monitoring	» Regular inspections to monitor plant regrowth/performance of rehabilitation efforts and weed infestation compared to natural/undisturbed areas.

OBJECTIVE 2: Stormwater management and erosion control

Soil erosion and siltation of the stormwater system and natural drainage system could occur to some degree. The increased hard surfaced area will also result in an increase of runoff of stormwater from the road reserve during operations. Unmanaged surface and stormwater runoff has the potential to impact negatively on the environment through erosion. Accidental spills of hazardous or hydrocarbon substances onto the road surface could also result in contamination of stormwater runoff.

Management of erosion will be required during the operation in order to prevent soil loss and sedimentation of the downstream environment. The section below provides a guideline for the management of stormwater on site.

Project Component/s	» Bare surfaces within the road reserve » Road surface
Potential Impact	» Soil degradation » Soil erosion » Siltation and contamination of drainage lines » Increased run-off over the site
Activities/Risk Sources	» Contaminated road spillages » Poor rehabilitation of cleared areas » Pollutants arising from operation and maintenance activities
Mitigation: Target/Objective	» Ensure rehabilitation of disturbed areas is maintained » Effective stormwater management system, that does not cause soil erosion » Minimise soil degradation (i.e. wetting)

Mitigation: Action/Control	Responsibility	Timeframe
Undertake regular inspections of stormwater drains and culverts to detect blockages. Remove material responsible for blockages.	NC DR&PW	Operation
Rehabilitate disturbance areas should the previous attempt be unsuccessful.	NC DR&PW	Operation
All bare areas should be revegetated with locally occurring species, to bind the soil and limit erosion potential.	NC DR&PW	Operation
Maintain erosion control measures implemented during the construction and rehabilitation phases (i.e. run-off attenuation on slopes (sand bags, logs), silt fences, stormwater catch-pits, and shade nets), if deemed necessary.	NC DR&PW	Operation
Measures relating to waste management, pollution control and the management of hazardous substances, as specified for the construction phase, should be implemented during operational maintenance activities, as appropriate.	NC DR&PW	Operation
Should additional erosion control measures be required within the vicinity of watercourses, ensure whether all appropriate environmental approvals are in place prior to implementation.	NC DR&PW	Operation
Compile and maintain environmental emergency procedures to ensure that there will be an appropriate response to unexpected or accidental environment-related incidents throughout the life cycle of the road.	NC DR&PW	Operation

Performance Indicator	» Minimal soil erosion within the road reserve. » No siltation in drainage lines due to operation of the road.
Monitoring	» Immediate reporting of ineffective sediment control systems. » Inspections of site in areas of high erosion risk on a regular basis.

OBJECTIVE 3: Appropriate maintenance activities

The section of the MN73 to be realigned will be a single carriageway gravel road. It should be noted that during the operation phase of the road, the maintenance of the road is not routinely scheduled, and is done on request. Maintenance and re-surfacing activities required from time to time could result in potential safety and environmental impacts.

Project Component/s	» Operation and maintenance of the road pavement and associated infrastructure
Potential Impact	» Maintenance and repair work » Day to day operations
Activities/Risk Sources	» Maintenance activities
Mitigation: Target/Objective	» Reduce impact of road operations and maintenance and repair

Mitigation: Action/Control	Responsibility	Timeframe
All vegetation in the road reserve should be managed as not to cause a public nuisance or result in potential road safety issues.	NC DR&PW	Operation
During road maintenance activities, ensure that suitable signage and traffic control is implemented to minimise the impact on road users.	EPC Contractor	Maintenance
During road maintenance activities, ensure that all potentially hazardous substances are stored in appropriately contained and do not pose a risk to the environment.	EPC Contractor	Maintenance
Ensure that the road and any ancillary infrastructure associated with the road is properly maintained.	NC DR&PW	Ongoing
Provide awareness training or alert contractors to the provisions of this EMP.	NC DR&PW	Ongoing

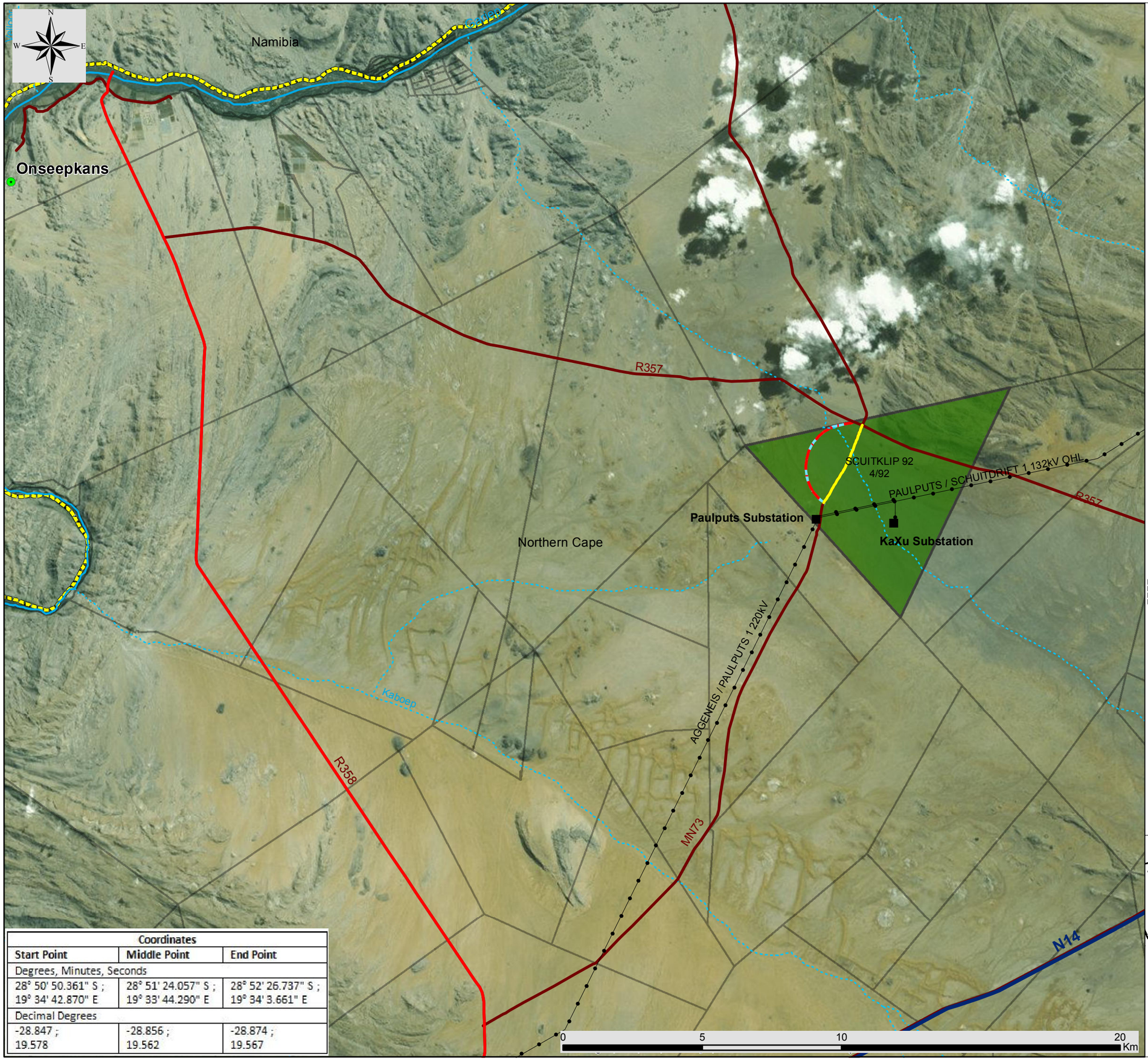
8.2. Revisions to the EMPr

The EMPr is a dynamic document, which must be updated to include any additional specifications as and when required throughout the operation/maintenance phase of the road. It is recommended that this EMPr be updated regularly to incorporate mitigation action emanating from the implementation of the EMPr and audit outcomes. These updates should be submitted to the competent authority for approval prior to implementation, in accordance with the requirements of the legislation applicable at that time.

APPENDIX A:
A3 LAYOUT AND SENSITIVITY MAPS

PROPOSED REALIGNMENT OF A SECTION OF THE MN73, NORTHERN CAPE PROVINCE

Locality Map



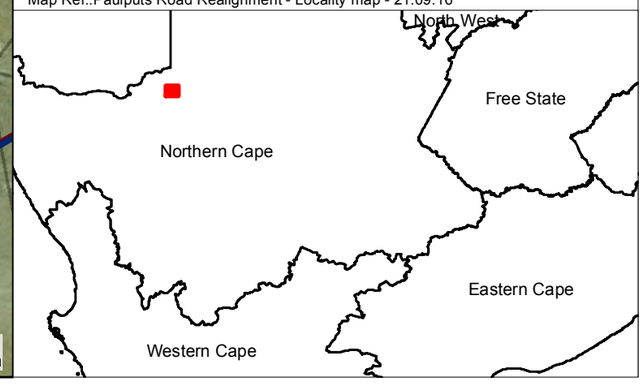
Coordinates		
Start Point	**Middle Point**	**End Point**
Degrees, Minutes, Seconds		
28° 50' 50.361" S ; 19° 34' 42.870" E	28° 51' 24.057" S ; 19° 33' 44.290" E	28° 52' 26.737" S ; 19° 34' 3.661" E
Decimal Degrees		
-28.847 ; 19.578	-28.856 ; 19.562	-28.874 ; 19.567

Legend

- Town
- Existing Substations
- Eskom Powerline
- National road
- Regional road
- Main road
- Perennial
- Non-perennial
- Existing MN73 section to be decommissioned
- Realigned MN73 section
- Realigned MN73 40m assessment corridor
- National Boundary
- Project Site
- Farm Portions

Savannah ENVIRONMENTAL (PTY) LTD

Scale: 1:133 000
Projection: LO19 WGS 1984
Map Ref.:Paulputs Road Realignment - Locality map - 21.09.16



PROPOSED REALIGNMENT OF A SECTION OF MNN73 ROAD, NORTHERN CAPE

Layout Map

VAAL KOPPIES
RE/80

SCUITKLIP
4/92

KONKOONSIES
6/91

SCUITKLIP
1/92

MN73

R357

R357

MN73

PAULPUTS / KAXU SOLAR 1 132kV OHL

PAULPUTS / SCHUITDRIFT 1 132kV OHL

Paulputs Substation

KaXu Substation

KAXU SOLAR ONE

XINA SOLAR ONE

KONKOONSIES SOLAR I
FACILITY

Aggeneis/Paulputs 1 220kV

0 1 2 4 Km

Legend

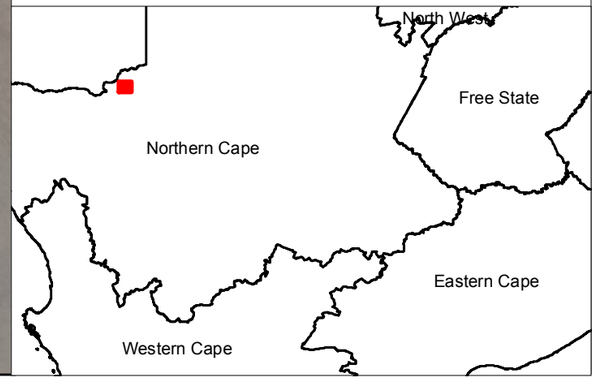
- Existing Substations
- Watercrossing
- Eskom Powerline
- National road
- Regional road
- Main road
- Ephemeral Wash
- Paulputs CSP Water Pipeline
- Paulputs CSP Heliostat Field
- Farm Portions
- Existing Solar Facilities
- Portion 4 of Scuitklip 92

Layout Plan:

- Existing MN73 section to be decommissioned
- Realigned MN73 section
- Realigned MN73 40m assessment corridor

Savannah ENVIRONMENTAL (PTY) LTD

Scale: 1:23 199
Projection: LO19 WGS 1984
Paulputs Road Realignment - Layout map - 21.09.16



PROPOSED REALIGNMENT OF A SECTION OF MN73 ROAD, NORTHERN CAPE

Environmental Sensitivity and Layout Map

Legend

- Existing Substations
- Eskom Powerline
- National road
- Main road
- Ephemeral Wash
- Paulputs CSP Water Pipeline
- Paulputs CSP Heliostat Field
- Existing Solar Facilities
- Portion 4 of Scuitklip 92
- Farm Portions

Layout Plan:

- Existing MN73 section to be decommissioned
- Realigned MN73 section
- Realigned MN73 40m assessment corridor

Environmental Sensitivities:

- Memorial Site (Heritage High Sensitivity)
- Rocky Outcrop (Heritage No-Go Area)
- 60m Rocky Outcrop Buffer (Heritage No-Go Area)
- Disturbed Vegetation (Ecological Moderate Sensitivity)
- Severely Disturbed Vegetation (Ecological Low Sensitivity)
- Terrestrial ESA
- Terrestrial CBA - 2

Scale:1:32 234
Projection: LO19 WGS 1984
Map Ref.:Paulputs Road Realignment - Sensi and Layout map - 03.01.2017

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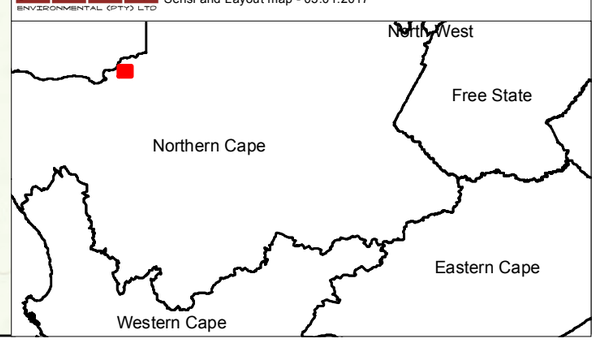

VAAL KOPPIES
RE/80

YSTERBERG

SCUITKLIP 92
4/92

SCUITKLIP
1/92

KONKOONSIES
6/91

KONKOONSIES SOLAR I
FACILITY

KAXU SOLAR ONE

XINA SOLAR ONE

Paulputs Substation

KaXu Substation

MN73

R357

PAULPUTS / KAXU SOLAR 1 132kV OHL

PAULPUTS / SCHUITDRIFT 1 132kV OHL

Aggeneis/Paulputs 1 220kV

970 m

874 m

791 m

1042 m

1056 m

896 m

0 1 2 4 Km

APPENDIX B:
GRIEVANCE MECHANISM FOR PUBLIC COMPLAINTS AND ISSUES

GRIEVANCE MECHANISM / PROCESS

1. PURPOSE

This Grievance Mechanism has been developed to receive and facilitate resolution of concerns and grievances about the Project's environmental and social performance. The aim of the grievance mechanism is to ensure that grievances or concerns raised by local landowners and or communities are addressed in a manner that:

» Provides a predictable, transparent, and credible process to all parties, resulting in outcomes that are seen as fair, effective, and lasting.
» Builds trust as an integral component of broader community relations activities.
» Enables more systematic identification of emerging issues and trends, facilitating corrective action and pre-emptive engagement.

The aim of this Grievance Mechanism is to address grievances in a manner that does not require a potentially costly and time consuming legal process.

2. PROCEDURE FOR RECEIVING AND RESOLVING GRIEVANCES

» Local landowners, communities and authorities must be informed in writing by the Proponent of the grievance mechanism and the process by which grievances can be brought to the attention of the Proponent through its designated representative.
» A company representative must be appointed as the contact person for grievances to be addressed to. The name and contact details of the contact person must be provided to local landowners, communities and authorities.
» Project related grievances relating to the construction and operational phase must be addressed in writing to the contact person. The contact person should assist local landowners and or communities who may lack resources to submit/prepare written grievances.
» The grievance must be registered with the contact person who, within 2 working days of receipt of the grievance, must contact the Complainant to discuss the grievance and agree on suitable date and venue for a meeting in order to discuss the grievances raised. Unless otherwise agreed, the meeting should be held within 2 weeks of receipt of the grievance.
» The contact person must draft a letter to be sent to the Complainant acknowledging receipt of the grievance, the name and contact details of Complainant, the nature of the grievance, the date that the grievance was raised, and the date and venue for the meeting (once agreed).
» Prior to the meeting being held the contact person must contact the Complainant to discuss and agree on the parties who should attend the meeting. The people who will be required to attend the meeting will depend on the nature of the grievance.

While the Complainant and or proponent are entitled to invite their legal representatives to attend the meeting/s, it should be made clear that to all the parties involved in the process that the grievance mechanism process is not a legal process. It is therefore recommended that the involvement of legal representatives be limited.

» The meeting should be chaired by the Proponent's representative appointed to address grievances. The Proponent must provide a person to take minutes of and record the meeting/s. Any costs associated with hiring venues must be covered by the Proponent.
» Draft copies of the minutes must be made available to the Complainant and the Proponent within 4 working days of the meeting being held. Unless otherwise agreed, comments on the Draft Minutes must be forwarded to the company representative appointed to manage the grievance mechanism within 4 working days of receipt of the draft minutes.
» In the event of the grievance being resolved to the satisfaction of all the parties concerned, the outcome must be recorded and signed off by the relevant parties. The record should provide details of the date of the meeting/s, the names of the people that attended the meeting/s, the outcome of the meeting/s, and where relevant, the measures identified to address the grievance, the party responsible for implementing the required measures, and the agreed upon timeframes for the measures to be implemented.
» In the event of a dispute between the Complainant and the Proponent regarding the grievance, the option of appointing an independent mediator to assist with resolving the issue should be discussed. The record of the meeting/s must note that a dispute has arisen and that the grievance has not been resolved to the satisfaction of all the parties concerned.
» In the event that the parties agree to appoint a mediator, the Proponent will be required to identify three (3) mediators and forward the names and CVs to the Complainant within 2 weeks of the dispute being declared. The Complainant, in consultation with the Proponent, must identify the preferred mediator and agree on a date for the next meeting. The cost of the mediator must be borne by the Proponent. The Proponent must provide a person to take minutes of and record the meeting/s.
» In the event of the grievance, with the assistance of the mediator, being resolved to the satisfaction of all the parties concerned, the outcome must be recorded and signed off by the relevant parties, including the mediator. The record should provide details on the date of the meeting/s, the names of the people that attended the meeting/s, the outcome of the meeting/s, and where relevant, the measures identified to address the grievance, the party responsible for implementing the required measures, and the agreed upon timeframes for the measures to be implemented.
» In the event of the dispute not being resolved, the mediator must prepare a draft report that summaries the nature of the grievance and the dispute. The report

should include a recommendation by the mediator on the proposed way forward with regard to the addressing the grievance.

» The draft report must be made available to the Complainant and the Proponent for comment before being finalised and signed by all parties. Unless otherwise agreed, comments on the draft report must be forwarded to the company representative appointed to manage the grievance mechanism within 4 working days. The way forward will be informed by the recommendations of the mediator and the nature of the grievance.

A Complaint is closed out when no further action can be or needs to be taken. Closure status will be classified in the Complaints Register as follows:

» Resolved. Complaints where a resolution has been agreed and implemented and the Complainant has signed the Confirmation Form.
» Unresolved. Complaints where it has not been possible to reach an agreed resolution and the case has been authorised for close out by the Appeals Committee.
» Abandoned. Complaints where the Complainant is not contactable after one month following receipt of a Complaint and efforts to trace his or her whereabouts have been unsuccessful.

The grievance mechanism does not replace the right of an individual, community, group or organization to take legal action should they so wish. In the event of the grievance not being resolved to the satisfaction of Complainant and or the Proponent, either party may be of the opinion that legal action may be the most appropriate option.

APPENDIX C:
WASTE MANAGEMENT PLAN

WASTE MANAGEMENT PLAN

1. PURPOSE

A Waste Management Plan (WMP) plays a key role in achieving sustainable waste management throughout all phases of the project. The plan prescribes measures for the collection, temporary storage and safe disposal of the waste streams associated with the project and includes provisions for the recovery, re-use and recycling of waste. The purpose of this plan is therefore to ensure that effective procedures are implemented for the handling, storage, transportation and disposal of waste on site during the construction phase.

This WMP has been compiled as part of the project Environmental Management Programme (EMPr) and includes waste stream information available at the time of compilation. Construction practices must be measured and analysed on an ongoing basis in order to determine the efficacy of the plan and whether further revision of the plan is required. This plan should be further updated should further detail regarding waste quantities and categorisation become available, during the construction phase.

2. WASTE GENERATED

It is expected that the development of the road realignment will generate construction solid waste, general waste, contaminated water and soil.

Waste generated on site, originates from various sources including but not limited to:

- Contaminated water, soil, rocks and vegetation due to hydrocarbon spills.
- Hazardous waste from vehicle, equipment and machinery parts, and servicing and used hydrocarbon containers.
- Recycable waste in the form of paper, glass, steel, aluminium, wood/ wood pallets, plastic (PET bottles, PVC, LDPE) and cardboard.
- Organic waste from food waste and alien and endemic vegetation removal.
- Sewage from portable toilets and septic tanks.
- Inert waste from spoil material from site clearance.

3. LEGISLATIVE REQUIREMENTS

Waste in South Africa is currently governed by several pieces of legislation, including:

» National Environmental Management: Waste Act (NEM:WA), 2008 (Act 59 of 2008)
» National Environmental Management: Waste Amendment Act, 2014 (Act 26 of 2014)
» The South African Constitution (Act 108 of 1996)
» Hazardous Substances Act (Act 5 of 1973)
» Health Act (Act 63 of 1977)
» Environment Conservation Act (Act 73 of 1989)
» Occupational Health and Safety Act (Act 85 of 1993)
» National Water Act (Act 36 of 1998)
» National Environmental Management Act (Act 107 of 1998) (as amended)
» Mineral and Petroleum Resources Development Act (Act 28 of 2002)
» Air Quality Act (Act 39 of 2004)

Storage of waste must be undertaken in accordance with the National Norms and Standards for the Storage of Waste published in GN926.

4. WASTE MANAGEMENT PRINCIPLES

An integrated approach to waste management on site is needed. Such an approach is illustrated in the **Figure 1**.

It is important to ensure that waste is managed with the following objectives in mind during the construction phase of the project:

» Reducing volumes of waste is a priority;
» If reduction is not feasible, the maximum amount of waste is to be recycled; and
» Waste that cannot be recycled is to be disposed of in the most environmentally responsible manner as possible.

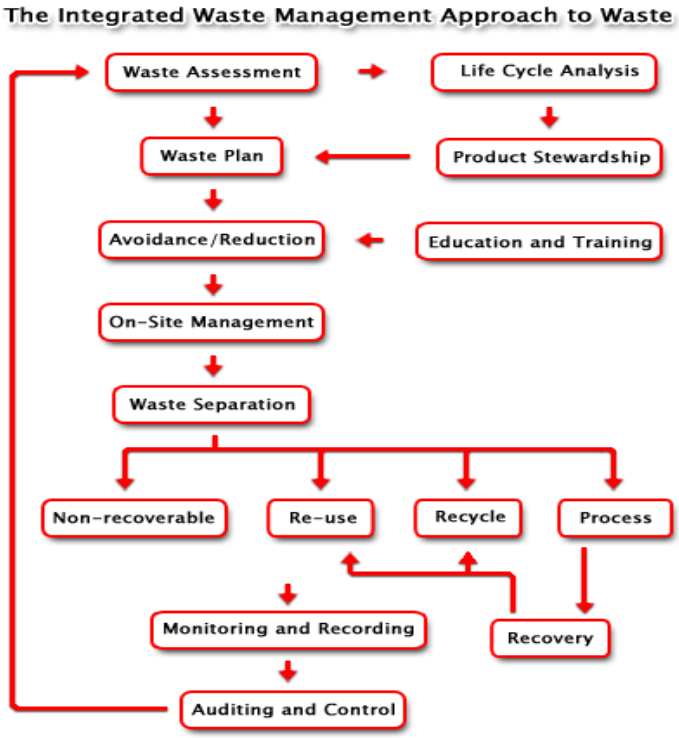

Figure 1: Integrated Waste Management Flow Diagram
(Source: http://www.enviroserv.co.za/pages/content.asp?SectionId=496)

4.1. Construction phase

A plan for the management of construction waste is detailed below. Construction practices must be measured and analysed in order to determine the efficacy of the plan and whether further revision of the plan is required. A Method Statement detailing specific waste management practices during construction should be prepared by the Contractor prior to the commencement of construction.

4.1.1. Waste Assessment / Inventory

- The Environmental Officer (EO), or designated staff member, must develop, implement and maintain a waste inventory reflecting all waste generated during construction for both general and hazardous waste streams.
- Construction method and materials should be carefully considered in view of waste reduction, re-use, and recycling opportunities.
- Once a waste inventory has been established, targets for recovery of waste (minimisation, re-use, recycling) should be set.
- The EO must conduct waste classification and rating in terms of SANS 10288 and Government Notice 634 published under the NEM: WA.

4.1.2. Waste collection, handling and storage

» It is the responsibility of the EO to ensure that each subcontractor implements their own waste recycling system, i.e. separate bins for food waste, plastics, paper, wood, glass cardboard, metals, etc.
» Waste manifests and waste acceptance approvals from designated waste facilities must be kept on hand in order to prove compliance.
» Septic tanks and portable toilets must be monitored and maintained daily. Below ground storage of septic tanks must withstand the external forces of the surrounding environment. The area above the tank must be demarcated to prevent any vehicles or heavy machinery from driving around the area.
» Waste collection bins and hazardous waste containers must be provided by the principal contractor and subcontractors and placed at various areas around site for the storage of organic, recyclable and hazardous waste.
» A dedicated waste area must be established on site for the storage of all waste streams, before removal from site. The storage period must not trigger listed waste activities as per the NEMWA, GN 921 of November 2013.
» Signage/ colour coding must be used to differentiate disposal areas for the various waste streams (i.e. paper, cardboard, metals, food waste, glass etc.).
» Hazardous waste must be stored within a bunded area constructed according to SABS requirements. The volume of waste stored in the bunds must not exceed 110% of the bund capacity.
» The location of all temporary waste storage areas must aim to minimise the potential for impact on the surrounding environment, including prevention of contaminated runoff, seepage, and vermin control.
» Waste storage shall be in accordance with all Regulations and best-practice guidelines and under no circumstances may waste be burnt on site.
» If possible a dedicated waste management team must be appointed by the principal contractors' EO, whom will be responsible for ensuring
» The continuous sorting of waste and maintenance of the area should be ensured. The principal contractors' EO will be responsible, and must be trained.
» All waste removed from site must be done so by a registered/ licensed subcontractor, whom must supply information regarding how waste recycling/ disposal will be achieved. The registered subcontractor must provide waste manifests for all removals at least once a month or for every disposal made.

4.1.3. Management of waste storage areas

» The position of all waste storage areas must be located at least 32m away from water features and ensure minimal degradation to the environment. The main waste storage area must have a suitable stormwater system separating clean and dirty stormwater.
» Collection bins placed around site and must be maintained and emptied on a regular basis by the principal contractor.

» Inspections and maintenance of the main waste storage area must be undertaken daily. Skips and storage containers must be clearly marked or colour coded and well-maintained, not allowing access to vermin or other rodents. A tarp or shade cloth should ideally be used to ensure avifauna does not have access to waste.
» Waste must be stored in designated containers and not on the ground.
» Inspections and maintenance of bunds must be undertaken daily. Bunds must be inspected for leaks or cracks in the foundation and walls.
» It is assumed that any rainwater collected inside the bund is contaminated and must be removed and stored as hazardous waste, and not released into the environment. If any leaks occur in the bund, these must be removed immediately.

4.1.4. Disposal

» Waste generated on site must be removed on a regular basis, as determined by the EO and ECO. This frequency may change during construction depending on waste volumes generated at different stages of the construction process.
» Waste must be removed by a suitably qualified contractor and disposed at an appropriately licensed landfill site. Proof of appropriate disposal must be provided by the contractor to the EO and ECO.

4.1.5. Record keeping

The success of the Waste Management Plan is determined by measuring criteria such as waste volumes, cost recovery from recycling, cost of disposal.

» Documentation (waste manifest, certificate of issue or safe disposal) must be kept detailing the quantity, nature, and fate of any regulated waste for audit purposes.
» Waste management must form part of the monthly reporting requirements in terms of volumes generated, types, storage and final disposal.

4.1.6. Training

Training and awareness regarding waste management shall be provided to all employees and contractors as part of the toolbox talks or on-site awareness sessions with the EO and at the frequency as set out by the ECO.

2. Operation phase

The Northern Cape Department of Roads and Public Works (NC DR&PW) will be responsible for maintenance activities.

3. Monitoring of Waste Management Activities

Records must be kept of the volumes/ mass of the different waste f that are collected from the site throughout the life of the project. The appointed waste contractor is to provide monthly reports to the operator containing the following information:

- Monthly volumes/ mass of the different waste streams collected;
- Monthly volumes/ mass of the waste that is disposed of at a landfill site;
- Monthly volumes/ mass of the waste that is recycled;
- Data illustrating progress compared to previous months.

This report will aid in monitoring the progress and relevance of the waste management procedures that are in place. If it is found that the implemented procedures are not as effective as required, this WMP is to be reviewed and amended accordingly. This report must from part of the EO's reports to the ECO on a monthly basis.

APPENDIX D:
ALIEN PLANT MANAGEMENT PLAN

ALIEN PLANT AND OPEN SPACE MANAGEMENT PLAN

1. PURPOSE

Invasive alien plant species pose the second largest threat to biodiversity after direct habitat destruction. The purpose of this Alien Plant and Open Space Management Plan is to provide a framework for the management of alien and invasive plant species during the construction of the road realignment. The broad objectives of the plan includes the following:

» Ensure alien plants do not become dominant in parts or the whole site, through the control and management of alien and invasive species presence, dispersal and encroachment.
» Develop and implement a monitoring and eradication programme for alien and invasive plant species.
» Promote the natural re-establishment and planting of indigenous species in order to retard erosion and alien plant invasion.

2. RELEVANT ASPECTS OF THE SITE

The disturbance created during the construction phase of the project would leave the site highly vulnerable to invasion by alien plant species, which would impact diversity and ecological processes within the area. Alien species that have been observed at the Gariep River and which might increase in response to the disturbance include Mesquite (*Prosopis spp*.). Invasive plant species currently present in the study area include the *Opuntia ficus-indica, Argemone mexicana, Datura stramonium, Agave Americana* and *Prosopis glandulosa.*

3. LEGISLATIVE CONTEXT

Conservation of Agricultural Resources Act (Act No. 43 of 1983)

In terms of the amendments to the regulations under the Conservation of Agricultural Resources Act (Act No. 43 of 1983), all declared alien plant species must be effectively controlled. Landowners are legally responsible for the control of invasive alien plants on their properties. In terms of this Act alien invasive plant species are ascribed to one of the following categories:

» Category 1: Prohibited and must be controlled.
» Category 2 (commercially used plants): May be grown in demarcated areas provided that there is a permit and that steps are taken to prevent their spread.

» Category 3 (ornamentally used plants): May no longer be planted. Existing plants may be retained as long as all reasonable steps are taken to prevent the spreading thereof, except within the flood line of watercourses and wetlands.

National Environmental Management: Biodiversity Act, 2004 (Act No.10 of 2004)

The National Environmental Management: Biodiversity Act (NEM:BA) regulates all invasive organisms in South Africa, including a wide range of fauna and flora. Regulations have been published in Government Notices R.506, R.507, R.508 and R.509 of 2013 under NEMBA. According to this Act and the regulations, any species designated under Section 70 cannot be propagated, grown, bought or sold without a permit. Below is an explanation of the three categories:

» **Category 1a:** Invasive species requiring compulsory control. Any specimens of Category 1a listed species need, by law, to be eradicated from the environment. No permits will be issued.
» **Category 1b:** Invasive species requiring compulsory control as part of an invasive species control programme. Remove and destroy. These plants are deemed to have such a high invasive potential that infestations can qualify to be placed under a government sponsored invasive species management programme. No permits will be issued.
» **Category 2:** Invasive species regulated by area. A demarcation permit is required to import, possess, grow, breed, move, sell, buy or accept as a gift any plants listed as Category 2 plants. No permits will be issued for Cat 2 plants to exist in riparian zones.
» **Category 3:** Invasive species regulated by activity. An individual plant permit is required to undertake any of the following restricted activities (import, possess, grow, breed, move, sell, buy or accept as a gift) involving a Category 3 species. No permits will be issued for Cat 3 plants to exist in riparian zones.

The following guide is a useful starting point for the identification of alien plant species: Bromilow, C. 2010. Problem Plants and Alien Weeds of South Africa. Briza, Pretoria.

It is important to note that alien plant species that are regulated in terms of the Conservation of Agricultural Resources Act (Act 43 of 1983) (CARA) as weeds and invader plants are exempted from NEM:BA. This implies that the provisions of the CARA in respect of listed weed and invader plants supersede those of NEM: BA.

4. ALIEN PLANT MANAGEMENT PRINCIPLES

4.1. Prevention and early eradication

A prevention strategy should be considered and established, including regular surveys of the road reserve and monitoring for invasive alien plants, effective rehabilitation of disturbed areas and prevention of unnecessary disturbance of natural areas.

Monitoring plans should be developed which are designed to identify Invasive Alien Plant Species shortly after they arrive in the project area. Keeping up to date on which weeds are an immediate threat to the site and road reserve is important, but efforts should be planned to update this information on a regular basis. When new Invasive Alien Plant Species are recorded on site, an immediate response of locating the site for future monitoring and either hand-pulling the weeds or an application of a suitable herbicide (where permissible only) should be planned. It is, however, better to monitor regularly and act swiftly than to allow invasive alien plants to become established on site.

4.2. Containment and control

If any alien invasive plants are found to become established on the site or within the road reserve, action plans for their control should be developed, depending on the size of the infestations, budgets, manpower considerations and time. Separate plans of control actions should be developed for each location and/or each species. Appropriate registered chemicals and other possible control agents should be considered in the action plans for each site/species. The key is to ensure that no invasions get out of control. Effective containment and control will ensure that the least energy and resources are required to maintain this status over the long-term. This will also be an indicator that natural systems are impacted to the smallest degree possible.

4.3. General Clearing and Guiding Principles

Alien species control programs are long-term management projects and should include a clearing plan which includes follow up actions for rehabilitation of the cleared area. The lighter infested areas should be cleared first to prevent the build-up of seed banks. All clearing actions should be monitored and documented to keep records of which areas are due for follow-up clearing.

i. <u>Clearing Methods</u>

Different species require different clearing methods such as manual, chemical or biological methods or a combination of both. Care should however be taken that the clearing methods used do not encourage further invasion. As such, regardless of the methods used, disturbance to the soil should be kept to a minimum.

Fire should not be used for alien species control or vegetation management at the site or within the road reserve. The best-practice clearing method for each species identified should be used.

» **Mechanical control**

This entails damaging or removing the plant by physical action. Different techniques could be used, e.g. uprooting, felling, slashing, mowing, ringbarking or bark stripping. This control option is only really feasible in sparse infestations or on a small scale, and for controlling species that do not coppice after cutting. Species that tend to coppice, need to have the cut stumps or coppice growth treated with herbicides following the mechanical treatment. Mechanical control is labour intensive and therefore expensive, and could cause severe soil disturbance and erosion.

» **Chemical Control**

Although it is usually preferable to use manual clearing methods where possible, such methods may create additional disturbance which stimulates alien plant invasion and may also be ineffective for many woody species which resprout. Where herbicides are to be used, the impact of the operation on the natural environment should be minimised by observing the following:

* Area contamination must be minimised by careful, accurate application with a minimum amount of herbicide to achieve good control.
* All care must be taken to prevent contamination of any water bodies. This includes due care in storage, application, cleaning equipment and disposal of containers, product and spray mixtures.
* Equipment should be washed where there is no danger of contaminating water sources and washings carefully disposed of in a suitable site.
* To avoid damage to indigenous or other desirable vegetation, products should be selected that will have the least effect on non-target vegetation.
* Coarse droplet nozzles should be fitted to avoid drift onto neighbouring vegetation.
* The appropriate health and safety procedures should also be followed regarding the storage, handling and disposal of herbicides.

For all herbicide applications, the following Regulations and guidelines should be followed:

* Working for Water: Policy on the Use of Herbicides for the Control of Alien Vegetation.
* Pesticide Management Policy for South Africa published in terms of the Fertilizers, Farm Feeds, Agricultural Remedies and Stock Remedies Act, 1947 (Act No. 36 of 1947) – GNR 1120 of 2010.
* South African Bureau of Standards, Standard SANS 10206 (2010)

According to Government Notice No. 13424 dated 26 July 1992, it is an offence to "*acquire, dispose, sell or use an agricultural or stock remedy for a purpose or in a*

manner other than that specified on the label on a container thereof or on such a container".

Contractors using herbicides need to have a valid Pest Control Operators License (limited weeds controller) according to the Fertilizer, Farm Feeds, Agricultural Remedies and Stock Remedies Act (Act No. 36 of 1947). This is regulated by the Department of Agriculture, forestry and Fisheries.

» **Biological control**

Biological weed control consists in the use of natural enemies to reduce the vigour or reproductive potential of an invasive alien plant. Biological control agents include insects, mites, and micro-organisms such as fungi or bacteria. They usually attack specific parts of the plant, either the reproductive organs directly (flower buds, flowers or fruit) or the seeds after they have dropped. The stress caused by the biological control agent may kill a plant outright or it might impact on the plants reproductive capacity. In certain instances, the reproductive capacity is reduced to zero and the population is effectively sterilised. All of these outcomes will help to reduce the spread of the species.

To obtain biocontrol agents, provincial representatives of the Working for Water Programme or the Directorate: Land Use and Soil Management (LUSM), Department of Agriculture, Forestry and Fisheries (DAFF) can be contacted.

4.4. General management practices

The following general management practices should be encouraged or strived for:

- Establish an on-going monitoring programme for construction phase to detect and quantify any alien species that may become established and identify the problem species.
- Alien vegetation regrowth on areas disturbed by construction must be immediately controlled once recorded throughout the entire site and the road reserve during construction, operation and maintenance.
- Care must be taken to avoid the introduction of alien invasive plant species to the site and the road reserve. Particular attention must be paid to imported material such as building sand or dirty earth-moving equipment. Stockpiles should be checked regularly and any weeds emerging from material stockpiles should be removed.
- Cleared areas that have become invaded by alien species can be sprayed with appropriate herbicides provided that these are such that break down on contact with the soil. Residual herbicides should not be used.
- The effectiveness of vegetation control varies seasonally and this is also likely to impact alien species. Control early in the wet season will allow species to re-grow

and follow-up control is likely to be required. It is tempting to leave control until late in the wet season to avoid follow-up control. However, this may allow alien species to set seed before control and hence will not contribute towards reducing alien species abundance. Therefore, vegetation control should be aimed at the middle of the wet season, with a follow-up event towards the end of the wet season. There are no exact dates that can be specified here as each season is unique and management must therefore respond according to the state and progression of the vegetation.

» Alien plant management is an iterative process and it may require repeated control efforts to significantly reduce the abundance of a species. This is often due to the presence of large and persistent seed banks. However, repeated control usually results in rapid decline once seed banks become depleted.
» Some alien species are best individually pulled by hand. Regular vegetation control to reduce plant biomass within the site and road reserve should be conducted. This should be timed so as to coincide with the critical growth phases of the most important alien species on site. This will significantly reduce the cost of alien plant management as this should contribute towards the control of the dominant alien species and additional targeted control will be required only for a limited number of species.
» No alien species should be cultivated on-site. If vegetation is required for aesthetic purposes, then non-invasive, water-wise locally-occurring species should be used.
» During operation, surveys for alien species should be conducted regularly. It is recommended that this be undertaken every 6 months for the first two years after construction and annually thereafter. All alien plants identified should be cleared using appropriate means.

4.5. Monitoring

In order to monitor the impact of clearing activities, follow-ups and rehabilitation efforts, monitoring must be undertaken. This section provides a description of a possible monitoring programme that will provide and assess of the magnitude of alien plant invasion on site and within the road reserve as well as an assessment of the success of the management programme.

In general, the following principles apply for monitoring:

» Photographic records must be kept of areas to be cleared prior to work starting and at regular intervals during initial clearing activities. Similarly, photographic records should be kept of the area from immediately before and after follow-up clearing activities. Rehabilitation processes must also be recorded.
» Simple records must be kept of daily operations, e.g. area/location cleared, labour units and, if ever used, the amount of herbicide used.

» It is important that, if monitoring results in detection of invasive alien plants, that this leads to immediate action.

The following monitoring should be implemented to ensure management of alien invasive plant species.

Construction Phase

Monitoring Action	Indicator	Timeframe
Document alien species present at the site of construction activities	List of alien plant species	Preconstruction & monthly thereafter
Document & record alien plant control measures implemented	Record of clearing activities	Monthly

Operation and Maintenance

Monitoring Action	Indicator	Timeframe
Document alien plant species distribution and abundance within road reserve	Alien plant distribution map	Biannually
Document alien plant control measures implemented during maintenance activities & success rate achieved	Records of control measures and their success rate. A decline in alien distribution and cover over time at the site	Biannually

APPENDIX E:
PLANT RESCUE AND PROTECTION PLAN

PLANT RESCUE AND PROTECTION PLAN

1. PURPOSE

The purpose of the plant rescue and protection plan is to implement avoidance and mitigation measures, in addition to the mitigations included in the Environmental Management Programme (EMPr) to reduce the impact of the development of the road realignment on listed and protected plant species and their habitats and to provide guidance on search and rescue of species of conservation concern.

2. RELEVANT ASPECTS OF THE SITE

A list of plant species previously recorded in the quarter degree grid in which the study area is situated was obtained from the South African National Biodiversity Institute. Additional species that could occur in similar habitats, as determined from official database searches and reviewed literature, but not recorded in these grids are also listed. A total of 11 species were determined to possibly be occurring in the broader study area[1].

The species, listed as possibly occurring in the study area, were evaluated to determine the probability of occurrence in the broader study area based on habitat suitability. Of the species that are considered to occur within the area under investigation, there were five species that could occur in habitats that are available in the study area. According to IUCN (IUCN, 2013) two of these are listed as Vulnerable, one as Near Threatened and two as Declining. One of the vulnerable species, *Aloe dichotoma*, was recorded in the broader study area (refer to **Figure 1**). All individuals of this species were recorded outside of the 40m road realignment corridor and is therefore avoided.

[1] The broader study area can be defined as Portion 4 of the Farm Scuitklip 92.

Figure 1: *Aloe dichotoma* recorded in the broader study area.

The one Declining species, *Acacia erioloba*, also a protected tree, has a high probability of occurring in the study area, while *Hoodia gordonii* was recorded in the broader study area in a number of places (Error! Reference source not found. to **Figure 2**). All individuals of this species were recorded outside of the 40m road realignment corridor and is therefore avoided.

Figure 2: *Hoodia gordonii* recorded in the study area.

3. PRINCIPLES FOR SEARCH AND RESCUE

Successful plant rescue can only be achieved if:

» Species can be removed from their original habitat with minimal damage to the plant, especially the roots.
» All plants removed are safely stored and treated according to their specific requirements prior to being transplanted again.
» They are relocated into a suitable habitat and protected from further damage and all disturbances to aid their re-establishment.
» Timing of planting activities is planned with the onset of the growing season.
» Steps are taken where necessary to aid the initial establishment of vegetation, including occasional watering.

The following principles apply in terms of plant rescue and protection:

» A permit is required from the Northern Cape Department of Environment and Nature Conservation to translocate or destroy any listed and protected species identified by the ecological walkthrough survey undertaken for the optimised final road realignment layout, even if they do not leave the property. This permit should be obtained prior to any search and rescue operations being undertaken.
» Where suitable species are identified, a search and rescue operation of these species should be undertaken within the development footprint, where these species would be affected, and prior to the commencement of construction.
» As far as possible, timing of search and rescue activities should be planned with the onset of the growing season.
» Affected individuals should be translocated to a similar habitat outside of the development footprint and marked and recorded for monitoring purposes. For each individual plant that is rescued, the plant must be photographed before removal, tagged with a unique number or code and a latitude longitude position recorded using a hand-held GPS device.
» The rescued plants must be planted into a container to be housed within a temporary nursery on site or immediately planted into the target habitat.
» Rescued plants, if re-planted back in the wild, should be placed as close as possible to where they were originally removed. Re-planting into the wild must cause as little disturbance as possible to existing natural ecosystems. The position of the rescued individual/s must be recorded to aid in future monitoring of that plant as noted earlier.
» During construction, the Environmental Control Officer (ECO)/ Contractor's Environmental Officer (EO)/ Environmental Representative must monitor vegetation clearing at the site. Any deviations from the plans that may be required should first be checked for listed species by the Environmental Control Officer (ECO)/ Contractor's Environmental Officer (EO/ SHE Representative) and any listed species present which are able to survive translocation should be translocated to a safe site.
» Any listed species suitable for translocation observed within the development footprint, and that would be affected, that were not previously observed be translocated to a safe site.

- The collecting of plants of their parts should be strictly forbidden. Staff should be informed of the legal and conservation aspects of harvesting plants from the wild as part of the environmental induction training.
- Sensitive habitats and area outside project development should be clearly demarcated as no go areas during the construction and operational phase to avoid accidental impacts.

4. REFERENCES

Van Wyk, A. & Smith, G., 2001. *Regions of floristic endemism in southern Africa.* Hatfield.: Umdaus press.

APPENDIX F:
REVEGETATION AND REHABILITATION PLAN

REVEGETATION AND REHABILITATION PLAN

1. PURPOSE

The purpose of the rehabilitation plan is to ensure that areas cleared or impacted during construction activities of the road realignment are rehabilitated with a plant cover that reduces the risk or erosion from these areas as well as restores some ecosystem function. The purpose of the rehabilitation plan for the site can be summarised as follows:

» Achieve long-term stabilisation of all disturbed areas to minimise erosion potential.
» Re-vegetate all disturbed areas with suitable local plant species.
» Minimise visual impact of disturbed areas.

This Revegetation and Rehabilitation Plan should be closely aligned with other site-specific plans, including inter alia an Erosion Management Plan, Alien Plant Management Plan, and Plant Rescue and Protection Plan. Prior to commencement of construction, a detailed Rehabilitation Plan and Method Statement for the construction site and road reserve should be compiled with the aid of a Rehabilitation Specialist, as required.

2. RELEVANT ASPECTS OF THE SITE

A floral survey was conducted in August 2015 (the dry season survey) and in March – April 2016 (during the wet season). Based on species composition, physiognomy, moisture regime, rockiness, slope and soil properties, three main vegetation communities were recognised (refer to **Figure 1**). The vegetation communities are described below and named according to dominant species and underlying substrate. The majority of the project site is covered by *Acacia mellifera – Aristida congesta dune* open shrubland.

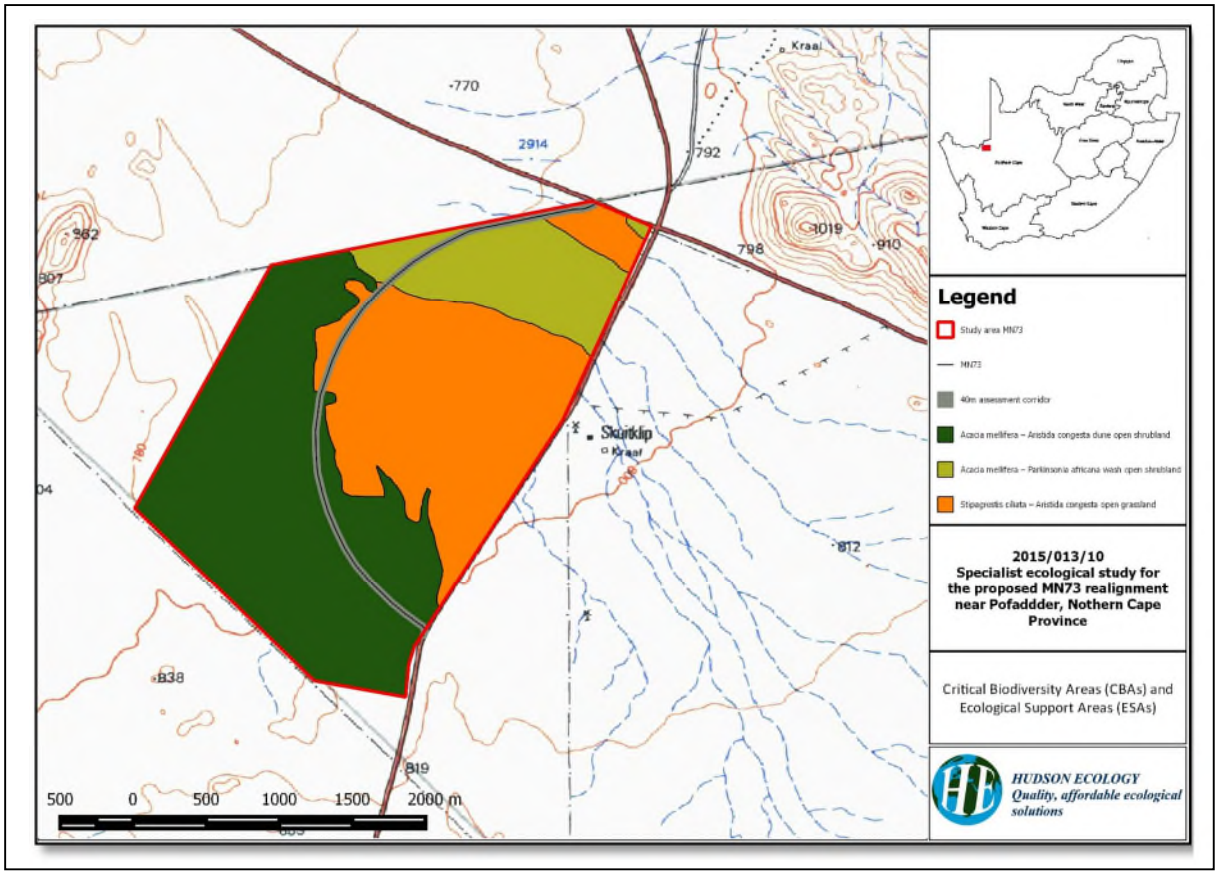

Figure 1: Distribution of vegetation communities within Portion 4 of the Farm Scuitklip 92.

Acacia mellifera – Aristida congesta dune open shrubland

This vegetation community is typically covered by sparse open grassland, with *Stipagrostis ciliata* and *Aristida congesta* being the dominant grass species. Other grass species occurring in this vegetation community include *Stipagrostis obtusa, Aristida adscensionis, Fingerhuthia africana* and *Eragrostis lehmanniana,* although these species occur in very modest abundance. Due to the deeper soils, as well as soil chemistry and an increased water retention potential, larger *Acacia mellifera* are dominant in this vegetation community, with scattered, drought resistant dwarf shrubs or small trees, e.g. *Rhigozum trichotomum* and *Boscia foetida* (refer to **Figure 2**). Species of concern found to occur in this vegetation community are the protected species *Aloe dichotoma* and *Boscia foetida*.

Acacia mellifera – Parkinsonia africana wash open shrubland

A drainage line within the plains of the study area is regarded as a wash, as water will only flow after good rains, and soon dry up again. The increased water retention in the underlying substrate allows for the growth of larger individuals of the species *Acacia mellifera* and *Parkinsona africana*. These washes are wide and sandy, and blend into the

landscape, merging with the adjacent grassland vegetation, but are nevertheless visible due to their microtopography and change in species composition (refer to **Figure 3**).

The vegetation is often somewhat heterogeneous and with weeds, due to the disturbance of the periodic flooding. Washes are of conservation concern and regarded as sensitive ecosystems, due to the ecosystem processes linked to provision and transport of water in the landscape.

Stipagrostis ciliata – Aristida congesta open grassland

The open, sparse grassland is dominated by Stipagrostis ciliata and Aristida congesta. The shrubby *Rhigozum trichotomum* is prominent on the sandy localities while *Salsola aphylla* is more prominent where calcrete is exposed (refer to Error! Reference source not found.**4**). Other dominant grass species occurring in this vegetation community include *Stipagrostis obtusa, Aristida adscensionis* and, to a much lesser extent, *Fingerhuthia africana* and *Eragrostis lehmanniana*.

Figure 2: *Acacia mellifera – Aristida congesta* dune open shrubland in the northern part of the study area.

Figure 3: *Parkinsonia africana* wash open shrubland running from left to right in the central part of the photo.

Figure 4: *Aristida congesta* open grassland.

Areas that have been disturbed by farming are considered of moderate conservation importance due to the fact that rehabilitation of these areas is possible. A grass mix of *Aristida congesta, Stipagrostis ciliata, Stipagrostis obtusa, Aristida adscensionis* and *Eragrostis lehmanniana* can be used. If shrubs or small trees are needed for soil retention of to increase biodiversity features, *Acacia mellifera* can be used, *Boscia foetida* can also be used but it must be noted that these are slow growing thus are seldom used in rehabilitation.

3. REHABILITATION METHODS

Any areas disturbed during the construction phase should be encouraged to rehabilitate as fast and effective as possible and, where deemed necessary by the ECO, artificial rehabilitation (e.g. re-seeding with collected or commercial indigenous seed mixes) should be applied in order to speed up the rehabilitation process in critical areas (e.g. steep slopes and unstable soils).

» Immediately after replacing topsoils in disturbed areas, the soil surface must be revegetated with a suitable plant cover.
» It is expected that soil seed banks of indigenous vegetation will be present to initiate initial vegetation cover. However, simply applying this topsoil to a well-prepared rehabilitation site does not result in the same species richness and diversity as the surrounding areas. In some areas the natural regeneration of the vegetation may be poor and the application relevant of seed to enhance vegetation recovery may be required.
» Where possible, seed should be collected from plants present at the site during plant rescue oprerations. Indigenous seeds may also be harvested for purposes of re-vegetation in areas that are free of alien or invasive vegetation, either at the site prior to clearance or from suitable neighbouring sites.
» Seed collection should be undertaken by a suitably qualified specialist who is familiar with the various seed types associated with the plant species and rehabilitation in the area.
» Seed collection may be done throughout the year as seed ripens, but can also be restricted to summer, when a large amount of the perennial seed should have ripened. The collection of unripe seeds will reduce the percentage germination thereby reducing the effectiveness of the rehabilitation efforts. Seeds should be stored in paper or canvas bags dusted with insecticide, and sown at the onset of the rainy season.
» Seed can be sown onto the soil, but should preferably be applied in conjunction with measures to improve seedling survival such as scarification of the soil surface or simultaneous application of mulch. Additional organic material may be added to the soil mix, if required, to assist with water retention during the early stages of seedling establishment.
» It should be ensured that the seed mix is as diverse as possible in the first season. After the first season, when pioneer plant communities have successfully established,

attempts should be made to re-sow and replant the area with more perennial and woody species. It is a process that will require several follow-ups.

» Planting is dependent on species involved. Planting of species recommended for rehabilitation should be carried out as far as is practicable to coincide with the onset of the first significant rains. In general however, planting should commence as soon as possible after construction is completed in order to minimise the potential for erosion.
» The final vegetation cover should resemble the original (non-encroached and indigenous) vegetation composition and structure as far as practicably possible.
» Progressive rehabilitation is an important element of the rehabilitation strategy and should be implemented where feasible. Re-vegetation of disturbed surfaces must occur immediately after construction activities are completed.
» Once revegetated, areas should be protected to prevent trampling and erosion.
» No construction equipment, vehicles or unauthorised personnel should be allowed onto areas that have been vegetated.
» Any erosion channels or wash aways developing after revegetation should be restored to a stable condition.

4. MONITORING AND FOLLOW-UP ACTION

The following are the minimum criteria that should be monitored within the road reserve during road maintenance activities:

» Composition, density and stability of replanted vegetation.
» Associated nature and stability of surface soils.
» Emergence of alien and invasive plant species. If noted, remedial action must be taken immediately.

The initial revegetation period post-construction is estimated to be over a period of 6 months (minimum) to 12 months. The rehabilitation phase (including post seeding maintenance) should be at least 12 months (depending on time of seeding and rainfall) to ensure establishment of an acceptable plant cover is achieved (excluding invasive plant species or weeds).

Monitoring and follow-up action is important in order to achieve the desired cover and soil protection. The following monitoring protocol is recommended:

» Re-vegetated areas should be monitored every 4 months for the first 12 months following construction.
» Re-vegetated areas showing inadequate surface coverage (less than 20% within 12 months after re-vegetation) should be prepared and re-vegetated.
» Any areas showing erosion should be re-contoured and seeded with indigenous grasses or other locally occurring species which grow quickly.

If the plants have not established and the acceptable plant cover is not achieved within the specified maintenance period, maintenance of these areas shall continue until an acceptable plant cover is achieved (excluding alien plant species or weeds). Additional seeding or planting may be necessary to achieve acceptable plant cover. Hand seeding may have to be considered as an option in this case.

Monitoring of rehabilitation success and follow-up adaptive management, together with clearing of emerging alien plant species should continue for as long as considered necessary, depending on regrowth rates.

APPENDIX G:
EROSION AND STORMWATER MANAGEMENT PLAN

PRINCIPLES FOR EROSION AND STORMWATER MANAGEMENT PLAN

1. PURPOSE

Exposed and unprotected soils are the main cause of erosion in most situations. Therefore, this erosion management plan and the revegetation and rehabilitation plan are closely linked to one another and should not operate independently, but should rather be seen as complementary activities within the broader environmental management of the site and should therefore be managed together.

This Erosion Management Plan addresses the management and mitigation of potential impacts relating to soil erosion. The objective of the plan is to provide:

» A general framework for soil erosion and sediment control, which enables the identification of areas where erosion can occur and is likely to be accelerated by construction related activities.
» An outline of general methods to monitor, manage and rehabilitate erosion prone areas, ensuring that all erosion resulting of the development is addressed.

2. RELEVANT ASPECTS OF THE SITE

Within a broad 20 km buffer area, Portion 4 of the Farm Scuitklip 92 is covered by five land types, namely:

» Ae67 (Red, freely-drained soils, high base status)
» Ag2, Ag37 (Shallow, red, freely-drained soils, high base status)
» Fb142 (Shallow lithosols and rock, mostly calcareous)
» Ic136 (Mostly rock, little soil)

The majority of the study area are red-yellow apedal soils, freely drained, with a high base status and <300 mm deep, with about one fifth of the area deeper than 300 mm, typical of Ag and Ae land types. A summary of the dominant soil characteristics is given in **Table 1** below.

Table 1 Land types occurring (with soils in order of dominance).

Land Type	Dominant soils	Depth (mm)	Percent of land type	Characteristics	Agric. Potential (%)
Ae67	Hutton 32/25/42/45 Hutton 32/25/42/45 Rock	500-1000 200-300 -	49% 30% 13%	Red, sandy soils on hard rock and calcrete Red, sandy topsoils on hard rock and calcrete -	High: 0.0 Mod: 49.0 **Low: 51.0**
Ag2	Hutton	100-300	48%	Red, sandy topsoils on hard	High:

	34/44/45/46 Mispah 10/12/14/22 Rock	50-150 -	29% 7%	rock and calcrete Grey-brown, sandy/loamy topsoils on hard rock/calcrete –	0.0 Mod: 12.0 **Low: 88.0**
Ag37	Hutton 32/35/42/45 Rock Dundee 10 + Oakleaf 24	200-300 - 500-1000	48% 20% 15%	Red, sandy topsoils on hard rock and calcrete - Red-brown, alluvial soils on calcrete	High: 0.0 Mod: 23.0 **Low: 77.0**
Fb142	Rock Mispah + Glenrosa Hutton 32/35	- 100-350 100-300	54% 25% 13%	 Grey-brown, sandy/loamy topsoils on hard rock/calcrete Red, sandy topsoils on hard rock and calcrete	High: 0.0 Mod: 8.0 **Low: 92.0**
Ic136	Rock Mispah 10/20	- 50-150	89% 7%	 Grey-brown, sandy/loamy topsoils on hard rock/calcrete	High: 0.0 Mod: 3.5 **Low: 96.5**

Soils on the site have below 5% dominant clay in the top soils. The soils are moderately susceptibility to water erosion which varies across the project site. The general assumption is that the erosion susceptibility increases with an increase in the slope angle and/if the slope length is constant.

3. EROSION AND SEDIMENT CONTROL PRINCIPLES

The goals of erosion control during and after construction for the length of the realigned road should be to:

» Protect the land surface within the road reserve and beyond from erosion;
» Intercept and safely direct and dissipate run-off water from the road/pavement surface without allowing it to cause erosion.
» Contain soil erosion, whether induced by wind or water forces, by constructing protective works to trap sediment at appropriate locations. This applies particularly during construction.
» Plan and construct stormwater management systems to remove contaminants before they pollute surface waters or groundwater resources.
» Reduce stormwater flows as far as possible by the effective use of attenuating devices (such as swales, berms, silt fences). As construction progresses, the stormwater control measures are to be monitored and adjusted to ensure complete erosion and pollution control at all times.
» Design culvert inlet structures to ensure that the capacity of the culvert does not exceed the pre-development stormwater flow at that point. Provide detention storage on the road and/or upstream of the stormwater culvert; and
» Progressively revegetate or stabilise disturbed areas.

These goals can be achieved by applying the management practices outlined in the following sections.

3.1. On-Site Erosion Management

General factors to consider regarding erosion risk at the site includes the following:

» Due to the sandy nature of soils in the study area, soil loss will be greater during dry periods as it is more prone to wind erosion.
» Soil loss will be greater on steeper slopes. Ensure that steep slopes are not de-vegetated unnecessarily and subsequently become hydrophobic (i.e. have increased runoff and a decreased infiltration rate) increasing the erosion potential.
» Soil loss is related to the length of time that soils are exposed prior to rehabilitation or stabilisation. Therefore the gap between construction activities and rehabilitation should be minimised. Phased construction and progressive rehabilitation, where practically possible, are therefore important elements of the erosion control strategy.
» The extent of disturbance will influence the risk and consequences of erosion. Therefore site clearing should be restricted to areas required for construction purposes only.
» The road should be planned and constructed in a manner which minimises the erosion potential. The road should therefore follow the natural contour as far as possible.
» Ensure that development does not increase the rate of stormwater flow above that which the natural ground can safely accommodate at any point in the sub-catchments.
» Where necessary, the new road constructed should include water diversion structures present with energy dissipation features present to slow and disperse the water into the receiving area.
» The road and other disturbed areas should be regularly monitored for erosion. Any erosion problems recorded should be rectified as soon as possible and monitored thereafter to ensure that they do not re-occur.
» Compacted areas should have adequate drainage systems to avoid pooling and surface flow. Where compaction does occur during construction outside of the pavement area, the areas should be ripped.
» All bare areas should be revegetated with appropriate locally occurring species, to bind the soil and limit erosion potential.
» Gabions and other stabilisation features should be used on steep slopes and other areas vulnerable to erosion to minimise erosion risk as far as possible.
» Topsoil should be removed and stored in a designated area separately from subsoil and away from construction activities (as per the recommendations in the EMPr). Topsoil should be reapplied where appropriate as soon as possible in order to encourage and facilitate rapid regeneration of the natural vegetation in cleared areas.

» Regular monitoring of the site for erosion problems during construction (ongoing) and operation (at least twice annually) is recommended, particularly after large summer thunderstorms have been experienced.

3.1. Engineering Specifications

A detailed engineering specification Stormwater Management Plan describing and illustrating the proposed stormwater control measures must be prepared by the Civil Engineers during the detailed design phase and should include erosion control measures. Requirements for project design include:

» Erosion control measures to be implemented before and during the construction period, including the final stormwater control measures (post construction).
» All temporary and permanent water management structures or stabilisation methods must be indicated within the Stormwater Management Plan.
» The drainage system for the site should be designed to specifications that can adequately deal with a 1:50 year intensity rainfall event or more to ensure sufficient capacity for carrying stormwater away.
» Procedures for stormwater flow through a project site need to take into consideration both normal operating practice and special circumstances. Special circumstances in this case typically include severe rainfall events.
» An on-site Engineer or Environmental Officer (EO)/ SHE Representative to be responsible for ensuring implementation of the erosion control measures on site during the construction period. The ECO to monitor the effectiveness of these measures on the interval agreed upon with the Site Manager and EO.

3.2. Monitoring

The site must be monitored continuously during construction and operation in order to determine any indications of erosion. If any erosion features are recorded as a result of the activities on-site, the Environmental Officer (EO)/ SHE Representative (during construction) or Environmental Manager (during operation) must:

» Assess the significance of the situation.
» Photograph the areas of soil degradation as a record.
» Determine the cause of the soil erosion.
» Inform the contractor/operator that rehabilitation must take place and that the contractor/operator is to implement a rehabilitation method statement and management plan to be approved by the Site/Environmental Manager in conjunction with the ECO.
» Monitor that the contractor/operator is taking action to stop the erosion and assist them where needed.

» Report and monitor the progress of the rehabilitation weekly and record all the findings in a site register (during construction).
» All actions with regards to the incidents must be reported on a monthly compliance report which should be kept on file for if/when the Competent Authority requests to see it (during construction) and kept on file for consideration during the annual audits (during construction and operation).

The Contractor (in consultation with an appropriate specialist, e.g. an engineer) must:

» Select a system/mechanism to treat the erosion.
» Design and implement the appropriate system/mechanism.
» Monitor the area to ensure that the system functions like it should. If the system fails, the method must be adapted or adjusted to ensure the accelerated erosion is controlled.
» Continue monitoring until the area has been stabilised.

4. CONCLUSION

The implementation of management measures is not only good practice to ensure minimisation of degradation, but also necessary to ensure compliance with legislative requirements. This document forms part of the EMPr, and is required to be considered and adhered to during the design, construction, and maintenance phases of the project (if and where applicable).

5. REFERENCES

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APPENDIX H:
HERITAGE MONITORING PROGRAMME

HERITAGE MONITORING PROGRAMME: CHANCE FIND PROCEDURES

1. PURPOSE AND RELEVANT ASPECTS OF THE SITE

The rocky outcrops and hills all had some trace of human activity from Stone Age to colonial times, with (from the Later Stone Age) small scatters of ostrich eggshell, quartz flakes and an upper grindstone adjacent to a bedrock grinding surface; a large core (Earlier Stone Age); and two instances of rectangular dry-packed stone walling (colonial). The landscape features are considered as sensitive and a no-go buffer of 60m has been recommended. Stone Age artefacts are considered to be of low sensitivity, but their cumulative significance is higher as the artefacts are particularly focused at these landscape features. The outcrop situated nearest to the 40m road realignment corridor is approximately 1.5km away.

Several memorial sites are located below Ysterberg which are regarded as high sensitivity and it is recommended that these memorial markers be respected by way of a 10m buffer zone. These memorials are completely avoided by the realignment of a section of the MN73 and the 40m assessment corridor. The open plains have been found to have sparsely scattered artefacts of which none have been identified within the 40m assessment corridor. Therefore, all these heritage features i.e. memorial sites, rocky features and scattered artefacts have been considered and will not be impacted by the road realignment.

Portion 4 of the Farm Scuitklip 92 consists of a sediment-choked drainage plain crossed by ephemeral, braided stream flows produced in a sheetflood and flashflood sediment-transport regime. Colluvial and aeolian deposits occur along the drainage-plain margins. The road realignment entails shallow disturbance of these superficial, geologically young (Quaternary) deposits which have low palaeontological potential and sensitivity. Very few fossils have been found in this context in the Northern Cape. Although there is a low probability of fossils within the project site, any find will be of considerable importance.

The purpose of this Heritage Monitoring Programme is to provide guidelines for potential finds and a reporting/action protocol for when finds are uncovered as well as to implement avoidance and mitigation measures, in addition to the mitigations included in the Environmental Management Programme (EMPr) to reduce the impact of the development of the road realignment on heritage features.

2. FOSSIL FIND PROCEDURE

In the context under consideration, it is improbable that fossil finds will require declarations of permanent "no go" zones. At most, a temporary suspension in activity at

a limited locale may be required. The strategy is to rescue the material as quickly as possible. The procedures suggested below are in general terms, to be adapted as befits a context. They are couched in terms of finds of fossil bones that usually occur sparsely, such as in the aeolian deposits. However, they may also serve as a guideline for other fossil material that may occur.

Bone finds can be classified as two types:
» isolated bone finds; and
» bone cluster finds.

2.1. ISOLATED BONE FINDS

In the process of digging the excavations, isolated bones may be spotted in the hole sides or bottom, or as they appear on the spoil heap. Therefore, isolated bone finds refer to bones that occur singly, in different parts of the excavation. If the number of distinct bones exceeds 6 pieces, the finds must be treated as a bone cluster (described below).

Response by personnel in the event of isolated bone finds:
» Action 1: An isolated bone exposed in an excavation or spoil heap must be retrieved before it is covered by further spoil from the excavation and set aside.
» Action 2: The site foreman and ECO must be informed.
» Action 3: The responsible field person (site foreman or ECO) must take custody of the fossil. The following information to be recorded:
    - Position (excavation position).
    - Depth of find in hole.
    - Digital image of hole showing vertical section (side).
    - Digital image of fossil.
» Action 4: The fossil should be placed in a bag (e.g. a Ziplock bag), along with any detached fragments. A label must be included with the date of the find, position info, depth.
» Action 5: ECO contacts the standby archaeologist and/or palaeontologist. ECO to describe the occurrence and provide images as soon as possible.

Response by Palaeontologist in the event of isolated bone finds:
The palaeontologist will assess the information and liaise with the developer, the environmental consultant and the ECO and a suitable response will be established.

2.2. BONE CLUSTER FINDS

A bone cluster is a major find of bones, i.e. several bones in close proximity or bones resembling part of a skeleton. These bones will likely be seen in broken sections of the

sides of the hole and as bones appearing in the bottom of the hole and on the spoil heap.

Response by personnel in the event of a bone cluster find:
» Action 1: Immediately stop excavation in the vicinity of the potential material. Mark (flag) the position and also spoil that may contain fossils.
» Action 2: Inform the site foreman and the ECO.
» Action 3: ECO contacts the standby archaeologist and/or palaeontologist. ECO to describe the occurrence and provide images as soon as possible.

Response by Palaeontologist in the event of a bone cluster find:
The appointed palaeontologist will assess the information and liaise with the developer and the environmental consultant and a suitable response will be established. It is likely that a Field Assessment by the palaeontologist will be carried out as soon as possible.

It will probably be feasible to "leapfrog" the find and continue the excavation farther along, or proceed to the next excavation, so that the work schedule is minimally disrupted. The response time/scheduling of the Field Assessment is to be decided in consultation with developer/owner and the environmental consultant.

The field assessment could have the following outcomes:
» If a human burial, the appropriate authority is to be contacted. The find must be evaluated by a human burial specialist to decide if Rescue Excavation is feasible, or if it is a Major Find.
» If the fossils are in an archaeological context, an archaeologist must be contacted to evaluate the site and decide if Rescue Excavation is feasible, or if it is a Major Find.
» If the fossils are in a palaeontological context, the palaeontologist must evaluate the site and decide if Rescue Excavation is feasible, or if it is a Major Find.

2.3. RESCUE EXCAVATION

Rescue Excavation refers to the removal of the material from the "design" excavation. This would apply if the amount or significance of the exposed material appears to be relatively circumscribed and it is feasible to remove it without compromising contextual data. The time span for Rescue Excavation should be reasonably rapid to avoid any or undue delays, e.g. 1-3 days and definitely less than 1 week.

In principle, the strategy during mitigation is to "rescue" the fossil material as quickly as possible. The strategy to be adopted depends on the nature of the occurrence, particularly the density of the fossils. The methods of collection would depend on the preservation or fragility of the fossils and whether in loose or in lithified sediment. These could include:
» On-site selection and sieving in the case of robust material in sand.

» Fragile material in loose/crumbly sediment would be encased in blocks using Plaster-of Paris or reinforced mortar.

If the fossil occurrence is dense and is assessed to be a "Major Find", then carefully controlled excavation is required.

2.4. MAJOR FINDS

A Major Find is the occurrence of material that, by virtue of quantity, importance and time constraints, cannot be feasibly rescued without compromise of detailed material recovery and contextual observations. A Major Find is not expected at the project site.

In consultation with the developer and the environmental consultant, the following options should be considered when deciding on how to proceed in the event of a Major Find:

Option 1: Avoidance
Avoidance of the major find through project redesign or relocation. This ensures minimal impact to the site and is the preferred option from a heritage resource management perspective. When feasible, it can also be the least expensive option from a construction perspective.

The identified site will require site protection measures, such as erecting fencing or barricades. Alternatively, the exposed finds can be stabilised and the site refilled or capped. The latter is preferred if excavation of the find will be delayed substantially or indefinitely. Appropriate protection measures should be identified on a site-specific basis and in wider consultation with the heritage and scientific communities.

This option is preferred as it will allow the later excavation of the finds with due scientific care and diligence.

Option 2: Emergency Excavation
Emergency excavation refers to the "no option" situation wherein avoidance is not feasible due to design, financial and time constraints. It can delay construction and emergency excavation itself will take place under tight time constraints, with the potential for irrevocable compromise of scientific quality. It could involve the removal of a large, disturbed sample by excavator and conveying this by truck from the immediate site to a suitable place for "stockpiling". This material could then be processed later. Consequently, emergency excavation is not a preferred option for a Major Find.

3. CHANCE FIND PROCEDURE

If during the construction, operations or closure phases of this project, any person employed by the developer, one of its subsidiaries, contractors and subcontractors, or service provider, finds any artefact of cultural significance, this person must cease work at the site of the find and report this find to their immediate supervisor, and through their supervisor to the senior on-site manager. It is the responsibility of the SHE to make an initial assessment of the extent of the find, and confirm the extent of the work stoppage in that area.

The ECO must be informed of the chance find and the ECO must then contact a professional archaeologist/palaeontologist for an assessment of the finds who will notify the SAHRA.

4. CONCLUSION

The implementation of management measures is not only good practice to ensure minimisation of impacts on heritage finds, but also necessary to ensure compliance with legislative requirements. This document forms part of the EMPr, and is required to be considered and adhered to during the design, construction, and maintenance phases of the project (if and where applicable).

APPENDIX I:
CURRICULUM VITAE OF THE PROJECT TEAM

CURRICULUM VITAE
(Energy-related projects)

KAREN JODAS

SAVANNAH ENVIRONMENTAL (PTY) LTD

Profession	:	Environmental Management and Compliance Consultant ; Environmental Assessment Practitioner
Specialisation	:	Strategic environmental assessment and advice; project management and co-ordination of environmental projects; environmental compliance advise and monitoring; Environmental Impact Assessment; environmental management; peer review; policy, strategy and guideline formulation; renewable energy projects; water resources management
Work experience	:	Nineteen (19) years in the environmental assessment and management field

VOCATIONAL EXPERIENCE

Provide technical input for projects in the environmental management field, specialising in strategic evaluation, Environmental Impact Assessment studies, Environmental Management Plans, integrated environmental management, environmental compliance monitoring; peer review of EIA reports and processes, strategy and guideline development, and public participation. Key focus on overall Project Management, integration of environmental studies and environmental processes into larger engineering-based projects, strategic assessment, and the identification of environmental management solutions and mitigation/risk minimising measures.

Undertaking studies requiring all environmental-related disciplines has allowed for considerable experience to be gained in the environmental assessment and management fields. A specialist area of focus is on management and assessment of multi-faceted projects, including electricity generation and transmission projects (with a strong focus on the renewable energy sector), linear developments (roads and power lines), bulk infrastructure and supply (e.g. WTWs, pipelines, landfills), the mining industry, urban, rural and township developments, environmental aspects of IDPs, EMFs, SoERs, as well as environmental planning, development and management.

Working knowledge of environmental legislation, strategies, guidelines and policies. Compilation of the reports for environmental studies are in accordance with the all relevant environmental legislation under the National Environmental Management Act.

SKILLS BASE AND CORE COMPETENCIES

- Nineteen years of experience in the environmental management, impact assessment and compliance fields
- Seventeen years of experience in Project Management - Project management of large environmental assessment and management projects
- Strategic and compliance advise for all aspects of environmental assessment and management
- External and peer review of environmental assessment and compliance reporting as well as EIA processes
- Working knowledge of environmental planning policies, regulatory frameworks and legislation
- Identification and assessment of potential environmental impacts and benefits
- Development of practical and achievable mitigation measures and management plans and evaluation of risk to project execution

- Experienced in environmental compliance advise, monitoring and reporting for construction projects
- Compilation and review of the reports in accordance with all relevant environmental legislation
- Public participation/involvement and stakeholder consultation
- Environmental strategy, policy and guidelines development
- Experienced in assessments for both linear developments and nodal developments
- Key experience in the assessment of impacts associated with renewable energy projects
- Wide range of experience for public and private sector projects
- Completed projects in all nine Provinces of South Africa, as well as Zambia and Lesotho

EDUCATION AND PROFESSIONAL STATUS

Degrees:
- B.Sc Earth Sciences, majoring in Geography and Zoology, *Rhodes University, Grahamstown,* 1993
- B.Sc Honours in Geography (in Environmental Water Management), *Rhodes University, Grahamstown,* 1994. Major subjects included Water Resources Management, Streams Ecology, Fluvial Geomorphology and Geographic Information Systems.
- M.Sc in Geography (Geomorphology), *Rhodes University, Grahamstown,* 1996

Short Courses:
Water Quality Management, *Potchefstroom University,* 1998
Environmental Law Course, *Aldo Leopold Institute*, 2002
WindFarmer Wind Farm Design course, *Garrad Hassan*, 2009

Professional Society Affiliations:
Registered with the South African Council for Natural Scientific Professions as a Professional Natural Scientist: *Environmental Scientist (400106/99)*

Other Relevant Skills:
Xtrack Extreme – Advanced Off-Road Driving Course (2003)

EMPLOYMENT

2006 - Current: Director of *Savannah Environmental (Pty) Ltd.* Independent specialist environmental consultant, Environmental Assessment Practitioner (EAP) and advisor. Primary focus on energy-sector projects.

1997 –2005: Associate of *Bohlweki Environmental (Pty) Ltd*. Environmental Management Unit: Manager; Principle Environmental Scientist focussing on Environmental Management and Project Management.

PROJECT EXPERIENCE

Experience includes projects associated with electricity generation and transmission, wastewater treatment facilities, mining and prospecting activities, property development, and national roads, as well as strategy and guidelines development. Selected projects in the energy and renewable energy sector include:

Strategic and Regional Assessments
- *Regional Assessment for wind energy developments within an identified area on the West Coast of the Western Cape Province (for Eskom Holdings Limited)*
- *Five Regional Assessment for wind energy developments within five identified area across South Africa (for Eskom Holdings Limited)*
- *Part of the Strategic Task Team for the identification of Eskom's future wind farm sites (Wind 1000) (for Eskom Holdings Limited)*
- *Regional Assessment for wind energy developments within an identified area in the De Aar Area of the Northern Cape Province (for juwi Wind)*
- *Strategic Regional Assessment for the Environmental Suitability of Wind Energy Facilities for the entire Western Cape Province (for DEA&DP)*

- *Regional Assessments for wind energy developments within identified areas in the Northern and Eastern Cape, including mapping (for Networx)*

Renewable power generation projects: Wind Energy Facilities

Environmental Impact Assessments and Environmental Management Plans

- *ABs Wind Energy Facility near Indwe, Eastern Cape (for Rainmaker Energy)*
- *Amakhala Emoyeni Wind Energy Facility near Cookhouse, Eastern Cape (for Windlab Developments)*
- *Castle Wind Energy Facility, in De Aar (for Juwi Renewable Energies)*
- *Cookhouse II Wind Energy Facility (for ACED & Tertia Waters)*
- *Dorper Wind Energy Facility near Molteno, Eastern Cape (for Rainmaker Energy)*
- *Elliot Wind Energy Facility (for Rainmaker Energy)*
- *Garob Wind Energy Facility, in Copperton (for Juwi Renewable Energies)*
- *Gouda Wind Energy Facility near Gouda, Western Cape (for VentuSA)*
- *Gunstfontein Wind Energy Facility (for Networx)*
- *Happy Valley Wind Energy Facility, Eastern Cape (for REISA)*
- *Hidden Valley Wind Energy Facility (for ACED)*
- *Hopefield Wind Energy Facility (for Umoya Energy)*
- *Karoo Renewable Wind and PV Solar Energy Facility near Victoria West, Northern & Western Cape (for SARGE)*
- *Pofadder 3x 140MW Wind Energy Facilities, Northern Cape (for Mainstream Renewable)*
- *Riverbank Wind Energy Facility near Wesley, Eastern Cape (for Just Energy)*
- *Sere Wind Energy Facility on the West Coast in the Western Cape (for Eskom Generation)*
- *Springfontein Wind Energy Facility (for Mainstream Renewable)*
- *Stormberg Wind Energy Facility (for Networx)*
- *West Coast One Wind Energy Facility (for Moyeng Energy (Pty) Ltd)*
- *West Coast Wind Energy Facility (for Exxaro)*
- *Wind Energy Facility at Cookhouse, Eastern Cape (for African Clean Energy Developments)*
- *Wind Energy Facility near Britannia Bay, Western Cape (for TerraPower Solutions)*
- *Zen Wind Energy Facility, near Gouda (for VentuSA Energy)*

Basic Assessments for wind monitoring masts

- *Caledon, Worcester, Tulbach Wind Energy Facilities (for SAGIT)*
- *Dorper, ABs, Dobos Wind Energy Facilities (for Rainmaker Energy)*

Compliance Advice

- *Amakhala Emoyeni Wind Energy Facility (for Amakhala Emoyeni)*
- *Amakhala Emoyeni Wind Energy Facility, Environment and Social Action Plan (for Cennergi)*
- *Cookhouse Wind Energy Facility site (for ACED Cookhouse Renewables)*
- *Cookhouse II Wind Energy Facility (for ACED)*
- *Dorper Phase 1 Wind Energy Facility (for Rainmaker Energy)*
- *Gouda Wind Farm (for Aveng / Acciona)*
- *Happy Valley Wind Energy Facility (for VentuSA Energy / EDPR)*
- *Loperberg Wind Farm (for Rainmaker Energy)*
- *Nobelsfontein Wind Energy Facility (for Coria / SARGE)*
- *Nojoli Wind Energy Facility (for ACED)*
- *Oyster Bay Wind Energy Facility (for RES)*

Due Diligence Reporting

- *ESG DD for Loeriesfontein, Khobab and Noupoort Wind Energy Facilities (for Actis)*

Renewable power generation projects: Solar Energy Facilities

Environmental Impact Assessments and Environmental Management Plans

- *5x CSP and 2x PV Solar Energy Facilities, Kenhardt, Northern Cape (for Kotulo Tsatsi)*
- *Blackwood PV Solar Energy Facility, near Kimberley/Boshoff (for VentuSA Energy)*
- *Bosjesmansberg PV Solar Energy Facility, Copperton (for Networx)*
- *Boundary PV Solar Energy Facility (for VentuSA Energy)*
- *De Aar CSP Energy Facility at De Aar, Northern Cape (for African Clean Energy Developments)*
- *De Aar PV Solar Energy Plant (for Solar Capital)*
- *Gihon and Kison PV Solar Energy Facilicies (for Networx)*

- *Grootdrink (Albany) PV Solar Energy Facility (for Africoast Engineers)*
- *Gunstfontein PV Solar Energy Facility (for Networx)*
- *Kabi Kimberley PV facility at DeBeers, Kimberley (Kabi Solar)*
- *Karoo Renewables PV Solar Energy Facility (for SARGE)*
- *KaXu CSP Facility near Pofadder, Northern Cape (for Abengoa Solar)*
- *Kheis Phase 1, 2 & 3 PV Solar Energy Facility (for GeStamp Solar)*
- *Khi CSP Facility near Upington, Northern Cape (for Abengoa Solar)*
- *Klipgat PV Solar Energy Facility (for Terra Solar)*
- *Loeriesfontein/Helios PV Solar Energy Plant (for Solar Capital)*
- *Naauwpoort PV Solar Energy Facility (for Terra Solar)*
- *Pofadder 75MW Solar Energy Facility, Northern Cape (for Mainstream Renewable)*
- *Prieska PV Solar Energy Facility, Prieska (for VentuSA Energy)*
- *PV Solar Energy Facility near De Aar, Northern Cape (for Solar Capital)*
- *Ritchie PV Solar Energy Facility (for Solar Capital)*
- *San Solar PV Solar Energy Facility, Kathu (for VentuSA Energy)*
- *Sirius (Tungston Lodge) x2 - PV Solar Energy Plants (for Aurora Power Solutions)*
- *Solar Plant in the Northern Cape Solar at Kathu (Wincanton) (for REISA)*
- *Solar Plant in the Northern Cape Solar at Sishen (Wincanton) (for VentuSA Energy)*
- *Stormberg Solar PV Solar Energy Facility (for Networx / Prana Energy)*
- *Tiger Kloof PV Solar Energy Facility (for Kabi Energy)*
- *Tiger Solar PV Solar Energy Facility, Northern Cape (for Kabi Energy)*
- *Upington 2 and 3 CSP Facilites near Upington, Northern Cape (for Abengoa Solar)*
- *Vaalkop and Witkop PV Solar Energy Facilities, North West (for Kabi Solar)*
- *Wagnbietjiespan PV Solar Energy Facility near Boshoff, Free State (for VentuSA)*
- *Wolmaransstad Municipality Solar PV Solar Energy Facility (for BlueWave)*
- *Xina CSP facility near Pofadder, Northern Cape (or Abengoa Solar)*
- *Zuurwater PV Solar Energy Facilities (x4) (for Solafrica / BlueWave)*

Basic Assessments
- *Amandla Welanga and Dida PV Solar Energy Facilities(for Terra Solar)*
- *Carolusberg PV Solar Energy Facility (for Ilio Energy (SARGE))*
- *Gosforth Park and Kynoch Rooftop PV Solar Energy (for Building Energy)*
- *Hibernia 5MW PV Solar Energy Facility (for EA Energy)*
- *Inkulukelo PV Solar Energy Facility (for Terra Solar)*
- *Kokerboom and Boabab PV Solar Energy Plants (for Brax Energy)*
- *Nigramoep PV Solar Energy Plant, Nababeep (for SARGE)*
- *Noupoort (Kleinfontein and Toitdale) CPV (for Terra Power)*
- *O'Kiep 1 PV Solar Energy Plant, Springbok (for Ilio Energy (SARGE))*
- *O'Kiep 2 PV Solar Energy Plant, Springbok (for BluePort Trade 118 (SARGE))*
- *O'Kiep 3 PV Solar Energy Plant (for Ilio Energy (SARGE))*
- *PV Solar Energy Plant - Kimberley (for Kabi Energy)*
- *Slurry PV Solar Energy Facility (for PPC)*
- *Small projects for PV Solar Energy Facilities (for BlueWave)*
- *Son Sitrus Rooftop PV Solar Energy (for Building Energy)*
- *Tollie PV Solar Energy Facility (for Terra Solar)*
- *x2 Southern Farms PV Solar Energy Plants, Augrabies (for Southern Farms)*

Compliance
- *Bokpoort PV Solar Energy Facility (for Solafrica)*
- *Kathu II Bid compliance (for Building Energy)*
- *Kathu PV Solar Energy Facility (for Building Energy / REISA)*
- *Pofadder and Upington CSP (for Abengoa Solar)*
- *Prieska PV Solar Energy Facility (for VentuSA)*
- *Sishen PV Solar Energy Facility phase 1, 75MW (for Aveng / Acciona)*
- *Xina compliance (for Abengoa Solar)*

Screening Studies
- *75MW facilities criteria-based analysis screenings (for BlueWave)*
- *Allemans, Wonderheuwel, Damfontein, Dida PV Solar Energy Facilities (for Terra Solar)*
- *Bobididi 5MW PV Solar Energy Facility (for Root 60Four Energy)*
- *Bosjesmansberg PV Solar Energy Facility, Copperton (for Networx)*
- *Lephalale PV Solar Energy Facility (for Exxaro)*
- *Northern Cape 5MW PV Solar Energy Facility, 2nd Stage One (for EDIP)*

- *Senekal 1 & 2, Pongola and Newcastle PV Solar Energy Facilities (for Building Energy)*
- *Small projects - PV Solar Energy Facility (x15) (for Building Energy)*
- *Small projects PV Solar Energy Facility (x3) (for GeoSolar)*
- *Small scale PV Solar Energy Facility - 2nd Stage One (for BlueWave)*
- *Small scale PV Solar Energy Facility - 2nd Stage One (for Building Energy)*
- *Various PV Solar Energy Facilities (for INCA Energy)*

Siting Study
- *CSP siting study (for Exxaro)*

Due Diligence Reporting
- *Equator Principles Due Diligence reporting - Kabi Kimberley PV plant (for Enertis Solar)*
- *Equator Principles Due Diligence reporting - Vaal River Solar 1 PV plant (for Enertis Solar)*

Power Generation Projects

Environmental Impact Assessments and Environmental Management Plans
- *Ankerlig OCGT to CCGT Conversion project, and the associated 400 kV transmission power line between Ankerlig and the Omega Substation, Western Cape (for Eskom Generation)*
- *Gourikwa OCGT to CCGT Conversion project, and the associated 400 kV transmission power line between Gourikwa and the Proteus Substation, Mossel Bay(for Eskom Generation)*

Basic Assessments
- *New raw water reservoir and pipeline for the Medupi Power Station, Limpopo Province (for Eskom Generation)*
- *Substation for Aggeneys PV facility (for BioTherm Energy)*

Screening
- *Indwe Power Station (for IPSA)*
- *IPP Baseload screening (coal) (for Exxaro)*

Siting Study
- *Siting study for a coal fired power station in the Bethal area (for ISS Global)*

Power line projects

Environmental Impact Assessments and Environmental Management Plans
- *Steelpoort Integration Project, Limpopo Province (for Eskom Transmission)*
- *Kyalami/Midrand Substation and 3 Transmission lines, Gauteng (for Eskom Transmission)*

Basic Assessments
- *Amakhala Emoyeni Power Line and Kopleegte substation (for Cennergi)*
- *Cuprum-Burchell; Burchell-Mooidraai power line BAR (Prieska) (for Eskom)*
- *Garob-Kronos Power Line (for Juwi Renewable Energies)*
- *Golden Valley Dx-Poseidon line and substation & Golden Valley-Kopleegte power line (for BioTherm Energy)*
- *Ilanga Lethemba-Hydra 132kV (for Solar Capital)*
- *Iziduli Emoyeni Substation, Power Line & LA18 (for Windlab)*
- *Kathu 132kV Power Line (for VentuSA Energy)*
- *Loeries 2 Power Line (for Mainstream Renewable)*
- *Loeriesfontein substation and power lines (for Mainstream Renewable)*
- *Nobelsfontein Wind Substation and Power line (for Coria / SARGE)*
- *Realignment of Dx lines at Hopefield Wind Energy Facility(for Umoya Energy)*
- *Rheboksfontein Power Line(for Moyeng Energy (Pty) Ltd)*
- *Sishen Solar PV Energy Facility 132kV Power line (for Aveng/Vexicom)*
- *Springfontein Power Line (for Mainstream Renewable)*
- *Wesley-Peddie / Riverbank Phase 2 Power Line 132 kV (for Just Energy)*

CURRICULUM VITAE
THALITA BOTHA

Profession	:	Junior Environmental Assessment Practitioner
Specialisation	:	Environmental Management
Years Experience	:	17 months

KEY RESPONSIBILITIES

- Professional execution of consulting services
- Impact assessment reporting
- Compliance monitoring and reporting
- Development of project proposals for procuring new projects
- Project administration

SKILLS BASE AND CORE COMPETENCIES

- EIA Report writing;
- Problem solving;
- Administrative tasks;
- GIS mapping;
- Analysis and manipulation of geographical information and technical experience with the use of ArcGIS; and
- Ability to work independently and in a team.

EDUCATION AND PROFESSIONAL STATUS

Degrees:

- *B.Sc. (Hons.) Environmental Management (2014), North-West University, Potchefstroom.*
- *B.Sc. Environmental- and Biological Science (2013), North-West University, Potchefstroom.*

EMPLOYMENT HISTORY

- 23 September 2015 – Current
  Savannah Environmental (Pty) Ltd: Junior Environmental Assessment Practitioner

PROJECT EXPERIENCE

Environmental Impact Assessments

- Environmental Impact Assessment for the Ilanga CSP 9 Project, Northern Cape Province (Emvelo Holdings)
- Environmental Management Programme for the Thaba Eco Hotel PV Solar System, Gauteng Province (Camco Clean Energy)
- Environmental Impact Assessment for the Noupoort CSP Project, Northern Cape Province (CRESCO Energy)
- Basic Assessment for the Gunstfontein Switching Station and 132kV overhead power line, Northern Cape Province (Gunstfontein Wind Farm)
- Revision of Environmental Management Programme (EMP) for the Hopefield Small Wind Farm, Western Cape Province (ACED)
- Environmental Impact Assessment for the proposed Hartebeest Wind Farm, Western Cape Province (Hartebeest Wind Farm)

GIS Mapping (ArcGIS 10.2)

- Noupoort CSP Project, Northern Cape Province.
- Sol Invictus PV Developments near Aggeneys, Northern Cape Province.
- Sol Invictus Shared Infrastructure and Housing Development near Aggeneys, Northern Cape Province.
- Environmental Management Programme for the Hopefield Small Wind Farm, Western Cape Province.
- Environmental Impact Assessment for the proposed Hartebeest Wind Farm, Western Cape Province.

CURRICULUM VITAE
GABRIELE WOOD

Profession	:	Public Participation and Social Consultant
Specialisation	:	Public Participation Process Implementation
Years experience	:	9 years

KEY RESPONSIBILITIES

Specific responsibilities as a Public Participation and Social Consultant include professional execution of public participation consulting for a variety of projects. This includes managing and coordinating public participation processes for Environmental Impact Assessments (EIA).

SKILLS BASE AND CORE COMPETENCIES

- Qualitative and Quantitative Social Research
- Social Assessment (Stakeholder and Social Analysis)
- Public participation process implementation, monitoring and evaluation
- Facilitation (Focus Groups, Community Meetings, Interest Group Meetings, Public Meetings, Public Open Days, Workshops, Forums, Committees, etc.)
- Stakeholder Management
- Community Needs Assessment
- Relocation Facilitation
- Project Administration
- Minute Taking
- Report Writing

EDUCATION AND PROFESSIONAL STATUS

Degrees:

- B. Hons. Anthropology (Cum Laude): University of Johannesburg (2004 – 2005)
- B.A. Psychology: University of Johannesburg (2002 – 2004)

Courses:

- International Association for Public Participation (IAP2) Certificate in Techniques for Effective Public Participation (2015)
- International Association for Public Participation (IAP2) Certificate in Foundations of Public Participation (Planning and Communication for Effective Public Participation) (2015)
- South African Advertising Research Foundation (SAARF) living Standards Measure (LSM) Training (2010).
- Certificate in Focus Group Moderation Skills, Market Research for Africa (2007)
- Prestige Diploma in Public Relations: Allenby Campus Boksburg now Damlin College (2001)

EMPLOYMENT

May 2012 – Current: Savannah Environmental (Pty) Ltd: Public Participation and Social Consultant

March 2007 – April 2012: NMA Effective Social Strategists (Pty) Ltd: Assistant Project Manager : Public Participation and Social Research

January 2005 – March 2007 (Part-time): University of Johannesburg: Department of Anthropology and Development Studies: Student Tutor and Research Assistant

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PROJECT EXPERIENCE

COAL FIRED POWER STATIONS:

- IPP Thabametsi Coal Fired Power Station – EIA (for Newshelf 1282)
- Transalloys Coal Fired Power Station – EIA (for Transalloys)
- Umbani Coal Fired Power Station – EIA (for ISS Global Mining)
- Tshivhaso Coal Fired Power Station – EIA (for Cennergi)

INTEGRATED WASTE WATER MANAGEMENT PLANS AND WATER USE LICENSE APPLICATIONS:

- IPP Thabametsi Coal Fired Power Station – IWWMP AND WULA (for Newshelf 1282)
- Yzermyn Coal Mine - IWWMP AND WULA (for Atha Africa Group)

GRID INFRASTRUCTURE CONNECTIONS AND SUBSTATIONS:

- Cuprum-Burchell and Burchell to Mooidraai – BA (for Eskom)
- Blackwood Power Line and Substation – BA (for VentuSA Energy)
- Iziduli Power Line and Substation – BA (for Windlab)
- 132kV Power Line for the authorised Excelsior Wind Farm (for Amstilinx (RF) (Pty) Ltd)
- Saldanha Bay Network Strengthening project – EIA (for Eskom SOC Limited)

RENEWABLE ENERGY PROJECTS:

- Karreebosch Wind Energy Facility – EIA (for G7 Renewable Energies)
- Tatuka PV Solar Energy Facility – EIA (for Eskom)
- Majuba PV Solar Energy Facility – EIA (for Eskom)
- Lethabo PV Solar Energy Facility – EIA (for Eskom)
- Karreebosch Wind Energy Facility – EIA (for G7 Energies)
- SolarReserve Kotulo Tsatsi Energy CSP Facilities – EIA (for SolarReserve & Kotulo Tsatsi Energy)
- Tewa Isitha Solar 1 & 2 PV Energy Facilities – EIA (for Africoast Engineering)
- Byromate Biomass Power Generation Facility – EIA (for Energuys)
- Bloemsmond Solar PV1 & PV2 Energy Facilities – EIA (for Atlantic Energy Partners)
- Buffels Solar 1 & 2 Energy Facilities – EIA (for Kabi Solar)
- Gunstfontein Wind Energy Facility – EIA (for Gunstfontein Wind Farm (Pty) Ltd)
- Ilanga CSP 7, 8 and 9 Solar Facilities – EIA (for Emvelo Eco Projects (Pty) Ltd)
- Sol Invictus 1 – 4 PV Solar Energy Facilities – EIA (for Cyracraft (Pty) Ltd)

Date of Birth

6 February 1972

Nationality

South African

Marital Status

Married

Drivers Licence

Code 08 (EB)

Age *43*

Education

Senior certificate with University Exemption

Bachelor of Science Degree (Majors: Zoology and Physiology)

Master of Science Degree (Environmental Science)

Currently PhD (Ecology and Zoology)

Certifications

Senior certificate with University Exemption

Languages

English – Fluent

Afrikaans – Fluent

Zulu – Fluent

Hudson Ecology (Pty.) Ltd. – Potchefstroom, South Africa

Position: Director/Senior Ecologist

Project conceptualisation

Skills growth and leadership

Develop and maintain linkages to universities and professional bodies

Development of new ecological products and methodologies

Project management

Ecology team growth and acquisition of new ecologists

Terrestrial ecological assessments

Biodiversity assessments

Biodiversity Action Plans

Development of intellectual capital

Employment History

Eques Trails Horse Safaris – Limpopo Province, South Africa
Position: Trail leader, Horse trainer (March 1993 to July 1993)

Leading horse trails with Big Five

Management of stables

Horse-training

Zabalaza Conservation Department – Kwazulu Natal, South Africa
Position: Head Ranger/Chief Instructor (July 1993 to July 1994)

Training in conservation and anti-poaching courses.

Evaluation and improvement of existing courses

Development of additional courses

Natal Parks Board – KwaZulu Natal, South Africa
Position: Anti-Poaching Consultant (Jul 1994 to Dec 1997)

Training of anti-poaching units.

Anti-poaching co-ordination

Training and co-ordination of anti poaching for Natal Parks Board

UNISA – Gauteng, South Africa
Position: Full-time student (BSc) (Jan 1998 to Dec 2001)
Majors: Zoology and Physiology

Other subjects: Chemistry, Physics, Botany

UNEP/GEF Desert Margins Program Potchefstroom – North West Province
Position: Researcher (Jan 2002 to Sept 2006)
Research in biodiversity and ecology in desert margins areas

Environmental awareness courses at local schools

Development of avian biological integrity index

ECOSUN cc. – Gauteng, South Africa
Position: Terrestrial and Wetland Ecologist (Sept 2006 to May 2007)
Wetland delineation

Terrestrial ecological assessments

Biodiversity assessments

Biodiversity Action Plans

Golder Associates Africa (Pty.) Ltd. – Midrand, South Africa
Position: Senior Ecologist and Terrestrial Group leader (May 2007 – August 2014)

Team leader

Project conceptualisation

Team skills growth and leadership

Develop and maintain linkages to universities and professional bodies

Development of new ecological products and methodologies

Project management

Ecology team growth and acquisition of new ecologists

Terrestrial ecological assessments

Biodiversity assessments

Biodiversity Action Plans

Development of intellectual capital

PROJECT EXPERIENCE

To date I have conducted ecological and biodiversity studies for over 90 projects in 20 countries in Africa, projects completed include, but are not limited to:

Farim Phosphate Guinea-Bissau	Ecological Assessment of mine site and surrounds Impact assessment for expansion.
BHP Billiton, Newmont, SMFG Mt Nimba, Guinea	Small Mammal and Red Data species (Nimba Otter Shrew, *Micropotamogale lamottei*) Impact Assessment of mine site and surrounds
Hassai Gold Mine Sudan	Ecological Assessment of mine site and surrounds Impact assessment for expansion.
Lonmin Exploration Site Tanzania	Investigation of the effects of possible platinum mine on the migration routes of species, with special reference to elephants and chimpanzees.
New Liberty Gold mine Liberia	Terrestrial ecology assessment of the mine site and environs. Impact assessment and mitigations
UNEP/GEF Desert Margins Program North West Province, South Africa	Research in biodiversity and ecology in desert margins areas. Environmental awareness courses at local schools. Development of avian biological integrity index.
Rietvlei Dam Pretoria, South Africa	Investigating effects of persistent organic pollutants (PCB's Furins and other endocrine disrupting chemicals) on wildlife at Rietvlei Dam, Pretoria.
Areva Uranium Mine Centrl African Republic	Terrestrial ecology assessment of the mine site and environs. Impact assessment and mitigations
Riversdale Coal Tete, Mozambique	Terrestrial ecology assessment of the mine site and environs. Impact assessment and mitigations.
AngloGold Ashanti, Mponeng Mine North West Province, South Africa	Investigation of bird-cyanide contact patterns on Mponeng Mine tailings storage facility. Report led to a two year long extension of the project currently being conducted at Vaal Reefs Tailings storage facility by the North-West University (Potchefstroom Campus).
Vale Moatize Coal Moatize Mozambique	Development and implementation of a small mammal monitoring program and avian acoustics monitoring program.

Debswana Diamond Mine Lethlakhane Diamond Mine, Botswana	Ecological assessment and ecological input into rehabilitation plans.
Kansanshi Copper Mine Kansanshi, Zambia	Terrestrial ecological and biodiversity assessment of proposed power station sites and environs. Wetland delineation of all wetlands within proposed possible sites. Ecological and biodiversity assessment of proposed wetlands within power station sites and environs.
Little Falls Gauteng, South Africa	Terrestrial ecological and biodiversity assessment of proposed development site and environs.
Tibane, Strydom and Associates President Park, Gauteng, South Africa	Terrestrial ecological and biodiversity assessment of proposed development site and environs.
Rietvallei, Roodepoort Gauteng, South Africa	Terrestrial ecological and biodiversity assessment of proposed development site and environs.
Konkola North Zambia	Terrestrial ecological and biodiversity assessment of proposed mining and tailings storage facility site and environs.
Fairleads, Benoni Gauteng, South Africa	Terrestrial ecological and biodiversity assessment of proposed development site and environs. Wetland delineation of surrounding wetlands. Avian diversity and impact assessment.
SASOL Dyno Nobel, Bronkhorstspruit Gauteng, South Africa	Terrestrial ecological and biodiversity assessment of proposed development site and environs.
Finsch Diamond Mine Northern Cape, South Africa	Terrestrial ecological and biodiversity assessment of proposed tailings storage facility site and environs.
Doornkuil Gauteng, South Africa	Terrestrial ecological and biodiversity assessment of proposed development site and environs. Wetland delineation of all wetlands within proposed development site. Ecological and biodiversity assessment of wetlands impacted by development site.
Xstrata Merafe, Boshoek North West Province, South Africa	Terrestrial ecological and biodiversity assessment of proposed mining site and environs. Biodiversity action plan for Xstrata Merafe mining area

Letseng Diamond Mine Lesotho	Terrestrial ecological and biodiversity assessment of proposed tailings storage facility sites and environs. Wetland delineation of all wetlands within proposed tailings storage facility sites. Ecological and biodiversity assessment of wetlands impacted by tailings storage facility sites.
Xstrata Maloma Swaziland	Terrestrial ecological and biodiversity assessment of proposed coal mining site and environs. Biodiversity action plan for Xstrata Maloma Colliery mining area.
Paardeplaats, Krugersdorp Gauteng, South Africa	Terrestrial ecological and biodiversity assessment of proposed development site and environs.
Olivedale Gauteng, South Africa	Terrestrial ecological and biodiversity assessment of proposed development site and environs. Study concentrated on Red listed small mammal species.
Xstrata Thornecliff Mpumalanga, South Africa	Terrestrial ecological and biodiversity assessment of reserve. Grazing capacity assessment, stocking plan and veld management plan for Xstrata reserve
Wesizwe Platinum Mine, Boshoek North West Province, South Africa	Terrestrial ecological and biodiversity assessment of proposed mining site and environs. Biodiversity action plan for Wesizwe Platinum mining area. Veld management plan for Wesizwe Platinum mining area.
URAMIN, Bakouma Central African Republic	Terrestrial ecological and biodiversity assessment of proposed tailings storage facility site and environs.
Anglo Coal Mafube, Boshoek Mpumalanga, South Africa	Terrestrial ecological and biodiversity assessment of proposed development site and environs. Wetland delineation of all wetlands within proposed development site. Ecological and biodiversity assessment of wetlands impacted by development site.
ASA Metals, Steelpoort Mpumalanga, South Africa	Terrestrial ecological and biodiversity assessment of proposed development site and environs. Wetland delineation of all wetlands within proposed development site. Ecological and biodiversity assessment of wetlands impacted by development site.
Bathlako Chromium Mine North West Province, South Africa	Terrestrial ecological and biodiversity assessment of proposed mining site and environs.

PROFESSIONAL AFFILIATIONS

Sponsored Member of the International Association for Conservation Biology

Member of Department of Environment Agriculture and Tourism Roster of Experts as Ecology and Desertification specialist

Member of UNCCD panel of experts on ecology and desertification

2003-2006 Chairperson of the Postgraduate Students Forum of the School for Environmental Sciences and Development at the North West University (Potchefstroom Campus)

Presently co-supervisor for three Masters of Science Degree students (NWU)

Professional registered scientist at SACNASP (Pr.Sci.Nat. Reg. No: 400429/14)

PUBLICATIONS

Other

Publications in accredited, peer-reviewed journals:

Hudson, A & Bouwman, H. 2006. New records of 45 bird species in the desert margins areas of the North West Province, South Africa. Koedoe. 49(1): 91-98. Pretoria. ISSN 0075-6458

Hudson, A & Bouwman, H. 2007. Different land-use types affect bird communities in the Kalahari, South Africa – African Journal of Ecology African Journal of Ecology 45 (3): 423–430

Hudson, A., Bouwman, H. 2008. Birds associated with a tailings storage facility and surrounding areas from a South African gold mine. African journal of ecology. 46:276-281

Publications being peer-reviewed at present:

Hudson, A & Bouwman, H. The effects of a fire on birds in the Molopo Nature Reserve of the North West Province, South Africa – for review at Journal of Arid Environments

Conference Contrbutions:

2003: Arid Zone Ecology Forum – Effects of land use on birds
2004: South African Academy of Arts and Science – Effects of psigionomy on avian demography
2005: Zoological Society of South Africa – Effects of fire on avian populations
2007 Zoological Society of South Africa – Biodiversity in rehabilitated areas of New Vaal coal mine
2009: Wetlands Indaba – Fauna and Flora of Heuningvlei Pan
2009: International mine water conference - Birds Associated with the Tailings Storage Facility and Surrounds of a South African Gold Mine

Dr David Morris

Head of Archaeology, McGregor Museum

Highest qualification
PhD

Specialisation
Archaeology, Rock Art

Years in profession
1985-present

Memberships
Association of Professional Archaeologists of Southern Africa

Institution
McGregor Museum

David Morris is Head of Archaeology at the McGregor Museum in Kimberley. His PhD from the University of the Western Cape in Cape Town was awarded for a thesis on rock art of the Northern Cape, his prior Masters dissertation having focused on the site of Driekopseiland near Kimberley. He has done extensive fieldwork and contract archaeology in the Karoo and other regions of the Northern Cape. His interests include public archaeology, and he was closely involved in developing the Wildebeest Kuil Rock Art Centre outside Kimberley and in writing the SAHRA-approved Conservation Management Plan for Wonderwerk Cave near Kuruman. With John Parkington and photographer Neil Rusch, he has co-authored the book *Karoo rock engravings* (2008); and he is co-editor with Ben Smith and Knut Helskog of the book *Working with rock art*,the proceedings of an international SACRA conference held in South Africa in 2006. He has attended rock art meetings in France and Mexico and is a partner in the South Africa-Mexico rock art programme launched in 2008 and broadened to include Botswana and Moçambique (2009). He addressed colleagues in archaeology at the Russian Academy of Sciences in St Petersburg in 2004. Born in Kimberley, he has a general interest in the history of the Northern Cape; and in museums and their role in society. He was editor of the South African Archaeological Society newsletter *The Digging Stick* (1994-2001), Vice-President of the Society (2002-2004), and is a Council Member (2013-present). He is a member of the Association of Southern African Professional Archaeologists, and is an accredited Principal Investigator for Heritage Impact Assessments – archaeology (specialist in Rock Art and Stone Age, experience with historical archaeology and human remains). He has served as external examiner for post-graduate dissertation work for the University of the Witwatersrand (2011) and University of KwaZulu-Natal (2012), and external examiner for a doctoral thesis at UCT (2013). He was examination moderator for an indigenous art module at UKZN (2012). He was a member of two Ministerial Working Groups (Sites and Collections and Archaeo-Palaeo Tourism) commissioned (2010) by the NRF, Department of Science and Technology, to advise on policy with regard to the Palaeo-Sciences in South Africa, and part of a Department of Arts and Culture working group on human remains (2013).

S Fautley
Abbreviated Curriculum Vitae

Profession
Traffic & Transportation Engineer

Current Position
Western Cape
Senior Transportation Engineer

Date and Place of Birth :
15 July 1961, Cape Town

Joined Techso:
2008

Nationality
South African

Academic Qualifications
NHD in Civil Engineering, Cape Technikon 1989

Professional Associations
The Engineering Council of South African (ECSA)

Specialisation
Traffic Engineering and Transportation Planning

Languages
Afrikaans, English

Appointments
- 1986– 1992: Principal Industrial and (1986 - 1991) Industrial Technician: Geometric Design: Provincial Administration: Western Cape
- 1993– 1994: Chief Industrial Technician: Mapping and Proclamations: Provincial Government: Western Cape
- 1994 – 1995: Chief Industrial Technician Regional Services: Provincial Government: Western Cape
- 1995 - 1996: Chief Industrial Technician, Urban Transportation: Provincial Government: Western Cape
- 1997 – 1998: Senior Technician, Kantey and Templer
- 1998 - 2006: Principal Technician: Traffic Engineering, City of Cape Town
- 2006 – 2008: Regional Head, Traffic Impact Assessments and Development Control, City of Cape Town
- 2008 - Senior Transportation Engineer, Techso

Contact Details
Phone: +27 (0) 21 5577730
Mobile: +27 (0) 84 300 7722
E-mail: steve@techso.co.za

Key Experience

Stephen is a traffic engineering technologist with 27 years of experience in traffic and transportation engineering. He has completed the Transportation Planning and Study Methodology course and the Highway Capacity course at the University of Stellenbosch. Stephen has been involved with civil, traffic and transportation engineering for ten (10) years at Provincial Government of the Western Cape, 1,5 years with Kantey and Templer Consulting Engineers and 10 yrs at local authority/city level and joined Techso in August 2008.

Traffic & Transportation:

- Transportation Planning
- Traffic Engineering
- Road Safety Audits

Projects:

- Local Traffic Engineering and Transportation Plans, such as Traffic Signal Design, Traffic Calming, Parking, Road Safety Audits, Road Design, Road Signs and Lane Marking for City of Cape Town.
- Developed Structure Parking Ramp Design Guidelines for the City of Cape Town.
- Project Management: Blaauwberg Road and Diep River Bridge Design, Milnerton
- Transport Systems Management Project Design and Implementation (City of Tygerberg & City of Cape Town)
- Technical Input to the City of Cape Town Kerbside Adjudication Bid Evaluation Committee.
- Various Traffic Impact Studies: Mtubatuba Weigh Station Facility
- Project Management sub-consultant: City of Cape Town - Integrated Rapid Transport intersection and traffic signal design.
- Traffic Engineer sub-consultant: City of Cape Town - Conceptual design of Eastern Region non-motorised transport project
- Transport Impact Assessments – Various
- Transportation Modelling – TIA for Windhoek Prime Ministers Offices
- Rustenburg Municipality – Integrated Rapid Transport System – AFC
- Ekhurleni Municipality – Integrated Rapid Public Transport Network – AFC and APTMS
- Nelson Mandela Bay Municipality – Integrated Public Transport System – AFC and APTMS
- Road Safety Audits – City of Cape Town - Integrated Rapid Transit Phase 1B

CURRICULUM VITAE
Pamela S. Sidambe

Profession	:	Social Consultant
Specialisation	:	Social Impact Assessments (SIA)
Years' experience	:	12 years

KE RESPONSIBILITIES

Specific responsibilities as a Social Consultant involve social research, community and household profiling, baseline data analysis, conducting field research, stakeholder engagement, socio-economic assessments, analysis of data and communicating the results. This includes managing and coordinating the Social Impact Assessment (SIA) process and compiling SIA reports in line with the country's guidelines and legislation.

SKILLS BASE AND CORE COMPETENCIES

- Social Impact Assessments (SIAs);
- Social Impact Management Plans;
- Socio-Economic Baseline Studies;
- Community needs analysis and profiling;
- Community development facilitation;
- EIA legislation;
- Public participation process;
- Project administration and management;
- Stakeholder engagement and management; and
- Research, report writing and presentation of results.

EDUCATION AND PROFESSIONAL STATUS

Degrees:

- MA in Social Impact Assessment, University of Johannesburg (2016)
- Honours Development Studies, University of South Africa (2011)
- BA in Community Development, University of South Africa (2009)

Courses:

- Certificate in HIV/Aids Care and Counselling. University of South Africa (UNISA) (2007).
- Diploma in Community Development. Association of Business Managers and Administrators (ABMA), United Kingdom (UK) (2006).
- Certificate in Systemic Family Counselling. Institute of Systemic Therapy/CONNECT (2005).

EMPLOYMENT

- July 2016 – date: Savannah Environmental (Pty) Ltd.; Social Consultant
- July 2013 to June 2016: Part-time Socio-Economic Consultant
- May 2010 to June 2013: CHOC Childhood Cancer Foundation; Divisional Assistant
- May 2009 to April 2010: BKS Engineering; Document Management Officer
- January 2004 to May 2007: Outreach Development Management; Project Manager

SYNOPSIS OF PROJECT EXPERIENCE

Social Impact Assessment Reports:

- September 2016: Specialist SIA report for the proposed Orkney Solar Farm Project and associated infrastructure, North West.
- August 2016: Specialist SIA report for the proposed Noupoort CSP Project and associated infrastructure, Umsobomvu, Northern Cape.
- August 2016: Specialist SIA report for the proposed 10MW Scuitdrift Solar Energy facility, near Augrabies, Northern Cape.
- August 2016: Specialist SIA report for the proposed road realignment project, Pofadder, Northern Cape.
- August 2016: Specialist SIA report for the proposed industrial development, Kuruman, Northern Cape.
- August 2016: Specialist SIA report for the proposed Solar Reserve Kotulotsatsi PV Facility & associated infrastructure near kenhardt, Northern Cape.
- July, 2016. Specialist SIA study for the proposed 400kV power line, Ilanga, Northern Cape Province.
- July 2016: Specialist SIA report for the proposed Saldanha Bay strengthening project, Western Cape.
- July 2016: Specialist social scoping study for the proposed Karoshoek Solar Valley Development- Power line, near Upington, Northern Cape Province (for FG Emvelo (Pty) Ltd);
- July 2016: Specialist SIA report for EIA process for the proposed Karoshoek Solar Valley Development- Power line, near Upington, Northern Cape Province (for FG Emvelo (Pty) Ltd); and
- July 2014: Specialist Socio-Economic Assessment for the proposed Cultural Precinct in Sandton, Gauteng Province.

Experience in Community Projects

- Community asset profiling and needs analysis;
- Stakeholder profiling, partnership building and stakeholder management;
- Strategy development, policy reviews and development;
- Facilitating community involvement and participation in planning and implementation of development projects;
- Project conceptualisation, planning and implementation management; and
- Data collection, impacts analysis and recommending mitigation measures;
- Programme and project performance Monitoring and Evaluation.